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Car Access Systems

Model: All

Production: All

OBJECTIVES

After completion of this module you will be able to:

- Understand the history of electronic vehicle immobilization systems.
- Describe the difference between CAS3 and CAS4
- Describe the operation of each system.

Introduction

History of Electronic Vehicle Immobilization at BMW

Electronic vehicle immobilizers have been used at BMW since the early 1990s.

The first system that prevented unauthorized starting involved entering a 4-digit code in the vehicle's on-board computer. The engine could not be started without entering this code.

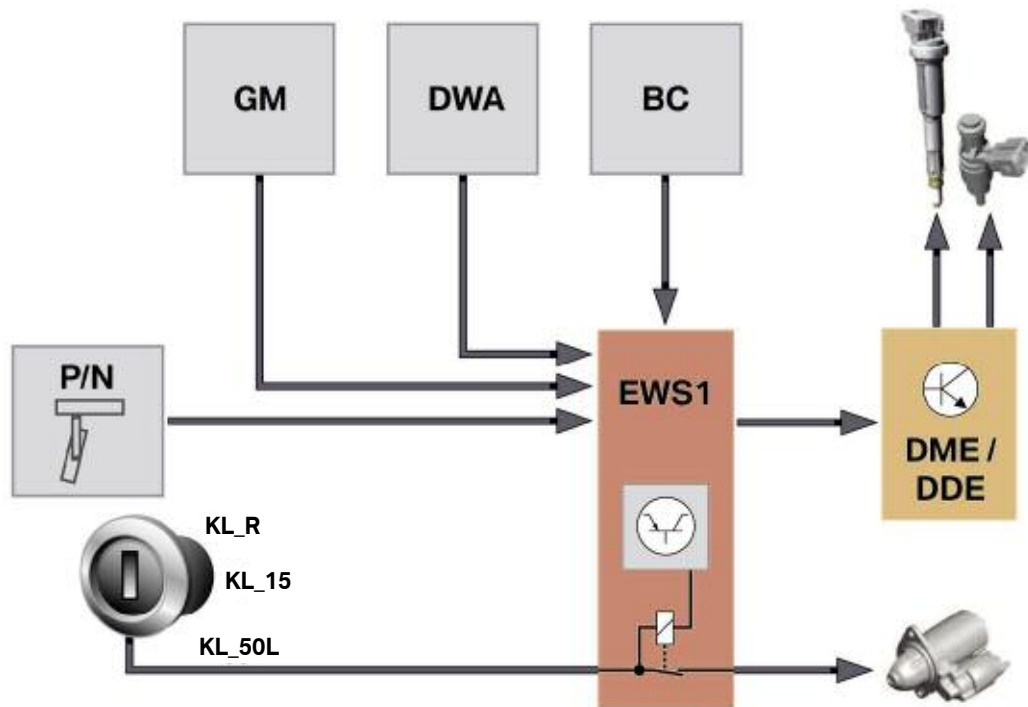
The disadvantage of the system was that the code had to be entered manually each time in order to secure the vehicle.

EWS1

The first electronic vehicle immobilizer that was activated automatically, the EWS1, was installed in all model series from January to December 1994. The EWS1 consisted of a relay that interrupted the starter circuit when the central locking was activated. The starter circuit could be additionally inhibited via the on-board computer (BC-code active).

The disadvantage of the system was that deactivation took place through the lock barrels and the central locking system. The EWS1 was switched off if the lock barrels were opened by force. The BC-code had to be entered manually.

Automatic transmission vehicles could be started only in selector lever position P/N.



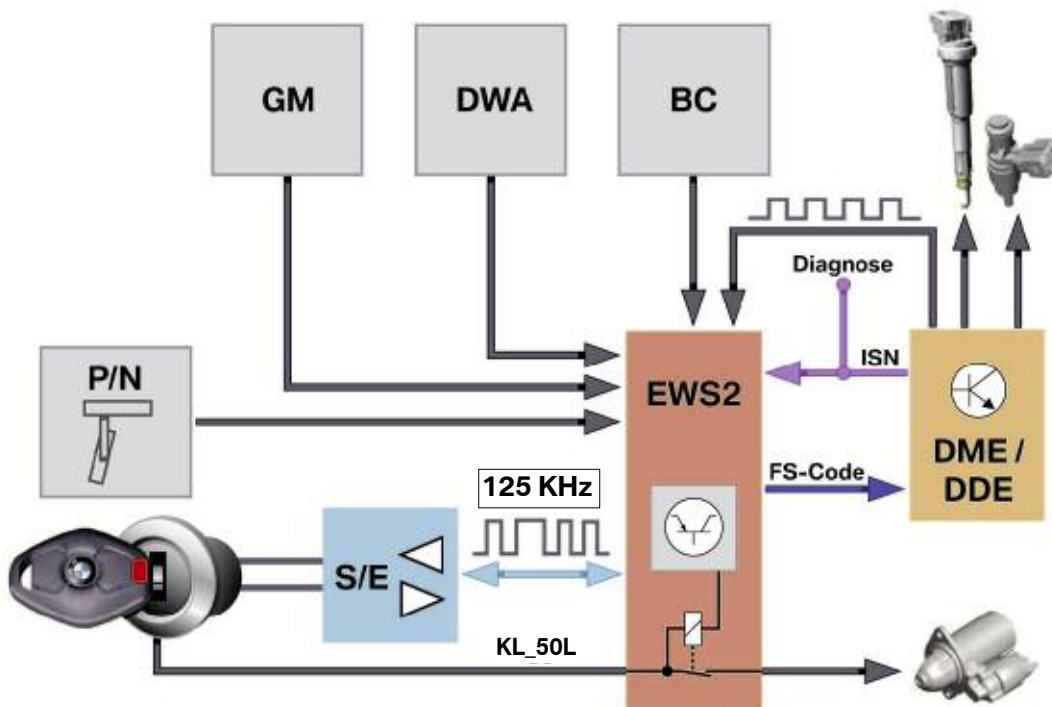
EWS1 System Overview

EWS2

The first electronically coded vehicle immobilizer, the EWS2, was installed in all vehicles as from January 1995. The EWS2 prevented the engine from being started after tampering with the ignition lock or the lock barrels in the doors. The EWS2 consists of the following components:

- Vehicle key with transponder chip.
- Ring antenna at ignition lock.
- Transceiver module for data exchange with the key.
- EWS control unit for start enable, terminal 50.
- Digital motor electronics for enabling the ignition/injection systems.

The electronic vehicle immobilizer consists of an EWS control unit that manages up to 10 vehicle keys and the digital motor electronics DME/DDE. The vehicle-specific data from the BMW database are programmed ex-factory in the control unit and assigned directly to the vehicle. In turn, the DME is assigned to the EWS control unit via the individual control unit number ISN.



EWS2 System Overview

In order to start the vehicle, the key data in the transponder chip are read out via the ring antenna at the ignition key and the transceiver module. The transceiver module transfers the key data via a bidirectional data cable to the EWS2.

The EWS control unit checks the correctness of the key data and only then sends an enable signal to the DME and the starter. After the engine has been started, the EWS control unit generates new key data (variable code) and sends them back via the bidirectional data line to the transponder chip in the key.

The EWS control unit sends the enable signal in the form of a 32 bit enable code via a unidirectional data line to the DME.

The enable code is formed from the ISN number (individual control unit number) of the DME and an internally calculated counter.

The enable code is stored in the DME. During the next start procedure, the next number is sent and the counter is incremented by 1. The system is OK as long as the counter in the EWS and the DME is incremented consistently.

If the counters run more than 5 starts apart the ignition and the fuel injection will no longer be enabled in the DME.

This situation can occur when the engine is stalled just after starting, e.g. in driving school vehicles. The EWS recognized the start and increased the counter. The DME was busy with the start procedure (processor utilization) and has not yet stored the enable code and therefore not incremented the counter.

In this case, it is necessary to perform EWS/DME matching via the diagnostic interface. As part of this procedure, the DME transfers and stores the ISN in the EWS control unit. The two counters are also reset.

With the aim of protecting the starter, the DME transfers the engine speed signal to the EWS.

If the engine is cranked but does not start, the start procedure is interrupted after a specific time defined in the control unit. Additional conditions such as the status of the central locking, automatic transmission range, DWS function, BC function are read in via separate interfaces in the EWS2 and evaluated.



Since the DME/DDE is assigned to the EWS control unit by means of the ISN, a DME can be replaced from another vehicle for test purposes. EWS-DME matching, however, must be performed for this purpose in order to transfer the new ISN to the EWS.

EWS3 and EWS3.2

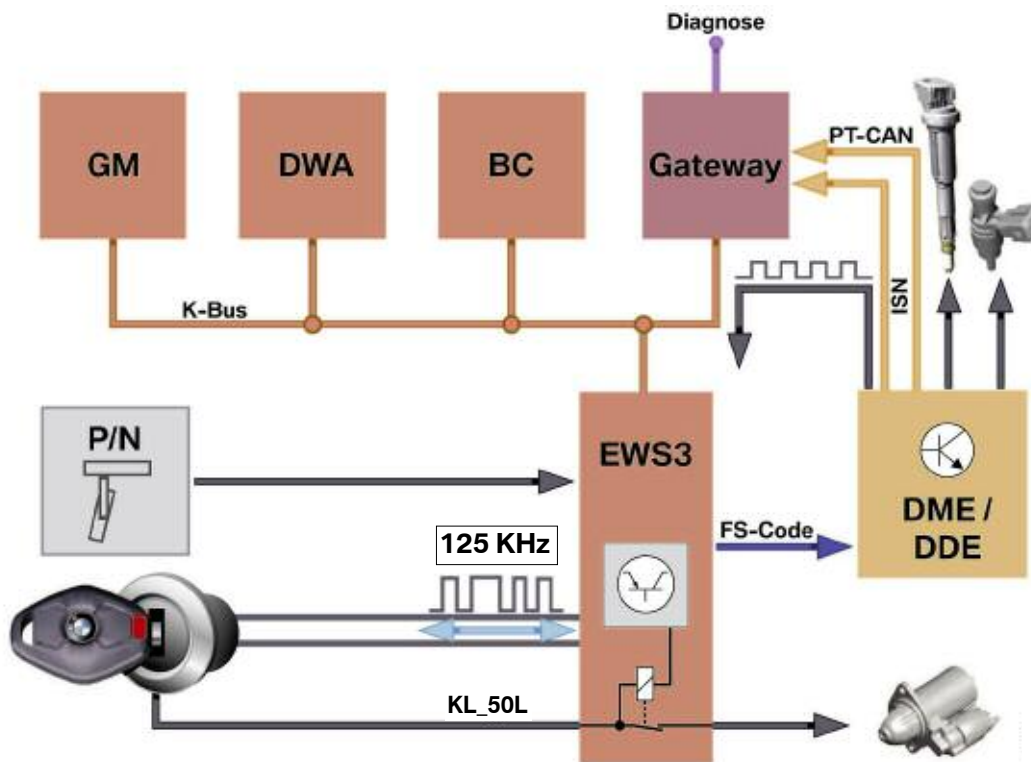
The EWS3 was introduced in the E38 as from September 1996. Its installation in the E39 followed in March 1997. Since these models are vehicles equipped with K-Bus systems networks, the general conditions are read in via the K-Bus.

Likewise, diagnosis as well as EWS-DME matching take place via the K-Bus.

The new feature of the EWS3 is that it no longer has the transceiver. The EWS3 now reads in the key data from the transponder chip directly via the ring antenna. After the engine has been started, the new variable code is transferred directly to the key.

The enable procedure for the starter and DME remains the same.

The EWS3 is renamed EWS3.2 with the introduction of the EWS3.3. The reason for this is the different matching procedures between the EWS and DME. In the case of the EWS3.2, EWS-DME matching takes place based on the ISN number, i.e. the same procedure as used in the EWS2.



EWS3/3.2 with K-Bus System Overview

EWS3.3

The EWS3.3 was introduced in the E46 as from April 1998. The EWS3.3 differs from the 3.2 version in terms of the following functions.

The 32 bit secret key was retained but the encryption procedure was changed. The entire vehicle data and the secret key are contained in the EWS control unit and assigned directly to the vehicle.

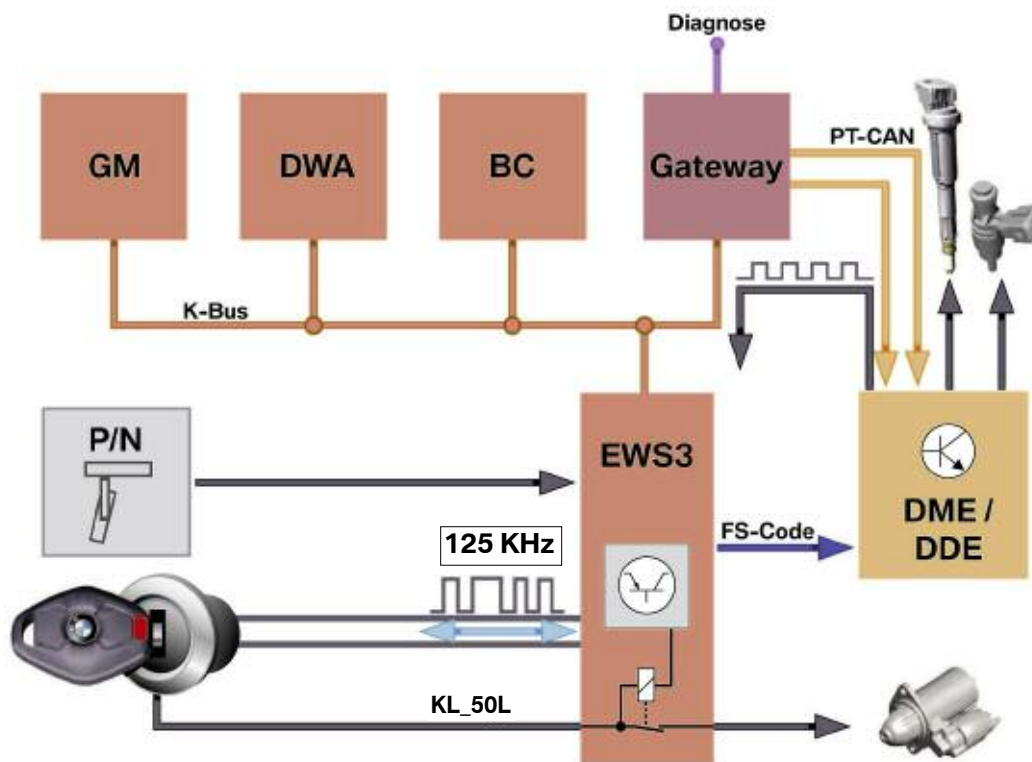
The DME/DDE is now assigned to the EWS control unit by way of programming.

Programming takes place via the PT-CAN and is possible only with an empty (blank) control unit.

Note: Consequently, swapping the control unit from another vehicle is no longer possible.

The EWS control unit contains the starter relay for enabling terminal 50 to the starter.

The EWS control unit sends a permanently changing code for the purpose of enabling the DME. This code contains information on the EWS control unit that is compared with the programmed information. If the sent data is OK, the DME/DDE will enable the ignition and fuel injection systems.



EWS3.3 System Overview

CAS with EWS3.3

The car access system CAS was introduced with the launch of the E65 (03/2002). The CAS is a vehicle access system that, in addition to the central locking function, also contains the electronic vehicle immobilizer.

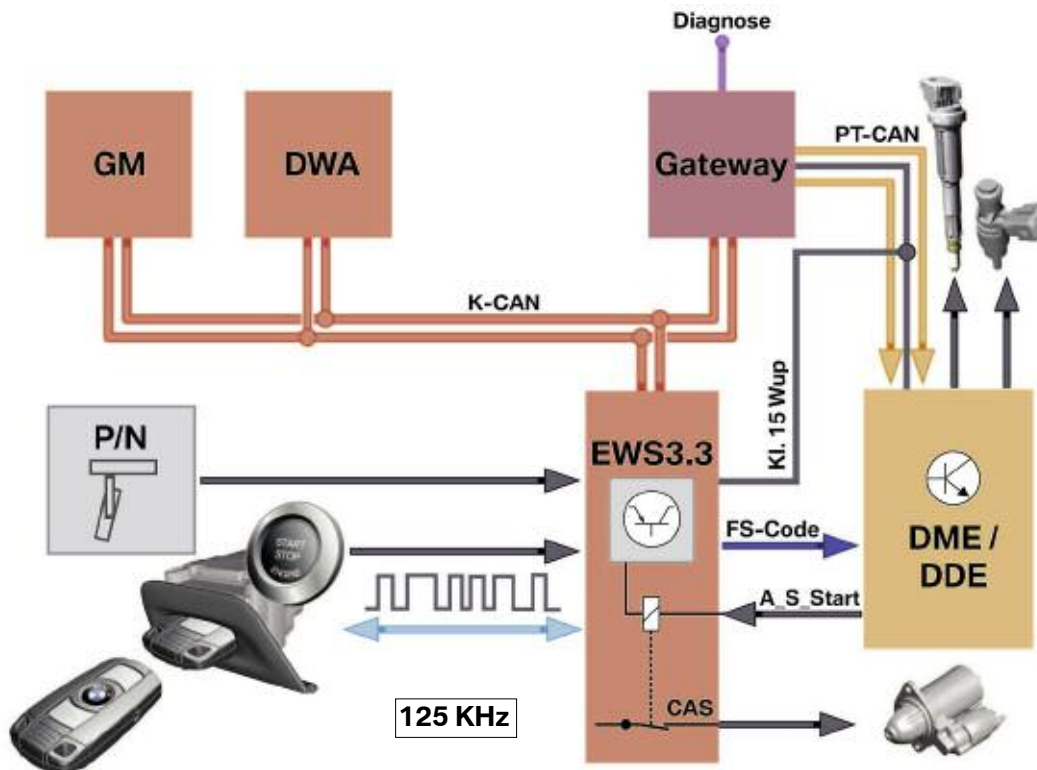
The CAS is connected to the systems network via the K-CAN. Vehicles with CAS generally feature an ID transmitter, an insertion slot and the Start-Stop button. The exceptions include the E60, E61, E63 and E64 up to 08/ 2005.

The vehicle key data are read into the CAS via the key slot. In principle, the function is identical to the previous EWS3.3. The DME/DDE is enabled by means of the enable code.

The CAS contains the start relay that is activated by means of an integrated circuit (ASIC). The ASIC is informed that the DME/DDE is ready to start via the A_S_Start line.

Furthermore, the start procedure is terminated via the A_S_Start line if the engine does not start up because, for example, there is a fault in the PT-CAN system.

CAS with EWS3.3 System Overview



Note: The signal from the key fob to lock and unlock the vehicle remotely is set at a frequency of 315 MHz.

Note: For more information refer to the E65 EWS training material.

Car Access System 3 with EWS4

The car access system 3 with the new generation of electronic vehicle immobilizer EWS4 was introduced in E92 vehicles with the N52/N54 gasoline engine. The EWS4 is a vehicle immobilizer that prevents unauthorized engine start.

The car access system 3 with an EWS3 interface was first used on diesel engine vehicles. This system evolved into CAS3 with EWS4.

The vehicle immobilizer consists of the ID transmitter which is identical for the vehicle and therefore to CAS3. CAS3 exchanges data with the DME via the CAS-Bus and cancels the vehicle immobilization function.

The EWS4 uses a new, modern encryption method. A 128 bit long secret key is assigned to each vehicle and stored in the BMW database.

This secret key is known only to BMW. The secret key is programmed and locked in the CAS and in the DME control unit. Once entered in the control unit, the secret key can no longer be changed or deleted. This therefore means that each control unit is assigned to a specific vehicle.

One control unit in the system sends an encrypted code to another control unit for the purpose of checking the authorization. In turn, this control unit sends back a corresponding code.

Replacement of Control Units

The procedure described below must be followed in order to replace a defective control unit (CAS/DME).

The required control unit is ordered together with the necessary vehicle data (VIN) from one of the worldwide central stores, e.g. in Dingolfing for Europe.

A new "blank" control unit is programmed with the corresponding program data for the vehicle and the secret key from the BMW database, locked and sent to the dealer.

The new control unit is installed in the vehicle and started. **No** matching procedure is necessary as in earlier EWS systems.

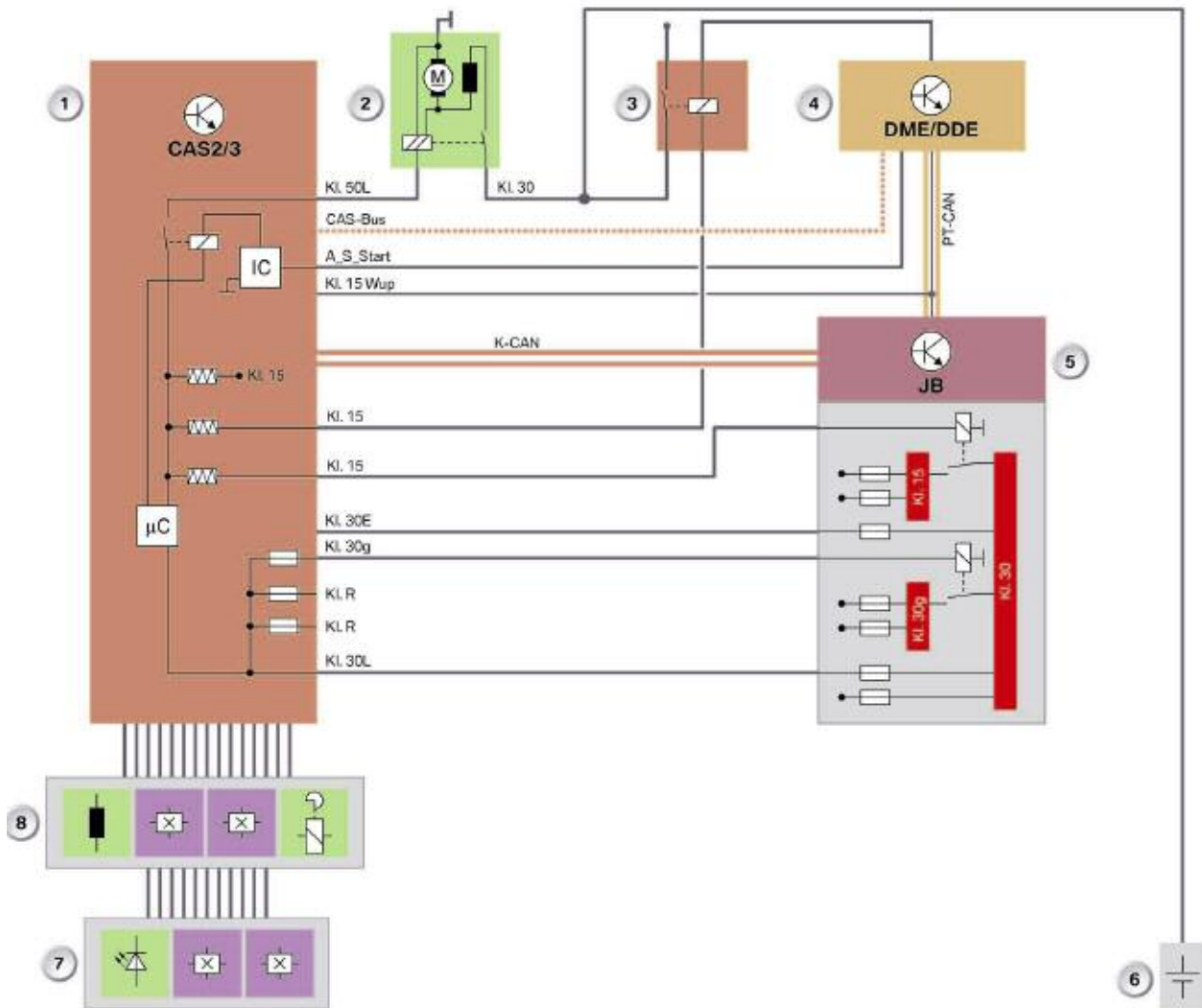


Since the control units are assigned to the specific vehicle, replacement with a unit from another vehicle is not possible.



Beginning with the introduction of the E70 and as part of a rolling update, most current (BN 2000) vehicles use CAS3 in combination with the EWS4 system. For further information regarding these systems refer to the Car Access System (E70) section of this training material.

Electronic Vehicle Immobilizer 4 in the E92



Index	Explanation	Index	Explanation
1	Car access system with EWS4	5	Junction box
2	Starter	6	Battery
3	Injection relay	7	Start/Stop button
4	Digital motor electronics MSV80/MSD80	8	Holder

The electronic vehicle immobilizer consists of several components. In the E92 these components are the CAS3 and the DME MSV80/MSD80.

The CAS3 contains the software for the EWS4 and, with corresponding identification of the ID transmitter, the enable of terminal R, 15 and 50 for the starter. The enable for the ignition and fuel injection systems is resident in the DME.

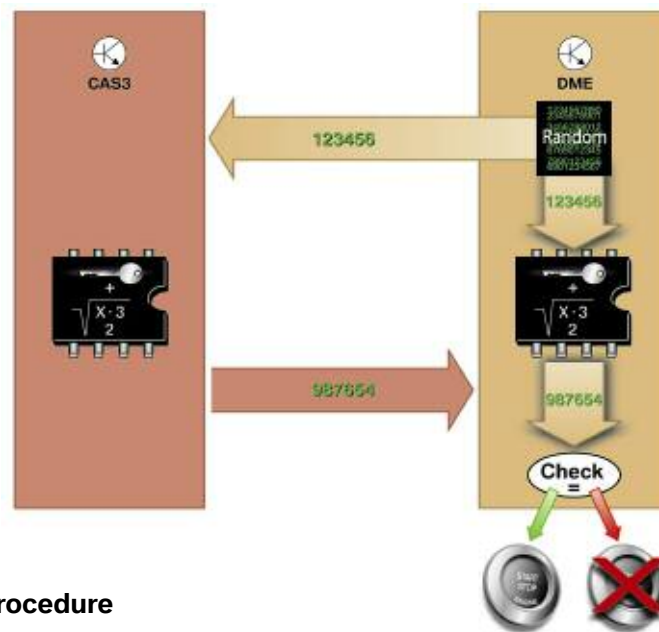
Both control units are connected by the KCAN, the junction box serving as the gateway and the PT-CAN. Data are also exchanged on the CAS-Bus. The data are always transmitted parallel via both bus systems. The signals that arrive first are used.

The DME activates the fuel injection relay for the power supply of the fuel injectors. The DME features a direct line (A_S_Start) to the starter relay in the CAS in order to initiate the start procedure and, if necessary, to terminate it, e.g. in the event of a PT-CAN fault or a faulty signal, e.g. engine speed signal.

Start Enable

The start procedure is enabled by means of a special request and response procedure known as challenge-response.

The DME generates a random number in a random generator and sends it as the challenge to the CAS. The CAS and the DME contain the same secret key and both control units use the same calculation algorithm.



EWS4 Start Enable Procedure

The CAS now calculates the result from the received random number, the secret key and the algorithm. The result is sent as the CAS response to the DME.

During this time, the DME now calculates the same random number with the secret key and the algorithm and already knows the result. The response of the CAS is compared with the result of the DME. Start is enabled if the result is identical.

Time-based Query

As from terminal R or terminal 15 ON, a query (challenge-response) is performed as long as the engine is not yet running. A fault code is entered in the CAS if no DME response is received approx. 10 seconds after the start of the query or if the response deviates.

Key Memory Expansion in CAS3

The data memory of the remote key in vehicles equipped with CAS3 is increased from 256 bytes to 512 bytes.

The benefit of this key memory expansion for the customer is that more accurate information on the time and scope of the workshop visit can be provided as part of the service acceptance procedure.

The following system network information can be read out from the identification transmitter with the key reader in the service workshop.

Data	Previous	New	Remark
Mileage reading	X		Current mileage (km) reading of vehicle
Vehicle Identification (VIN)	X		
Key number	X		Number of identification transmitter
Service- relevant CC message	X		
DTC Information (fault code memory)	X		As from SAM 25, the DTC data is indicated and linked to possible measures in PUMA
NAVI-DVD version		X	Data status of NAVI-DVD
Engine oil		X	Information on topping up or draining the engine oil (overfilling)
Battery condition		X	Change status of the battery in the vehicle
Integration stages		X	I-stage that left the factory, I-stage last programmed and I-stage currently available in the dealership network

NOTES

PAGE

Car Access System 3 (E70)

The Car Access System now features the 3rd generation of control units. The electronic vehicle immobilizer 4 (EWS 4) is also used in connection with the Car Access System 3. The previous functions of the electronic vehicle immobilizer 3 have been retained.

The Car Access System 3 can therefore be operated together with the electronic vehicle immobilizer 3 or 4. The digital motor electronics and the Car Access System 3 were incorporated in the overall electronic vehicle immobilizer system in the E70.

In addition, the electronic transmission control is used as a further immobilizer. The electronic vehicle immobilizer 4 improves the antitheft properties of the vehicle.

A longer cryptic code is used for the data exchange.

The cryptic code provides the enable to start the engine. The Car Access System 3 is backwards compatible with the Car Access System 2. This means the functions of the Car Access System 2 are also included in the Car Access System 3.

The electronic vehicle immobilizer 3 or the electronic vehicle immobilizer 4 is used depending on the engine installed and the associated digital engine management.

The table below shows the assignment of the engine management to the respective electronic vehicle immobilizer.

Vehicle	Launch Date	Engine	Engine Management	EWS function
E70	10/06	N62B4801	ME9.2.3	EWS 3
E70	10/06	N52B3001	MSV80	EWS 4

History of the Car Access System

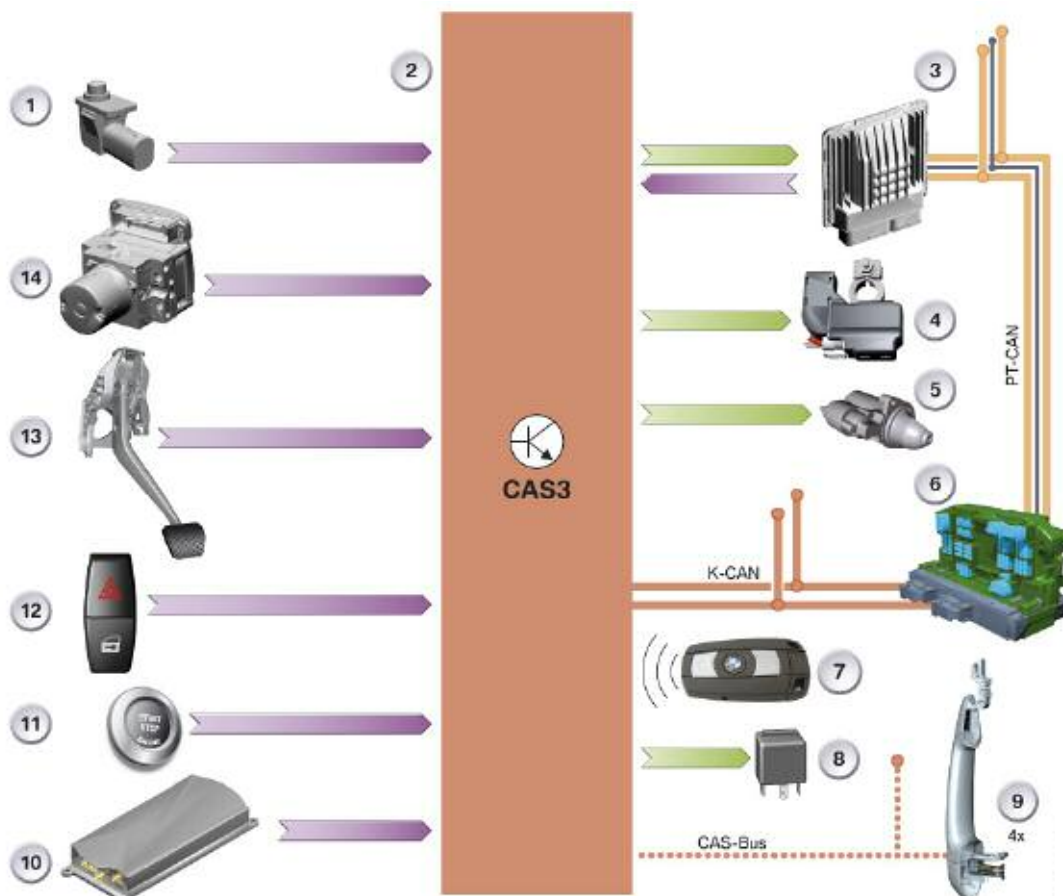
The Car Access System was used for the first time in the E65 (03/2002). It has undergone continuous further development and has been successively introduced in various BMW models.

CAS3 combined with EWS4 has been gradually installed in most (BN2000) vehicles (E6x, E8X, E9x and E7x) over the recent years.

With the introduction of the F01 in 2008 (the first of the BN2020 vehicles) the Car Access 4 System was introduced.

Note: For more information regarding the Car Access 4 system installed in F0x vehicles refer to the Car Access System 4 (F01) section of this training material.

IPO Car Access System 3 (CAS 3)

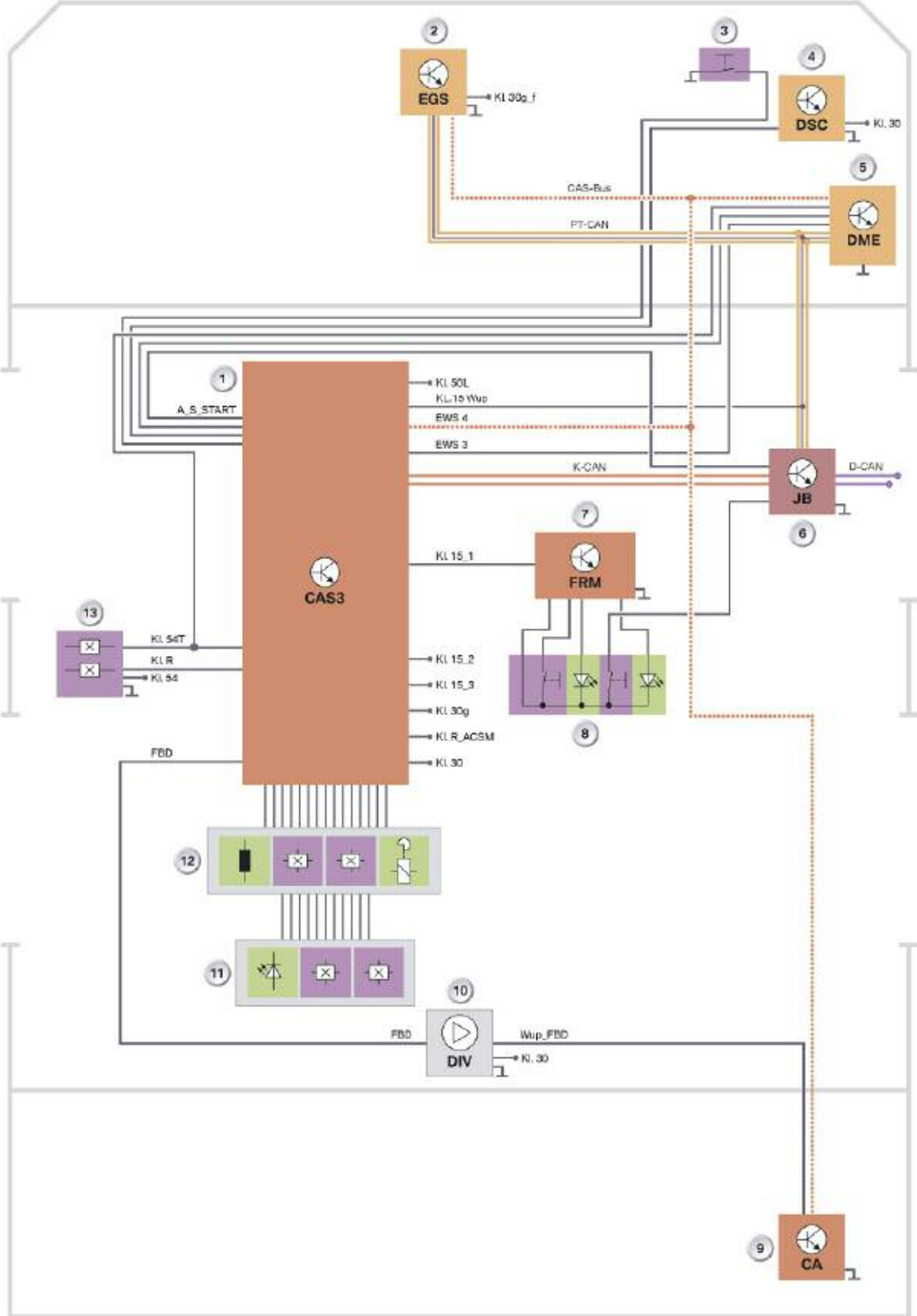


The Car Access System 3 (2) is responsible for terminal control. For instance "Terminal 15 ON" is made available to the intelligent battery sensor (4). The terminal status, e.g. "Terminal R ON/terminal R OFF", can be selected with the START-STOP button (11).

The Car Access System 3 provides the start enable for the starter (5) in connection with the digital motor electronics 3 and the brake light switch (13).

Index	Explanation	Index	Explanation
1	Hood contact switch	10	Telematics Control Unit
2	Car Access System 3	11	START-STOP button
3	Digital Motor Electronics	12	Central Lock Button
4	Intelligent Battery Sensor	13	Brake Light Switch
5	Starter	14	Dynamic Stability Control
6	Junction Box Control Unit	CAS-Bus	CAS-Bus
7	Identification Transmitter	K-CAN	Body-CAN
8	Terminal 15	PT-CAN	Powertrain-CAN
9	Electronic Outer Door Handle Module		

System Circuit Diagram - CAS 3



Legend for System Circuit Diagram - CAS3

Index	Explanation	Index	Explanation
1	Car Access System 3	KL15_3	Terminal 15 (output 3)
2	Electronic Transmission Control Module	KL15 Wup	Terminal 15 (wake-up)
3	Hood contact switch	KL30	Terminal 30
4	Dynamic Stability Control	KL30g	Terminal 15 (switched)
5	Digital Motor Electronics	KL30g_f	Terminal 15 (switched, fault)
6	Junction Box Control Unit	KL50L	Terminal 50 load
7	Footwell Module (FRM)	KL54	Signal, brake light switch
8	Central-lock button/hazard warning switch	KL54T	Signal, brake light switch
9	Comfort Access (CA)	CAS-Bus	CAS-Bus
10	Remote control receiver in diversity module	D-CAN	Diagnosis CAN
11	START-STOP button	K-CAN	Body CAN
12	Holder	PT-CAN	Powertrain CAN
13	Brake Light Switch (BLS)	A_S_START	Start/Start termination DME
KLR	Terminal R	FBD	Remote control services
KLR ACSM	Terminal R, Advanced Crash Safety Management	WUP FBD	Wake-up, remote control services
KL15_1	Terminal 15 (output 1)	EWS 3	Electronic Vehicle Immobilizer 3
KL15_2	Terminal 15 (output 2)	EWS 4	Electronic Vehicle Immobilizer 4

Functional Overview

The Car Access System 3 is responsible for many functions, including the master for the following functions:

- Central locking
- Power windows
- Panoramic glass roof
- Comfort Access

The Car Access System 3 enables or interrupts the execution of the aforementioned functions.

The control units which execute the functions are:	
Junction Box control unit	Central Locking
Footwell Module	Power Windows
Roof Functions Center	Panoramic Glass Roof
Comfort Access	

The following are additional functions integrated in the Car Access System 3:

- Terminal control
- Electronic vehicle immobilizer 4
- Vehicle data storage (See service Information section)

Terminal Control (E70)

The remote control must be inserted and locked in its slot in order to activate terminal control. The vehicle then automatically receives the terminal status "terminal R ON." The terminals can now be changed with the START-STOP button in the following order:

- Terminal 15
- Terminal R
- Terminal 30
- Terminal R
- Terminal 15

Note: This order is only possible when the brake pedal has not been pressed on automatic transmission vehicles. As soon as the brake pedal is pressed, the engine will start the next time the START-STOP button is pressed.

Terminal Control (in Comfort Access)

On vehicles equipped with Comfort Access, the identification transmitter need only be located in the vehicle interior and need not be inserted in the holder. The identification transmitter is detected by the antennas in the vehicle interior. Provided the vehicle was left in a correct manner, the terminal selection will start with the status "terminal 30". Provided the brake pedal has not been pressed, it is now possible to switch through the terminals one after the other by pressing the START-STOP button.

Note: For more information refer to the Terminal Control section of this training material.

Electronic Vehicle Immobilizer 3 (EWS 3)

The familiar functions of the previous electronic vehicle immobilizer 3 have been retained. The Car Access System 3 is integrated in the system network via the K-CAN. The vehicle key data are read into the Car Access System 3 via the key slot.

Pin 20 is used in connection with the Car Access System 3. The enable code is signalled to the digital motor management via this pin.

The Car Access System 3 contains the start relay that is activated by means of an integrated circuit. The integrated circuit is informed via a separate line (A_S_Start) that the digital engine electronics is ready to start. Furthermore, the start procedure is terminated via the A_S_Start line if the engine does not start up because, for example, there is a fault in the PT-CAN system. Data transmission is unidirectional.

Electronic Vehicle Immobilizer 4 (EWS 4)

The electronic vehicle immobilizer 4 is an immobilizer system that prevents unauthorized engine start. It was used for the first time in the Car Access System 3 in the E92. This combination has been gradually introduced in most (BN2000) vehicles.

The electronic vehicle immobilizer 4 uses a new, modern encryption system. A 128 bit long secret key is assigned to each vehicle and stored in the BMW database. This secret key is known only to BMW. The secret key is programmed and locked in the Car Access System 3 and in the digital engine management.

Once entered in the control unit, the secret key can no longer be changed, deleted or read. This therefore means that each control unit is assigned to a specific vehicle. The electronic vehicle immobilizer 4 operates with bidirectional and redundant data transmission. The K-CAN (CAN protocol) and CAS-Bus (K-Bus protocol) are used for this purpose.

Pin 30 of the Car Access System 3 serves as the connection to the CAS-Bus. The redundant data transmission enables operation of the electronic vehicle immobilizer even if a bus system fails due to a defect.

Design of EWS 4

The vehicle immobilizer consists of the identification transmitter which identifies itself to the vehicle and therefore to the Car Access System 3. The Car Access System 3 exchanges data via the CAS-Bus with the digital motor electronics and thus cancels the immobilizer function.

The software for the electronic vehicle immobilizer as well as the enable for the starter is resident in the CAS 3. The digital engine management is responsible for issuing the enable for the ignition and fuel injection.

The gearbox functions are enabled by the electronic transmission control. The remote control or the identification transmitter must be identified as matching the vehicle before the electronic vehicle immobilizer issues the start enable. This already takes place before a vehicle is unlocked.

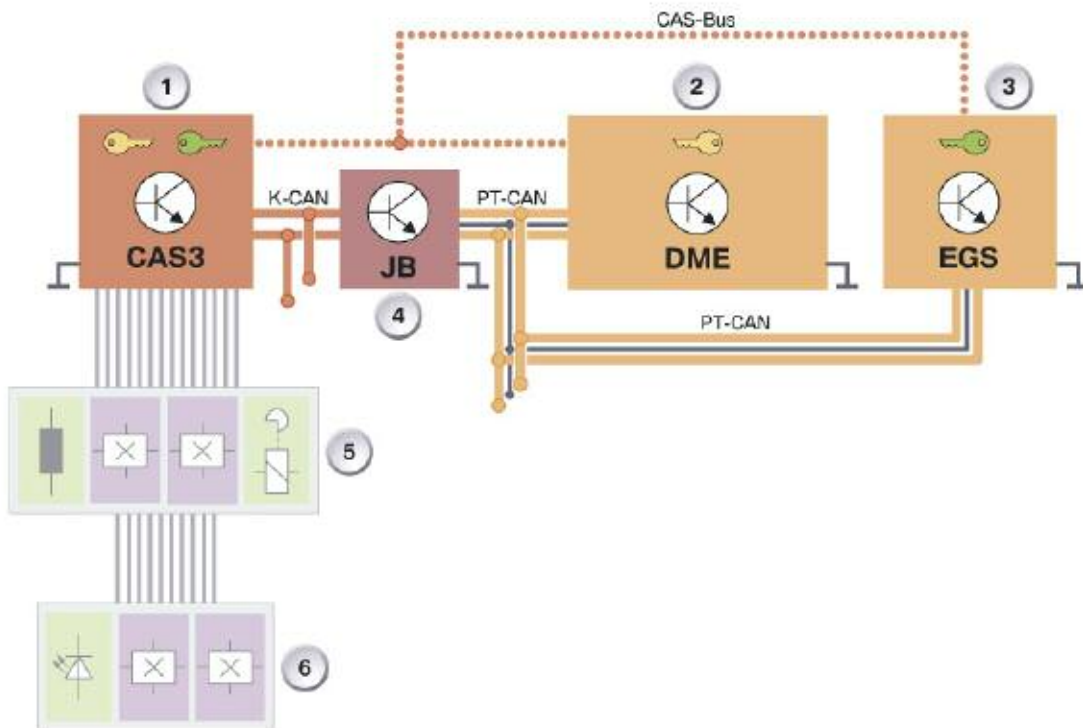
A renewed check (authentication) must be performed as soon as an attempt is made to start the engine. The check establishes whether the remote control matches the vehicle or the identification transmitter is located in the vehicle interior.

The vehicle can be started if the check is successful. Authentication starts with the status "Terminal 15 ON".

Note: The start enable can be given only by a remote control matching the vehicle or a suitable identification transmitter.

Start Enable through EWS

The start procedure is enabled by means of a special request and response procedure known as challenge-response. As from "Terminal 15 ON", the digital engine management sends an encrypted random number to the CAS 3. The digital engine management generates the random number in a random number generator.



Index	Explanation	Index	Explanation
1	Car Access System 3	4	Junction Box Control Unit
2	Digital Motor Electronic	5	Key Slot
3	Electronic Transmission Control	6	START-STOP Button

From this random number together with its secret key, the Car Access System calculates a response and sends it to the digital engine management. In the meantime, the digital engine management calculates the expected response from the random number with its secret key.

The Car Access System 3 and the digital engine management use the same secret key and algorithm for the calculation. The electronic vehicle immobilizer is cancelled if the value which the CAS 3 sends to the digital engine management agrees with the value calculated by the engine management.

The engine can now be started.

Note: As from "Terminal 15 ON", a cyclic query (challenge-response) is performed as long as the engine is not yet running. A fault code is entered in the CAS 3 if there is no query from the digital engine management approximately 10 seconds after the start of the request.

■ Data Transmission

Data transmission is redundant via the bus systems. The signal from the digital engine management reaches the CAS 3 via the K-CAN and the CAS-Bus. The digital engine management, however, is connected to the PT-CAN. For this reason, the signal is sent via the gateway of the junction box control unit to the K-CAN. The runtime of the signals via the bus systems is of no significance as the signal that reaches the digital engine management first is used for the electronic vehicle immobilizer.

The authentication is repeated in response to following events:

- Transmission and response time exceeded
- Transmission problems
- Response with the secret security code incorrect (e.g. incorrect secret key due to control unit from another vehicle).

Secret Key

The control units are assigned a secret key on the assembly line. This secret key is generated from a random number. The secret key is valid for a pair of control units and linked to the specific vehicle. This means that one pair of control units receives the same secret key. Once the secret key has been entered, the control unit is locked. From this point on, the control unit is permanently tied to this secret key and the vehicle. The CAS 3 and the digital motor electronics form one pair of control units.

Note: Since the control units are assigned to the specific vehicle, replacement with a unit from another vehicle is not possible. When replacing a control unit, the new control unit must be ordered from BMW. Matching of the control units to each other is no longer necessary.

Gearbox Enable

The enable is based on a procedure similar to that used for EWS 3. As from "Terminal 15 ON", the CAS 3 sends encrypted individual codes to the electronic transmission control. The electronic transmission control deciphers and checks these individual codes. If the check is successful, the gearbox control unit will enable the gearbox functions.

The electronic gearbox control unit forms a pair of control units together with the CAS 3.

Start Value Matching

A start value matching procedure between the CAS 3 and the electronic transmission control is performed on the assembly line. As part of this procedure, the CAS 3 transfers in encrypted form an individual code to the electronic transmission control.

Consequently, the electronic transmission control knows the individual code and can check whether the gearbox functions can be enabled.

Service Information (CAS 3)

Emergency Release

The parking lock cannot be released in the event of a defect or data transmission error. For this reason, the E7x vehicles feature a mechanical emergency release facility for the parking lock.

Early vehicles used a handle for the emergency release of the parking lock is located in the luggage compartment.

This handle must be plugged in under the left cup holder, turned through 90° and pushed down. The gearbox is released as soon as the handle has been locked in position. The vehicle can now be towed but not driven.

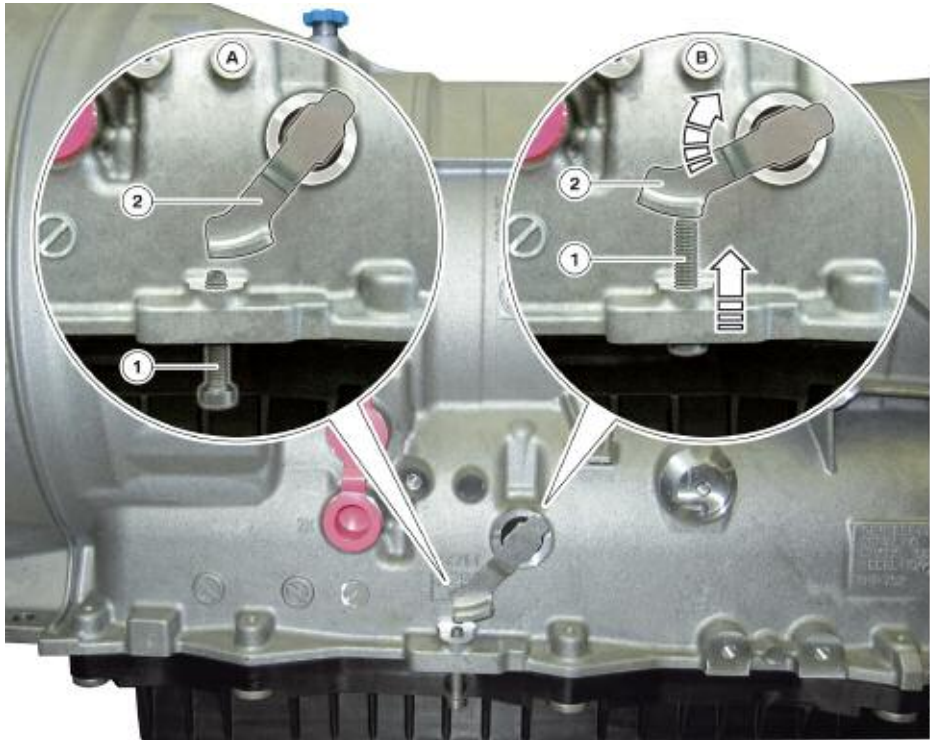


Index	Explanation
1	Turn Handle
2	Push Handle

The handle must remain locked in position while the vehicle is being towed. The parking lock will engage if the handle is removed while the vehicle is being towed. This could cause an accident in unfavorable towing situations.

Beginning with the introduction 2011 E70 LCI the existing transmission emergency release was gradually removed from all vehicles with the 8 speed automatic transmissions, as part of a rolling update.

In the event of a fault affecting the powertrain, the transmission parking lock can be unlocked mechanically and put in “Neutral” by means of a set screw/stop (adjusting screw) that acts on the gear selector lever. In addition to the mechanical transmission parking lock emergency release, the procedure to put the vehicle in “Neutral” can also be done electronically via ISTA and through a special in vehicle software solution. [See Car Access System 4 (F01)]



Index	Explanation
1	Adjusting set screw/stop
2	Parking lock lever
A	Transmission Parking lock engaged
B	Transmission Parking lock dis-engaged

Note: Refer to the repair instructions for the proper procedure on releasing the parking lock on the GA8HP automatic transmission.

Vehicle Data Storage (CAS 3)

The Car Access System 3 stores the following vehicle data:

- Personal Profile, the Car Access System 3 stores data for the Personal Profile.
- Vehicle order, the vehicle order is stored in the footwell module.
- Redundant data storage for instrument cluster.
- Data for condition-based service CBS.
- Authentication for diagnosis access to vehicle.

Data for Condition-based Service

The data for condition-based service are stored and transferred to the remote control. This data can be read out via the key reader for service purposes. The data for the condition-based service are updated during vehicle operation.

The data in the fault code memory are also updated during vehicle operation.

The conditions are:

- "Terminal 15 ON", Speed above 50 km/h and below 30 km/h.
- The data are updated after covering a distance of 10 km and at a speed below 30 km/h.

■ Manual Update of CBS Data

The procedure for transferring current data to the remote control during servicing is as follows:

- Insert remote control in its holder.
- Press and hold center-lock button and select "terminal 15 ON" with the START-STOP button.
- After 15 s the CBS data will have been transferred to the remote control.
- Read out remote control.

■ Manual Update of Fault Memory Data

The procedure for transferring current data to the remote control during servicing is as follows:

- Press and hold center-lock button.
- Insert remote control in its holder.
- Select "Terminal 15 ON" with the START-STOP button.
- The fault code memory data are transferred to the remote control after 15 seconds.
- Read out remote control.

Control Unit Replacement

A defect in the control units belonging to the EWS represents a challenge for the service technician. Since a defective control unit cannot be replaced by control units from other vehicles particular care is necessary when performing the diagnostic procedure.

A control unit can be ordered through the Parts department. However, it is important to bear in mind that the digital engine electronics (DME) and the CAS 3 are supplied already coded to the vehicle.

This has the advantage that only the control unit is replaced and the matching procedure with the electronic vehicle immobilizer is not necessary. There is no point in ordering a control unit to be kept in stock as the secret key is assigned to the control unit and the vehicle.

A matching procedure is necessary for the electronic transmission control after replacement. As part of this procedure, the CAS 3 transfers the individual code to the electronic transmission control.

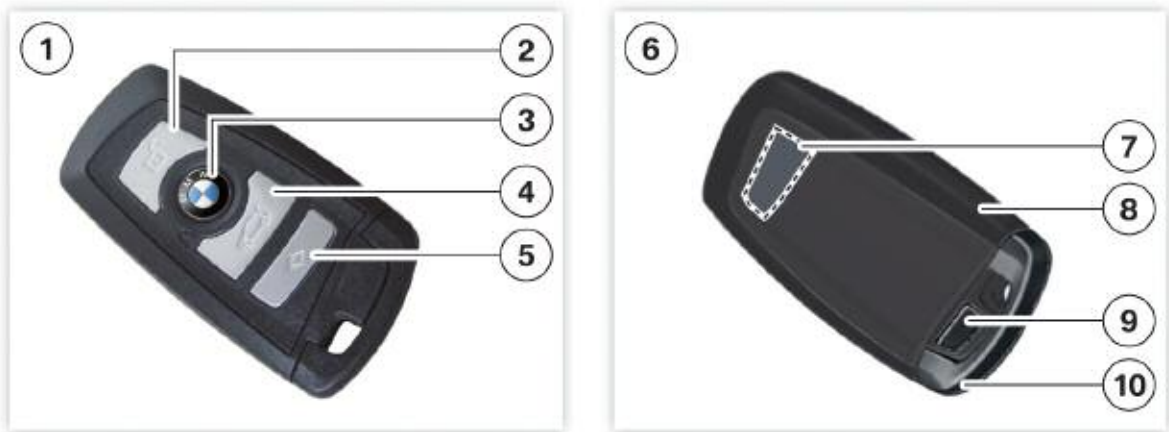
Note: The matching procedure between the CAS3 and electronic transmission control can take several minutes.

Car Access System 4 (F01)

Many Functions, One Control Unit

The Car Access System now features the 4th control-unit generation. Associated with that is complete integration of the Comfort Access functions in the Car Access System.

The F01 (introduced in 09/08) was the first BMW model be fitted with the Passive Go system as standard. Passive Go allows the driver to start the engine without actively using the ID transmitter. There is no slot for the ID transmitter on the F0x vehicles.



Index	Explanation	Index	Explanation
1	ID transmitter, top view	6	ID Transmitter, rear view
2	Unlock vehicle button	7	Location of emergency start coil
3	Lock vehicle button	8	Battery compartment
4	Unlock luggage compartment button	9	Release button for mechanical key
5	Panic alarm and headlight courtesy delay feature or open large trunk lid (F07) or Independent A/C system on (F04)	10	Mechanical key

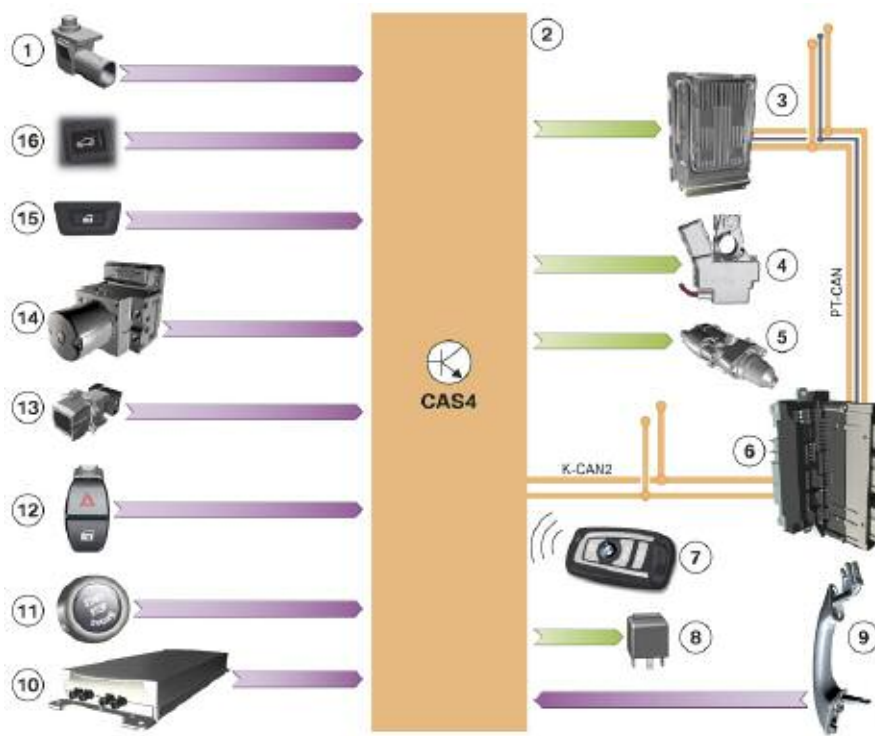
The ID transmitter only needs to be somewhere inside the passenger compartment for the engine to be started. The ID transmitter is fitted with a battery. The battery has a life of approximately four years.

Up to eight ID transmitters can be used for a particular vehicle. Four of the eight ID transmitters can be used for personal profiles.

System Overview

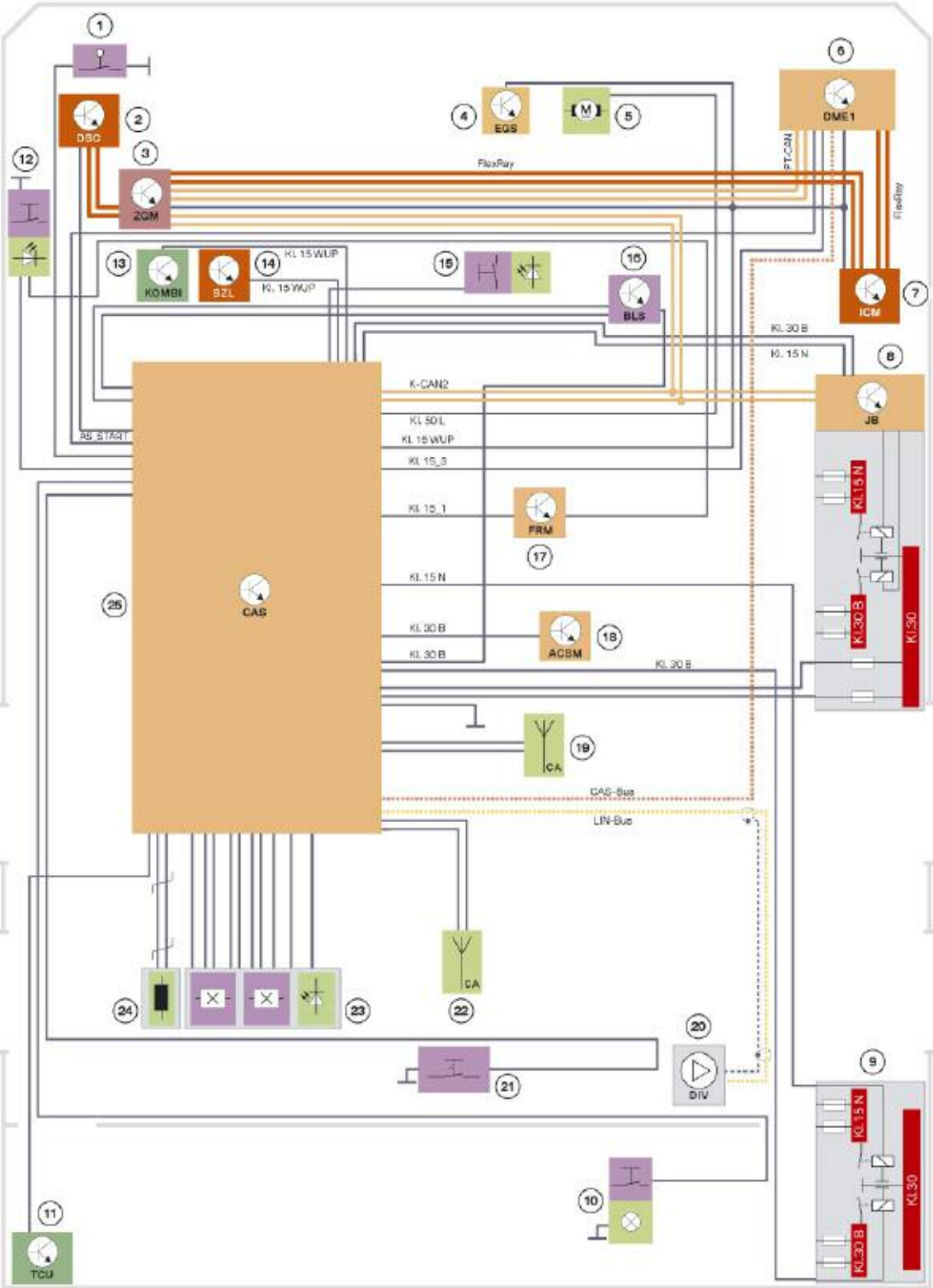
Input/Output - Car Access System 4

The Car Access System 4 (2) is responsible for terminal control. For instance "Terminal 15 ON" is made available to the intelligent battery sensor (4). The terminal statuses, e.g. "Terminal 15 ON/Terminal 0", can be selected by means of the START-STOP button (11). In conjunction with the digital motor electronics (3), the Car Access System 4 issues the start enabling signal for the starter motor (5).



Index	Explanation	Index	Explanation
1	Hood switch	11	START-STOP button
2	Car Access System 4 (CAS 4)	12	Center-lock button
3	Digital motor electronics (DME)	13	Brake light switch (BLS)
4	Intelligent battery sensor (IBS)	14	Dynamic Stability Control (DSC)
5	Starter	15	Central double-locking button
6	Junction box module	16	Interior tailgate button, A- pillar
7	Identification transmitter	CAS-Bus	CAS-Bus
8	Terminal 15	K-CAN	Bodyshell CAN
9	Electronic outer door handle module (TAGE)	PT-CAN	Powertrain CAN
10	Telematics control unit (TCU)		

System Circuit Diagram - CAS 4



Legend for System Circuit Diagram - CAS 4

Index	Explanation	Index	Explanation
1	Hood switch	20	Remote control receiver in diversity module (DIV)
2	Dynamic Stability Control (DSC)	21	Hotel setting switch
3	Central Gateway Module (ZGM)	22	Comfort Access interior antenna
4	Electronic transmission control (EGS)	23	START-STOP button
5	Starter	24	Emergency start coil (transponder coil)
6	Digital motor electronics (DME)	25	Car Access System 4 (CAS 4)
7	Integrated Chassis Management (ICM)	KI. 15_1	Terminal 15 (output 1)
8	Junction box module (JB) and front power distribution box	KI. 15_3	Terminal 15 (output 3)
9	Luggage compartment power distribution box	KI. 15 WUP	Terminal 15, wake-up
10	Tailgate central double-locking button	KI. 15N	Terminal 15N (Overrun)
11	Telephone control unit (TCU)	KI. 30	Terminal 30
12	Interior tailgate button, A- pillar	KI. 30B	Terminal 30B, switched
13	Instrument cluster (KOMBI)	KI. 50L	Terminal 50 load
14	Steering column switch cluster	CAS-Bus	CAS-Bus
15	Center-lock button/ hazard warning switch	LIN-Bus	Local Interconnect Network bus
16	Brake light switch (BLS)	K-CAN2	Body CAN2
17	Footwell module (FRM)	PT-CAN	Powertrain CAN
18	Crash Safety Module (ACSM)	A_S_START	Start/start termination DME
19	Comfort Access interior antenna		

Functions

Function Overview

The Car Access System 4 provides, among other things, the central control unit for vehicle access and vehicle locking. Consequently, the Car Access System 4 has complete control over central locking. The Car Access System 4 has sole knowledge of the system and decides whether, for instance, to allow access to the vehicle or not. In other words, whether to unlock the vehicle or not. That function is referred to as a master function.

The Car Access System 4 incorporates the following master functions:

- Comfort Access
- Central locking
- Power windows
- Sliding/tilting sunroof
- Terminal control
- Electronic immobilizer 4

Other functions of the Car Access System 4 include:

- Vehicle data storage
- Data transmission for Conditioned Based Service (CBS)
- Checking plausibility of remote control signals.

The Car Access System 4 enables or disables the execution of a number of functions. However, other control units may be involved in the execution of the function. A selection of them is listed in the table below.

Selection of function-executing control modules	
Junction box module (JB)	Central locking
Footwell Module (FRM)	Power windows
Roof functions center (FZD)	Sliding/tilting sunroof

For the purposes of communication with other electrical-system devices, the Car Access System 4 is connected to the K-CAN2, CAS bus and LIN bus.

The Car Access System 4 analyzes the status of the hood switch and broadcasts it for use by the alarm system. It also analyzes the status of the following buttons and initiates the central locking function.

- Center Lock button, locking/unlocking central locking
- Interior tailgate button on A-pillar, unlocking tailgate
- Central double-locking button, locking and double-locking vehicle doors using button on underside of open tailgate
- Hotel setting switch, preventing tailgate unlocking function.

The Car Access System 4 provides the power supply for the brake light switch and also analyzes its status.

The sections that follow describe some of the functions of the Car Access System. Those functions are:

- Terminal control
- Electronic immobilizer
- Gearbox enable
- Vehicle data storage

Terminal Control (CAS 4)

The Car Access System 4 provides the terminal status information for the other electrical-system devices. It does so by broadcasting the terminal status signal on the K-CAN2 or by directly switching the terminal concerned on/off.

The Car Access System 4 brings with it a revised terminal control system. As a result, the designations of some of the terminals have changed.

Previous terminal designation	New terminal designation
Terminal 15	Terminal 15/Terminal 15N
Terminal 30g	Terminal 30B
Terminal 30g_f	Terminal 30F

Terminal Designations

There are a number of terminals for supplying electrical-system components with power, and therefore a number of terminal designations. This allows defined grouping of control units and devices.

■ Terminal 30

- Control units and components that must continue to function up to the point when the battery is completely discharged are connected directly to the continuous positive, Terminal 30. That relates to units such as the Car Access System 4, roof function center and the junction box module.

The power supply for control units that are not connected to Terminal 30 is switched on/off via relays by the Car Access System 4. In addition, the Car Access System broadcasts the terminal status on the K-CAN2.

On vehicle wake-up, the Car Access System 4 activates the relays for signalling the statuses. In addition, the Car Access System broadcasts the terminal status on the K-CAN2.

The power supplies controlled by the Car Access System 4 have the following terminal designations:

■ Terminal 30F

Terminal 30 Fault is used for control units operating in the **driver's absence**. That applies, for instance, to the trailer module (AHM), footwell module (FRM), instrument cluster and automatic climate control module (IHKA).

■ Terminal 30B

Terminal 30 Basic is used for control units and electrical loads operating **when the driver is present**. That applies primarily to components such as the seat module, digital motor electronics (DME), gearbox control unit (EGS), Controller and CD changer.

Note: The relay for Terminal 30F is located in the front power distribution box and the rear power distribution box.

■ **Terminal 15**

Terminal 15 is used to signal the status “Ignition ON/Ignition OFF” rather than as a power supply. That applies, for instance, in the case of the digital motor electronics (DME), the footwell module (FRM) and BMW Night Vision.

■ **Terminal 15N**

Terminal 15 N (Overrun) is used for control units and electrical loads operating at status “Ignition ON” when the vehicle is being driven. That applies, for instance, to the lane departure warning (SWW), short range radar (SRR) and Night Vision.

Note: The relay for Terminal 15N is located in the front power distribution box and the rear power distribution box.

■ **Terminal 15WUP**

Terminal 15 Wake-up is used to wake up control units that can not be woken up by bus communication.

■ **Terminal 50**

Terminal 50 is provided for controlling the starter motor.

Terminal 30 Fault

If Terminal 30F has been switched off due to an electrical system fault, for instance, it is switched on together with the other components at vehicle wake-up.

The conditions that result in Terminal 30F being switched on are:

- Requests for ID transmitter e.g. Comfort Access due to request from exterior door handle module.
- Unlocking central locking Locking central locking Double-locking central locking.
- START-STOP button pressed.
- Bus activity e.g. demand for power supply to a part of the electrical system.
- Power reset if the conditions for switching on are met after a power reset.

If a vehicle can not switch to sleep mode despite the power reset, Terminal 30F is switched off.

If electrical consumers such as side lights, parking lights or hazard warning lights are switched on, Terminal 30F can nevertheless be switched off.

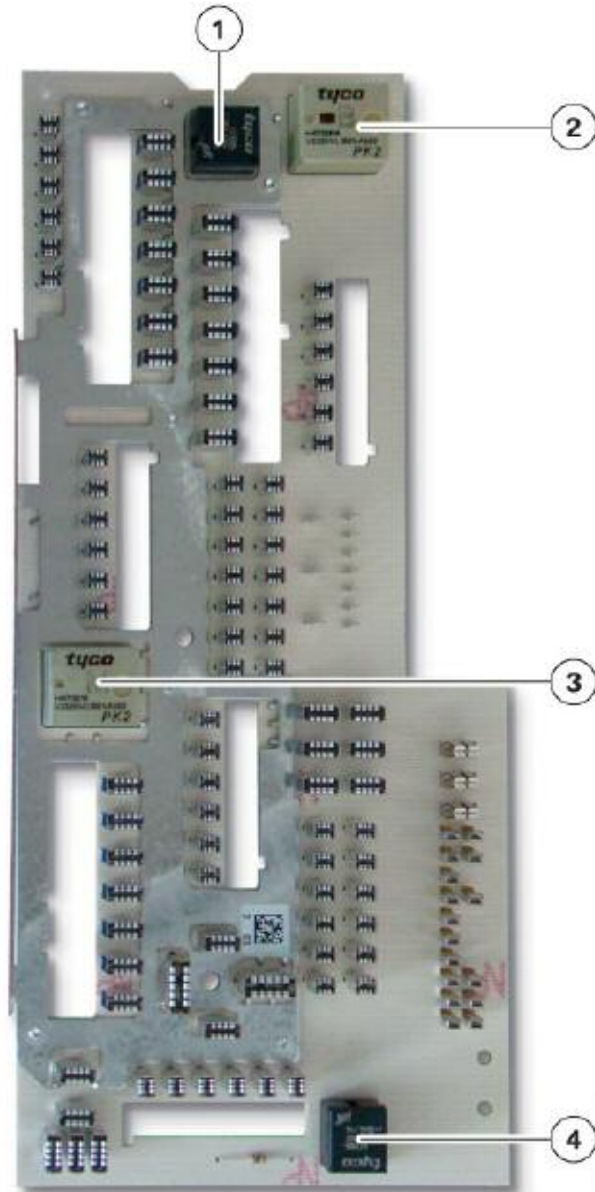
■ Switch-off inhibitors

Terminal 30F can not be switched off at status Terminal 30B ON. That prevents control units or electrical devices being switched off during basic-mode operation of the vehicle.

Switch-off of Terminal 30F is also prevented if a terminal status is implausible.

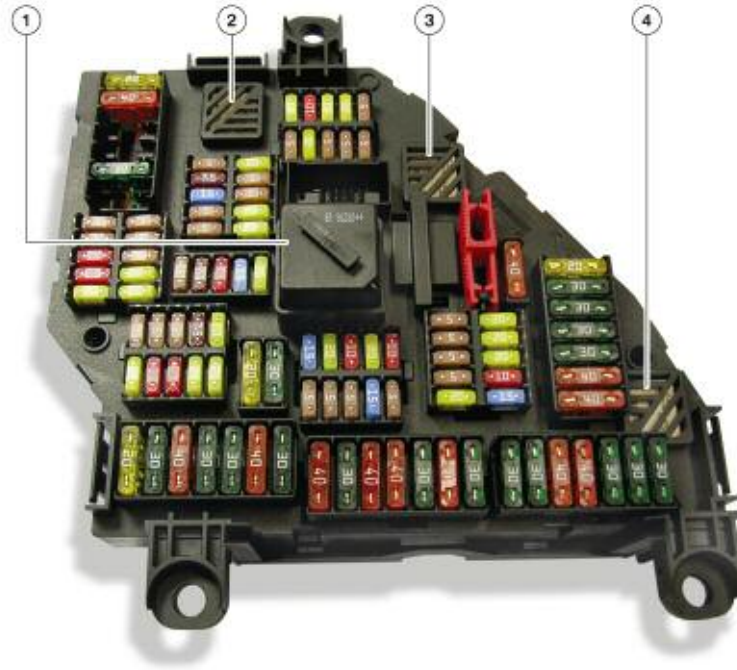
The relay contacts for Terminal 30F are monitored. If the contacts stick, it prevents the relay for Terminal 30F switching off.

Front power distribution box on F01/F02



Index	Explanation
1	Terminal 30F relay, bistable
2	Headlamp washer relay
3	Terminal 15N relay
4	Horn relay

Rear power distribution box on F01/F02



Index	Explanation	Index	Explanation
1	Terminal 30B relay	3	Terminal 15N relay
2	Terminal 30F relay	4	Rear window heater relay

■ Switching Off Terminal 30F

If the Car Access System has switched off Terminal 30B, then Terminal 30F can be switched off if the battery upper starting capacity limit is reached. Terminal 30F can be switched off after a power reset has been carried out. Additional conditions must also be met, however. Those conditions are:

- Additional bus wake-ups at least ten bus wake-ups
- Unexplained bus activity
- Closed-circuit current too high.

If the vehicle is in transport mode status, then, if possible, Terminal 30F is switched off.

Terminal 30 Basic

The conditions that result in Terminal 30B being switched on are:

- Requests for ID transmitter e.g. Comfort Access due to request from exterior door handle module.
- Unlocking central locking Locking central locking Double-locking central locking.
- START-STOP button pressed.
- Bus activity e.g. demand for power supply to a part of the electrical system.
- Change of door-switch status Change of tailgate switch status.

■ Switching Off Terminal 30B

When the vehicle is locked, the Car Access System receives the central double-locking signal. Once the vehicle is locked, Terminal 30B remains on for approx. one minute and is then switched off by the Car Access System. The tailgate must have already been closed.

If the vehicle is not locked or if the tailgate remains open, the delay until Terminal 30B is switched off is approx. 30 minutes. After that, the Car Access System switches Terminal 30B off.

In addition, Terminal 30B can be switched off when the vehicle is in parked mode if the battery upper starting capacity limit is reached.

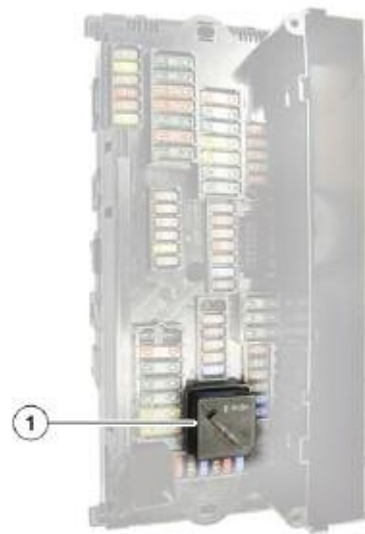
During fault diagnosis, the power down command can be used to switch off Terminal 30B under defined conditions for the purposes of measuring quiescent current.

If the vehicle is in transport mode status, Terminal 30F is switched off.

Terminal 15

After Terminal 30 is switched on, the Car Access System 4 signals the status of Terminal 15 by switching on the power supply or broadcasting it via the K-CAN2.

Direct power supply from Terminal 15 has the advantage that the control units continue to be supplied from Terminal 15 even if terminal status messages are not received within a bus system, for example. In that way, emergency-mode functions can be maintained on the basis of terminal status if necessary.



Index	Explanation
1	Terminal 30B relay

Note: Driver output stages are integrated in the Car Access System for the purpose of switching on Terminal 15. The Car Access System has three outputs for the status of Terminal 15.

The following control units receive the Terminal 15 status signal directly:

Those control units are:

- Driver's-side footwell module, FRM
- Crash Safety Module, ACSM
- Instrument cluster, KOMBI
- Digital engine management module, DME
- Central Gateway Module, ZGM
- Electronic transmission control EGS
- Steering column switch cluster, SZL
- Integrated Chassis Management, ICM

■ **Switching Off Terminal 15**

Terminal 15 can be switched off by pressing the START-STOP button, a change of status to Terminal 0.

Terminal 15 is automatically switched off if the following conditions occur:

- Vehicle double-locked by double-lock command.
- Battery reaching upper starting capacity limit.
- Car-wash special mode, switch-off takes place after 15 or 30 minutes.

■ **Switch-off inhibitors**

Automatic switching off of Terminal 15 may be prevented if the following conditions occur:

- Vehicle is moving, road-speed signal.
- Engine running.
- Brake pedal operated.
- Gear selector lever in position N, time-limited for special Car Wash mode.
- Low beam headlights ON Not when vehicle double-locked.
- Vehicle in transport mode status when coding in progress.
- Communication with the OBD.
- Switch-off inhibitor diagnosis.

Terminal 15N

Terminal 15N is switched on via a relay by the Car Access System. There is a relay fitted both in the front and rear power distribution boxes for the purpose.

■ Relay for Terminal 15N

The control modules connected to Terminal 15N are connected to the vehicle power supply shortly after Terminal 15 is switched on.

■ Switching Off Terminal 15N

Before Terminal 15 is switched off, the control modules that are connected to Terminal 15N are notified that Terminal 15N is to be switched off.

After Terminal 15 is switched off, the control units connected to Terminal 15N have five seconds time to save their data. After those five seconds have elapsed, the Car Access System 4 switches the relay off. At that point, the control modules concerned are switched off under defined conditions.

Note: The notification that Terminal 15N is to be switched off can only be received by control units or components that are connected to a bus system.

Functional Reliability of Switchable Terminals

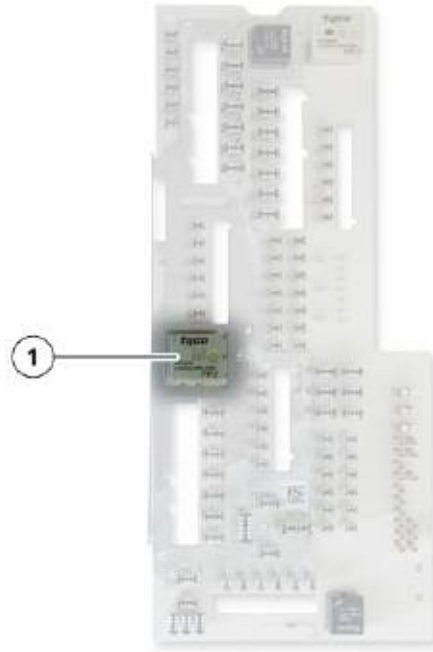
In order to increase the functional reliability of the vehicle's power supply, Terminal 30F, Terminal 30B and Terminal 15N can not be switched off under the following conditions:

- Terminal 15 ON
- Vehicle moving
- Engine running

The Car Access System has two processors that are responsible for terminal control. The software on the main processor and coprocessor prevents undefined switch-off of Terminal 15 and switch-on of Terminal 50.

Terminal 30F is safeguarded by the status of Terminal 30B. That means that when Terminal 30B is on, Terminal 30F can not be switched off.

Front power distribution box on F01/F02



Index	Explanation
1	KL15 N relay, soldered

ID Transmitter Search in Passenger Compartment

When the START-STOP button is pressed, it triggers the search for an ID transmitter in the passenger compartment. The passenger compartment search is required for the Passive Go function in order that starting can be enabled.

When performing the passenger compartment search, the Car Access System 4 issues a request for an ID transmitter to register with the vehicle.

There are two antennas provided for the passenger compartment search. One antenna covers the front of the passenger compartment and the other the rear. The antennas are connected to the Car Access System 4.

The Car Access System 4 sends out a signal with a frequency of 125 KHz through the antennas. That signal triggers the ID transmitter to register with the vehicle.

The ID transmitter responds with an encrypted radio signal. The remote control receiver in the diversity module passes the radio signal information to the Car Access System 4 via the LIN bus.

The Car Access System checks whether the ID transmitter belongs to the vehicle.

Subsequent communication takes place on the ID transmitter's transmission frequency, e.g. 315 MHz.

The Car Access System 4 checks whether the ID transmitter matches the vehicle. If the check is positive, the Car Access System 4 enables terminal control. The individual terminals can then be selected.

Note: If communication with the ID transmitter can not be established, a Check Control message is displayed on the instrument cluster. The driver is notified that no ID transmitter could be located inside the passenger compartment.

The ID transmitter can be held in the position marked on the steering column. There is an emergency start coil under the steering column trim. Communication between the Car Access System 4 and the ID transmitter can be established via the emergency start coil. More detailed information on this subject can be found in the description of the emergency start coil component.

Terminal Selection

Briefly pressing the START-STOP button cycles through the terminal statuses in the following order:

- Terminal 0
- Terminal 15
- Terminal 0
- Terminal 15

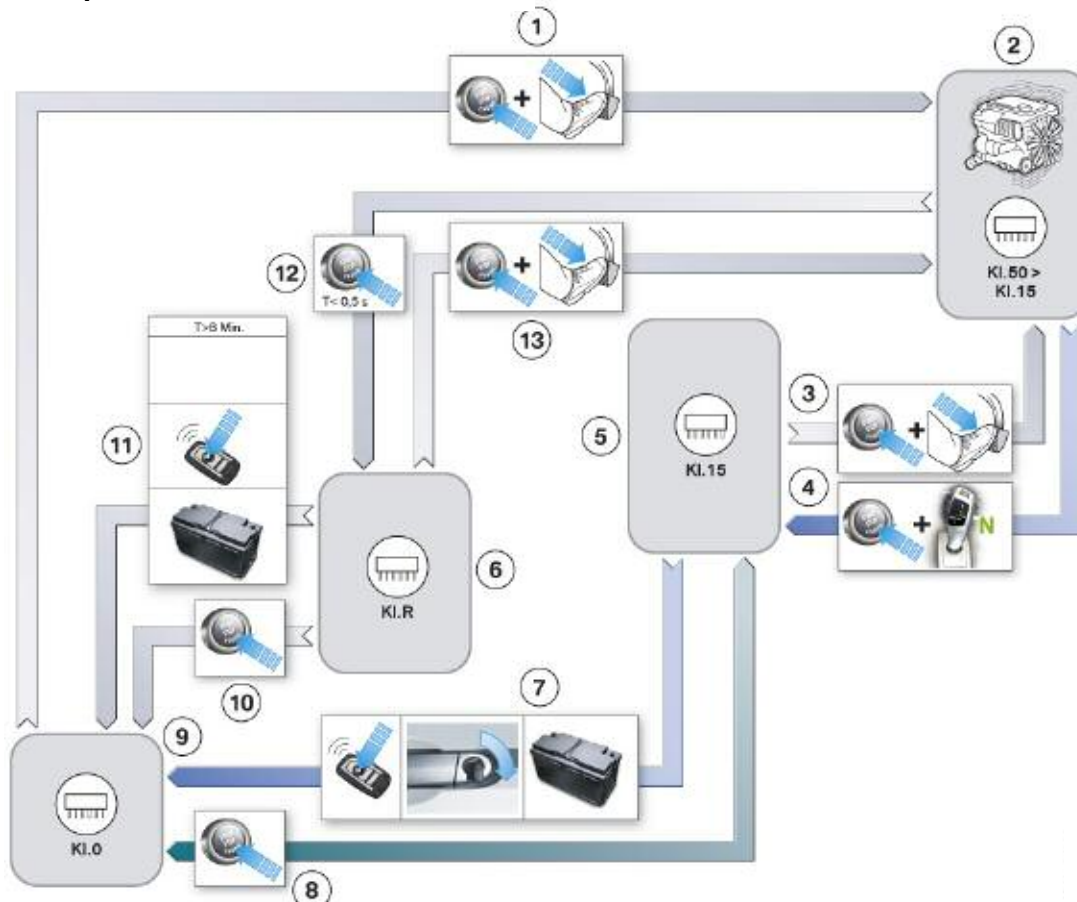
Note: On automatic vehicles, selecting the statuses in that order is only possible if the brake pedal is not depressed.

As soon as the brake pedal is pressed, the engine will start the next time the STARTSTOP button is pressed.

Terminal 0 is a logical terminal and does not provide a power supply. Terminal 0 comprises Terminal 30, Terminal 30B and Terminal 30F.

The graphic below illustrates how terminal control operates.

Principle of terminal control on F01/F02



Legend for principle of terminal control on F01/F02

Index	Explanation	Index	Explanation
1	START-STOP button + (brake pedal operated)	8	Central double-locking, driver's door lock, upper starting capacity limit reached
2	Engine running (Terminal 50 > Terminal 15)	9	Off (Terminal 0)
3	START-STOP button + (brake pedal operated)	10	START-STOP button, SST
4	SST + selector position "N" (car wash)	11	8 minutes central double-locking upper starting capacity limit reached
5	Ignition (Terminal 15)	12	SST briefly pressed
6	Radio (Terminal R)	13	START-STOP button + (brake pedal operated)
7	Central double-locking, driver's door lock, upper starting capacity limit reached		

■ Washing the vehicle in a car wash

A new feature of the function for washing the car in a car wash is that, under certain circumstances, the status Terminal 15 ON is maintained for at least 15 minutes.

The conditions for that are:

- Gear selector lever in position “N”
- Engine stopped by START-STOP button

A timer on the Car Access System 4 is started and maintains the status Terminal 15 ON for a period of 15 minutes. If the vehicle is moved during that period, the period for which Terminal 15 ON is upheld is extended by a further 15 minutes. The maximum period for the function is limited to 30 minutes. In that way, the vehicle’s battery is saved and not unnecessarily discharged.

Note: When Terminal 15 is switched off, the gear selector lever is automatically moved to position P.

Movement of the vehicle is detected by means of the signals from the wheel speed sensors. The Dynamic Stability Control (DSC) registers the wheel speed sensor signals, while the Integrated Chassis Management makes the road-speed signal available to the electrical system.

A Check Control message for the driver is displayed on the instrument cluster indicating that the vehicle is capable of moving and can not be locked from the outside. In addition, attention is drawn to the situation by an audible gong signal.

If, for instance, the driver attempts to lock the vehicle using the ID transmitter, permission is denied. Instead, the horn is sounded to draw attention to the fact that the vehicle has not been locked.

■ Terminal R

The status Terminal R ON can only be selected if the engine has been stopped by briefly pressing the START-STOP button.

The status Terminal R ON/Terminal R OFF is purely a bus signal. The Car Access System broadcasts the signal on the K-CAN2. Consequently, the F01/F02 does not have a separate lead for Terminal R!

Terminal R is switched off under the following conditions:

- START-STOP button pressed
- Vehicle double-locked by double-lock command
- Time limit of 8 minutes not exceeded
- Battery upper starting capacity limit reached

Electronic Immobilizer 4

The electronic vehicle immobilizer 4 is an immobilizer system that prevents unauthorized engine start. The immobilizer was first introduced with the Car Access System 3 on the E92 and the latest version is a derivation of that design.

Design of the Electronic Vehicle Immobilizer EWS

The vehicle immobilizer consists of the identification transmitter which identifies itself to the vehicle and therefore to the Car Access System 4. The Car Access System 4 exchanges data via the CAS bus with the digital motor electronics in order to cancel the immobilizer function.

Note: The ID transmitter also has to identify itself to the vehicle and, therefore, to the Car Access System 4.

The software for the electronic immobilizer and for enabling engine starting is incorporated in the Car Access System 4. Enabling of ignition and fuel injection is the responsibility of the digital motor electronics.

Before the electronic immobilizer issues the enabling signal for starting, the ID transmitter must be identified as matching the vehicle. As soon as an attempt is made to start the engine, a check (authentication) has to be carried out.

That check establishes whether a matching ID transmitter is located in the passenger compartment. The vehicle can be started if the check is successful. Authentication starts with the status "Terminal 15 ON".

Note: The time taken to search for an ID transmitter in the passenger compartment may result in a delay before engine starting is enabled. That delay may occur in a time span of up to half a second.

Start Enable Through the Electronic Vehicle Immobilizer

The start procedure is enabled by means of a special request and response procedure known as challenge-response.

As of “Terminal 15 ON”, the digital motor electronics sends an encrypted random number to the Car Access System 4. The digital motor electronics uses a random number generator to generate the random number.

On the basis of that random number and its secret key, the Car Access System 4 calculates a response and sends it to the digital motor electronics. In the meantime, the digital motor electronics calculates the expected response from the random number and its secret key.

The Car Access System 4 and the digital motor electronics use the same secret key and algorithm for the calculations.

If the figure that the Car Access System 4 sends to the digital motor electronics matches the figure calculated by the motor electronics, the electronic immobilizer is deactivated.

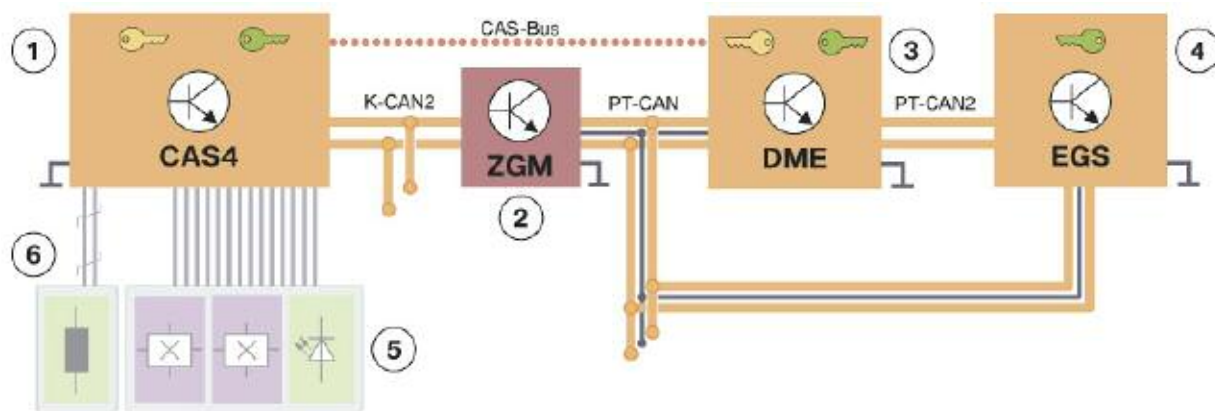
The engine can now be started.

Note: As from “Terminal 15 ON”, a cyclic query (challenge-response) is performed as long as the engine is not yet running.

■ Data transmission

Data transmission is redundant via the bus systems.

Duplicated data transmission on F01/F02



Index	Explanation	Index	Explanation
1	Car Access System 4 (CAS 4)	4	Electronic transmission control unit
2	Central Gateway Module	5	START-STOP button
3	Digital Motor Electronics (DME)	6	Transponder coil (emergency start coil)

The signal from the digital motor electronics, for instance, reaches the Car Access System 4 via both the K-CAN2 and the CAS bus. The digital motor electronics, however, is connected to the PT-CAN. For that reason, the signal is transferred from PT-CAN to the K-CAN2 by the central gateway module. The time taken by the signals via the different bus systems is of no consequence as the signal that reaches the digital motor electronics first is used for the electronic immobilizer.

The authentication is repeated in response to following events:

- Transmission and response time exceeded
- Transmission problems
- Response with the secret security code incorrect (e.g. incorrect secret key due to control unit from another vehicle).

■ **Secret key**

The control units are assigned a secret key on the assembly line. This secret key is generated from a random number. The secret key is valid for a pair of control units and linked to the specific vehicle. This means that one pair of control units receives the same secret key. Once the secret key has been entered, the control unit is locked. From this point on, the control unit is permanently tied to this secret key and the vehicle.

The Car Access System 4 and the digital motor electronics form a control unit pairing.

Note: Since the control units are assigned to the specific vehicle, replacement with a unit from another vehicle is not possible. When replacing a control unit, the new control unit must be ordered from BMW. Matching of the control units to each other is no longer necessary.

Gearbox Enable

The enable is based on a procedure similar to that used for the electronic vehicle immobilizer 3.

As of “Terminal 15 ON”, the Car Access System 4 sends encrypted individual codes to the transmission control unit. The signal is applied to the PT-CAN2 by the digital motor electronics.

The electronic transmission control deciphers and checks these individual codes. If the check is successful, the gearbox control unit will enable the gearbox functions.

The electronic gearbox control unit forms a pair of control units together with the Car Access System 4.

Start Value Matching

A start value matching procedure between the Car Access System 4 and the electronic transmission control is performed on the assembly line. That involves the Car Access System 4 transferring an encrypted individual code to the transmission control unit. Consequently, the electronic transmission control knows the individual code and can check whether the gearbox functions can be enabled.

Emergency Release of Parking Lock

The parking lock cannot be released in the event of a defect or data transmission error. For that reason, the F0x vehicles feature a mechanical emergency release facility for the parking lock.

Early vehicles used handle for the emergency release of the parking lock is located in the luggage compartment. That handle must be inserted in the slot at the bottom of the cup holder, turned through 90° and pushed down.

The gearbox is released as soon as the handle has been locked in position. The vehicle can now be towed but not driven.

Index	Explanation
1	Turn handle
2	Press handle down



Releasing parking lock on F01/F02

Note: The handle must remain locked in position while the vehicle is being towed. The parking lock will engage if the handle is removed while the vehicle is being towed. This could cause an accident in unfavorable towing situations.

Beginning with the introduction 2011 E70 LCI the existing transmission emergency release was gradually removed from all vehicles with the 8 speed automatic transmissions, as part of a rolling update. [See Car Access System 3 (E70)]

In the event of a fault affecting the powertrain, the transmission parking lock can be unlocked mechanically and put in “Neutral” by means of a set screw/stop (adjusting screw) that acts on the gear selector lever. In addition to the mechanical transmission parking lock emergency release, the procedure to put the vehicle in “Neutral” can also be done electronically via ISTA and through a special in vehicle software solution.

How to release the parking lock electronically in case the vehicle does not start:

- Activate ignition.
- Press the brake pedal and continue pressing it throughout all further steps .
- Press start/stop-button.
- As soon as you notice the starter motor has engaged, press the unlock-button of the gearshift and move forward to position N (please note: for models with diesel engines and at low ambient temperatures a delay of 4 seconds is to be expected). Continue to hold the gearshift in this position up to the sound of the CC-message-gong which indicates the message of “gearbox dysfunction” – now please release the gearshift.

How to release the parking lock electronically:

- Reselect gear-position N within a timeframe of 6 seconds (repeat step 4 of the instructions). Gear-position N is then displayed on the instrument display.
- Please continue pressing the brake pedal until the starter-motor stops, then the brake-pedal can be released and the vehicle can be moved to the desired position.
- The ignition must remain activated at all times. In case of switching off the ignition, the gear position P is automatically engaged.
- In cases where the N selection cannot be achieved, first switch on the ignition and then off. (Press start/stop-button several times without pressing the brake pedal). You may then retry the process following the steps 1-7. If after 3 attempts N cannot be selected please wait a minimum of 10 minutes in order to allow the starter motor to cool down.

CAUTION!!!

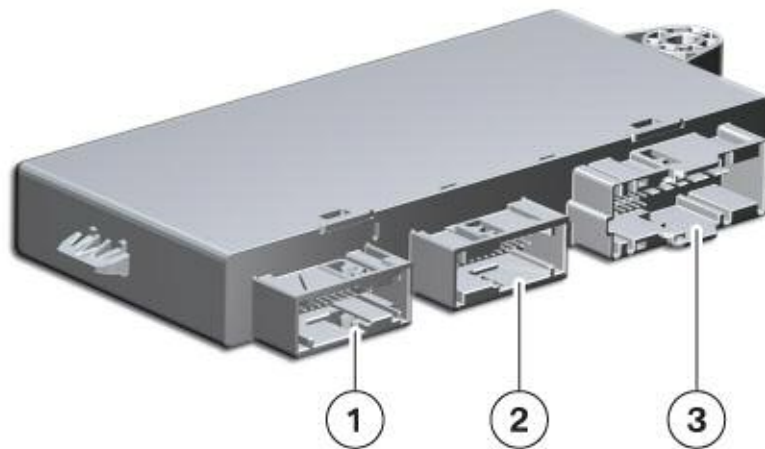
**The vehicle can only be moved manually.
Towing the vehicle is advised since the parking
lock could engage and be damaged.**

System Components

Car Access System Connections

Due to the integration of the Passive Go function, the START-STOP button is now connected to the Car Access System 4 via the instrument panel wiring loom.

The Car Access System has a separate connector socket for the Comfort Access system. The Car Access System 4 has three connector sockets in all.



Index	Explanation
1	Cockpit connector socket, 26-pin
2	Comfort Access connector socket, 26-pin
3	Vehicle wiring loom connector socket, 41-pin

Note: The instrument panel is pre-assembled so that it is fitted in the car as a complete unit on the assembly line. For that reason, the Car Access System 4 has only one connector for the main wiring loom. All other connectors are connected up during pre-assembly of the instrument panel.

On vehicles without Comfort Access, the Car Access System does not have the Comfort Access connector socket (2).

Other Components

START-STOP Button

The START-STOP button is integrated in the instrument panel. In contrast with the previous connection, the ribbon cable has been dispensed with. The necessary leads for connecting the START-STOP button are now integrated in the wiring loom for the instrument panel.

The START-STOP button is illuminated by an LED as of status Terminal 58g ON (KL58g).

Emergency Start Coil

In unfavorable situations, the system may not be able to find the ID transmitter in the passenger compartment. For that reason, the Car Access System initiates display of a message on the instrument cluster. The message notifies the driver that no ID transmitter could be located inside the passenger compartment.

Since the F01/F02 does not have a slot for the ID transmitter, there is an emergency start coil on the steering column. The emergency start coil can be used to communicate with the ID transmitter so that the engine can still be started and the vehicle driven.

The emergency start coil is equivalent to the function of the transponder coil. By communicating via the transponder coil, the Car Access System 4 is able to identify a valid ID transmitter. Thus the Car Access System 4 is able to issue the start enabling signal following successful identification.

In the following situations, for example, the system may not be able to find the ID transmitter:

- ID transmitter defective
- Interference with radio transmission to ID transmitter
- Discharged battery in ID transmitter



Index	Explanation
1	Emergency start coil

Remote Control Receiver

The remote control receiver now has a transmitter and receiver unit and is integrated in the diversity module. As a result, bidirectional communication can be established between the ID transmitter and the remote-control receiver.

The remote control receiver now also has a LIN bus connection. The remote control receiver use that LIN bus connection to wake up the Car Access System 4. In that case, the Car Access System 4 asks the remote control receiver if there is a message waiting.

That message may contain a request to unlock the vehicle. The Car Access System checks, for instance, whether the ID transmitter belongs to the vehicle. If the check is positive, the Car Access System 4 initiates unlocking of the vehicle.

Note: As a LIN-Bus device, the remote control receiver is an input capable of waking up the Car Access System 4.

Input Components

The Car Access System 4 analyzes buttons for the central locking functions. All buttons connect to earth. That means that the Car Access System 4 receives a low signal when the button is pressed.

The buttons concerned are:

- Center-lock button
- Interior tailgate button on A- pillar
- Central double-locking button on underside of tailgate
- Hotel setting switch
- Hood switch (alarm system)

Service Information (CAS 4)

Vehicle Data Storage

The Car Access System 4 stores the following vehicle data:

- Personal Profile, the Car Access System 4 stores data for the Personal Profile
- Vehicle order, the vehicle order is stored in the footwell module
- Redundant data storage for instrument cluster
- Data for condition-based service CBS
- Service key data (e.g. data for Condition Based Service, fault memory entries, Check Control messages, etc.)
- Authentication for diagnostic access to the Car Access System 4

The Car Access System's temporary memory permanently stores data such as the Condition Based Service version, the vehicle identification number (VIN), software version, etc.

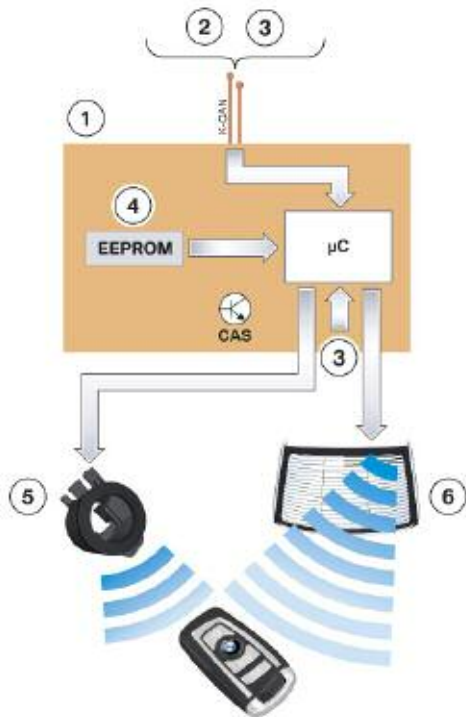
The Car Access System receives current data from the electrical system, such as outside temperature, engine temperature, date, time and odometer reading, via the K-CAN2. The Car Access System collects that information. Under certain conditions, the data is transferred to the ID transmitter. In that way, the service key data is kept up to date for readout when the vehicle is taken in for servicing.

Updating Service Data

The service data records and fault memory entries are collected in a temporary memory by the Car Access System. The service data is thus available from a central point.

If one of the conditions set out below results in transfer of the service key data, the service key data on the ID transmitter is updated.

ID transmitter updating principle



Index	Explanation
1	Car Access System
2	Current data on electrical system that Car Access System receives via K-CAN2
3	Diagnosis data via K-CAN2 or direct from Car Access System
4	Permanently stored data provided by Car Access System
5	Manual data transfer (emergency start coil, low frequency)
6	Automatic updating of data (transmission frequency of ID transmitter, high frequency)
µC	Accumulated data in Car Access System's temporary memory

Note: Updating can be performed both by way of the emergency start coil's low frequency signal (5) and by means of the transmission frequency used by the ID transmitter (6).

Updating Service Key Data

The service key data is stored in the Car Access System and transferred to the ID transmitter. Transfer is initiated automatically by specific conditions or manually. The data can be read out using the BMW Key Reader when the vehicle is serviced.

Automatic updating

The service key data is updated every time the vehicle is driven. That data comprises:

- Conditioned Based Service data
- Check Control messages
- Fault memory entries

The conditions for updating are:

- “Terminal 15 ON”, speed above 40 kph followed by speed below 40 mph.
- The data is updated once a distance of 10 km has been covered and the speed is below 40 mph.
- The remote control receiver transfers the data to the ID transmitter when the engine is switched off. Data continues to be written to the ID transmitter even after it is taken out of the vehicle.
- A data read-out can then be obtained from the ID transmitter.

■ Manual updating

The procedure for transferring current service key data to the ID transmitter in the course of servicing is as follows:

- Press and hold the Center-Lock button and use the START-STOP button to select “Terminal 15 ON”, then release both buttons.
- Within 10 s, hold the ID transmitter against the right-hand side of the steering column trim in the position marked by the key symbol.

Note: The key symbol is printed on the steering column trim.

Wait until the Check Control message appears on the instrument cluster. The instrument cluster display shows the message “Updating service data”.

- As soon as the updating process is complete, the Check Control message disappears and a gong sounds.
- A data read-out can then be obtained from the ID transmitter.

Note: The manual updating process transfers Conditioned Based Service data, Check Control messages and fault memory entries.

Display of “Updating service data” message on F01/F02



Index	Explanation
1	Key symbol
2	Updating service data
3	“Caution Symbol”

Control Unit Replacement

As is the case with the CAS 3 system, a defect in the control units belonging to the EWS represents a challenge for the service technician. Since a defective control unit cannot be replaced by control units from other vehicles particular care is necessary when performing the diagnostic procedure.

A defective control unit can be ordered through parts department. However, it is important to bear in mind that the digital motor electronics (DME) and the Car Access System 4 are supplied already-coded for the vehicle.

This has the advantage that only the control unit is replaced and the matching procedure with the electronic vehicle immobilizer is not necessary.

There is no point in ordering a control unit to be kept in stock as the secret key is assigned to the control unit and the respective vehicle.

A matching procedure is necessary for the electronic transmission control after replacement. As part of this procedure, the Car Access System 4 transfers the individual code to the electronic transmission control.

Note: The matching procedure between the CAS 4 and a new electronic transmission control can take several minutes.

Note: For more service information regarding the Car access System refer to FTD-ANL-SBT2003-610303019_H1 General information for service staff on CAS and always refer to the repair instructions.