

F10 General Vehicle Electronics



BMW Service

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General information

Symbols used

The following symbol / sign is used in this document to facilitate better comprehension and to draw attention to particularly important information:



Contains important safety guidance and information that is necessary for proper system functioning and which it is imperative to follow.

Information status and national-market versions

The BMW Group produces vehicles to meet the very highest standards of safety and quality. Changes in terms of environmental protection, customer benefits and design make it necessary to develop systems and components on a continuous basis. Consequently, this may result in differences between the content of this document and the vehicles available in the training course.

As a general principle, this document describes left-hand drive European version vehicles. Some controls or components are arranged differently in right-hand drive vehicles than those shown on the graphics in this document. Further discrepancies may arise from market-specific or country-specific equipment specifications.

Additional sources of information

Further information on the individual topics can be found in the following:

- in the Owner's Handbook
- in the integrated service technical application

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The information in the document is part of the BMW Group technical training course and is intended for its trainers and participants. Refer to the latest relevant BMW Group information systems for any changes/supplements to the technical data.

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1. Introduction

The vehicle electrical system of the F10 is based on that of the F01/F02. This training material provides an overview of the following vehicle electrical system topics.

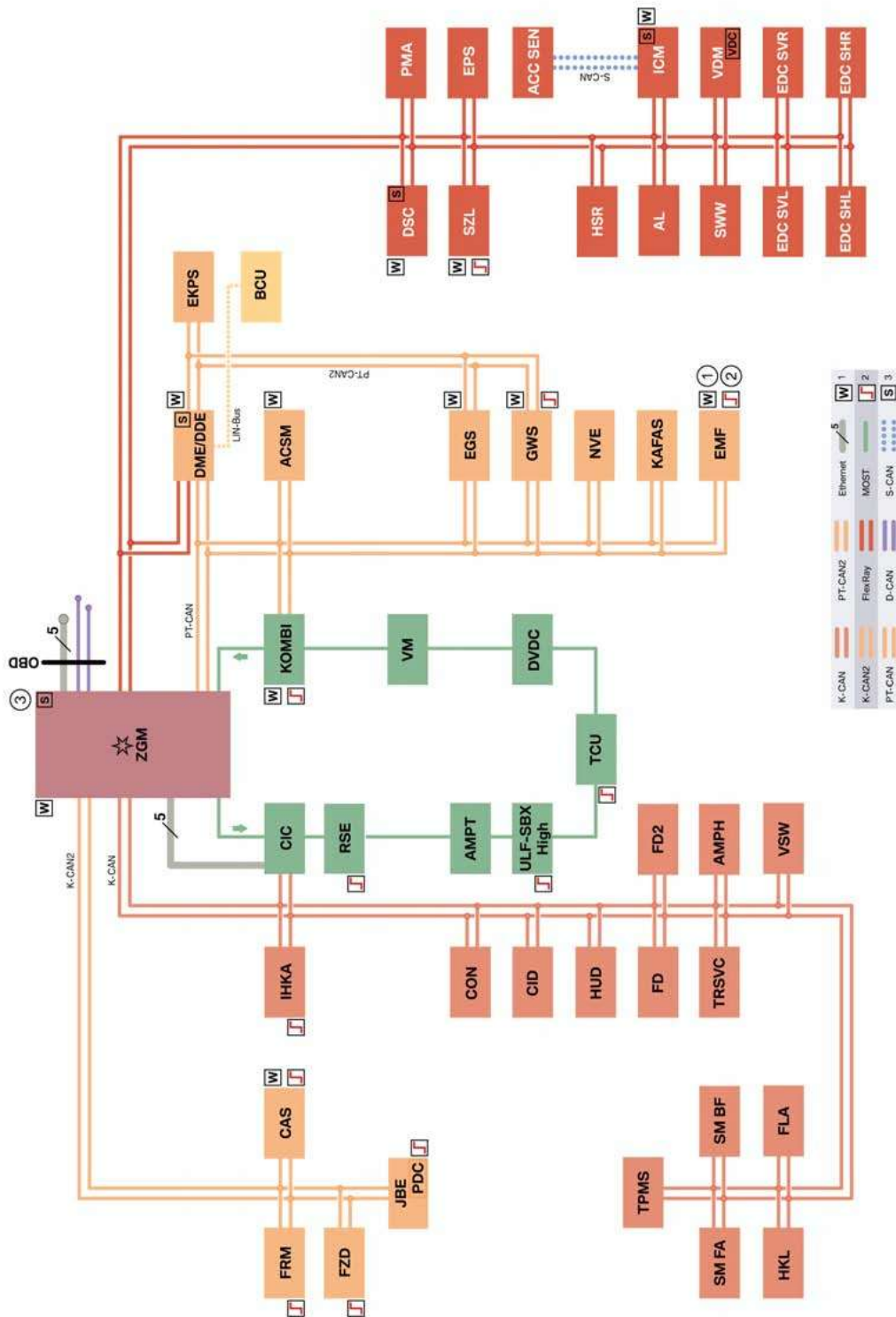
For more information on the respective topics, refer to the F01/F02 training material available on TIS and ICP.

F10 Topic	F01/F02 Training Material
Voltage supply	F01/F02 Voltage supply
Car Access System	F01/F02 Car Access System
Comfort Access	F01/F02 Comfort Access
Central locking system	F01/F02 Central locking system
Automatic Soft Close system	F01/F02 Automatic Soft Close system
Power window regulators	F01/F02 Power windows
Roller sun blinds for side windows	F01/F02 Power windows
Glass sunroof	F01/F02 Slide/tilt sunroof
Alarm system	F01/F02 Alarm system
Luggage compartment lid lift	F01/F02 Automatic operation of tailgate
Exterior lighting	F01/F02 Exterior lights
Interior lighting	F01/F02 Interior lighting
Seats	F01/F02 Seats
Heating and air conditioning systems	F01/F02 Heating and air conditioning systems

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1. Introduction

1.1. Bus diagram



F10 Bus diagram

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1. Introduction

Index	Explanation
1	Wakeable control units
2	Control units authorized to wake up the vehicle
3	Startup node control units, for starting up and synchronizing the FlexRay bus system
ACC-SEN	Active Cruise Control Sensor
ACSM	Advanced Crash Safety Module
AL	Active steering
AMPH	Amplifier High (high fidelity amplifier)
AMPT	Amplifier Top (top high fidelity amplifier)
BSD	Bit-serial data interface
BCU	Battery Charge Unit (for auxiliary battery)
CAS	Car Access System
CIC	Car Information Computer
CIC Basic	Car Information Computer Basic
CID	Central Information Display
CON	Controller
D-CAN	Diagnosis on Controller Area Network
DDE	Digital Diesel Electronics (Not for US)
DME	Digital Motor Electronics
DSC	Dynamic Stability Control
DVD	DVD changer
EDC SHL	Electronic Damper Control, rear left satellite unit
EDC SHR	Electronic Damper Control, rear right satellite unit
EDC SVL	Electronic Damper Control, front left satellite unit
EDC SVR	Electronic Damper Control, front right satellite unit
EGS	Electronic transmission control
EKPS	Electronic fuel pump control
EMF	Electromechanical parking brake
EPS	Electronic Power Steering
Ethernet	Cabled data network technology for local data networks
FD	Rear display
FD2	Rear display 2
FLA	High-beam assistant
FlexRay	Fast, preset and fault-tolerant bus system for use in automotive applications
FRM	Footwell module

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1. Introduction

Index	Explanation
FZD	Roof function center
GWS	Gear selector switch
HKL	Luggage compartment lid lift
HSR	Rear suspension slip angle control
HUD	Head-Up Display
ICM	Integrated Chassis Management
IHKA	Integrated automatic heating / air conditioning
JBE	Junction box electronics
KAFAS	Camera-based driver assistance system
K-Bus	Body bus
K-CAN.	Body controller area network
K-CAN2	Body controller area network 2 (500 kBit/s)
KOMBI	Instrument cluster
LIN-Bus	Local Interconnect Network bus
Local-CAN	Local Controller Area Network
MOST	Media Oriented System Transport
MOST port	Media Oriented System Transport port
NVE	Night Vision electronics
PDC	Park Distance Control
PMA	Parking Maneuvering Assistant Control Unit
PT-CAN	Powertrain CAN
PT-CAN2	Powertrain controller area network 2
OBD	Diagnosis socket
RSE	Rear seat entertainment system
SDARS	Satellite tuner
SMBF	Front passenger seat module
SMFA	Seat module, driver
SWW	Blind Spot Detection
SZL	Steering column switch cluster
TCU	Telematics Control Unit
TPMS	Tire Pressure Monitoring System
TR SVC	Control unit for reversing camera and side view
ULF-SBX	Universal interface box

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1. Introduction

Index	Explanation
VDM	Vertical Dynamics Management
VM	Video Module
VSW	Video switch
ZGM	Central Gateway Module

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2. Voltage Supply

The Voltage supply concept of the F10 is based on that of the F01. The components and the structure used are largely the same.

2.1. Components

Due to the steady increase of electrical functions for comfort, communication and safety in BMW vehicles, the voltage supply is becoming ever more important.

In the F10, two separate power distribution boxes with fuse blocks are installed. The front power distribution box with fuse block is near the glove box and the rear power distribution box with fuse block is on the right-hand side of the luggage compartment.

The front power distribution box with fuse block forms the junction box together with the junction box electronics (JBE).

In the graphic below, you can see the layout of the most important components of the voltage supply system in the F10.

In the F10, three main power lines (bolted to on the underbody of the vehicle) are run from the power distribution box on the battery to the engine compartment :

- One of the main power lines runs via the positive battery terminal to the starter motor and to the alternator.
- The second line supplies the electronics box in the engine compartment with voltage for the engine electronics. This line is protected by a high-current fuse in the distribution box at the battery.
- The third line leads to the engine compartment power distribution box. This distribution box supplies the electric fan with power. This line is protected by the high-current fuse in the distribution box at the battery.

In addition, a battery cable is routed through the vehicle interior to the front power distribution box with fuse block. This line is also protected by a high-current circuit breaker.

Depending on the model, different line cross sections are used.

The transfer points for the main power cables are located under the luggage compartment floor. The main power lines on the underbody are laid in a protected area to prevent damage.

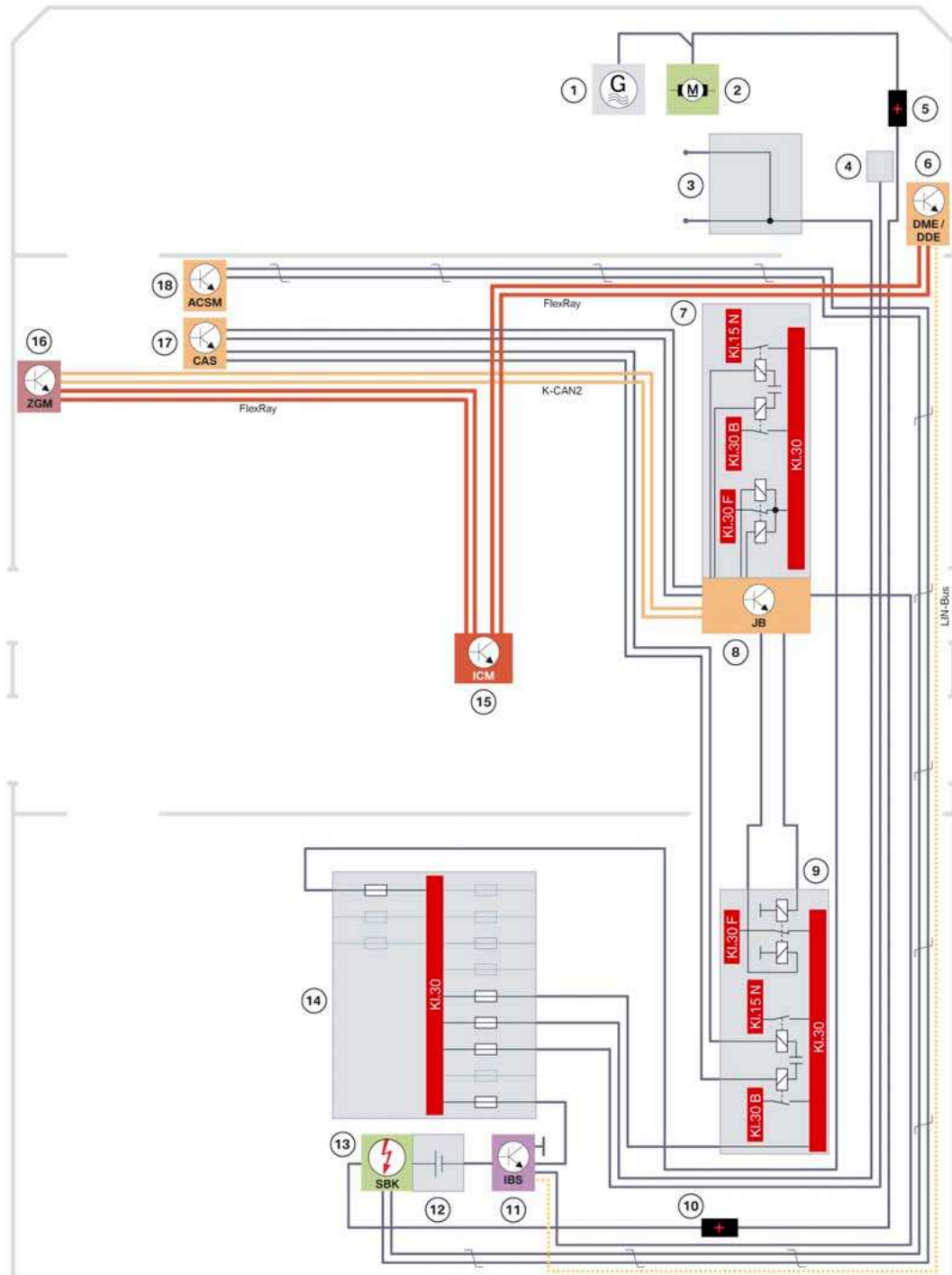
The electromechanical power steering is supplied with voltage differently, depending on equipment and engine.

For more information on the voltage supply, refer to the F01/F02 "Voltage Supply" training material available on TIS and ICP.

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2. Voltage Supply

2.2. System wiring diagram



F10 System wiring diagram for voltage supply

TE08-0084

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2. Voltage Supply

Index	Explanation
1	Alternator
2	Starter
3	Power distribution box in engine compartment
4	Electronics box in the engine compartment
5	Positive battery connection point
6	Digital Motor Electronics (DME)
7	Power distribution box with fuse block in front behind the glove box
8	Junction box electronics
9	Power distribution box with fuse block, rear right in the luggage compartment
10	Transfer point under the luggage compartment floor
11	Intelligent battery sensor (IBS)
12	Battery
13	Safety battery terminal (SBK)
14	Power distribution box on the battery
15	Integrated Chassis Management (ICM)
16	Central Gateway Module (ZGM)
17	Car Access System (CAS)
18	Crash safety module (ACSM)

2.3. EPS Voltage Supply

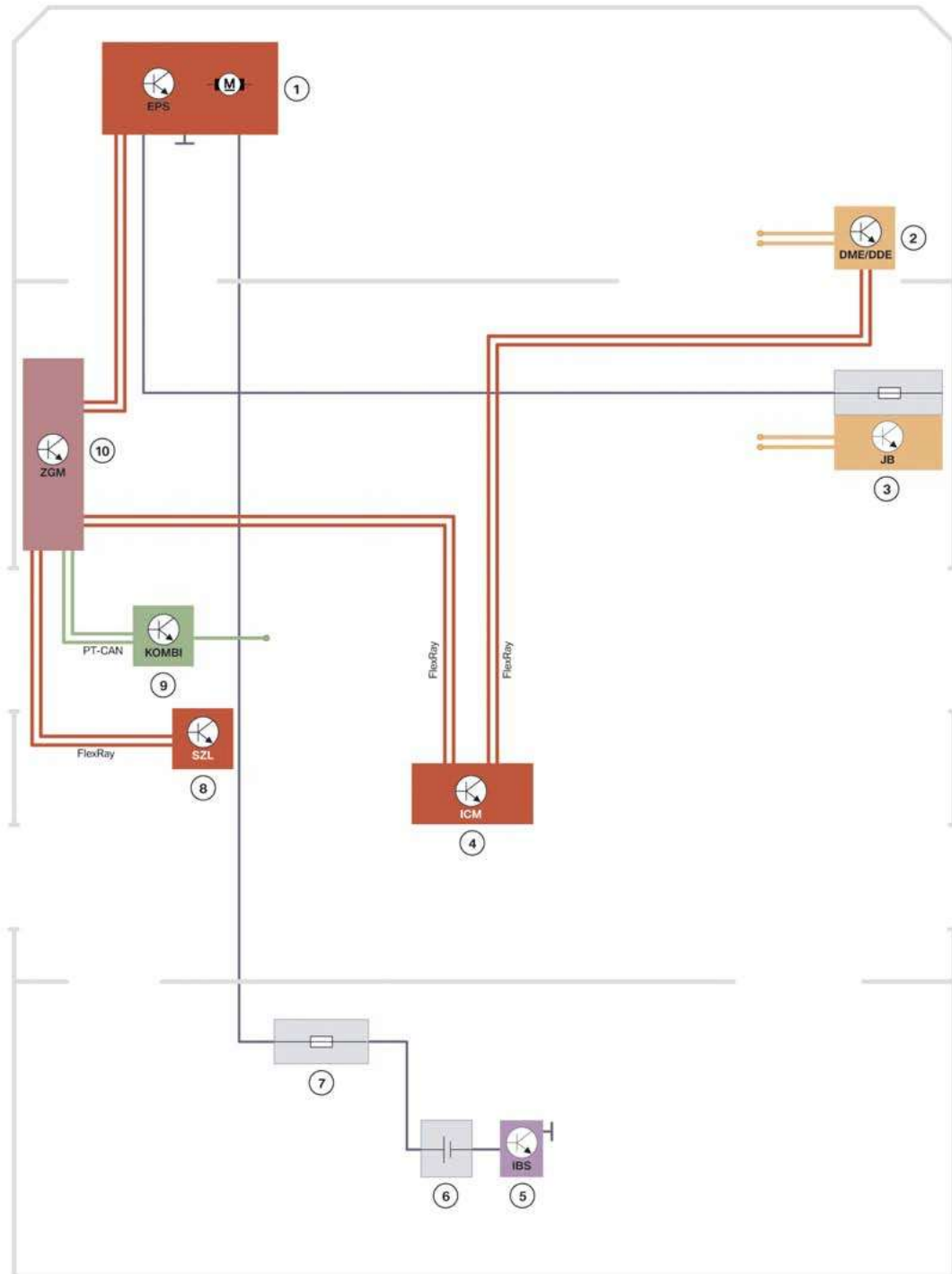
The electromechanical power steering is supplied with voltage differently, depending on equipment and engine.

In the F10, electromechanical power steering is combined for the first time with the active steering planetary gearbox with override function already familiar from the F01. As a result, the steering is implemented completely electrically.

F10 General Vehicle Electronics

2. Voltage Supply

2.3.1. System wiring diagram



F10 System wiring diagram for basic steering

TE09-2243

F10 General Vehicle Electronics

2. Voltage Supply

Index	Explanation
1	EPS
2	Digital Motor Electronics (DME)
3	Junction box electronics with front power distribution box
4	Integrated Chassis Management (ICM)
5	Intelligent battery sensor (IBS)
6	Battery
7	Battery power distribution box
8	Steering column switch cluster (SZL)
9	Instrument cluster (KOMBI)
10	Central Gateway Module (ZGM)

2.3.2. EPS in conjunction with active steering

Due to the higher weight of the some engines and the higher steering forces associated with the greater front axle load, the power of a 12V steering system is no longer sufficient. For this reason, on F10 vehicles with the V8 engine a 24V EPS system will be installed in conjunction with the optional Integral Active Steering equipment.

The following table tells you when a 24V EPS is installed.

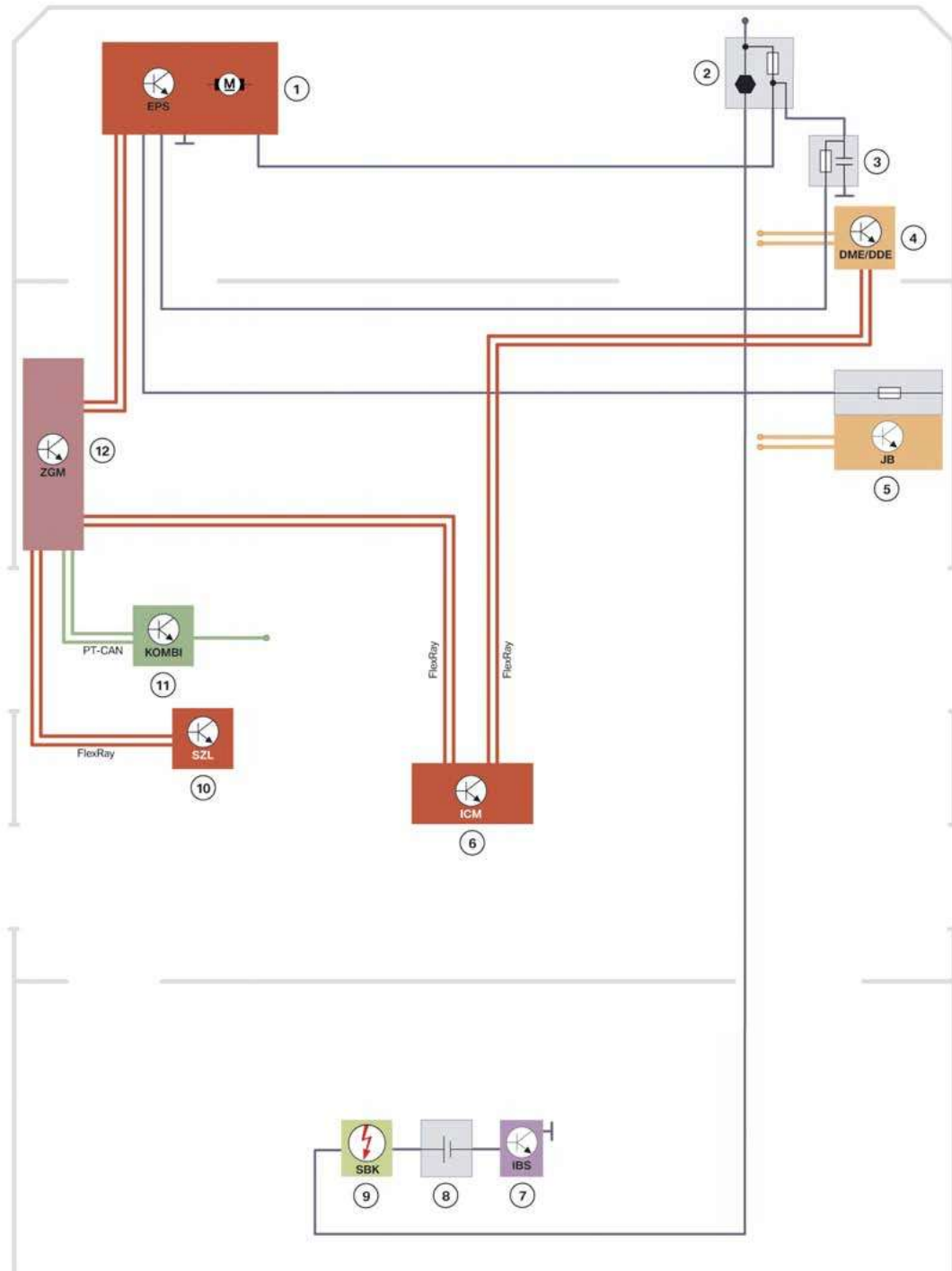
Engine	EPS voltage supply
528i	12V
535i	12V
550i	24V

EPS with 12V

Since active steering demands higher forces from the electromechanical steering and due to the higher current necessary, the voltage supply can no longer be implemented as in previous systems. If active steering is used in a vehicle with 12V EPS, the voltage is supplied through a separate positive battery connection point.

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2. Voltage Supply



F10 System wiring diagram EPS with 12V and active steering

TE09-2234

F10 General Vehicle Electronics

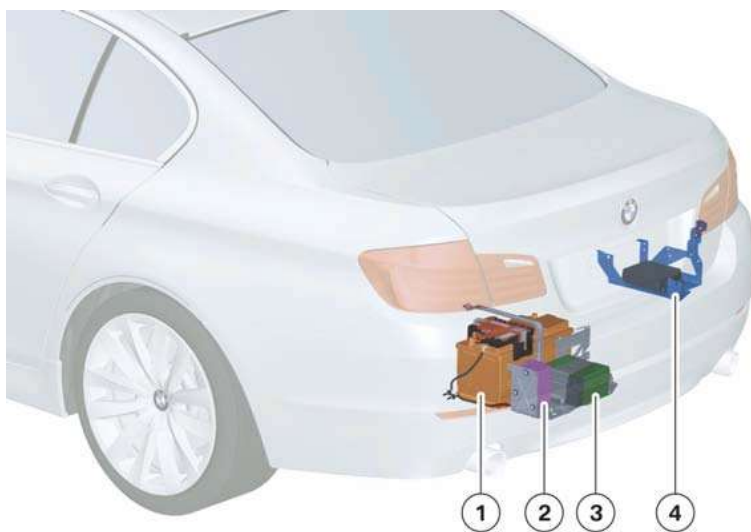
2. Voltage Supply

Index	Explanation
1	EPS
2	Positive battery connection point
3	Capacitor box
4	Digital Motor Electronics (DME)
5	Junction box electronics with front power distribution box
6	Integrated Chassis Management
7	Battery power distribution box
8	Intelligent battery sensor (IBS)
9	Battery
10	Safety battery terminal (SBK)
11	Steering column switch cluster
12	Instrument cluster (KOMBI)
13	Central Gateway Module (ZGM)

EPS with 24V

The higher weight of the V8 engines in the BMW 550i results in a higher front axle load. This in turn causes the power required for the steering system to increase. In conjunction with the active steering, an even higher exertion of force, and therefore an even higher current is required by the steering electrical components. This high current made it necessary to increase the voltage supply of the EPS to 24V.

This system requires an auxiliary battery, a separator and a charging unit for the auxiliary battery. These components are installed in the luggage compartment of the F10.



F10 24V components

TF09-2316

F10 General Vehicle Electronics

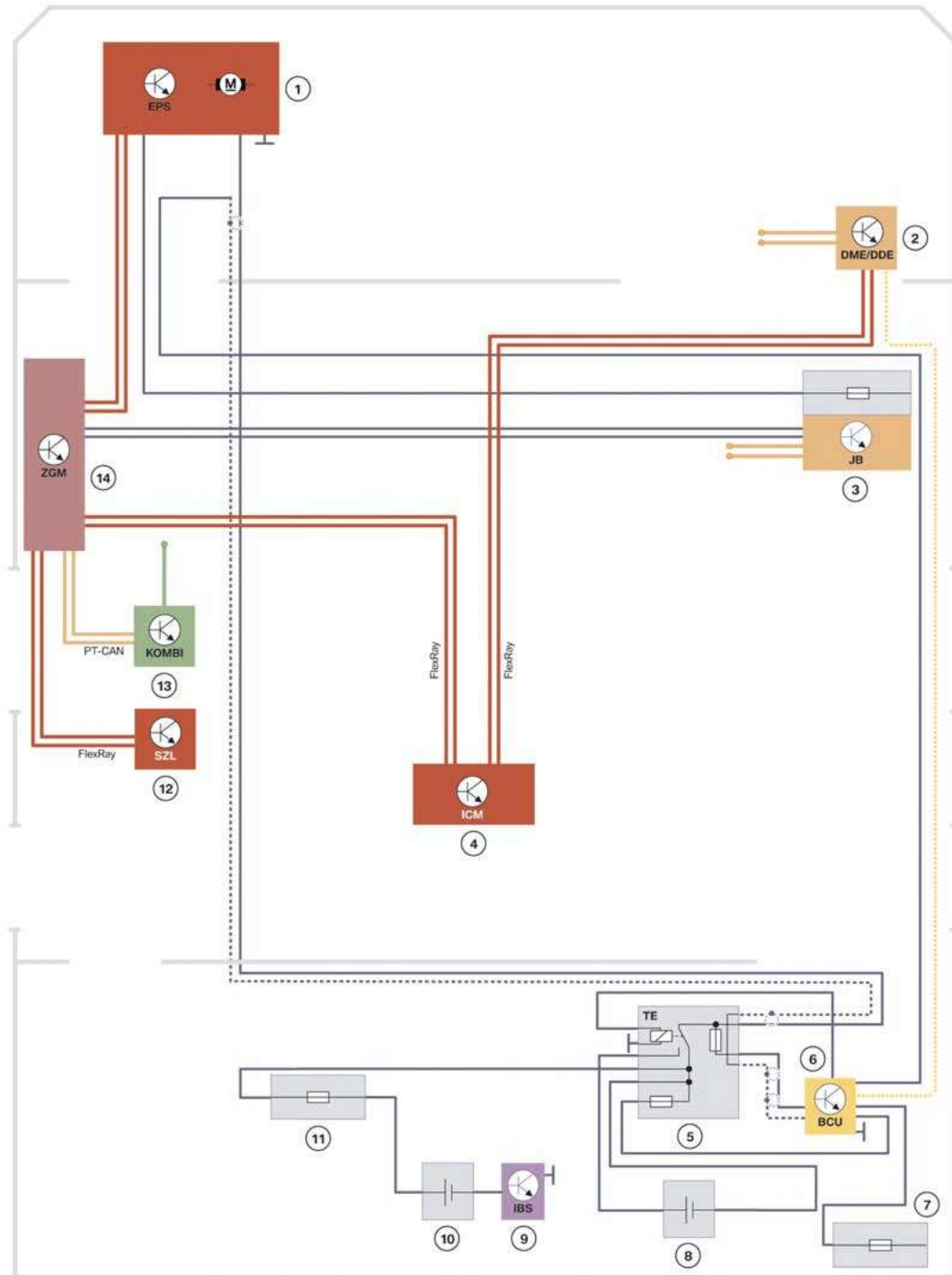
2. Voltage Supply

Index	Explanation
1	Battery
2	Separator
3	Auxiliary battery
4	Battery Charge Unit (BCU) (for auxiliary battery)

The battery charging unit (BCU) takes over the monitoring of the state of charge and the charging of the auxiliary battery with an 150W DC/DC converter. It monitors a cable sheathing of the 24V line (isolation) and among various other preconditions; it also switches the relay in the separator with which the auxiliary battery is integrated into the circuit. The EPS is supplied with 24V only after this relay has been switched (closed). In the event of a fault, the EPS can also be operated with 12V. If there is no fault, the relay in the separator is switched (to close the circuit) as of terminal 15.

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2. Voltage Supply



TE09-2216

F10 System wiring diagram EPS with 24V and active steering

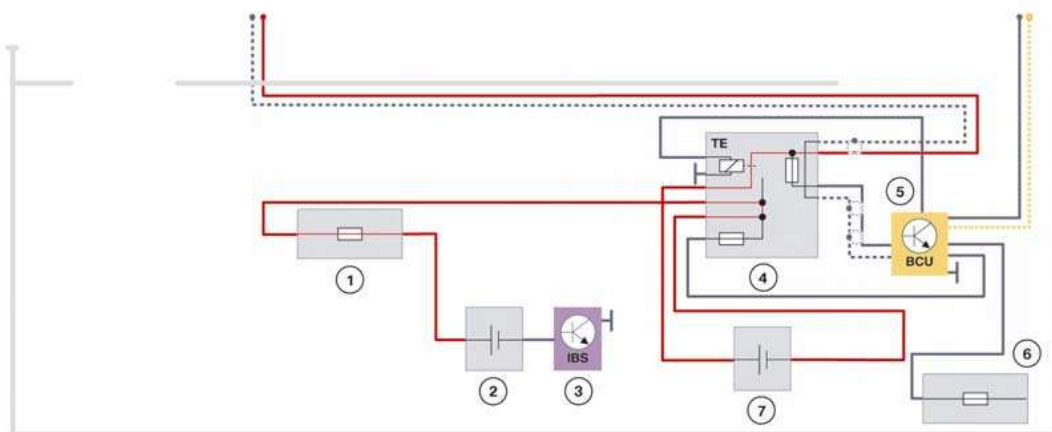
F10 General Vehicle Electronics

2. Voltage Supply

Index	Explanation
1	EPS
2	Digital Motor Electronics (DME)
3	Junction box electronics with front power distribution box
4	Integrated Chassis Management (ICM)
5	Separator
6	Battery Charge Unit (BCU) (for auxiliary battery)
7	Rear right power distribution box
8	Auxiliary battery
9	Intelligent battery sensor (IBS)
10	Battery
11	Battery power distribution box
12	Steering column switch cluster (SZL)
13	Instrument cluster (KOMBI)
14	Central Gateway Module (ZGM)

The 24V line is routed on the vehicle floor. It is surrounded by a cable sheathing (isolation) that is monitored by the battery charging unit.

The following system wiring diagram details show the various switch situations and the charging of the auxiliary battery.



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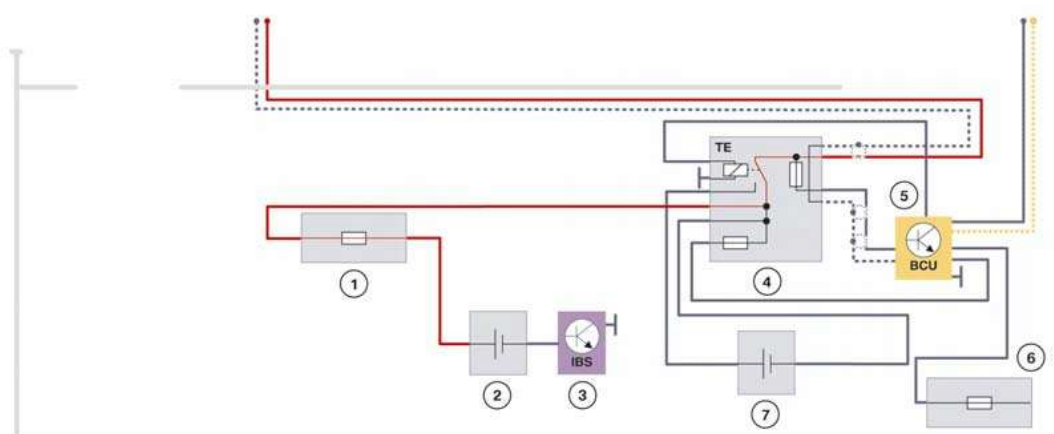
F10 24V operation of the EPS

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2. Voltage Supply

Index	Explanation
1	Battery power distribution box
2	Battery
3	Intelligent battery sensor IBS.
4	Separator (here: 24V operation)
5	Battery Charge Unit (BCU)
6	Rear right power distribution box
7	Auxiliary battery

In 24V operation, the battery and the auxiliary battery are connected in series by the relay in the separator. As a result, the EPS is operated with 24V.



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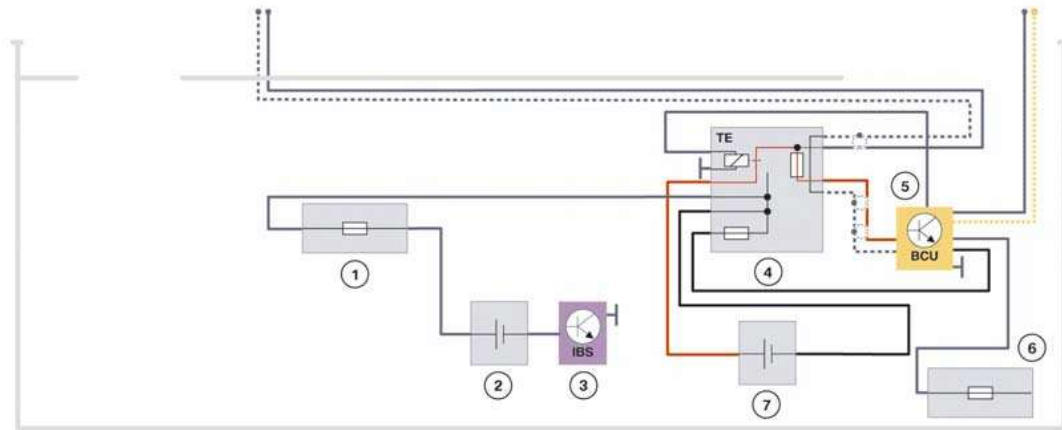
F10 12V operation in the event of a fault

Index	Explanation
1	Battery power distribution box
2	Battery
3	Intelligent battery sensor IBS.
4	Separator (here: 12V operation)
5	Battery Charge Unit (BCU)
6	Rear right power distribution box
7	Auxiliary battery

In the event of a fault or before terminal 15, the relay is open and the separator is in the 12V position. The auxiliary battery is no longer connected in series and is no longer in the circuit.

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2. Voltage Supply



TE09-2275

F10 Charging of the auxiliary battery in 24V operation

Index	Explanation
1	Battery power distribution box
2	Battery
3	Intelligent battery sensor IBS.
4	Separator (here: 24V operation)
5	Battery Charge Unit (BCU)
6	Rear right power distribution box
7	Auxiliary battery

The auxiliary battery can be charged in 24V operation using the battery charging unit (BCU) for the auxiliary battery. To do so, the charging unit takes the energy it uses for charging the auxiliary battery from the vehicle electrical system via the rear right power distribution box.

The 24V line is routed on the vehicle floor and is surrounded by a cable sheathing that is monitored by the BCU.

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2. Voltage Supply



F10 24V components and line routing

Index	Explanation
1	Battery Charge Unit (BCU) (Charging unit for auxiliary battery)
2	Separator and auxiliary battery
3	Battery
4	EPS with active steering