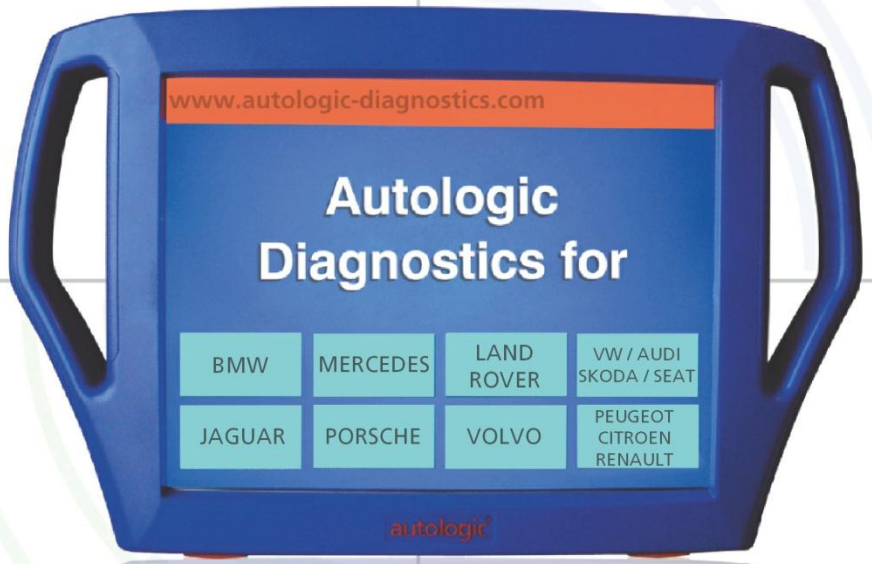


Autologic Diagnostics Ltd

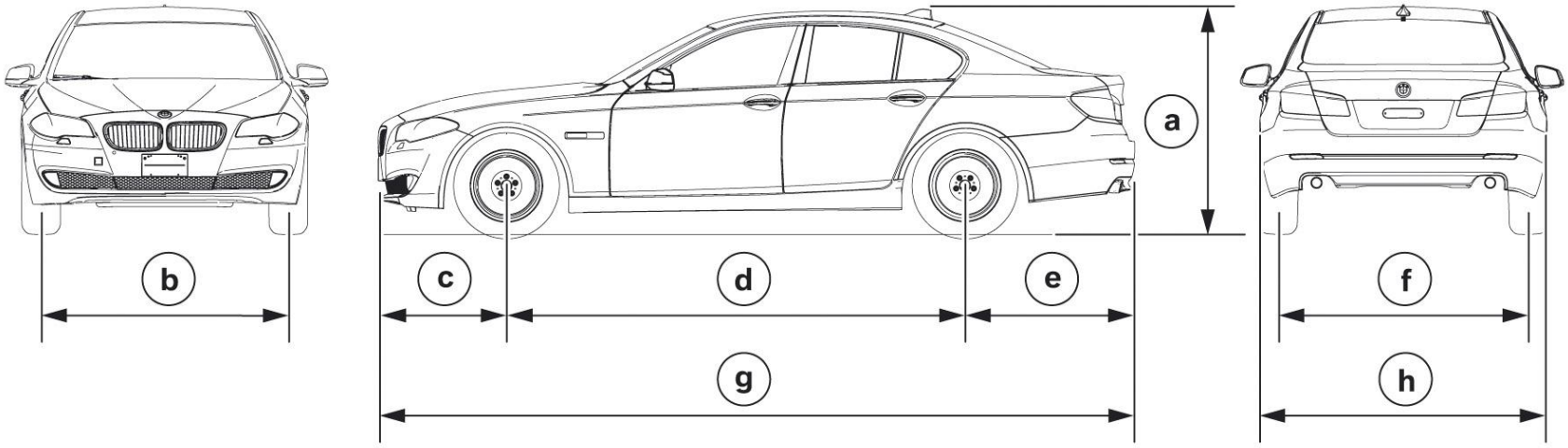
Presentation by ChungYin

April 2012

Today Topic

- History, Body, Engine, Gearbox, Chassis
- IAL (Integral active steering)
- EPS
- EMF
- Drive Assist
- Passive Safety System
- Engine
- BUS System
- Wiring diagram, Control Unit location, Instrument panel test function
- CIP (E-series and F-series), Foundation

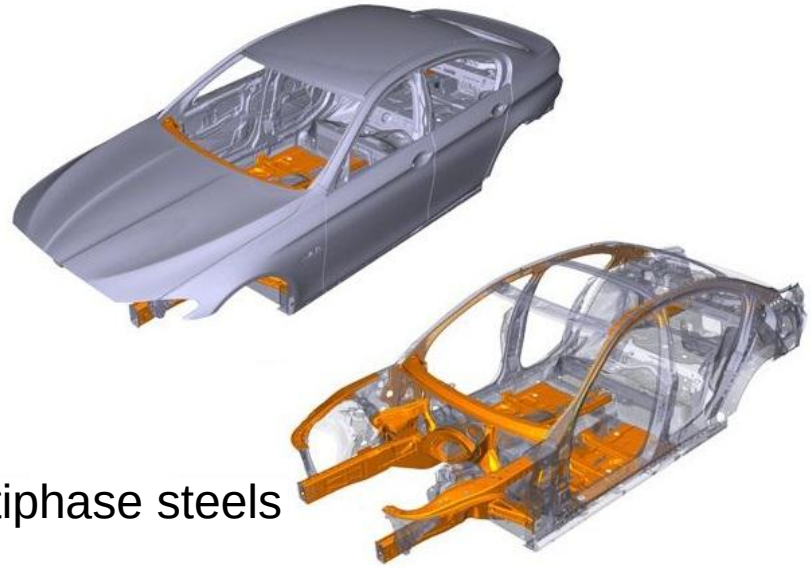
F10 Dimension



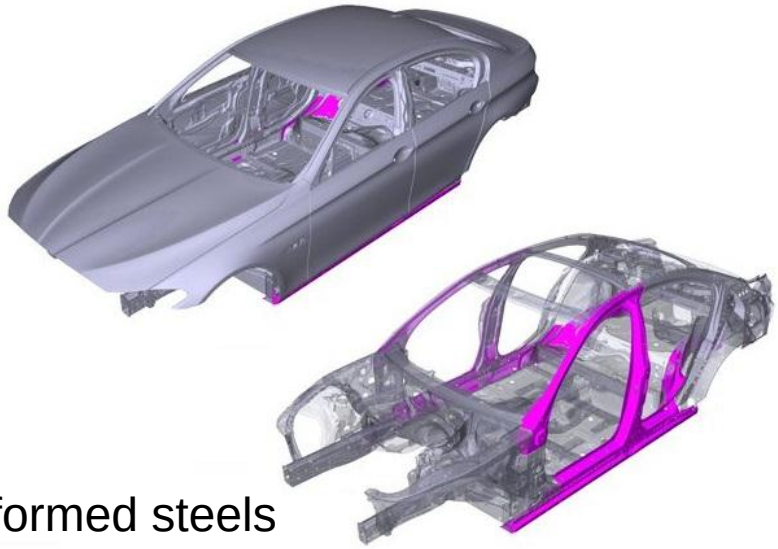
a - Vehicle height, empty (1464mm)
b - Track width of basic wheels, front (1600mm)
c - Overhang, front (832mm)
d - Wheelbase (2968mm)
e - Overhang, rear (1099mm)
f - Track width of basic wheels, rear (1627mm)
g - Vehicle length (4899mm)
h - Vehicle width without exterior mirrors (1860mm)

.Body

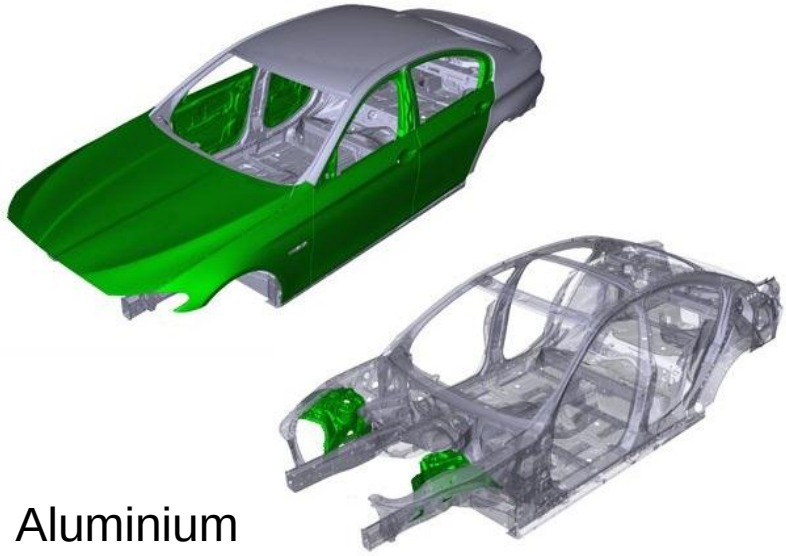
Other steels



Multiphase steels

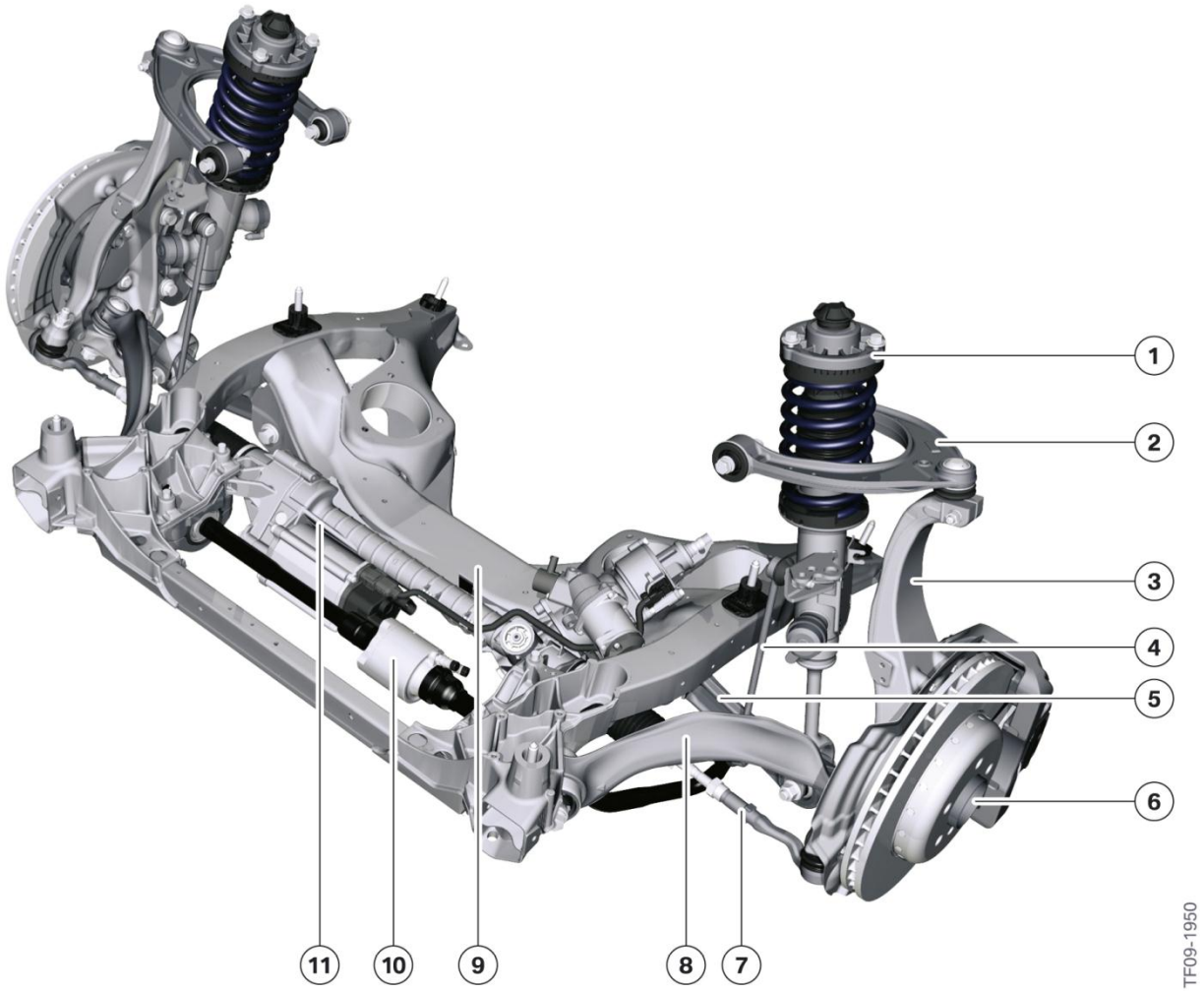


Hot-formed steels



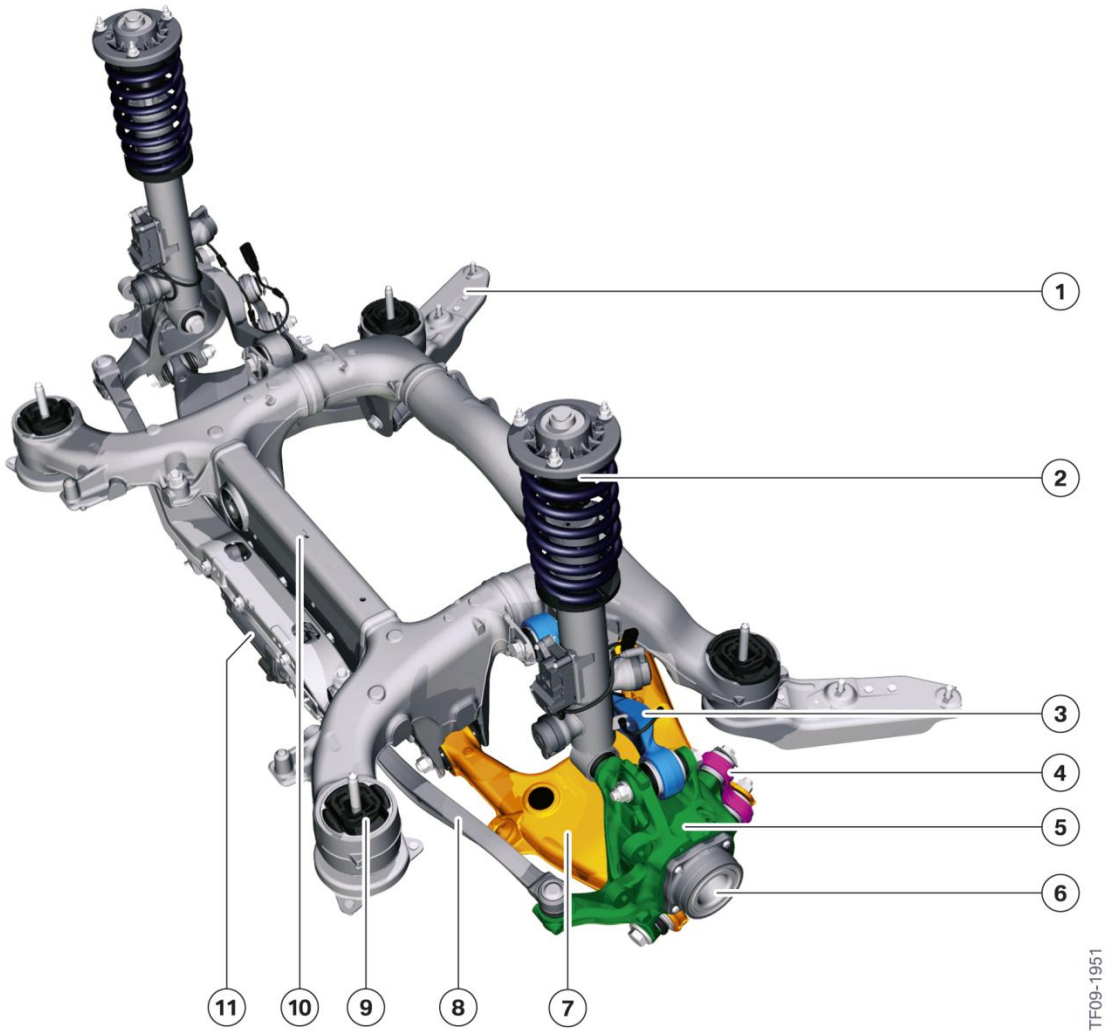
Aluminium

F10 - Front axle



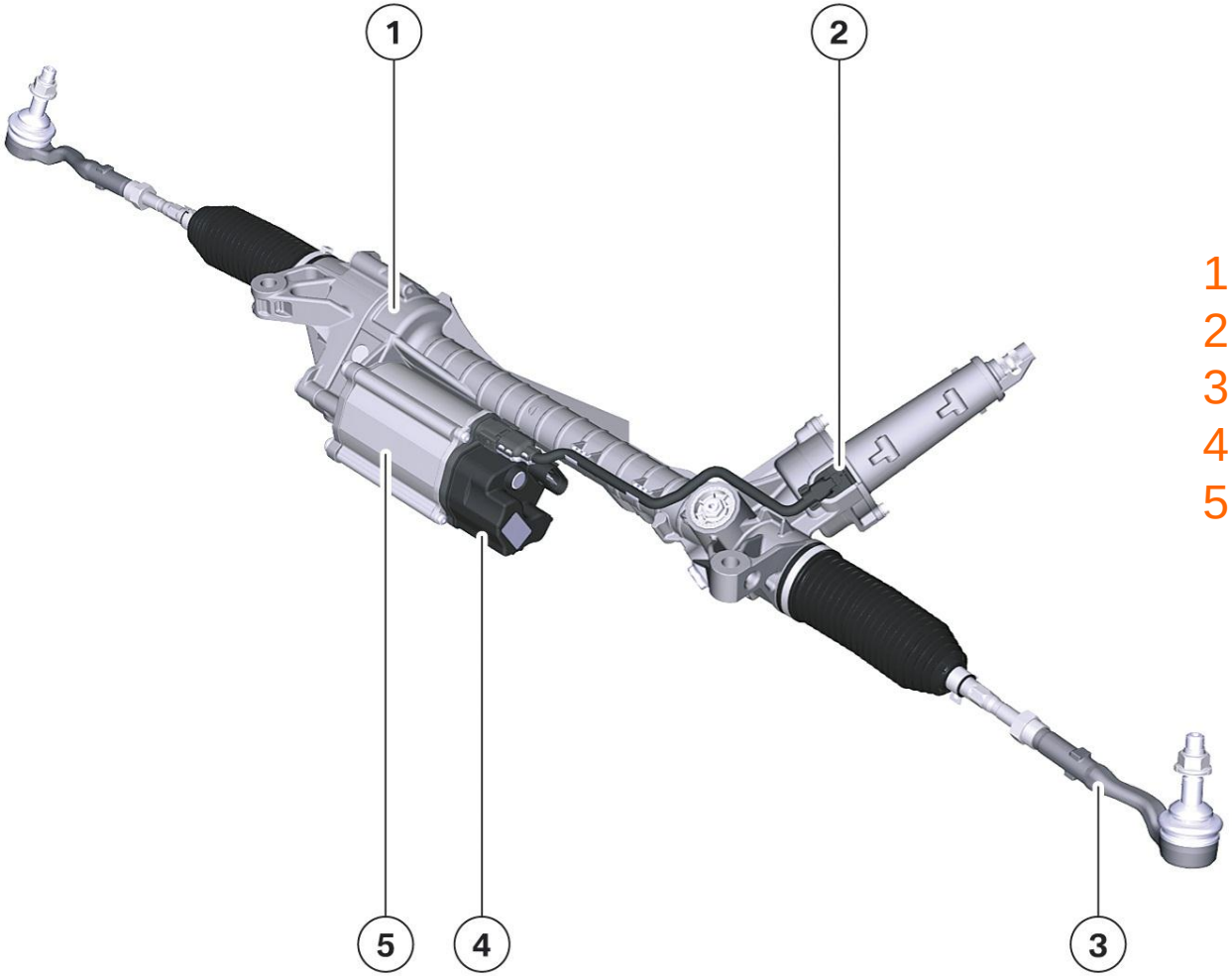
1 - Spring strut
2 - Top wishbone
3 - Swivel bearing
4 - Stabiliser link
5 - Bottom wishbone
6 - Wheel hub
7 - Track rod
8 - Tension strut with hydraulic mount
9 - Front axle subframe
10 - Anti-roll bar with hydraulic swivel motor
11 - Steering gear

F10 - Rear axle



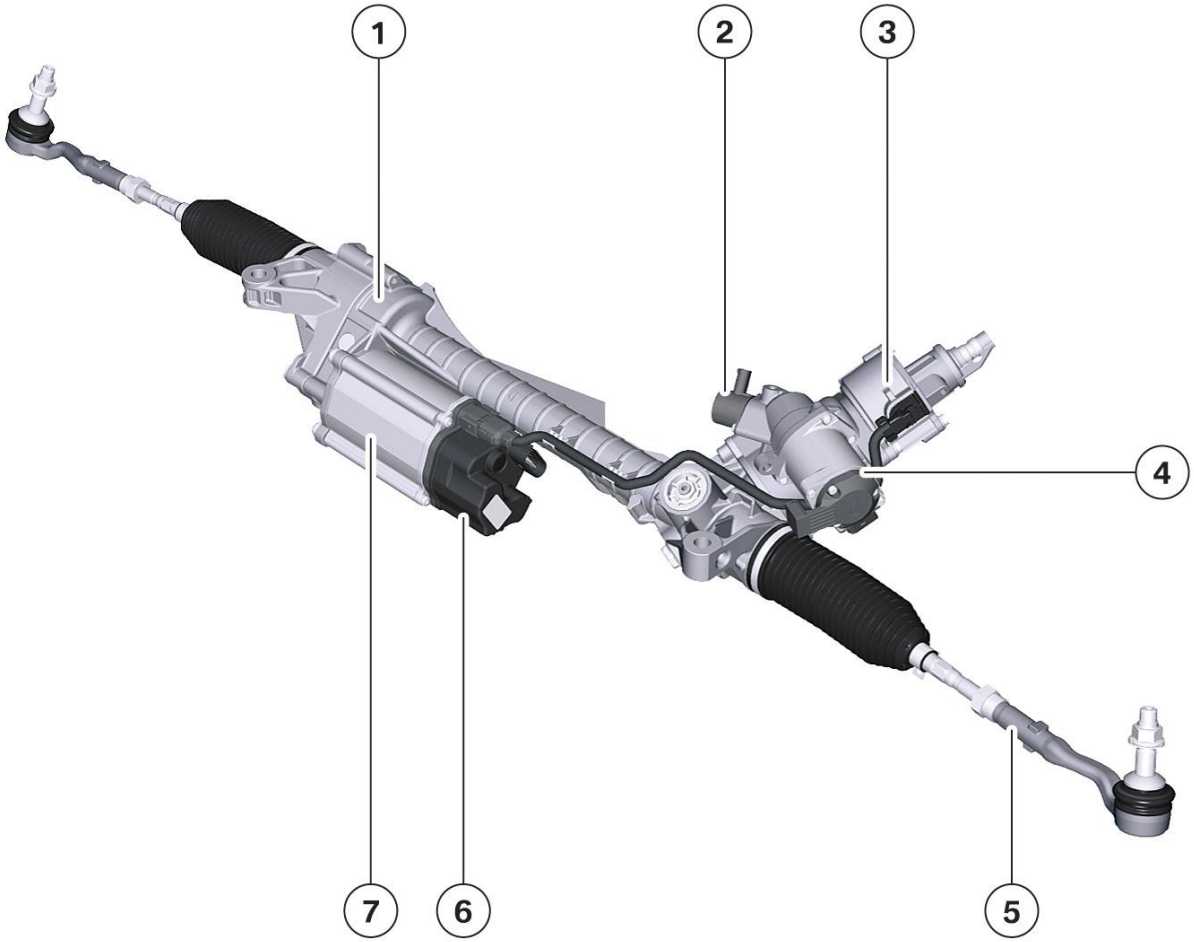
1 - Thrust strut
2 - Spring strut
3 - Top wishbone
4 - Integral link
5 - Wheel carrier
6 - Wheel bearing
7 - A-arm (swinging arm)
8 - Track rod
9 - Rubber mount for rear axle
10 - Rear suspension subframe
11 - HSR actuator

F10 – Steering (EPS BASIC)



1 - Speed reducer
2 - Steering torque sensor
3 - Track rod
4 - EPS control unit
5 - Electric motor with motor position sensor

F10 – Active Steering (FRONT)



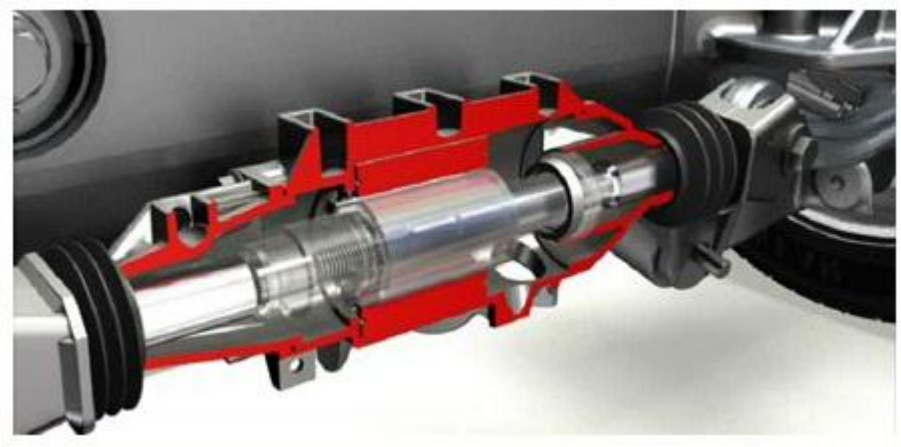
1 - Speed reducer
2 - Active steering lock
3 - Steering-torque sensor
4 - Active steering servomotor with motor position angle sensor
5 - Track rod
6 - EPS control unit
7 - Electric motor with motor position sensor

F10 – Active Steering (FRONT)

- AL and HSR control the actuators that adjust the front and rear axle.

Electric motor with motor position sensor and planetary gear train

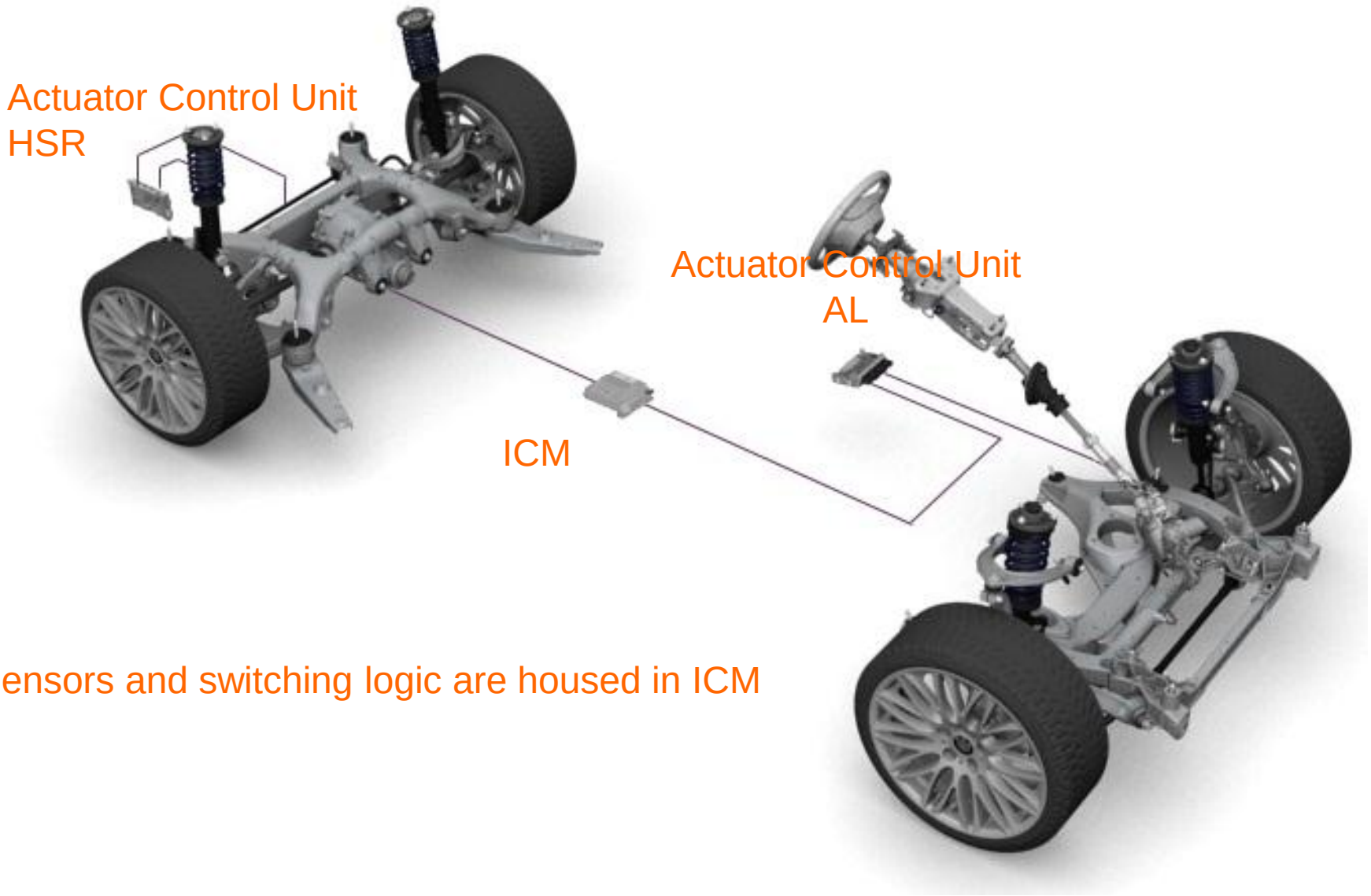
.F10 – IAL (Rear with HSR)



Spindle drive with electric motor

- Actuator was mount coaxially, which Electric motor can adjust the rear wheels In direction up to 3 degrees.

.F10 – IAL



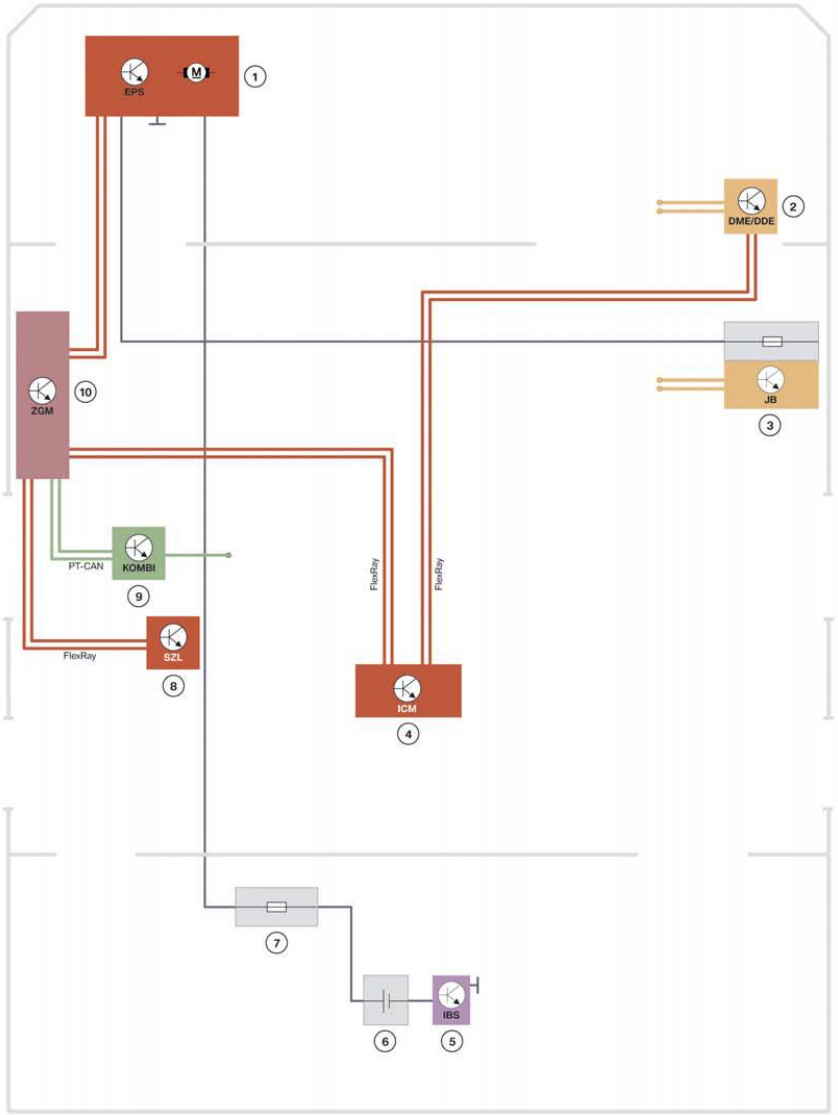
Sensors and switching logic are housed in ICM

Type of EPS equipped

- Electromechanical Power Steering with Active Steering (EPS AS)
- Due to EPS AS reach its limit with large engine and higher weight on front axle.
- Two type of EPS AS in F10

- EPS AS - 12Volt
- EPS AS - 24Volt

EPS (Basic)

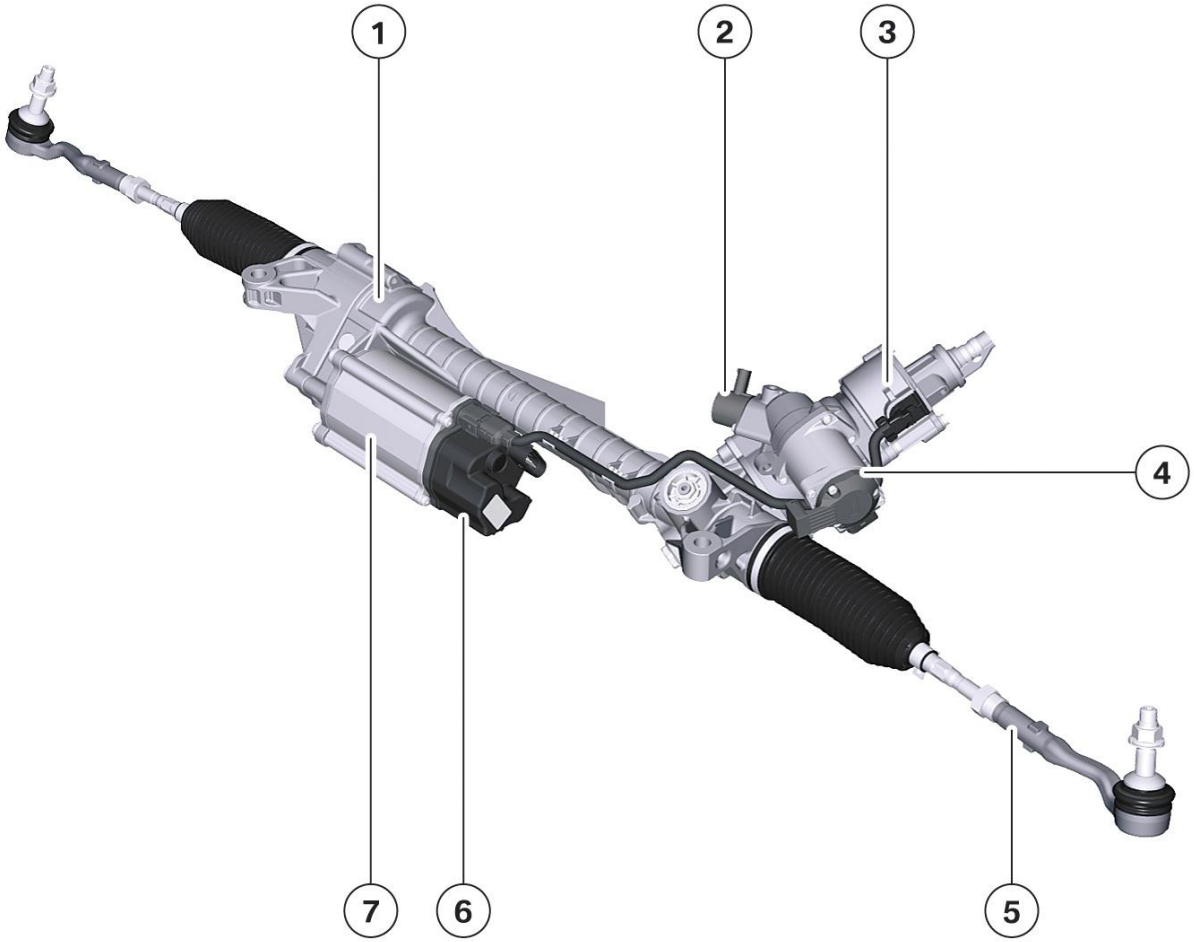


1 - EPS
2 - Digital Motor Electronics (DME)
3 - Junction box electronics with front power distribution box
4 - Integrated Chassis Management (ICM)
5 - Intelligent battery sensor (IBS)
6 - Battery
7 - Battery power distribution box
8 - Steering column switch cluster (SZL)
9 - Instrument cluster (KOMBI)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

F10 – Active Steering (EPS AS)

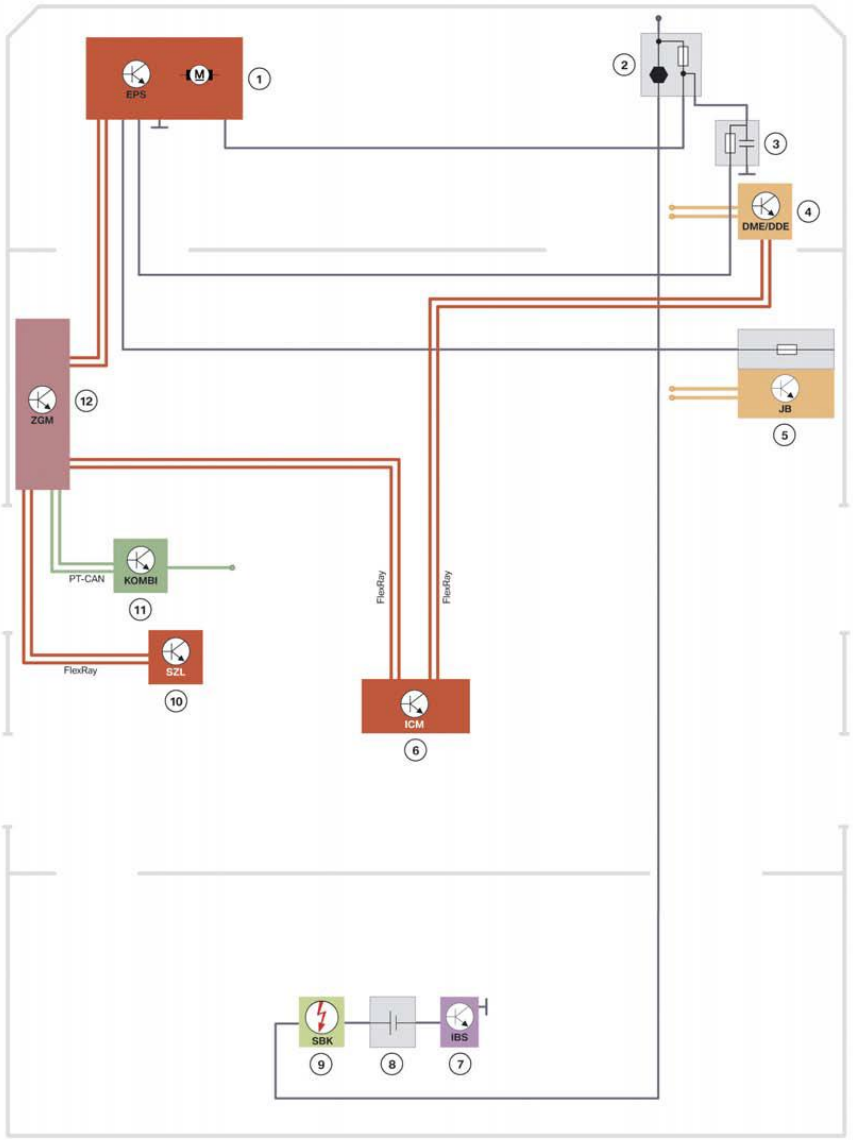
1 - Battery charging unit for auxiliary battery (BCU)
2 - Separator and auxiliary battery
3 - Battery
4 - EPS with active steering

F10 – Active Steering (EPS AS)



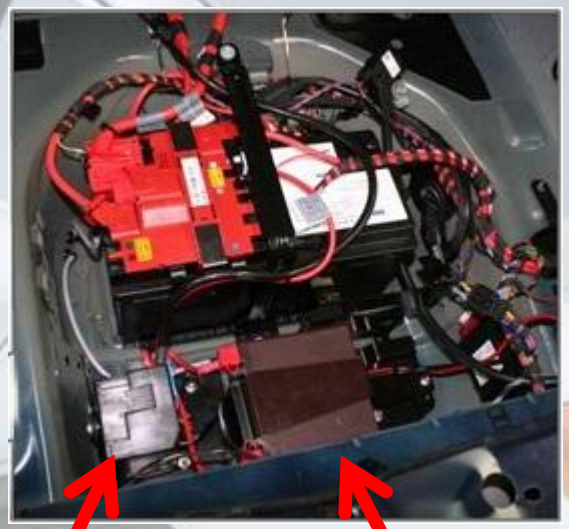
1 - Speed reducer
2 - Active steering lock
3 - Steering-torque sensor
4 - Active steering servomotor with motor position angle sensor
5 - Track rod
6 - EPS control unit
7 - Electric motor with motor position sensor

EPS AS(12Volt)



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 - Intelligent battery sensor (IBS)
8 - Battery
9 - Safety battery terminal (SBK)
10 - Steering column switch cluster
11 - Instrument cluster (KOMBI)
12 - Central Gateway Module (ZGM)

.EPS AS (24Volt)

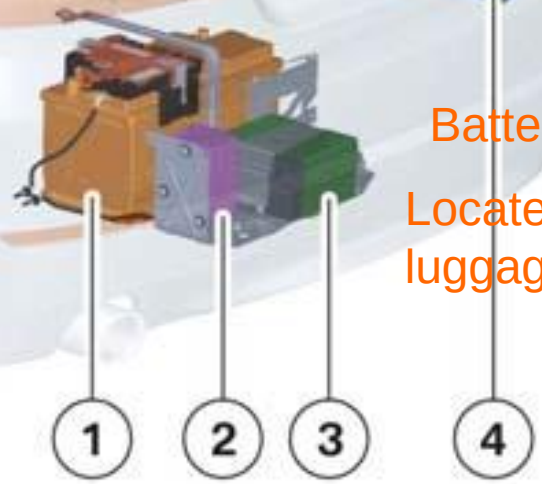


Separator

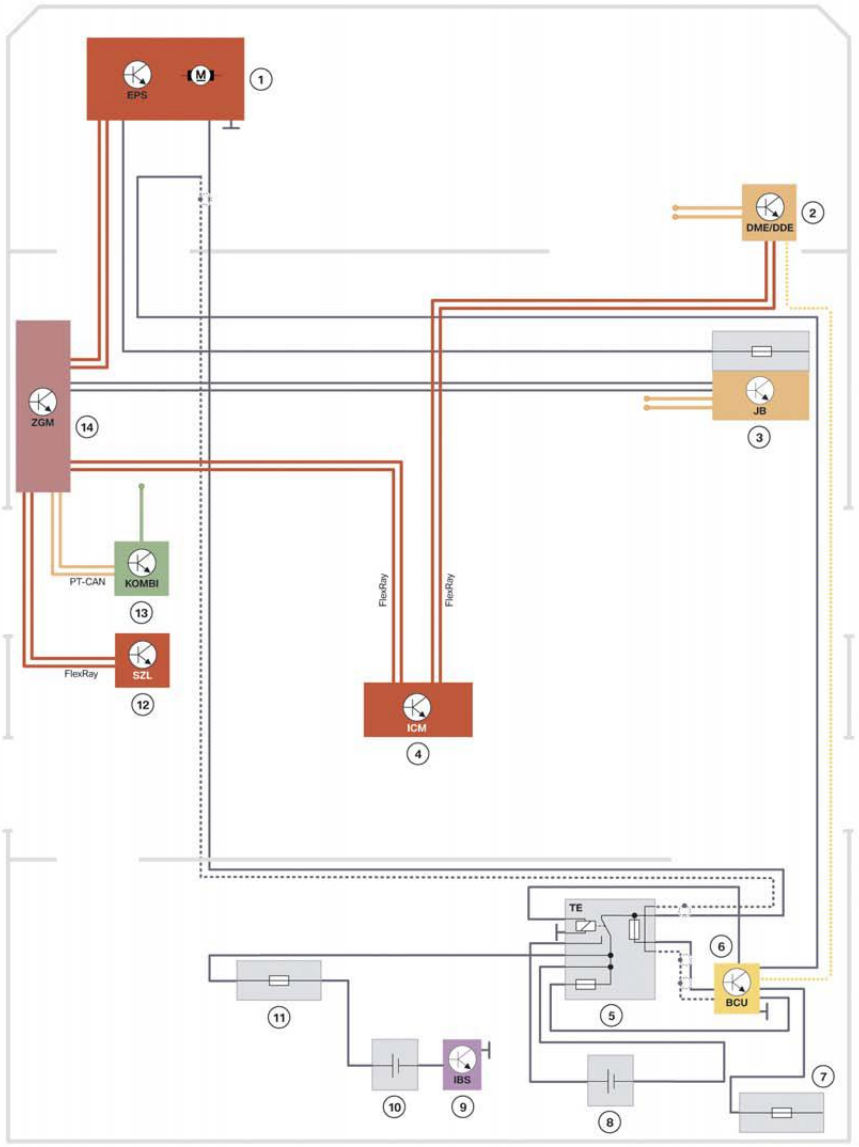
12Volt Battery

Battery charge unit

Located in the right luggage compartment

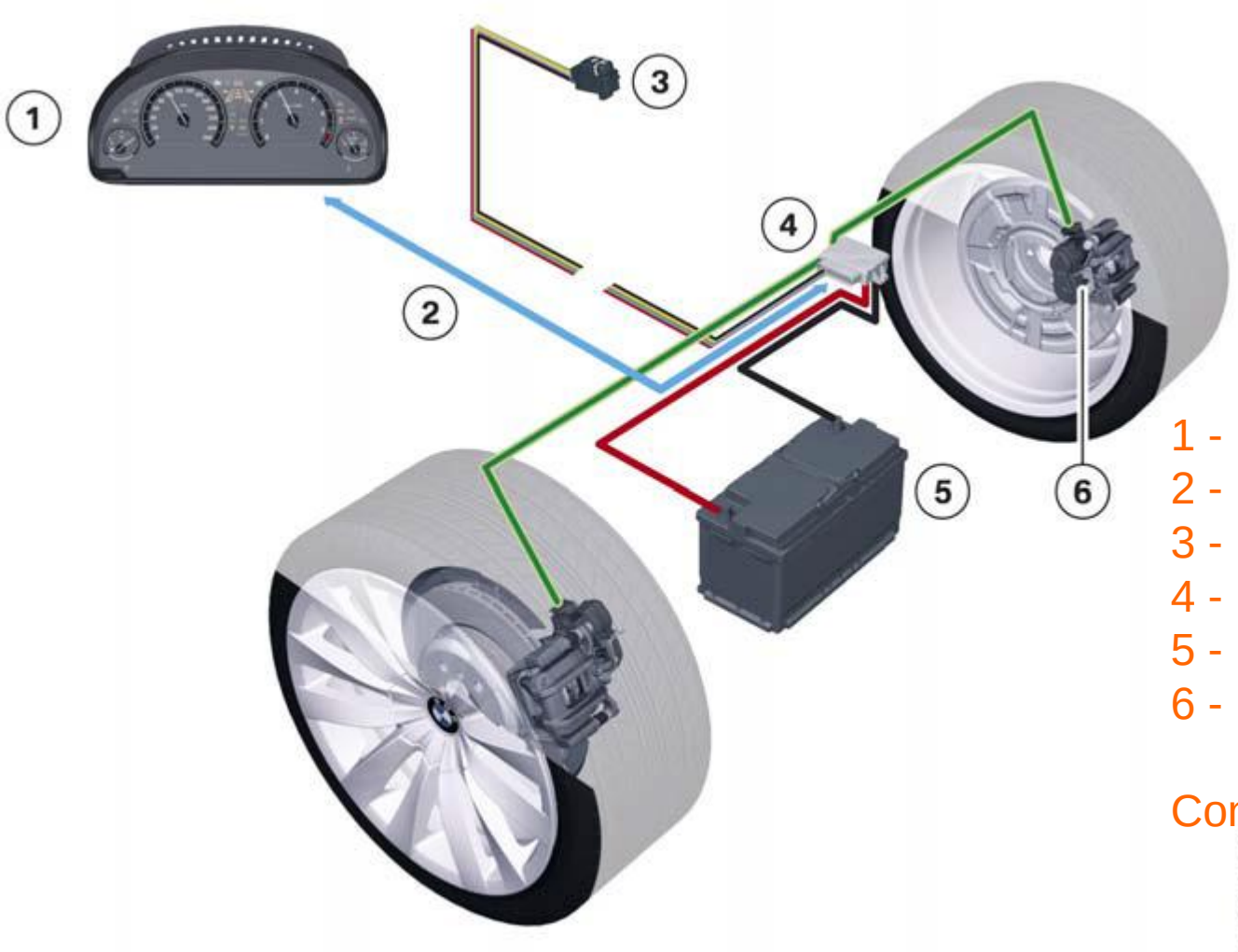


EPS AS (24Volt)



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 charging unit for auxiliary battery (BCU)
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)

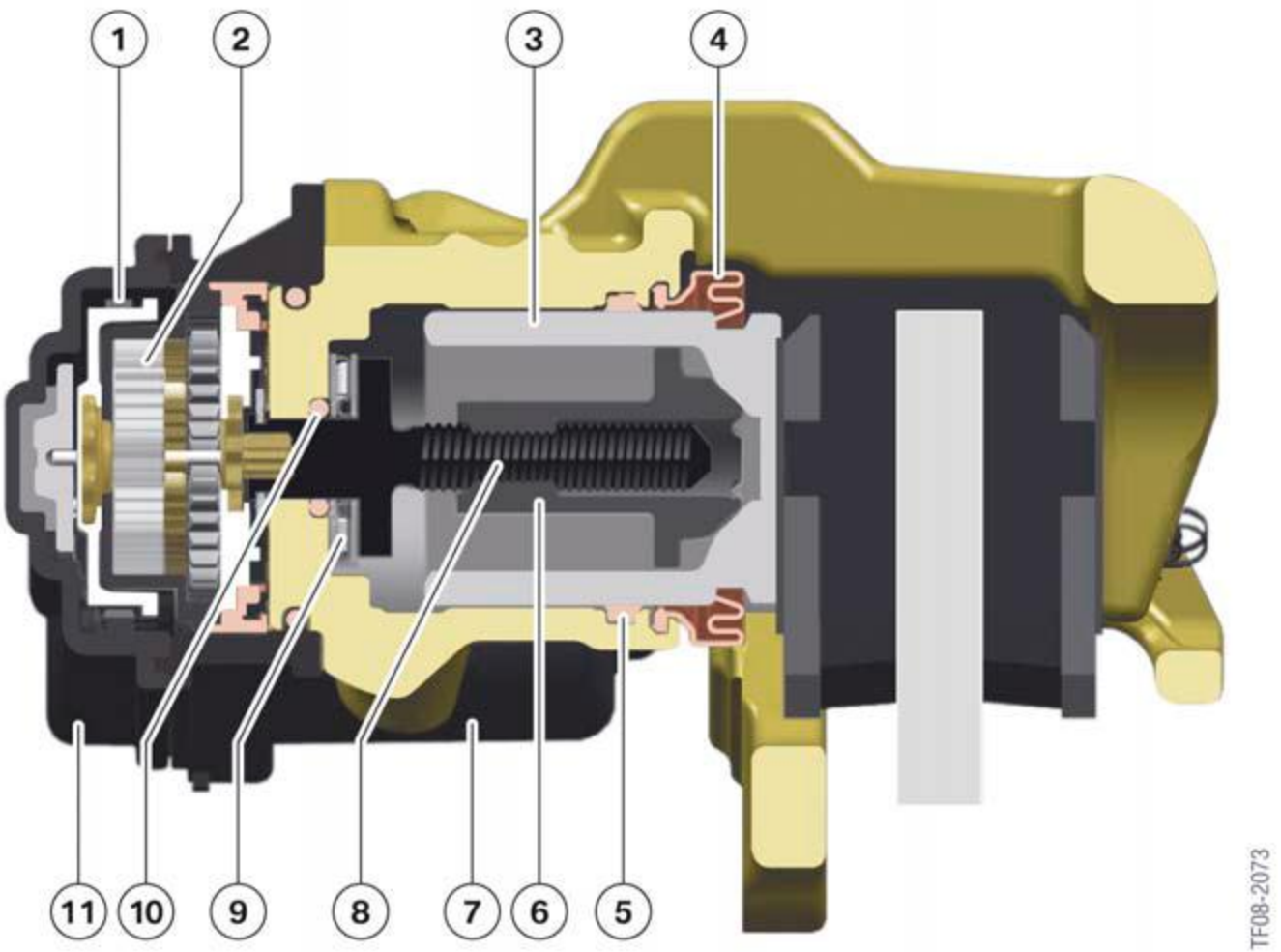
F10 – EMF



1 - Instrument cluster
2 - Flow of information
3 - Parking brake button
4 - EMF control unit
5 - Battery
6 - EMF actuator

Configuration like E89/F25

F10 – EMF



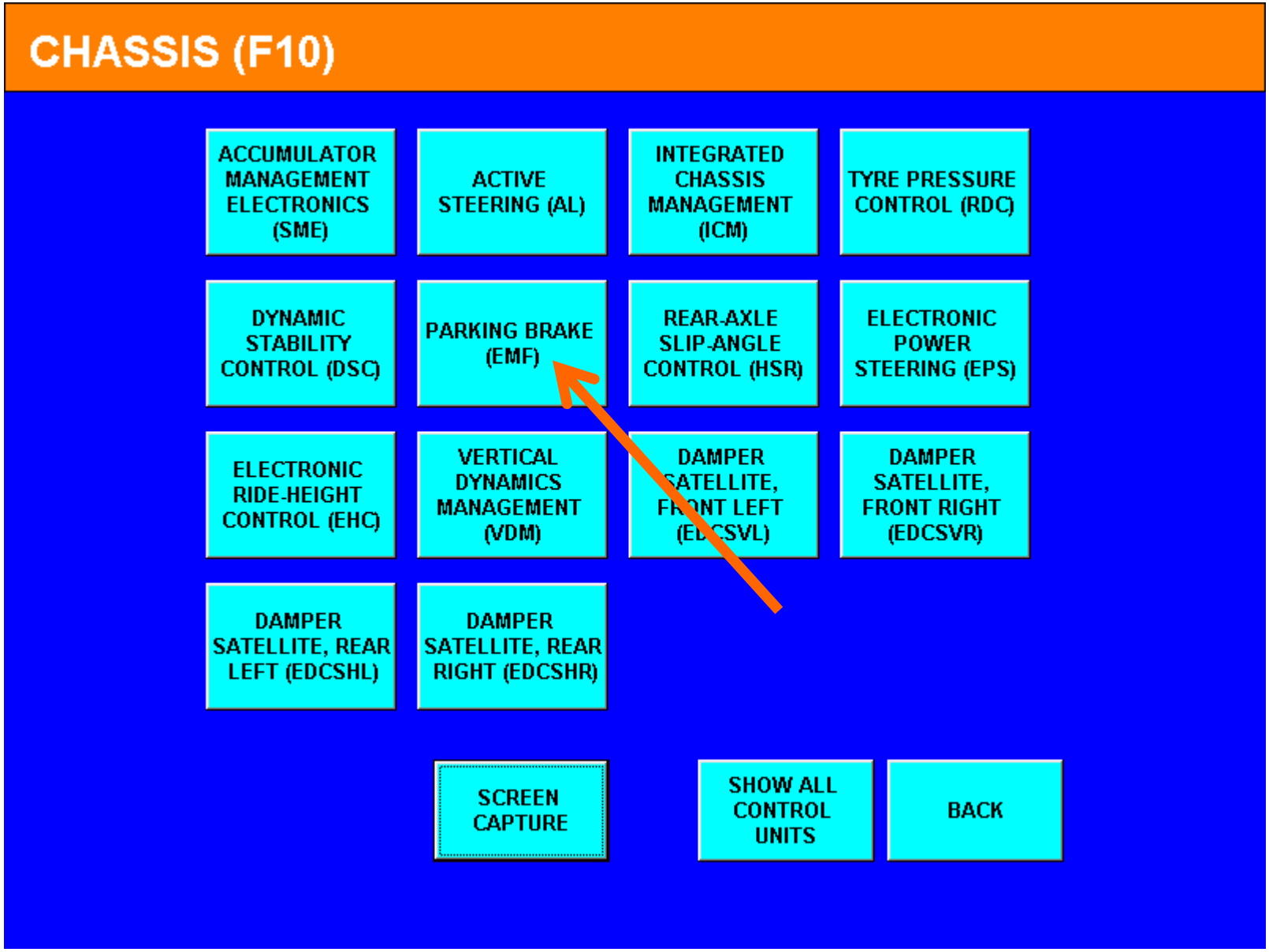
1 Drive belt
2 Planetary gearing
3 Brake piston
4 Dust boot
5 Sealing ring
6 Worm nut
7 Electric motor
8 Spindle
9 Roller bearing
10 Sealing ring
11 Casing

Changing brake pad

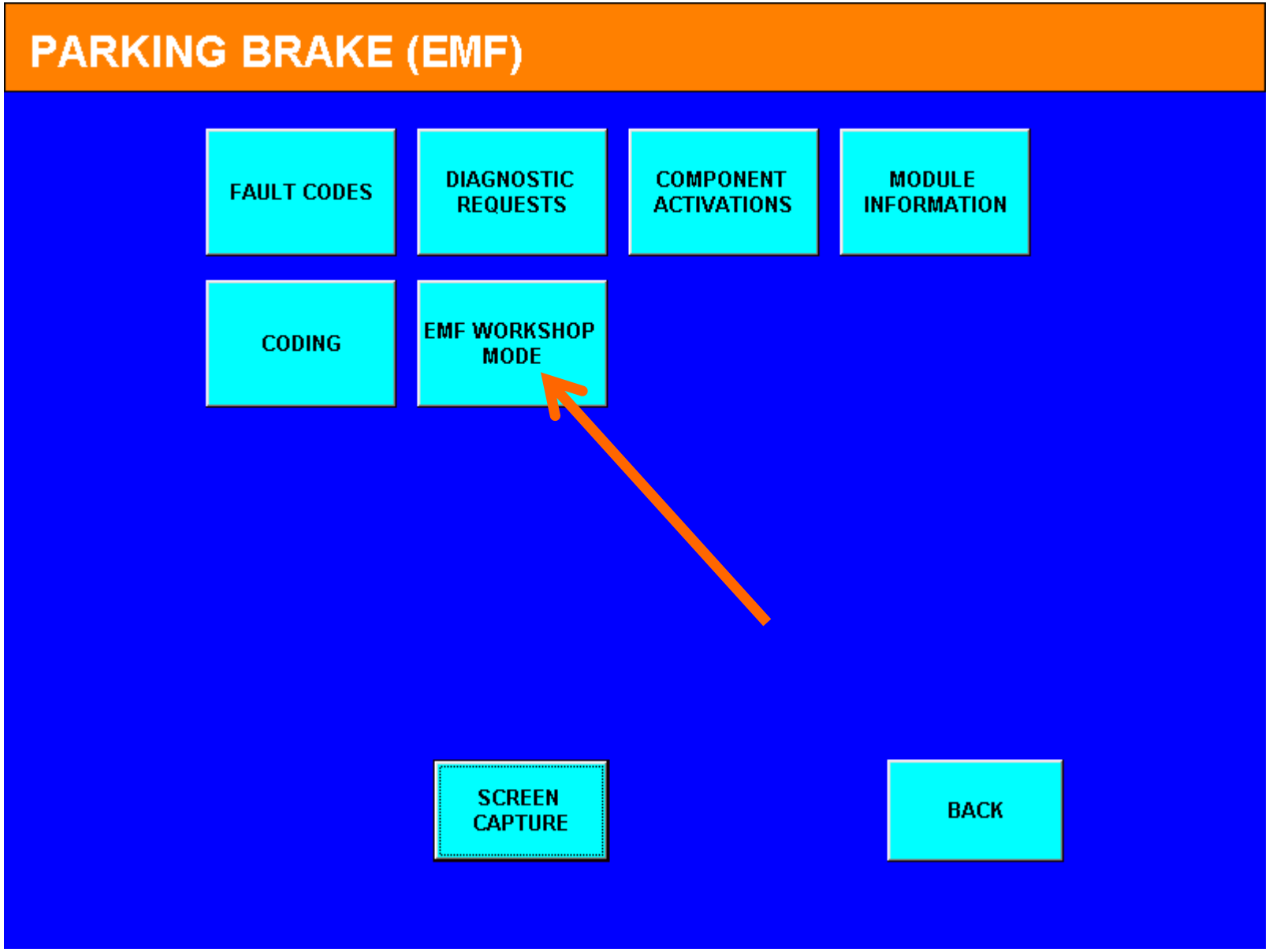
To change the brake pads, the EMF actuator must be in the completely open position. By move the actuators of the electric parking brake into an installation position.

So that the brake piston can be pushed back. The EMF actuators can be activated and moved into the completely open position. This position is necessary to change The brake pads.

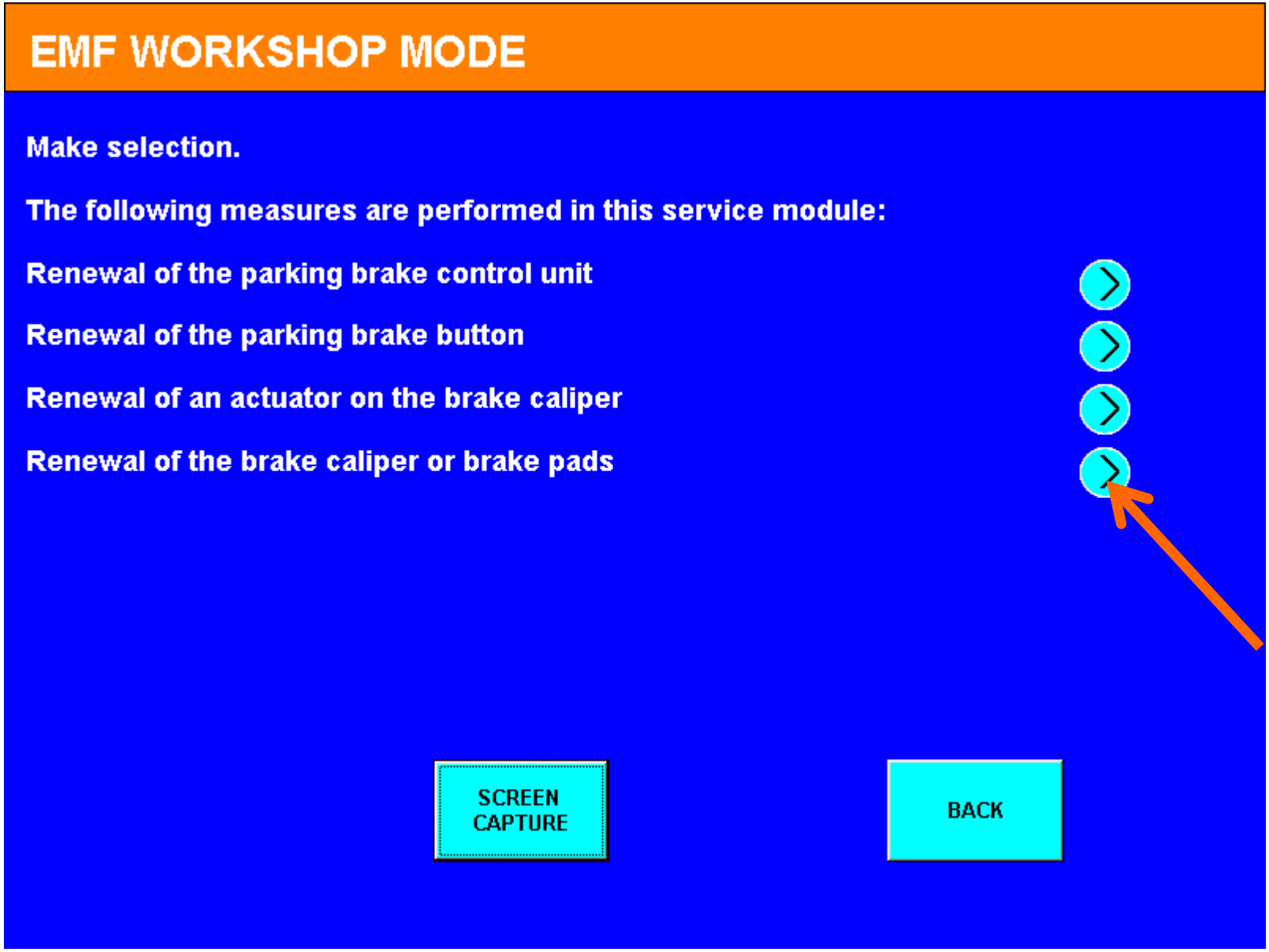
.Changing brake pad



.Changing brake pad



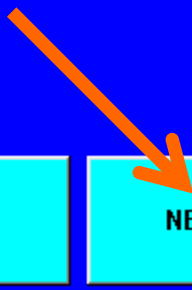
.Changing brake pad



.Changing brake pad

RENEWAL OF THE BRAKE CALIPER OR BRAKE PADS

Pull the parking brake button and wait for approximately 3 seconds until the parking brake is set
The setting of the parking brake is audible.



SCREEN CAPTURE

BACK

NEXT

PAGE 1 OF 5

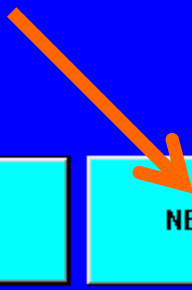
.Changing brake pad

RENEWAL OF THE BRAKE CALIPER OR BRAKE PADS

Next, the parking brake is released.

To do this, activate the footbrake and press the parking brake button.

Releasing of the parking brake takes approximately 3 seconds and is audible



SCREEN CAPTURE

BACK

NEXT

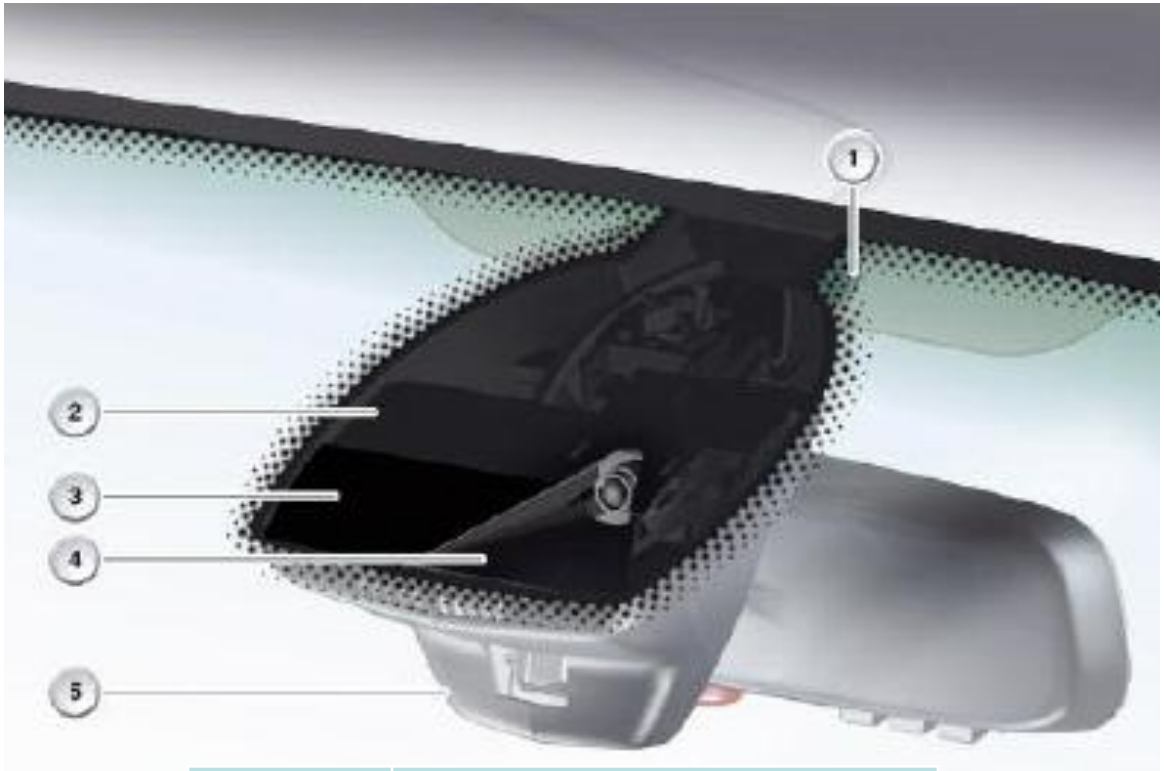
PAGE 2 OF 5

Lane Departure Warning

Lane Departure Warning

The lane departure warning (option 5AD) warns the driver in the event that the vehicle deviates from the lane it is currently traveling without the driver's intention. For this function to work properly recognizable road and lane markings should be present and detected by the system. The KAFAS control unit performs an evaluation of the images recorded by the forward-pointing video camera, located near the rear-view mirror base.
Although the driver continues to have full responsibility for driving the vehicle, the system is only designed to assist the driver in case of a lapse of attention.
This system is will only operate as intended on highways, major roads and well maintained country roads. Therefore, warnings are only given at speeds of over 70 km/h/43mph.
The driver activates the system using the lane departure warning button in the driver assistance control panel (to the left of the steering column).

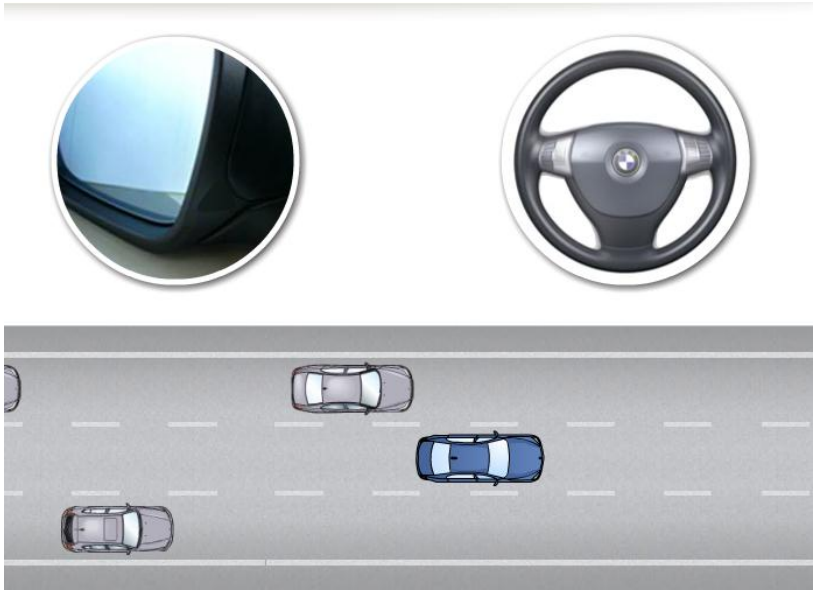
Lane Departure Warning



Index	Explanation
1	Headlining cut-out with cable end
2	Rain/light sensor
3	Condensation sensor
4	Lane Departure warning camera
5	Mirror caps/high beam assistant

Lane Departure Warning

Lane change warning



In terms of safety and comfort. The new Lane change warning system, signals to the driver there are vehicles approaching from the rear and warns the driver if they intend to change lane.

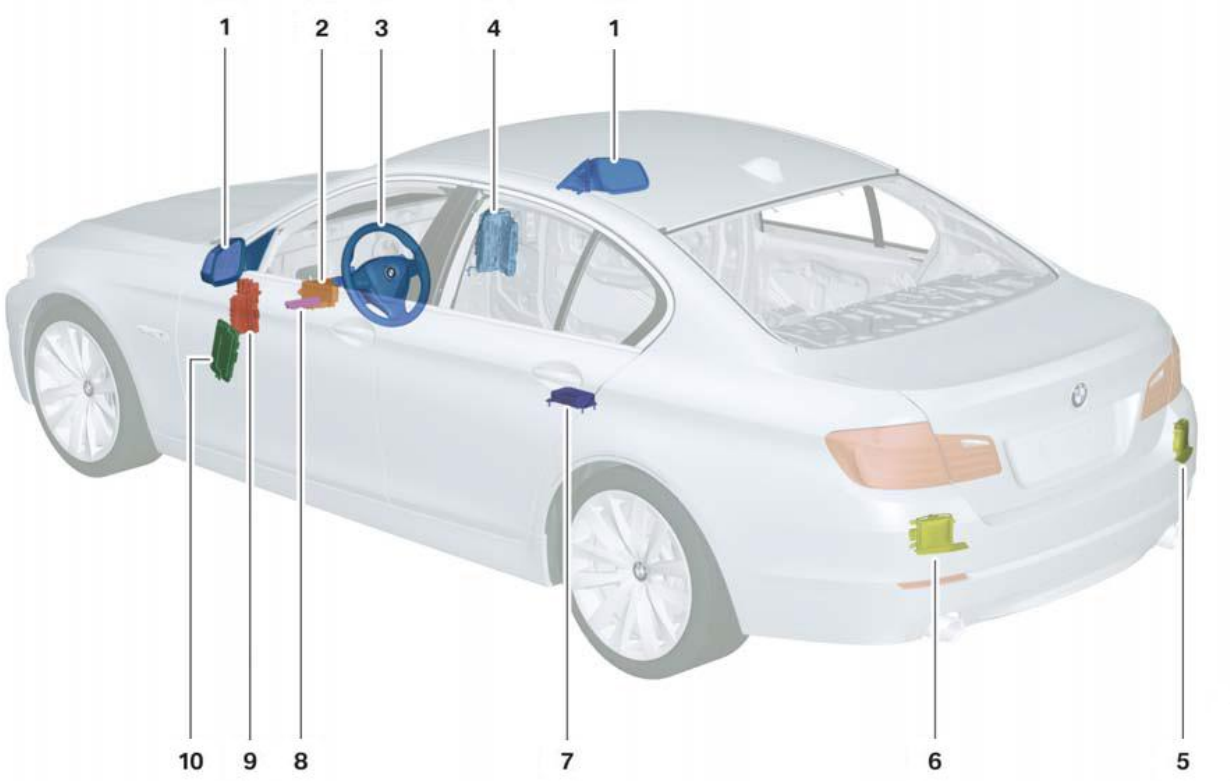
Lane Departure Warning

Lane change warning

If there is a obstruction within the area of the rear view mirror a warning triangle symbol appears in the rear view mirror
And the steering wheel vibrates (do not exit into the lane)?

ActiveBlindSpotDetection

The active blind spot detection system (option 5AG) is meant to assist the driver during lane changes.
To do this, the active blind spot detection system monitors traffic at the rear and sides of the vehicle with two radar sensors. The radar sensors are located above the rear bumper support.
You can see the components that make up the active blind spot detection system in the following graphic.



1 Exterior mirrors
2 Car Access System
3 Steering wheel with vibration actuator
4 Junction box (junction box electronics and front power distribution box)
5 Radar sensor, right
6 Radar sensor, left
7 Integrated Chassis Management
8 Driver assistance systems operating unit
9 Central Gateway Module
10 Footwell module
11 Steering column switch cluster

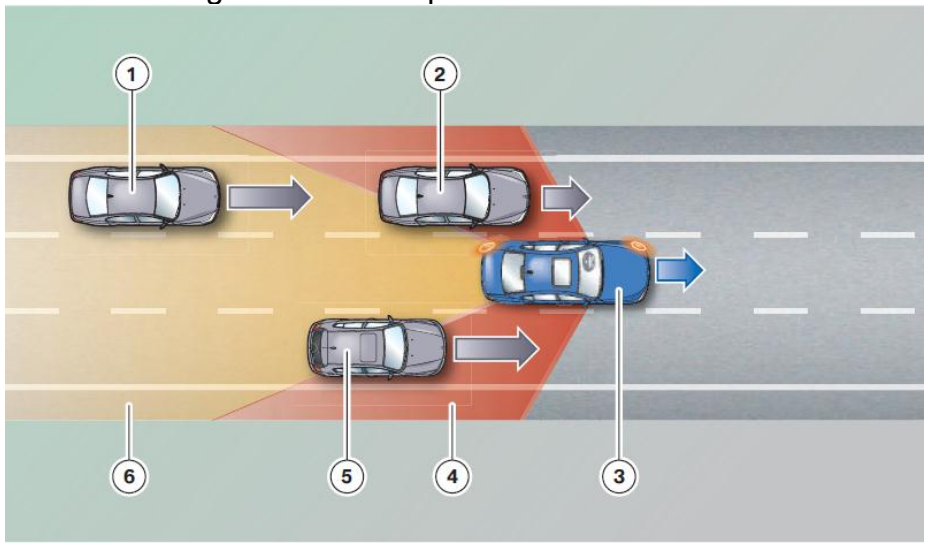
.ActiveBlindSpotDetection

**The system can detect traffic situations that could be dangerous or result in a collision if your vehicle changes lanes.
The driver is first informed by a warning light in the exterior mirrors.
If the driver intends to change lanes in this situation and indicates this by operating the turn indicator,
the driver is warned by a vibrating steering wheel and a flashing warning light in the exterior mirror.**

ActiveBlindSpotDetection

Active Blind Spot Detection

Active Blind Spot Detection is a new BMW system. It is being introduced for the first time in the F01/F02 7 Series . The system is designed to assist the driver in making lane change maneuvers by monitoring traffic at the rear and sides of the vehicle. Using two radar sensors it detects vehicles traveling in the rear and along side our vehicle and warns the driver of the position of any unseen vehicles around him traveling in his “Blind Spot”.



Index	Explanation
1	Fast approaching vehicle on the left-hand neighboring lane
2	Vehicle in the left-hand lane neighboring lane travelling at the same time
3	Your own vehicle, with the intension of changing lanes to the left
4	Blind spot area (left/right)
5	Vehicle in the right-hand neighboring lane travelling at a faster speed
6	“Lane change zone”

Head Up Display

Head-Up Display

The very name “Head-Up” describes the principle benefit of this system. The Head-up Display (HUD) projects a virtual image into the driver’s field of vision. Important information such as cruise control details or graphical directions from the navigation system are projected onto the windshield and are thus permanently visible within the driver’s field of view.

The driver of a BMW thus has the important data and graphics put up in his field of view, just like a pilot in his jet fighter.

The head-up display in the new BMW 7 Series incorporates various functions aimed at enhancing road safety and driver convenience.

That includes display of:

- **Information from the cruise control system**
- **Information from the navigation system**
- **Check Control messages**
- **Road speed**

Having the displays in the driver’s direct field of view increases safety, as the eyes are always on the traffic.

Night Vision

Night Vision

The BMW Night Vision 2 system provides the driver with a black-and-white image of the driving environment ahead of the vehicle in the control display CD or central information display CID.
BMW Night Vision 2 is a passive system without active infrared illumination. Objects situated ahead of the vehicle are shown in varying degrees of brightness depending on the temperature of these objects. This enables the driver to detect in good time heat-emitting objects such as, for example, persons, animals and other vehicles.
This thermal image is recorded with a Far Infrared camera (FIR) via a special imaging sensor which detects the infrared radiation in a specific wavelength range.
Intelligent algorithms in the control unit makes it possible to automatically detect persons in the image. Following evaluation of distance and direction of movement, a symbol on the central information display CID and in the head-up display HUD warns the driver of any persons at risk.

ACC Stop & Go

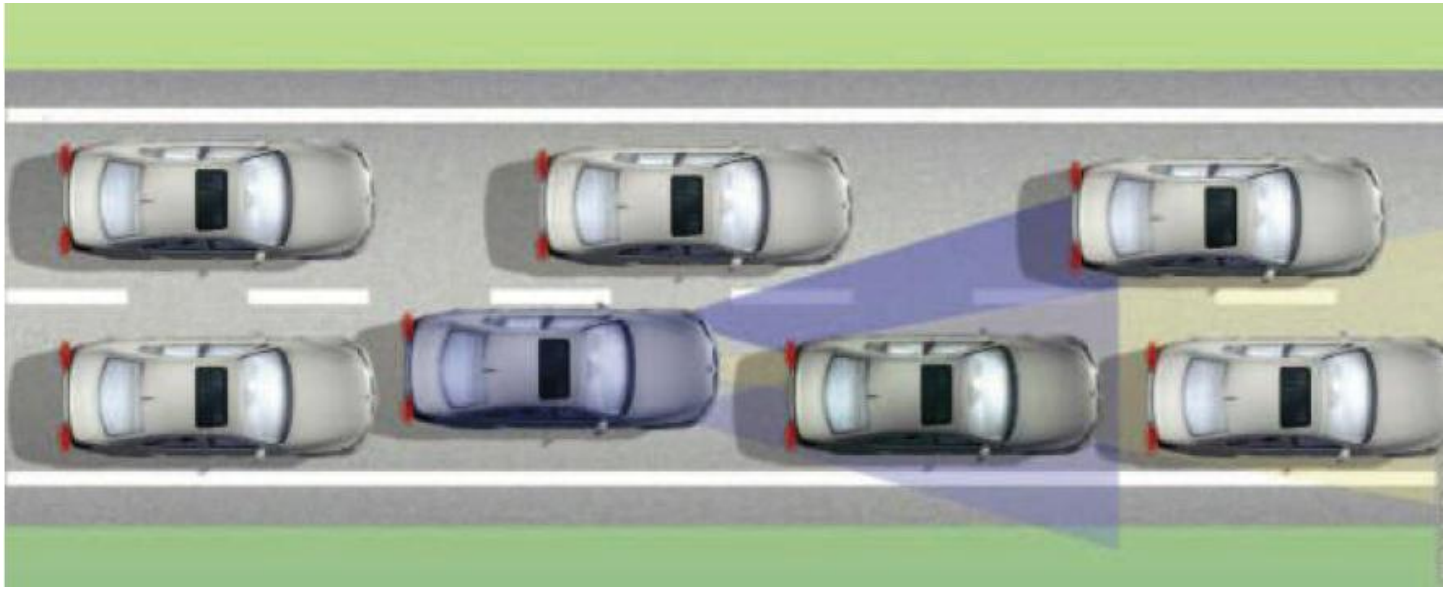
TF09-2236

The sensor is located behind a removable grille on the front apron.

ACC Stop & Go

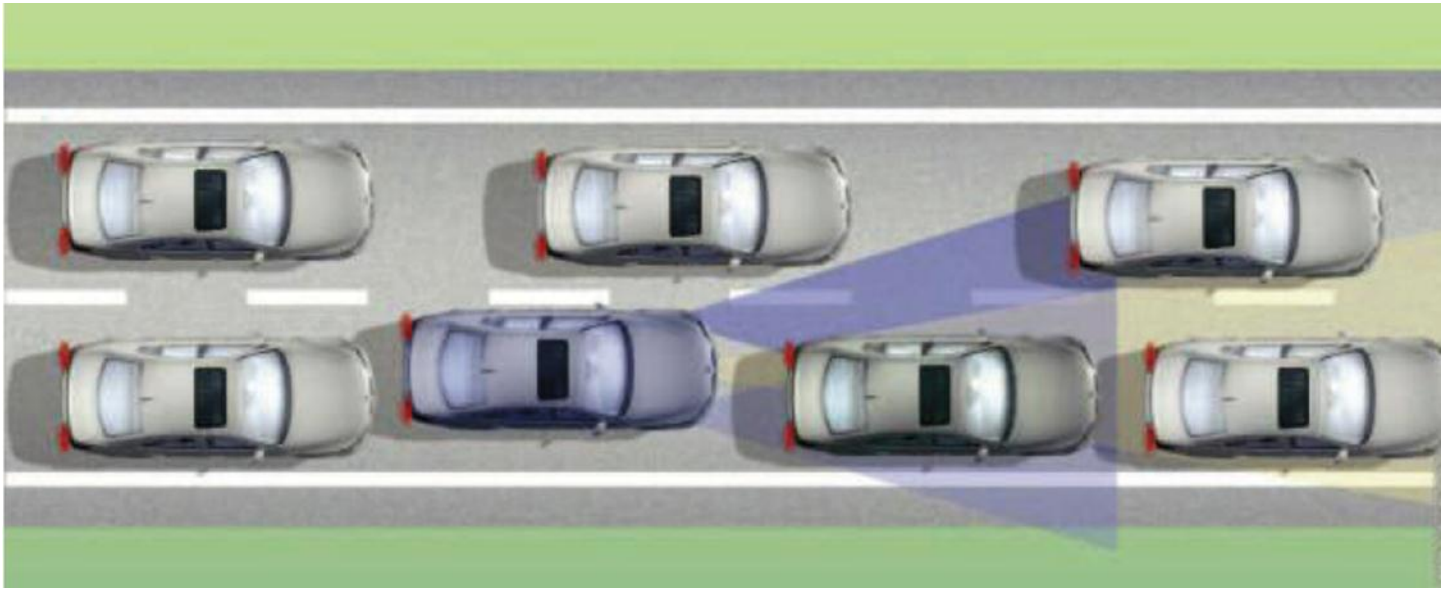
Active Cruise Control with Stop & Go Function

ACC Stop & Go extends the operating range of the former ACC system to include low speeds down to a standstill. In other words, speed and distance from the vehicle in front are automatically controlled at those speeds as well.



ACC Stop & Go

Active Cruise control with stop and go function.



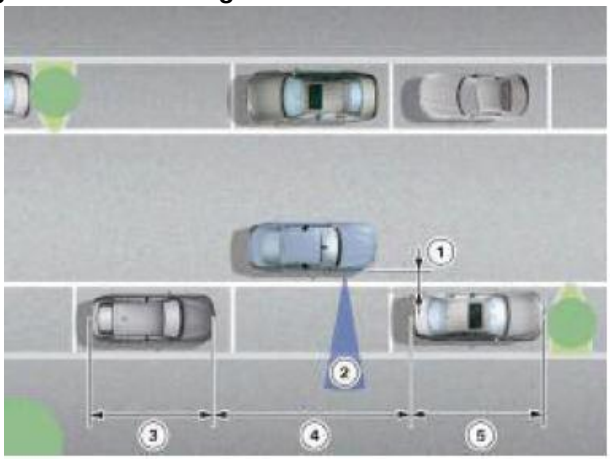
ACC Stop & Go will automatically stop the car if necessary and then indicate to the driver as soon as it detects that it is possible to start moving again. To pull away again, the driver has to acknowledge this message. The pulling-away process is controlled fully automatically by ACC Stop & Go only if the duration of the standstill is very short.
Thus, ACC Stop & Go provides optimum assistance for the driver not only in moving traffic but also in traffic jams such as are more and more frequently encountered on highways.
However, this system (in common with ACC) is not intended for use in urban areas for negotiating junctions or traffic lights.

Parking Assist

Parking Assistance

For the first time in a BMW vehicle, a system is being introduced in the F10 that assists the driver when performing a parallel parking maneuver. Parking assistance is available as optional equipment (option 5DP) in conjunction with the optional Park Distance Control (option 508).

Parking assistance makes it easier to maneuver the vehicle into parking spaces parallel to the roadway. The system measures potential parking spaces when driving by them at speeds less than 35 km/h, regardless of whether parking assistance has been activated or not. When a parking space 1.2m larger than the vehicle length is detected and the system has been activated, the space is shown to the driver in the central information display (CID). The driver remains responsible for the acceleration and braking of the vehicle. The parking assistance system only takes over the steering function and the PDC monitors the distances and obstacles. The driver is led through the parallel parking process with detailed instructions for action displayed on the CID and, where applicable, additional acoustic warnings and acknowledgements are issued.



Index	Explanation
1	Maximum distance to the row of parked vehicles: 1.5m
2	Horizontal opening angle of the ultrasonic sensor plus or minus 10º , range approximately 4.5m
3	Vehicle or object length at least 1.5m
4	Length of the parking space, vehicle length plus approximately 1.2m
5	Vehicle or object length at least 1.5m

Parking Assistant

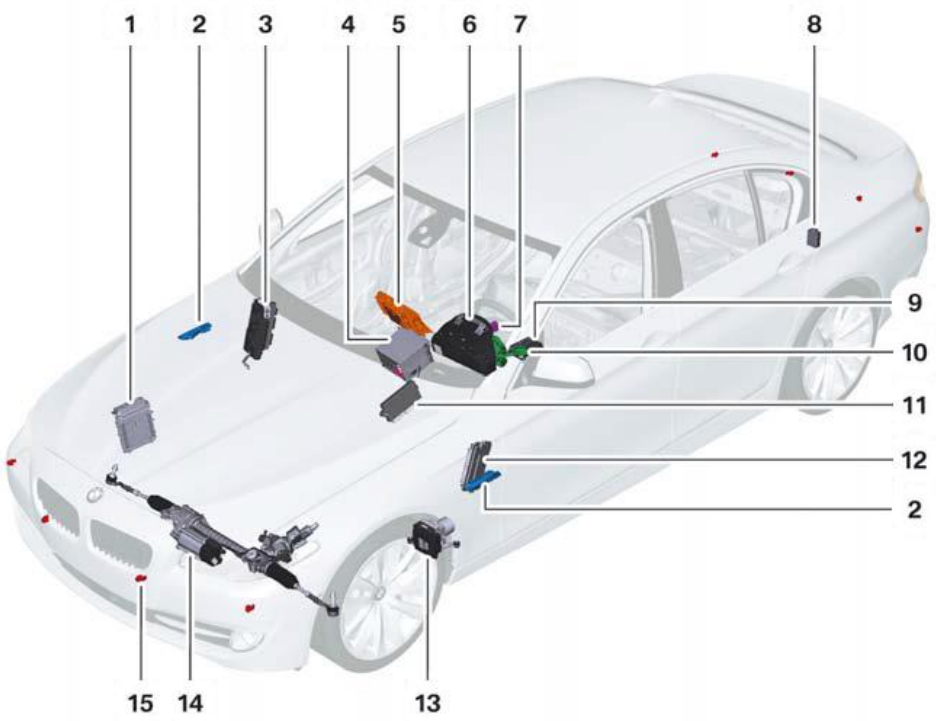
For the first time in a BMW vehicle, a system is being introduced in the F10 that assists the driver when performing a parallel parking maneuver. Parking Assistant is available as optional equipment (option 5DP) in conjunction with the optional Park Distance Control (option 508).
Parking Assistant makes it easier to maneuver the vehicle into parking spaces parallel to the roadway.

The system measures potential parking spaces (on both sides of the road) when driving by them at speeds less than 35 km/h/22mph, regardless of whether parking assistant has been activated or not. When a parking space 1.2m larger than the vehicle length is detected and the system has been activated, the space is shown to the driver in the central information display. The driver remains responsible for the acceleration and braking of the vehicle while the parking assistant system takes over only the steering function and the PDC monitors the distances and obstacles. The driver is Led through the parallel parking process with detailed instructions for action displayed on the CID and, where applicable, additional acoustic warnings and acknowledgements are issued.

Note:

The Parking Assistant system does not relieve the driver of personal responsibility.
The driver is still responsible for monitoring the parking space and the parking process. The driver should intervene if necessary in order to avoid any potential accident.

Parking Assistant



1 Digital Motor Electronics or Digital Diesel Electronics
2 Parking assistant ultrasonic sensor in the auxiliary turn indicator
3 Junction box (junction box electronics and front power distribution box)
4 Car Information Computer
5 Central Information Display
6 Instrument cluster
7 Center console operating unit and controller
8 Parking Manoeuvring Assistant (PMA)
9 Integrated Chassis Management (ICM)
10 Steering column switch cluster
11 Car Access System
12 Footwell module
13 Dynamic Stability Control
14 Electromechanical power steering
15 Park Distance Control sensors

Parking Assistant

The two ultrasonic sensors of parking assistant are integrated in the side marker turn signal indicators (installed in the front fenders).
The function of these two ultrasonic sensors is similar to the function of the ultrasonic sensors of the Park Distance Control (PDC). Ultrasonic pulses are sent out and echo impulses are received. The signals are evaluated by the Parking Manoeuvring Assistant (PMA) control unit. This is used along with the distance information from the Dynamic Stability Control to calculate the length and width of the parking space.
The ultrasonic sensors communicate with the parking assistance control unit via a LIN-Bus.

1 Parking assistant ultrasonic sensor in the side marker turn signal indicator

Pedestrian Protection

Pedestrian Protection

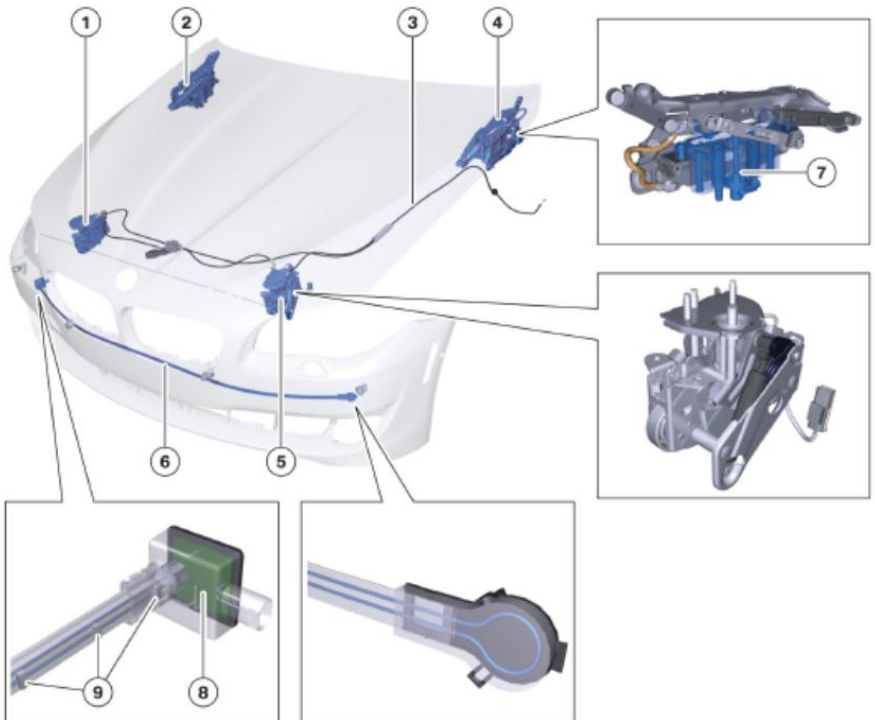
The front end of the F10 incorporates several pedestrian-protection measures. An impact absorber is installed between the bumper support and the bumper trim to provide protection for leg impact. The Engine compartment lid and the front side panels are made of aluminium and incorporate deformation elements. These design measures are adopted to produce a defined dissipation of energy in the event of an accident.

Active engine compartment lid

Depending on the national-market version, an active engine compartment lid may be installed (models in the European version always have this equipment). In case of a collision with a pedestrian, the engine compartment lid is lifted. This produces a crumple zone that protects the pedestrian.

Pedestrian Protection

Pedestrian Protection



Index	Explanation
1	Engine compartment lid catch, right (with actuator)
2	Engine compartment lid hinge, right (with actuator)
3	Bowden cable
4	Engine compartment lid hinge, left (with actuator)
5	Engine compartment lid catch, left (with actuator)
6	Optical fibre
7	Actuator (on the engine compartment lid hinge)
8	Sensor
9	Object of interference

.Pedestrian Protection

Pedestrian Protection

An optical fibre is integrated between the bumper support and impact absorber. The optical fibre is connected to the sensor and is routed through a loop on the opposite side of the vehicle and back to the sensor.

When a force acts on the optical fibre, the fibre is deformed between the objects of interference. This attenuates the light in the optical fibre. The action of the force is proportional to the light attenuation. The different damping action of the light depending on the mass and rigidity of the colliding object generates a characteristic signal.

This signal is measured by the sensor and transmitted via a data line to the Crash Safety Module (ACSM). The Crash Safety Module (ACSM) determines from the data whether the threshold value for the detecting a collision with the pedestrian have been reached or exceeded, and thus makes the decision whether to trigger the actuators on the engine compartment lid.

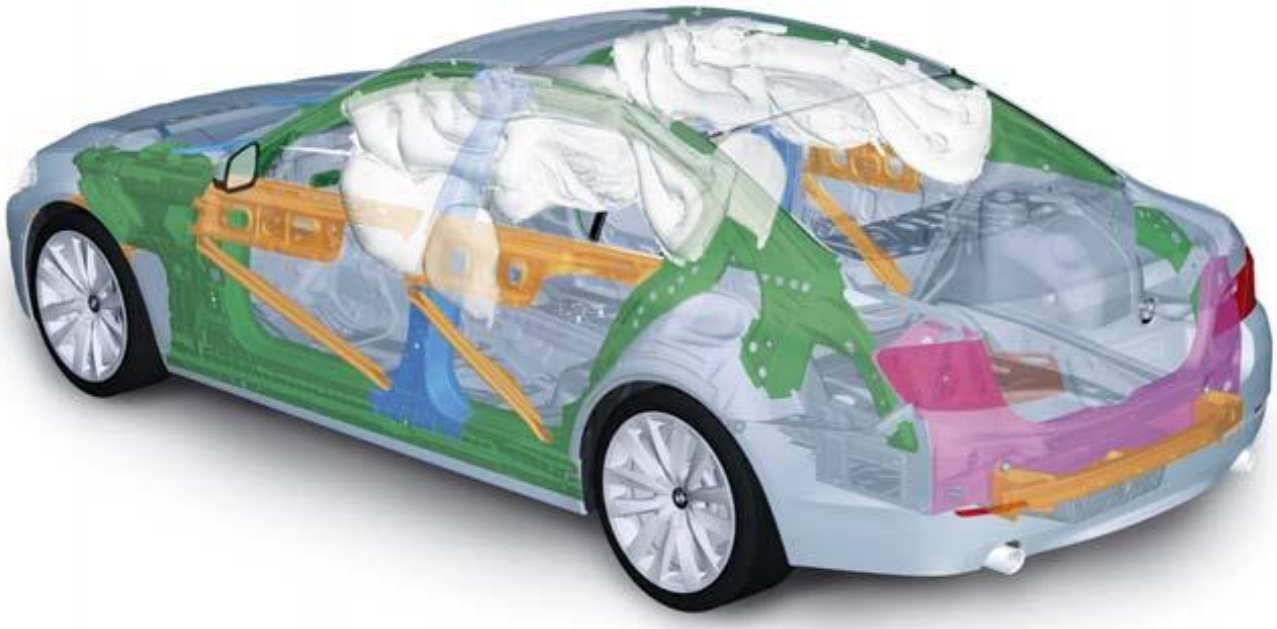
The actuators are triggered pyrotechnically, and the engine compartment lid is lifted via the spring force of the integrated preloaded springs.

The active engine compartment lid is triggered at speeds of approx, 20 - 50 km/h only. For the safety reasons, the system can also trigger in rare cases if a pedestrian collision cannot be clearly ruled out, such as the following situations:

- **When crashing into a barrel or boundary post**
- **When colliding with animals**
- **In case of a stone chipping**
- **When driving into a snow bank**

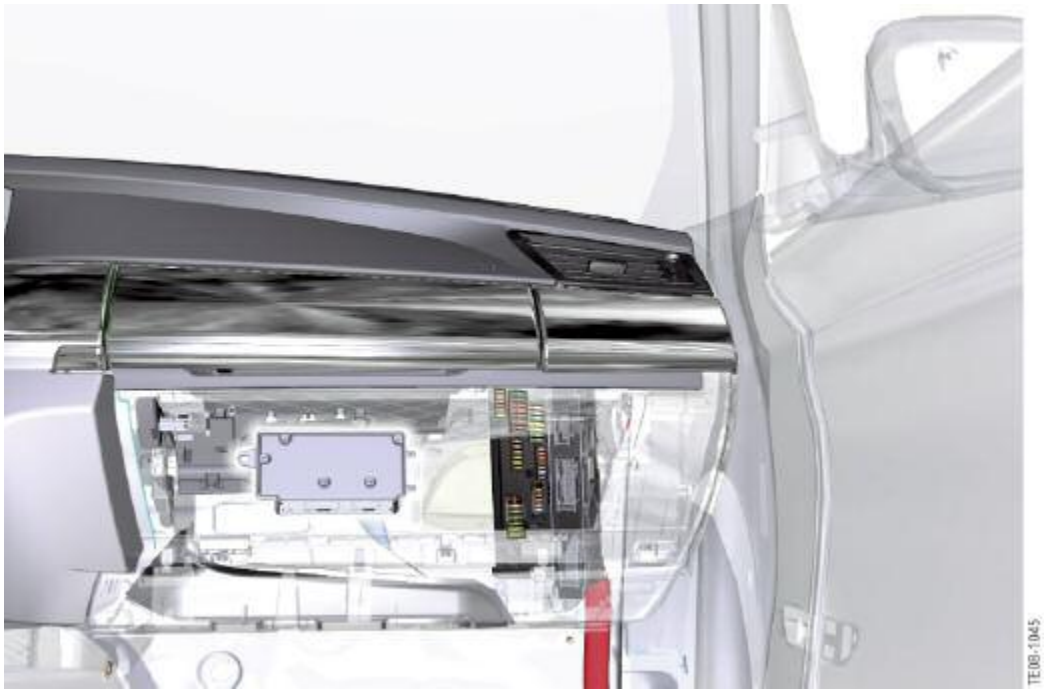
After the active engine compartment lid is activated, a red warning light appears in the instrument cluster and a check control message is displayed in the information display. The engine compartment lid can then be returned to its initial position, but the active pedestrian protection is not available until after a component change.

F10



The 3rd generation of the Advanced Crash Safety Module ACSM is used on the F10 As the central airbag control unit for the passive safety system. It differs from the Previous crash safety modules in that it has an external sensor system.

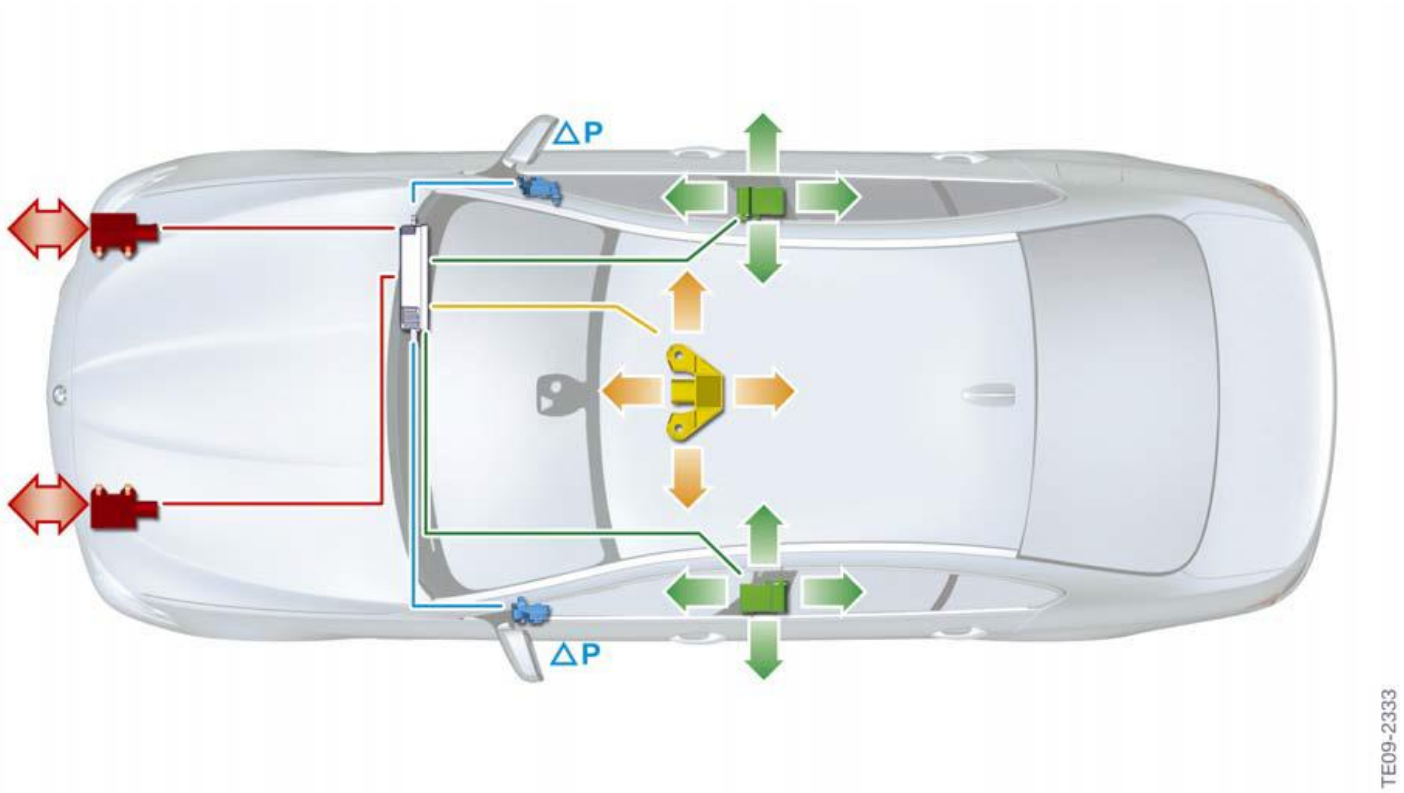
.Function of ACSM



Location of ACSM 3

- Evaluating the sensor signals
- Detecting crashes
- Determining the triggering time and the triggering sequence
- Triggering the output stages of the firing circuits
- Sending the crash message to all bus users
- Crash documentation
- Emergency call function

Sensors



European version vehicles :

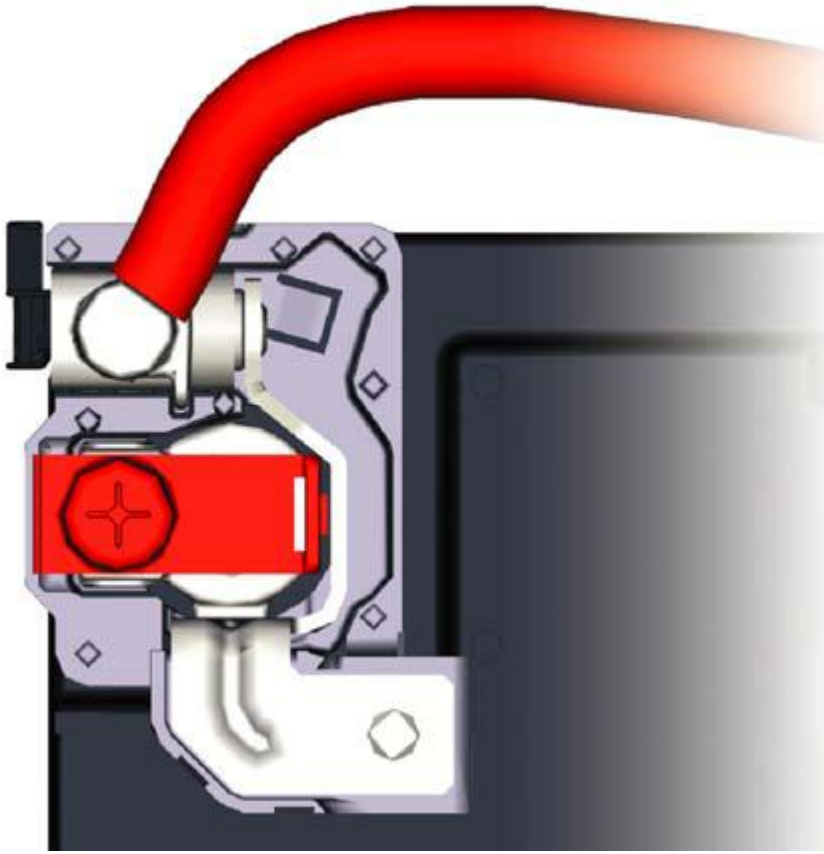
- One transverse and longitudinal acceleration sensor in the central sensor (yellow)
- One transverse and longitudinal acceleration sensor in each of the B-pillars (green)
- One airbag sensor for pressure in each of the front doors (blue).
- One longitudinal acceleration sensor on each of the engine supports (red)

Actuators

- Driver's airbag
- Front-passenger airbag
- Knee airbag, left and right
- Head airbag, left and right
- Side airbag, front left and right
- Belt tensioner, front left and right
- Active head restraints, front left and right
- Safety battery terminal.

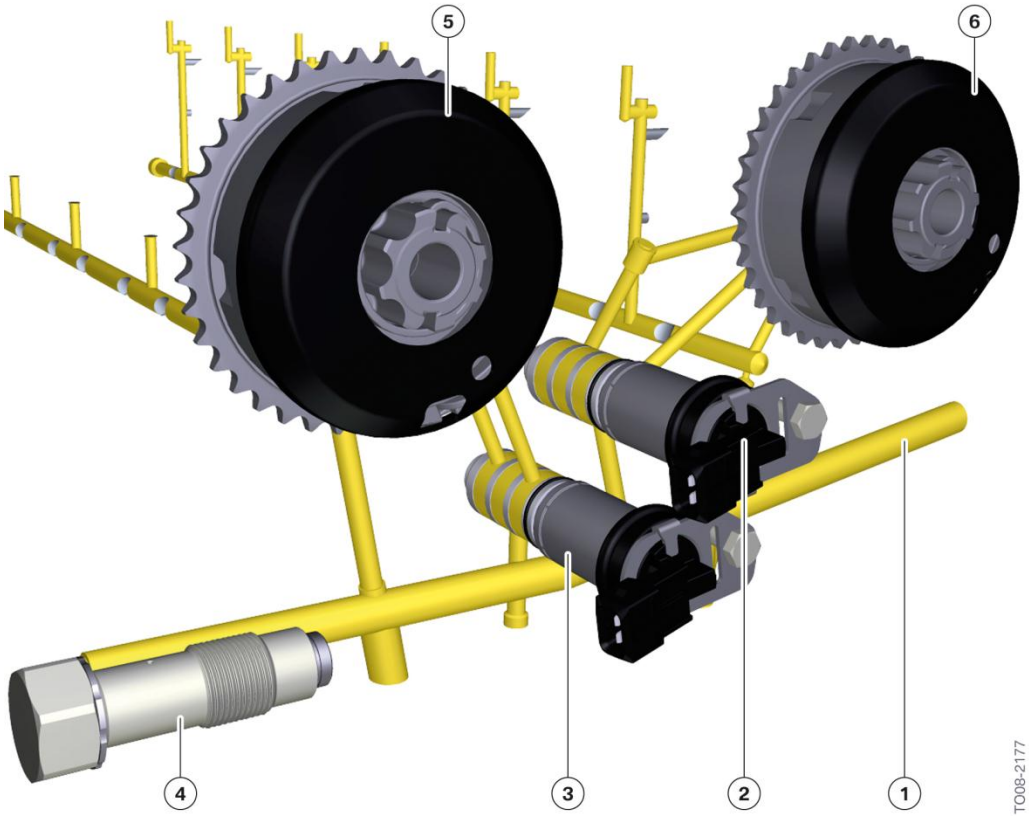
Safety Battery Terminal

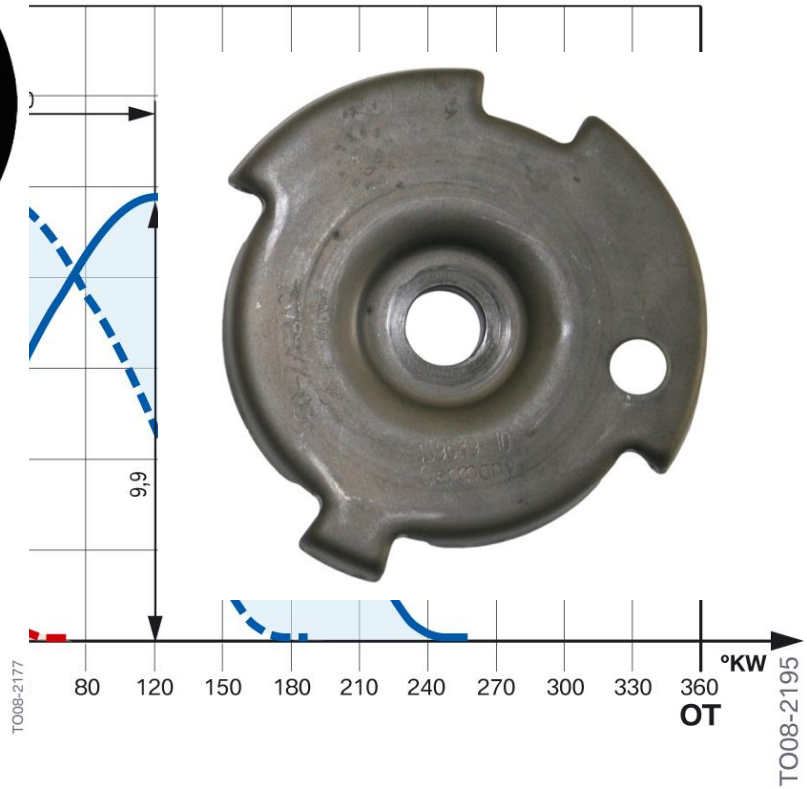
The safety battery terminal is triggered at different thresholds when the ACSM detects a head-on, side-on or rear-end crash of sufficient severity. The connecting cable between the battery and starter/alternator and positive battery connection point is then disconnected pyrotechnically. The safety battery terminal is located directly at the positive terminal of the battery.



N55 Engine

.N55 – VANOS

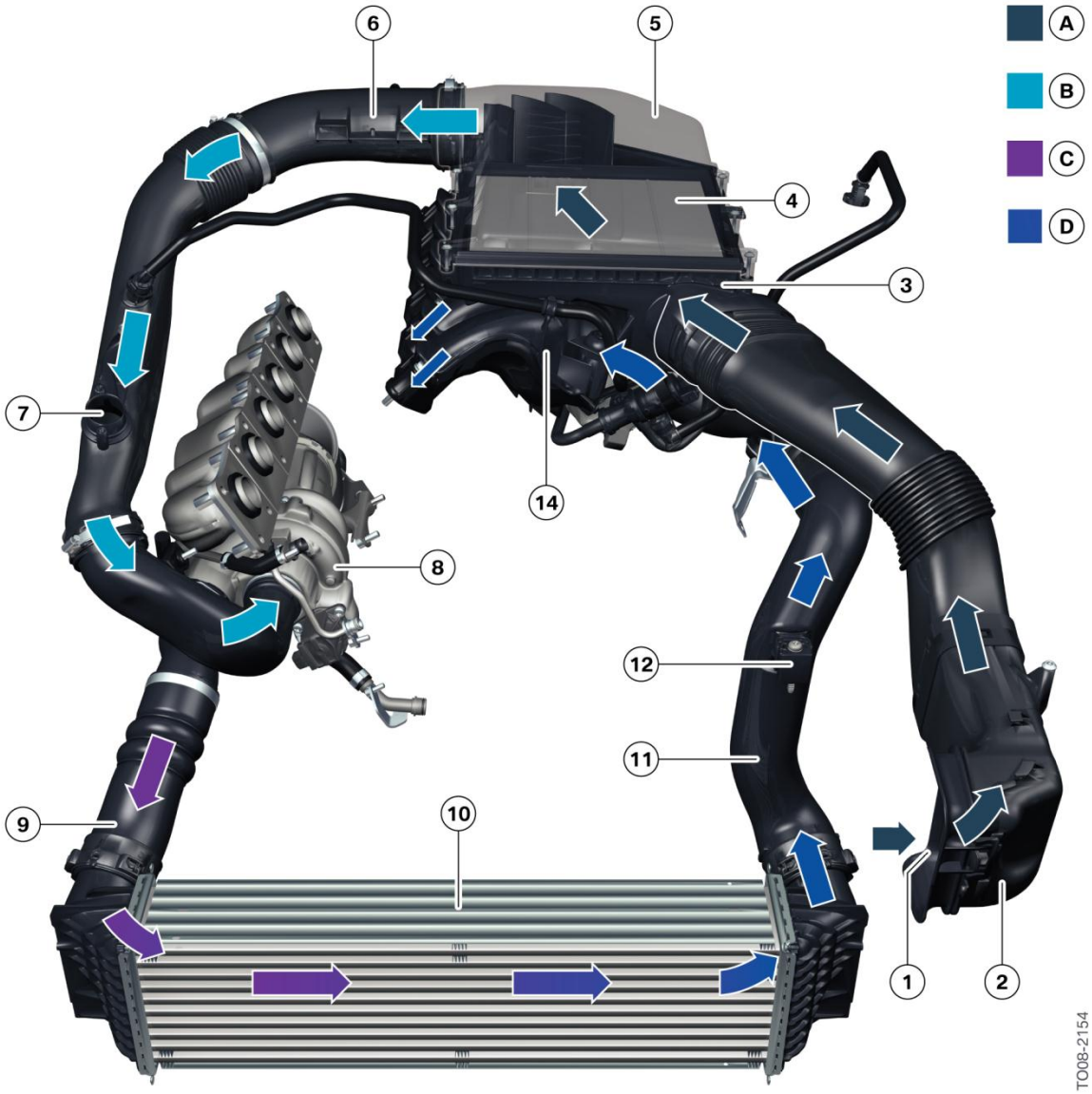




1 - Main oil duct
2 - VANOS solenoid valve, intake side
3 - VANOS solenoid valve, exhaust side
4 - Chain tensioner
5 - VANOS adjustment unit, exhaust side
6 - VANOS adjustment unit, intake side

Camshaft Sensor Wheel

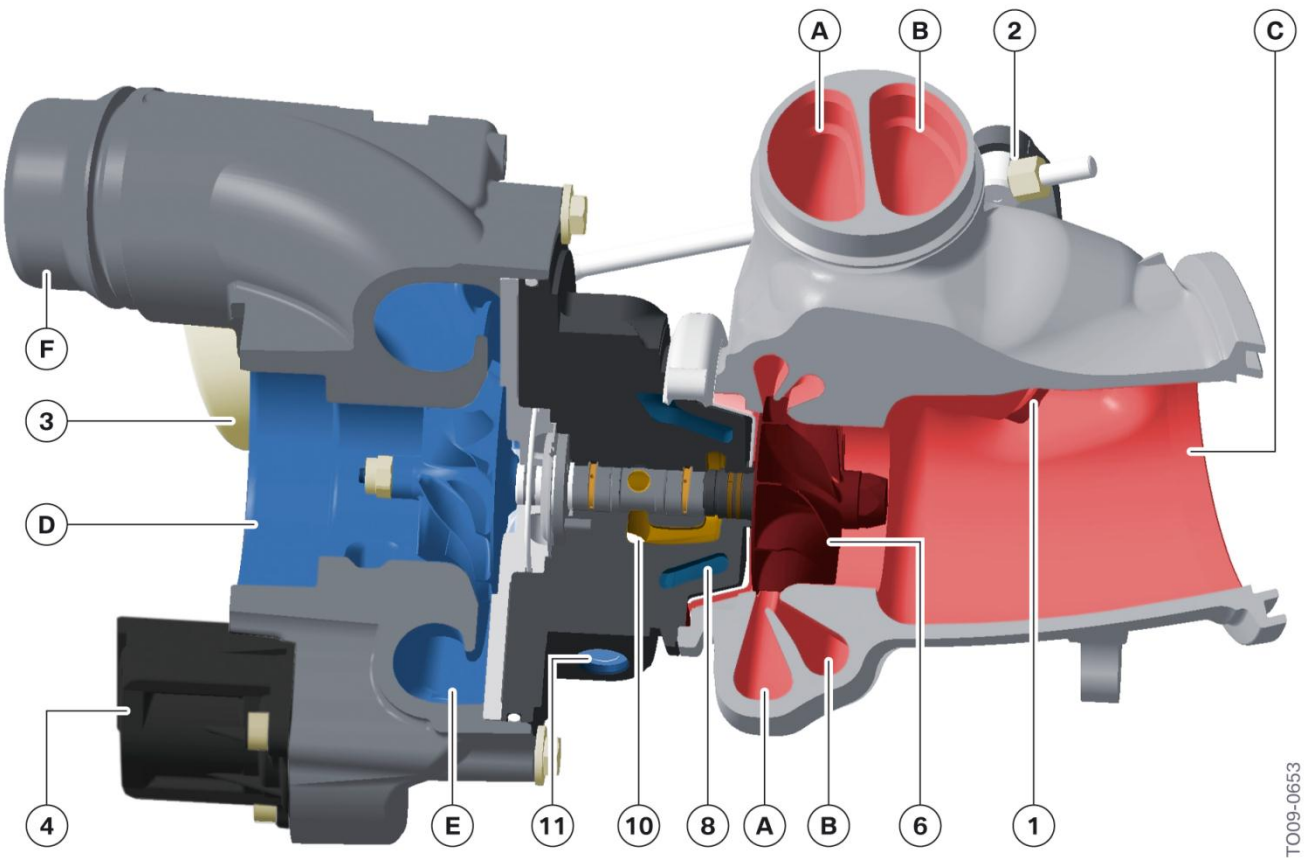
N55 – Intake System



A - Unfiltered air
B - Purified air
C - Heated charge air
D - Cooled charge air

1 - Intake snorkel
2 - Unfiltered air line
3 - Intake silencer
4 - Filter element
5 - Air intake silencer cover
6 - Hot-film air mass meter
7 - Crankcase ventilation connection
8 - Exhaust turbocharger
9 - Charge-air pipe
10 - Intercooler
11 - Charge-air pipe
12 - Boost pressure-temperature sensor
14 - Intake air manifold

.N55 – Exhaust turbocharger

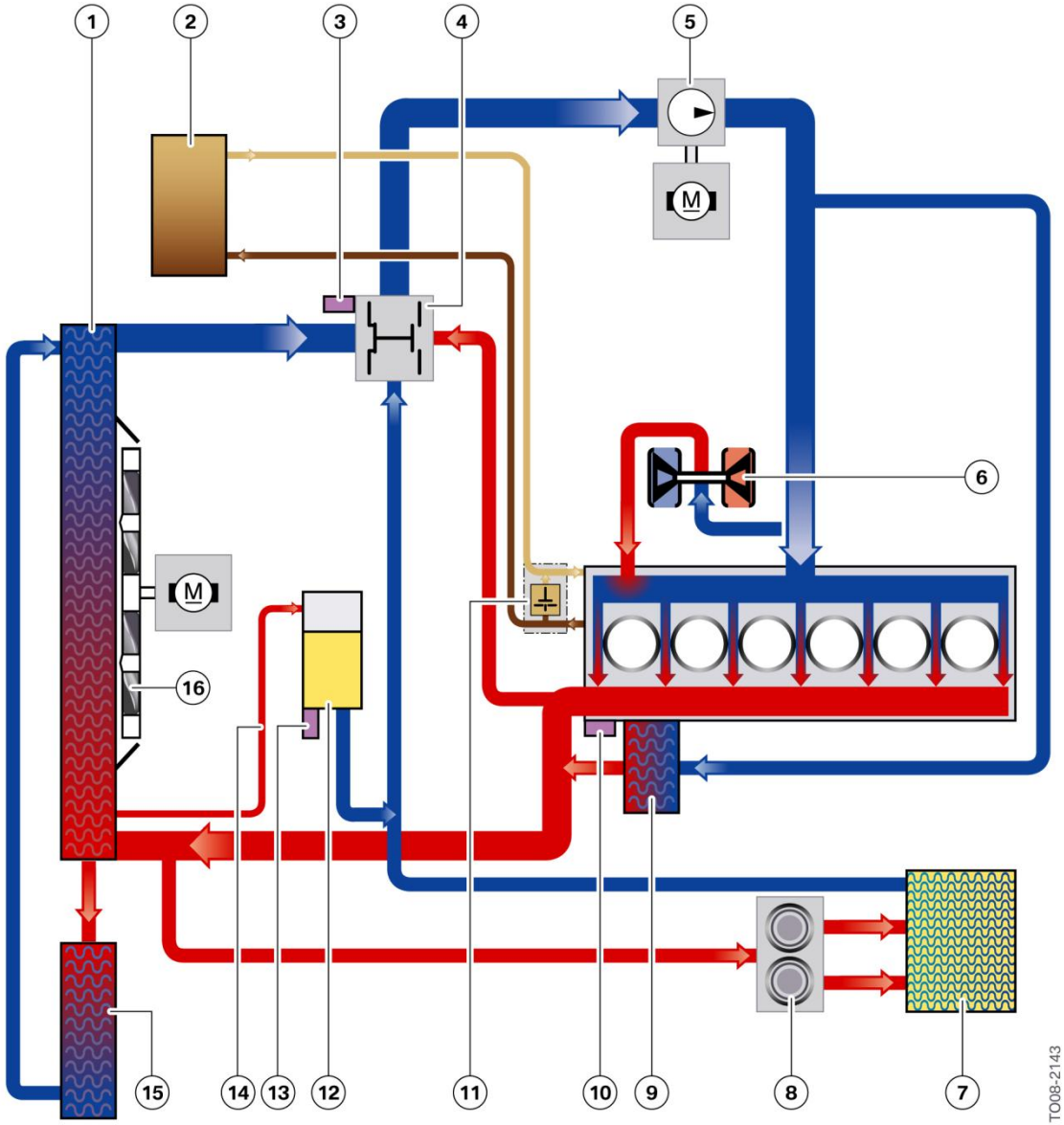


A - Exhaust duct 1 (cylinders 1 - 3)
B - Exhaust duct 2 (cylinders 4 - 6)
C - Connection to catalytic converter
D - Inlet from intake silencer
E - Ring channel
F - Outlet to intercooler

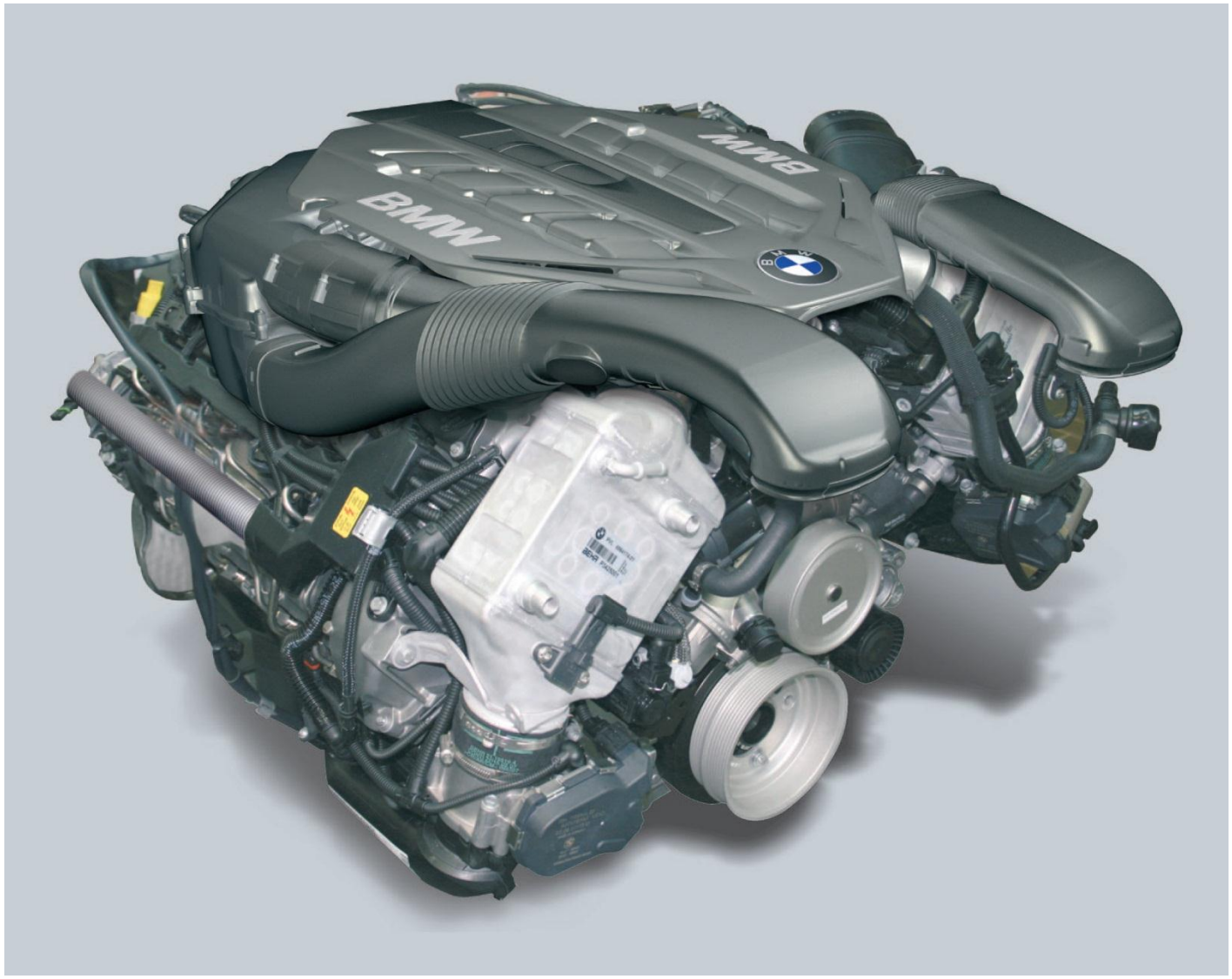
1 - Wastegate valve
2 - Lever arm, wastegate valve
3 - Vacuum unit for wastegate valve
4 - Diverter valve
6 - Turbine wheel
8 - Cooling duct
10 - Oil return
11 - Coolant return

The N55 engine is equipped with a twin scroll exhaust turbocharger.

N55 – Engine cooling

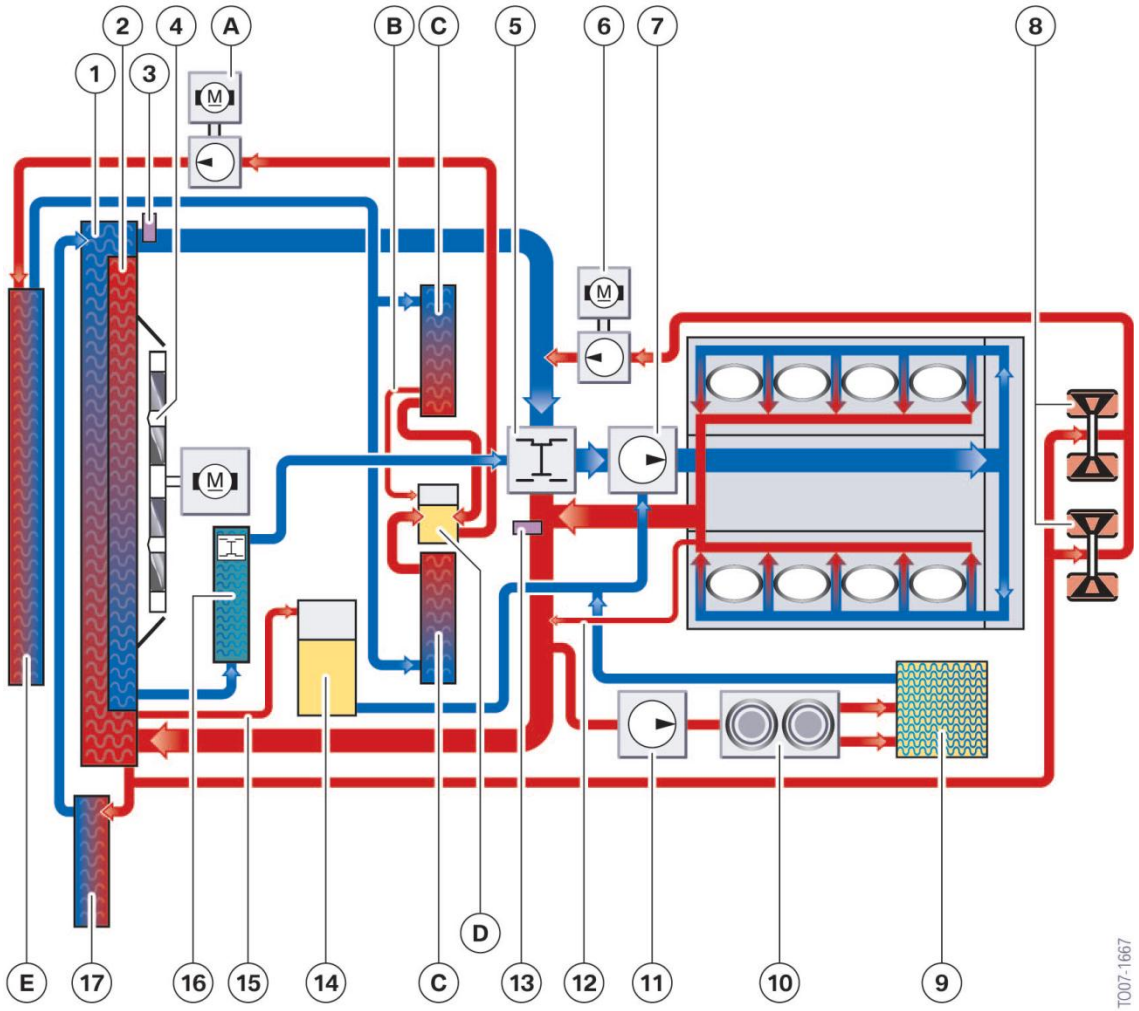


1 - Radiator
2 - Engine oil cooler (hot climate version)
3 - Heater coil
4 - Characteristic map thermostat
5 - Electric coolant pump
6 - Exhaust turbocharger
7 - Heating heat exchanger
8 - Coolant valve
9 - Oil-to-coolant heat exchanger (Europe version)
10 - Coolant temperature sensor
11 - Engine oil thermostat (hot climate version)
12 - Expansion tank
13 - Coolant level switch
14 - Equalisation line
15 - Auxiliary radiator (Europe version)
16 - Electric fan



N63 Enigne

.N63 – Cooling

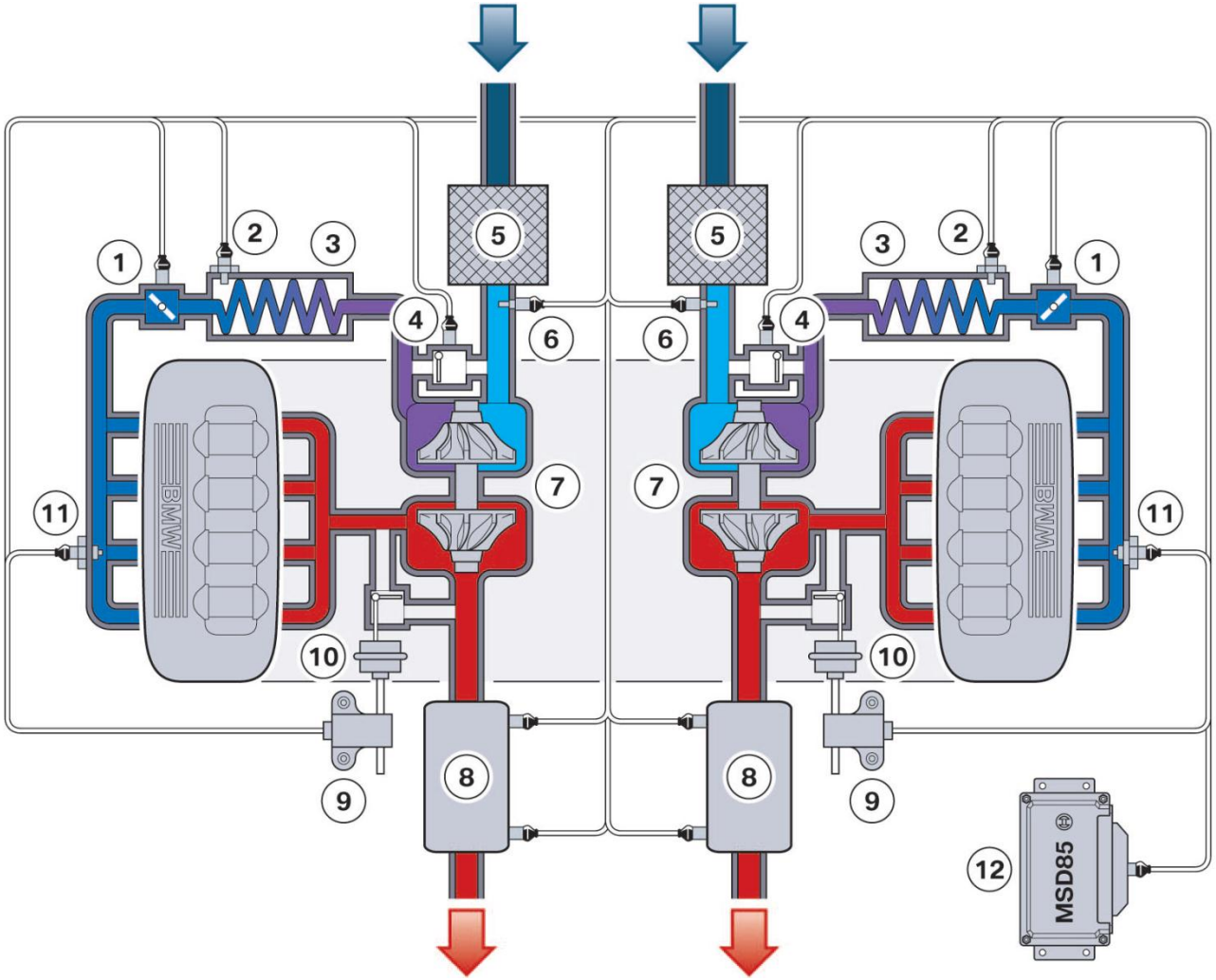


There are two separate cooling circuits for engine and charge air cooling.

1 - Radiator
2 - Radiator for transmission cooling
3 - Coolant temperature sensor at radiator outlet
4 - Electric fan
5 - Characteristic map thermostat
6 - Electric auxiliary coolant pump for turbochocharger cooling
7 - Coolant pump
8 - Exhaust turbocharger
9 - Heating heat exchanger
10 - Duo-valve
11 - Electric auxiliary coolant pump for vehicle heating
12 - Vent line
13 - Coolant temperature sensor at engine outlet
14 - Expansion tank
15 - Vent line
16 - Transmission fluid-to-coolant heat exchanger
17 - Auxiliary coolant radiator

A - Electric coolant pump for charge air cooling
B - Vent line
C - Intercooler
D - Expansion tank for charge air cooling
E - Radiator for charge air cooling

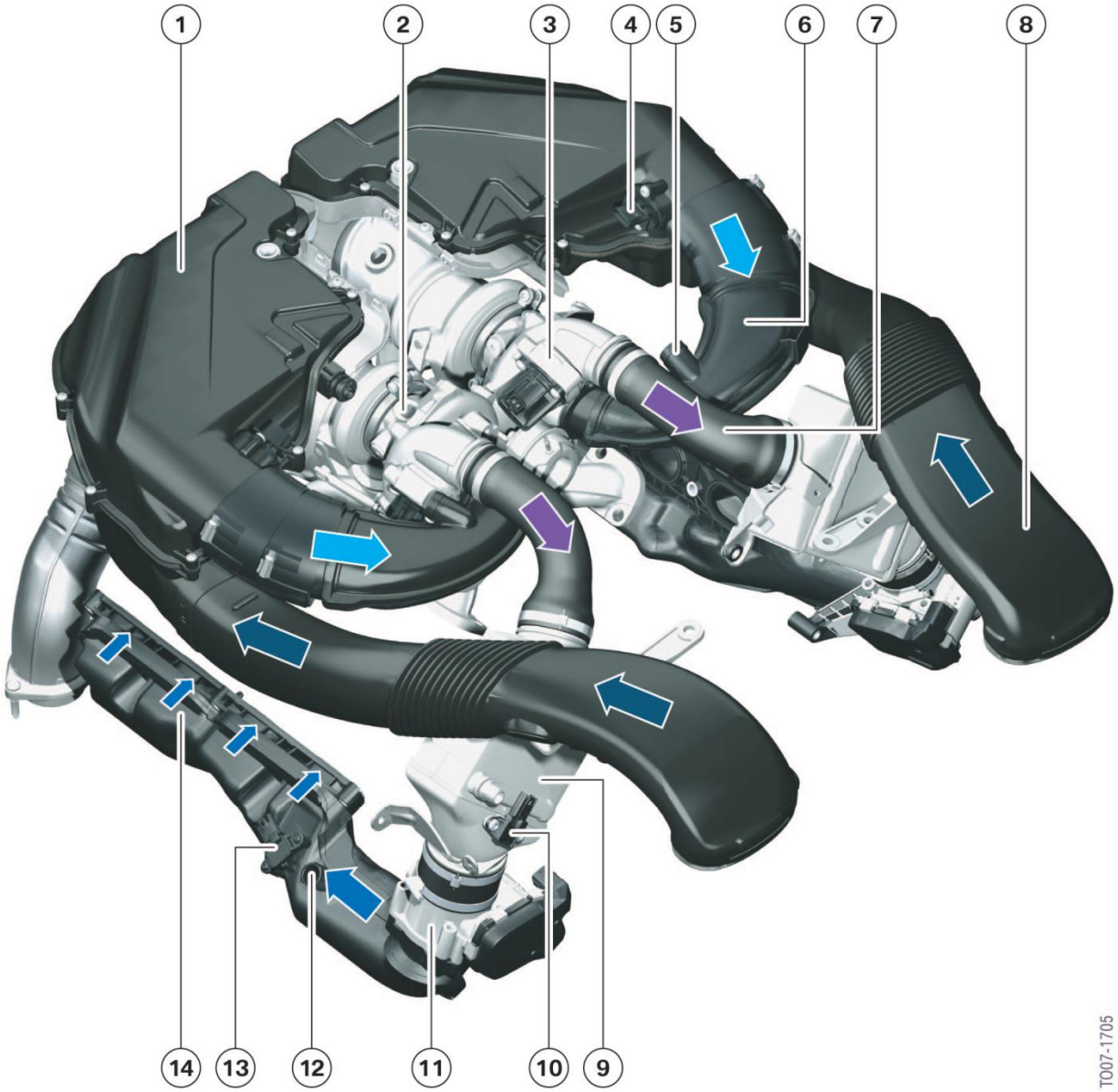
.Air intake and exhaust system



1 - Throttle valve
2 - Charge air temperature and pressure sensor
3 - Intercooler
4 - Diverter valve
5 - Intake silencer
6 - Hot-film air mass meter
7 - Exhaust turbocharger
8 - Catalytic converter
9 - Electropneumatic pressure converter
10 - Wastegate valve
11 - Intake-manifold pressure sensor
12 - Digital motor electronics (DME)

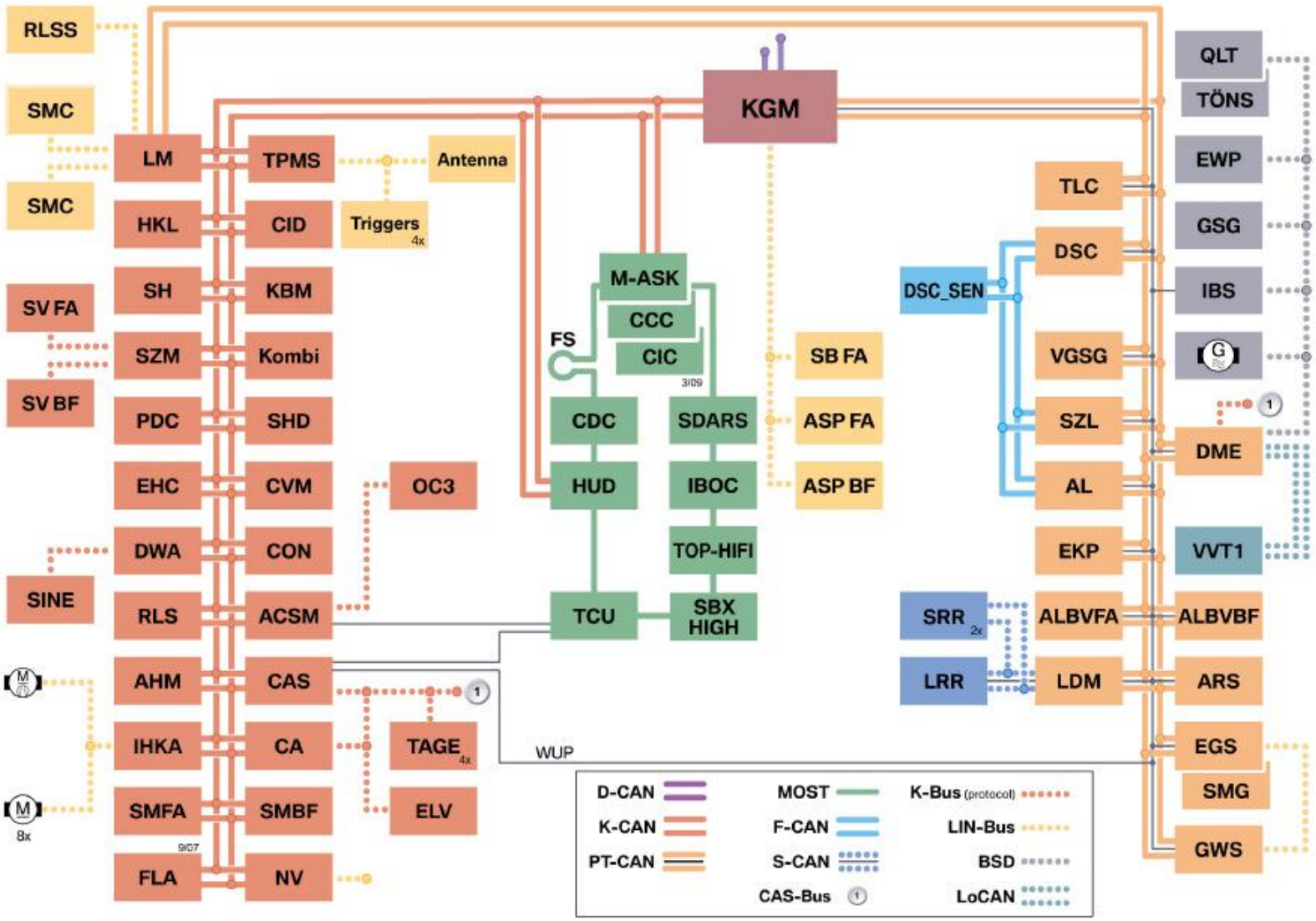
Interchanged positions of the intake and exhaust sides.

Air intake system

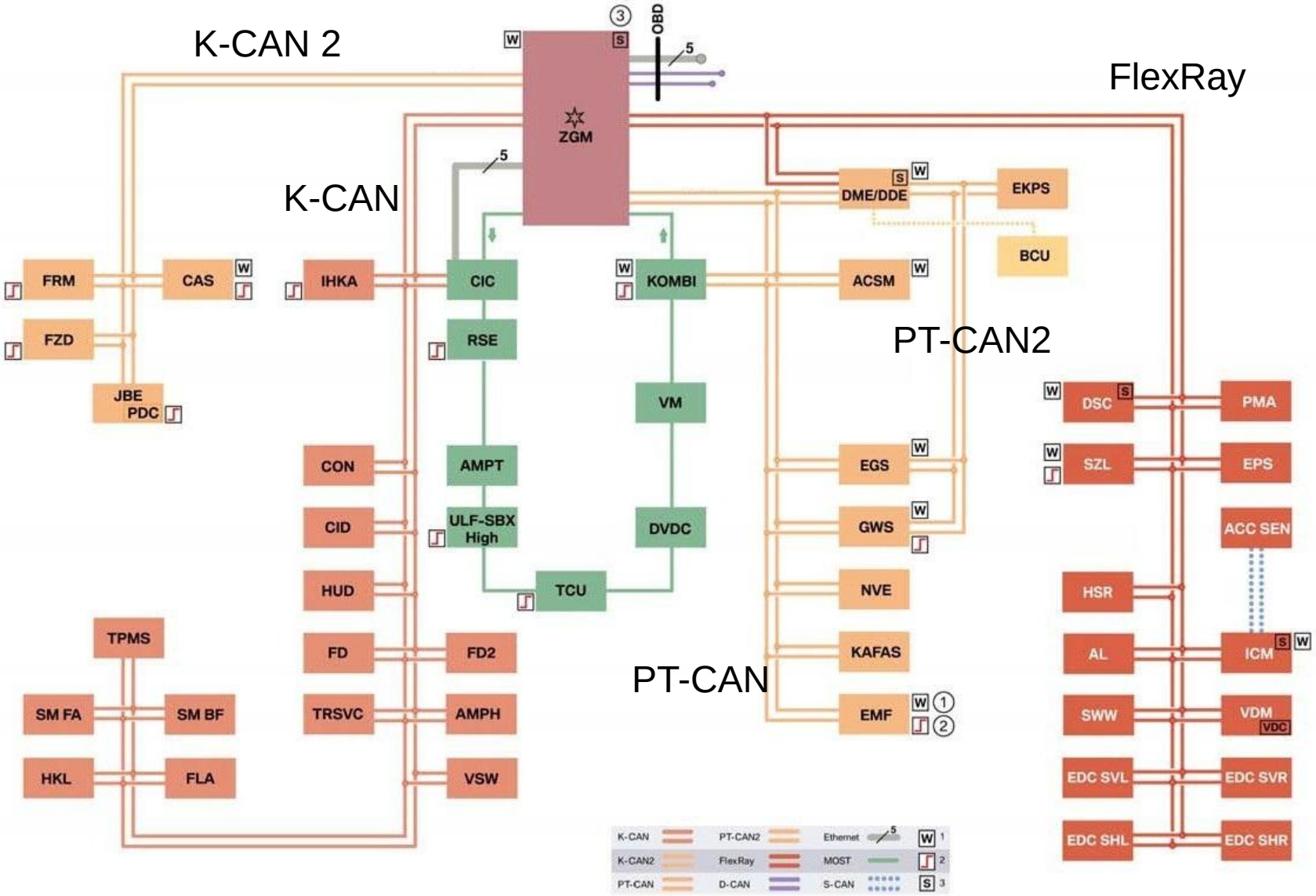


1 - Intake silencer
2 - Exhaust turbocharger
3 - Diverter valve
4 - Hot-film air mass meter
5 - Crankcase breather connection for turbocharged engine operation
6 - Clean air pipe
7 - Charge air pipe
8 - Unfiltered air pipe
9 - Intercooler
10 - Charge air temperature and pressure sensor
11 - Throttle valve
12 - Crankcase breather connection for naturally aspirated engine operation
13 - Intake manifold pressure sensor
14 - Intake manifold

E60


RLSS
SMC
SMC
SV FA
SV BF
SINE
LM
HKL
SH
SZM
PDC
EHC
DWA
RLS
AHM
IHKA
SMFA
FLA
TPMS
CID
KBM
Kombi
SHD
CVM
CON
ACSM
CAS
CA
SMBF
NV
Antenna
Triggers 4x
OC3
TAGE 4x
ELV
KGM
M-ASK
CCC
CIC
FS
CDC
HUD
TCU
SDARS
IBOC
TOP-HIFI
SBX HIGH
SB FA
ASP FA
ASP BF
WUP
TLC
DSC
DSC_SEN
VGSG
SZL
AL
EKP
SRR 2x
LRR
ALBVFA
LDM
QLT
TÖNS
EWP
GSG
IBS
DME
VVT1
ALBVBF
ARS
EGS
SMG
GWS
8x
D-CAN
K-CAN
PT-CAN
MOST
F-CAN
S-CAN
CAS-Bus
K-Bus (protocol)
LIN-Bus
BSD
LoCAN

.F10


K-CAN 2
FlexRay
K-CAN
PT-CAN2
PT-CAN
ZGM
OBD
FRM
CAS
FZD
JBE
PDC
IHKA
CIC
RSE
KOMBI
VM
DME/DDE
EKPS
BCU
ACSM
CON
AMPT
CID
ULF-SBX
High
DVDC
HUD
TCU
EGS
GWS
NVE
KAFAS
EMF
DSC
PMA
SZL
EPS
ACC SEN
HSR
AL
ICM
SWW
VDM
VDC
EDC SVL
EDC SVR
EDC SHL
EDC SHR
TPMS
SM FA
SM BF
HKL
FLA
FD
FD2
TRSVC
AMPH
VSW
K-CAN
PT-CAN2
Ethernet
K-CAN2
FlexRay
MOST
PT-CAN
D-CAN
S-CAN

PT – CAN 2

- Forms a redundancy for the PT- CAN in the area of the engine control system and also transfers signals to the fuel pump control. The PT - CAN 2 has a data transfer rate of 500kBit/s and consists of two twisted wires with an additional wake-up line.

K – CAN 2

- Is responsible for communication of the control units with high data transfer rates. The K-CAN 2 is also linked to the other bus systems across the central gateway module.A LIN bus is connected as sub-bus on all control units in the K - CAN 2. The K - CAN 2 has a data transfer rate of 500kBit/s and consists of two twisted wires.

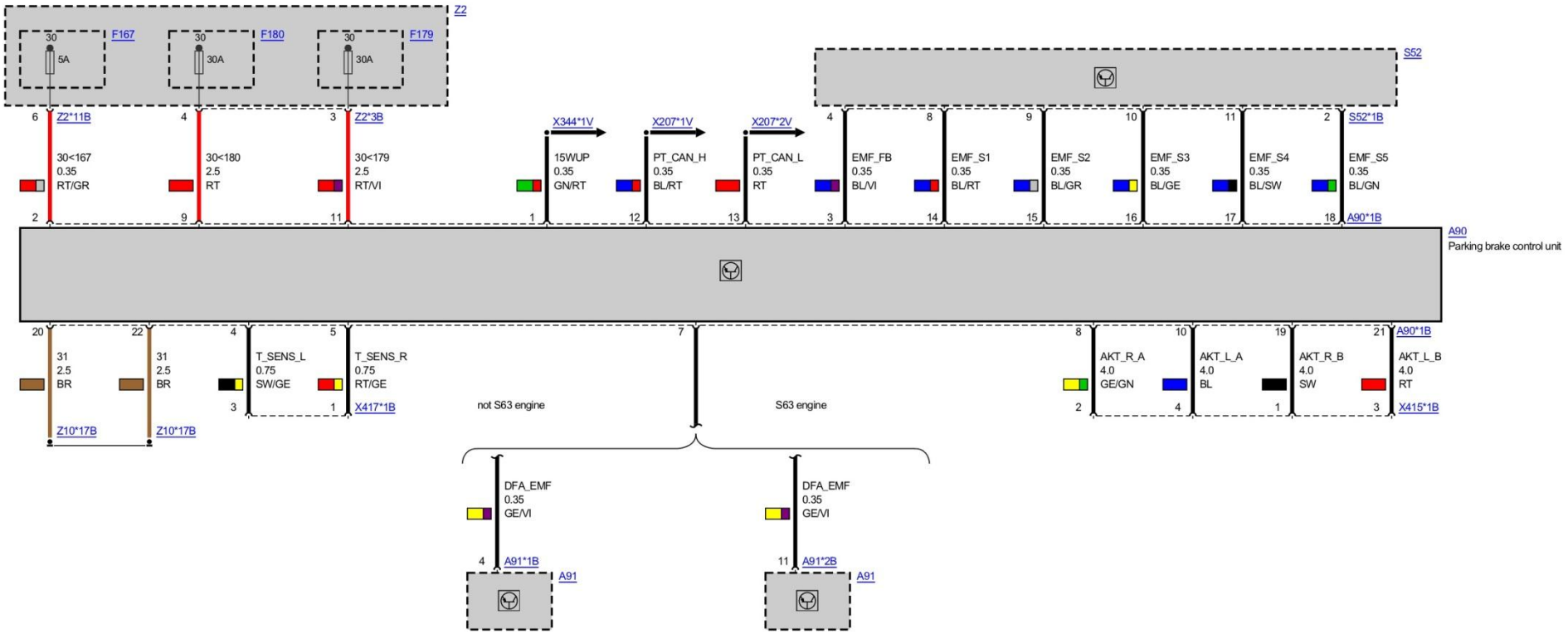
FlexRay

- With a maximum data transfer rate of 10 MBit/s per channel, which is significantly faster than the data buses employed so far in the areas of body and powertrain/suspension in motor vehicles. The central gateway modules sets up the link between the various bus systems and the FlexRay. Depending on the equipment fitted in the vehicle, the ZGM has one or two so-called star couplers, each with four bus drivers. The bus drivers forward the data of the contorl units across the communication controller to the central gateway module (ZGM). The deterministic data interchange ensures that each message is transferred in the time-controllered section in real time. Real time means that the transmission takes place in a specified time.

Ethernet

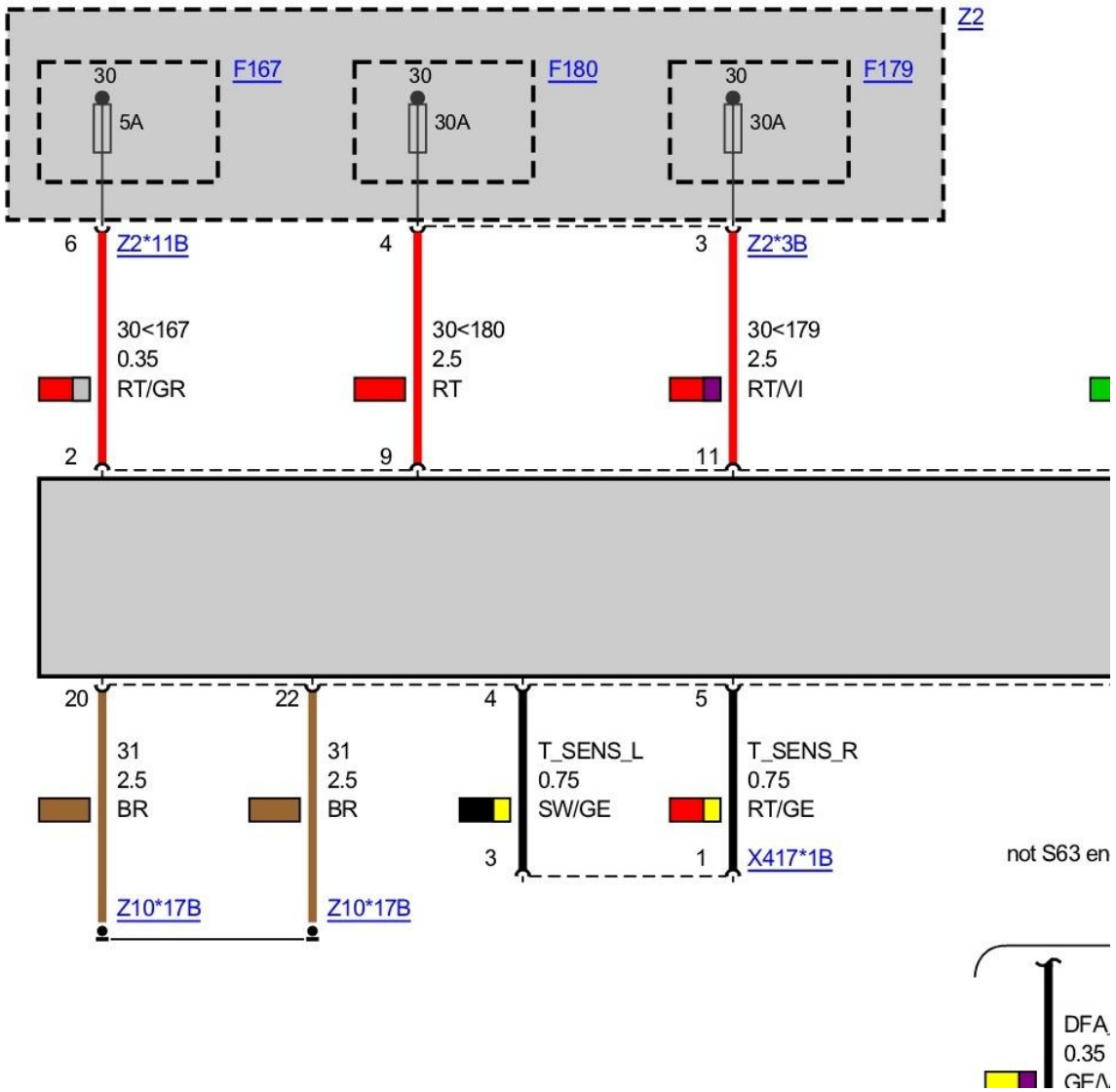
- Ethernet is a manufacturer-neutral, cable-bound network technology. The protocols TCP/IP(Transmission Control Protocol/Internet Protocol) and UDP (User Datagram Protocol) are used as transfer protocols.

Wiring Diagram

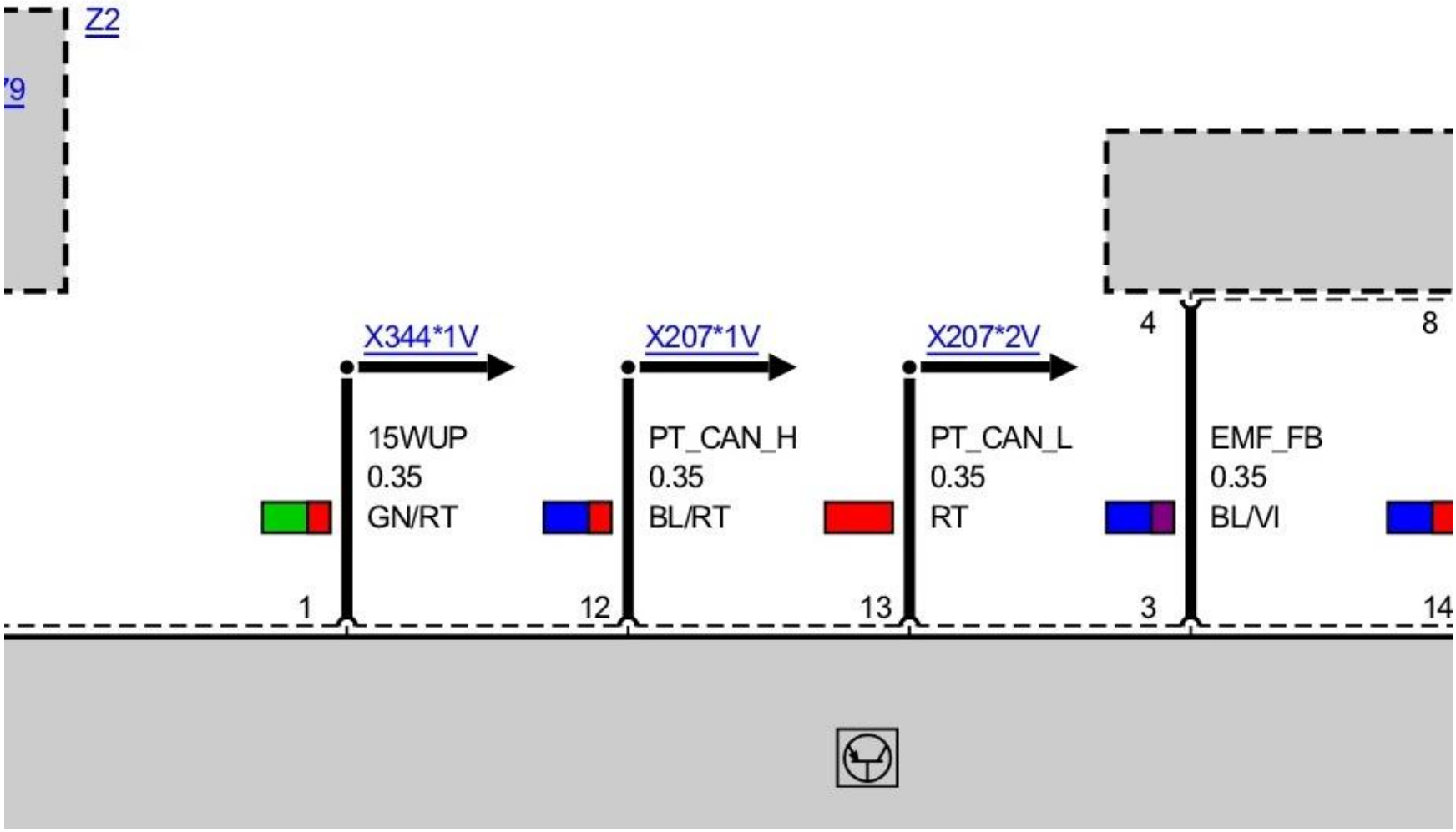


Wiring Diagram of a F10 EMF Control Unit

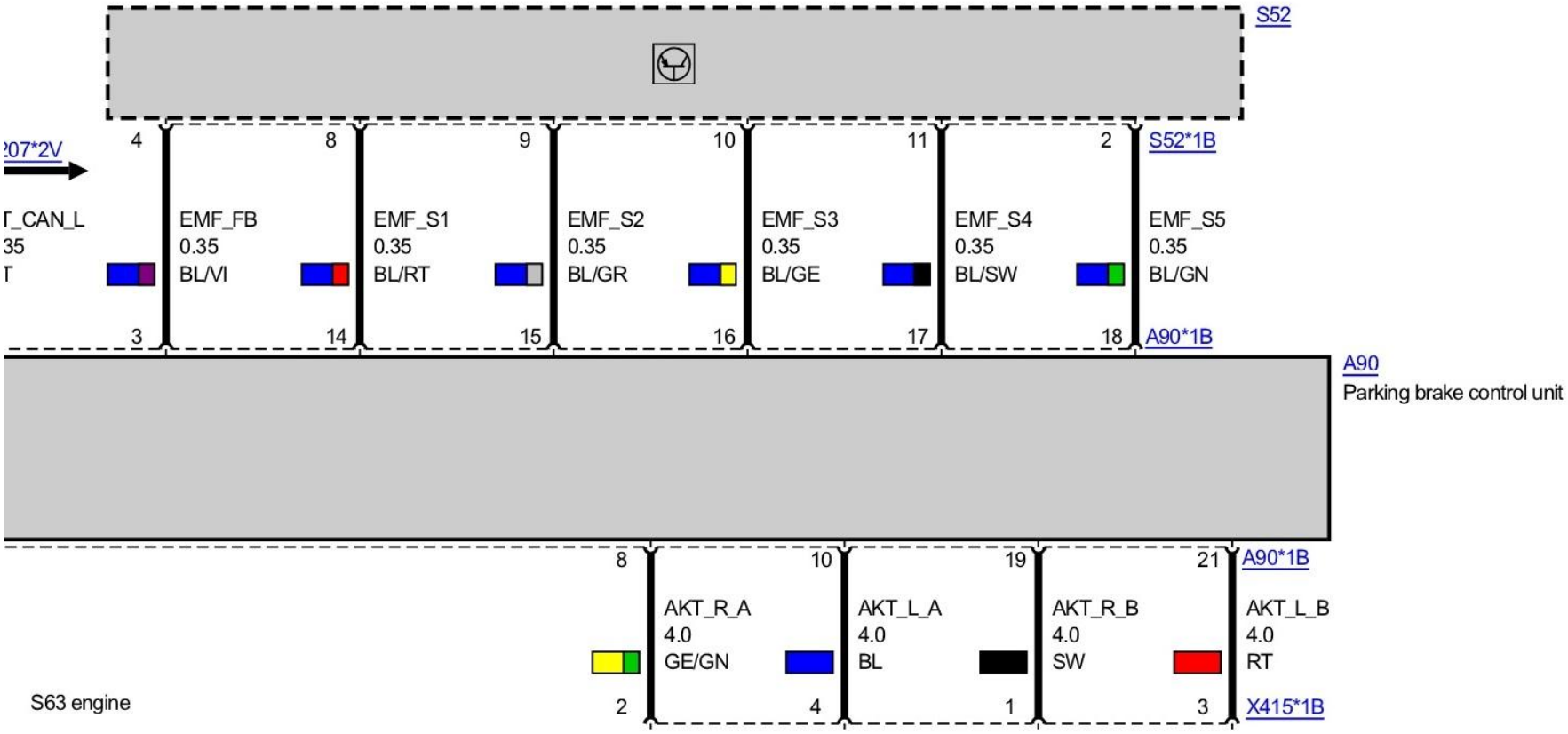
Power supply and Ground

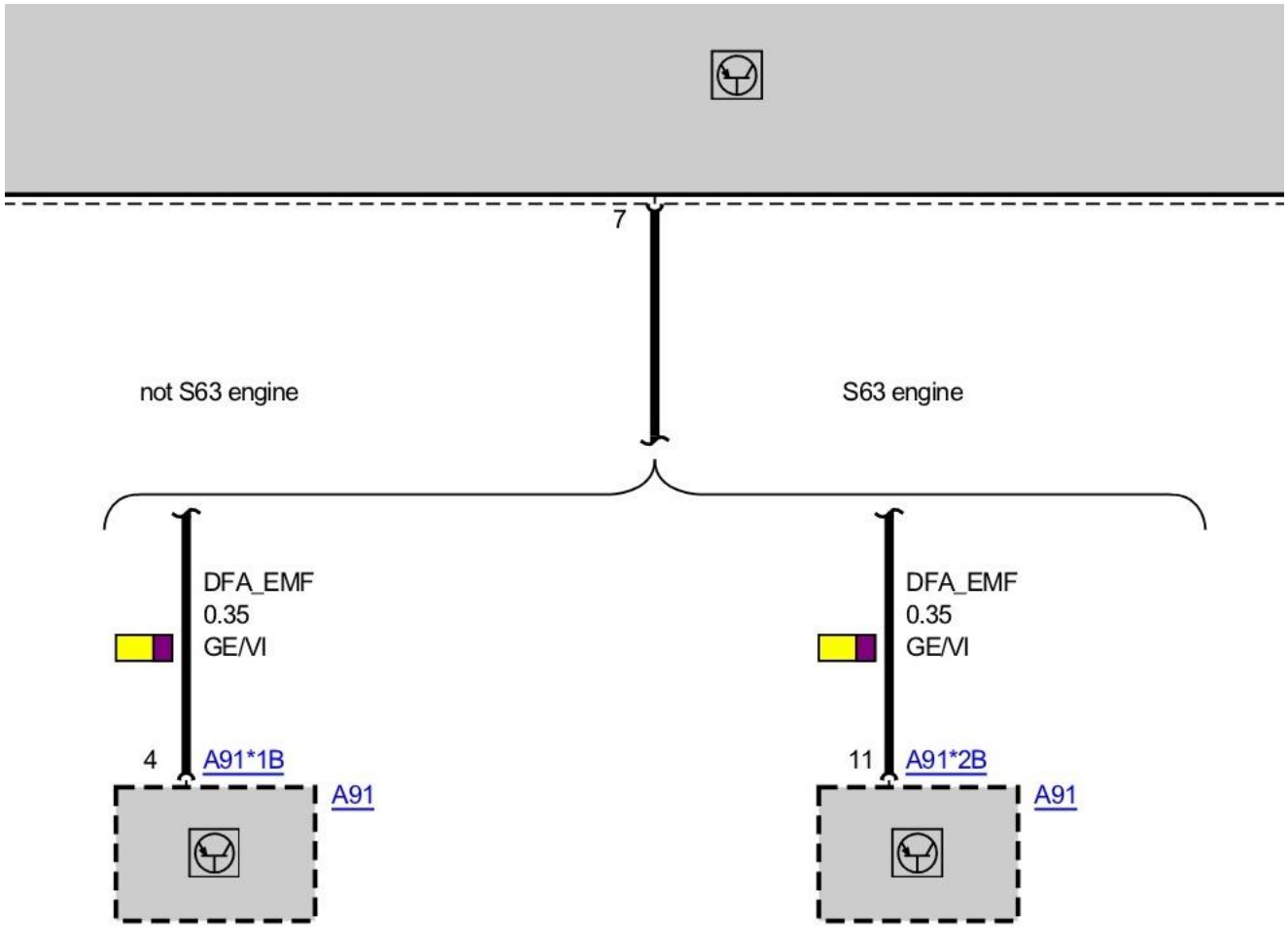


PT-CAN


Z2
X344*1V
X207*1V
X207*2V
15WUP
0.35
GN/RT
PT_CAN_H
0.35
BL/RT
PT_CAN_L
0.35
RT
EMF_FB
0.35
BL/VI
1
12
13
3
4
8
14

Parking Switch Button




7
not S63 engine
S63 engine
DFA_EMF
0.35
GE/VI
4
A91*1B
A91
DFA_EMF
0.35
GE/VI
11
A91*2B
A91

Symbols


Battery


Fuses


Fuse link


Automatic cut–out


Solenoid coil


Capacitor


Solenoid valve


Heating element

motor with blower or fan


Loudspeaker without horn


Bulb


Variable resistor

Overtemperature protection


Permanent magnet motor one speed


Permanent magnet motor two speeds


Potentiometer Wiper moved by external force


Potentiometer Change by pressure or temperature


Antenna

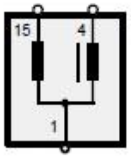

Diode Current flows in direction of arrow only


Amplifier


Z–diode for voltage control


LED


Oxygen sensor



Ignition coil


Control/performance electronics


Radio


Hall–effect sensor

Transistor switch

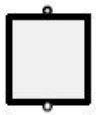

Knock sensor

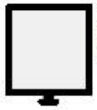

Heating element

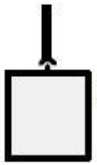
Symbols


Entire component


Part of a component

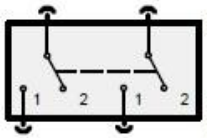

Component with screw terminals


Component housing, connected directly to vehicle ground


Plug connected at component


Plug connected to connection wire of component

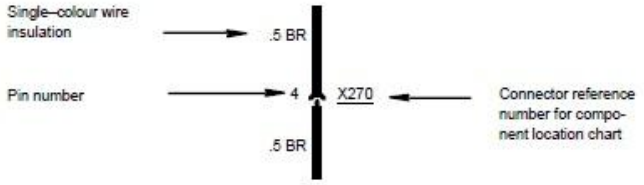
One–pole on/off switch

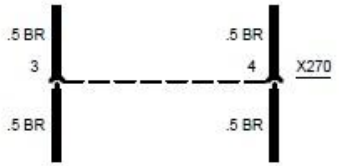


Two–pole switch

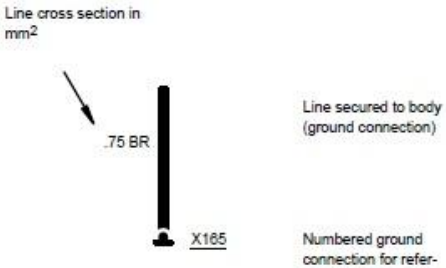
Dashed line indicates mechanical connection between switches

Wire colour	
BL	blue
BR	brown
GE	yellow
GN	green
GR	grey
OR	orange
RS	pink
RT	red
SW	black
VI	violet
WS	white
TR	transparent





Dashed line indicates connection points of the same connector



Instrument Panel test functions

1. Terminal 15 ON or terminal R ON
2. Keep the trip distance recorder reset button pressed for approx. 10 seconds or if the terminal R is switched off, hold down the trip distance recorder reset button and at the same time terminal 15 ON or terminal R ON
3. In the instrument panel, the test functions 01 to 04 can now be called up by pressing the trip distance recorder reset button.
4. Scroll down to test function "04 Unlock" by pressing the trip distance recorder reset button four times
5. Keep the trip distance recorder reset button pressed for approx. 2 seconds until the input box LOCK: ON, CODE: 00 appears
6. Add together the last 5 digits of the vehicle identification number and enter it by pressing the trip distance recorder reset button the corresponding number of times
7. Keep the trip distance recorder reset button pressed down to change the display to the output display
8. Now press the trip distance recorder reset button to scroll through the test functions 01 to 19
9. Select the desired test function and keep the trip distance recorder reset button for approx. 2 seconds to access this function.

Instrument Panel test functions

01 - Identification
02 - System test
03 - End test
04 - Unlock
05 - Consumption
06 - Range
07 - Fuel tank
08 - Temperature
09 - ø BC
10 - Speed reading/engine speed
11 - Vehicle voltage
12 - Acoustics
13 - Error codes
14 - Dim./LCD
15 - DIM./PWM
16 - CBS
17 - Check
18 - Correction factor
19 - SW reset

Ethernet

Ethernet is a manufacturer-neutral, cable bound network technology.
Most computer networks nowadays are based on this data transfer technology.
The so-called Ethernet was developed more than 30 years ago. Since then, the data transfer rates have multiplied. The IEEE
802.3u specification with 100 MBit/s data transfer rate is used in the F series. The IEEE 802.3xx is a standard for cable-bound
networks of the Institute of Electrical and Electronic Engineers. This specification is also known as "Fast Ethernet".
The transfer protocols are the protocols TCP/ IP (Transmission Control Protocol/ Internet Protocol) and UDP (User Datagram Protocol).
The Ethernet in the diagnosis socket is only enabled when programming is enabled and the OBD connector is connected. There is an activation bridge in the programming connector, between pins 8 and 16. This switches the power supply for the Ethernet controller in the central gateway module.
This means that Ethernet access to the central gateway module is disabled while the vehicle is being driven by the customer. The Ethernet connection between the information and communications systems is permanently enabled in the diagnosis socket independently of the activation bridge.

Ethernet

Security

Each participant in an Ethernet has an individually assigned identification number, an MAC address (Media Access Control). This address and the VIN (Vehicle Identification Number) identifies the vehicle to the Autologic Diagnostic Tool.
In the same way as in a computer network in the office, each device in a network must receive unique identification. This is why the central gateway module is assigned a so called IP address by the programming system after connection setup.
The function of an IP address in a network corresponds to that of a telephone number in the telephone network. This IP address is assigned per DHCP (Dynamic Host Configuration Protocol). This is a method of automatic allocation for IP addresses to user devices in a network.

Ethernet

The challenge facing the Service Department is the programming of ever increasing data in increasing numbers of vehicles.
In order to accelerate the programming procedure in the workshop, an Ethernet access has been integrated in the diagnostic socket in the F series in addition to the OBD access (D-CAN) also on E series vehicles of 2010 model year.
It is Fast Ethernet compliant with IEE802.3 2005 100baseTX. This standardised interface provides a centralised, standardised access in the vehicle. This access permits IP-based communication with the vehicle. The vehicle is therefore uniquely identifiable as a communication partner in an IP-based network and Autologic diagnosis and programming systems can be used in the workshop for the data exchange with the vehicle.

Not used in the F series vehicles

.Ethernet

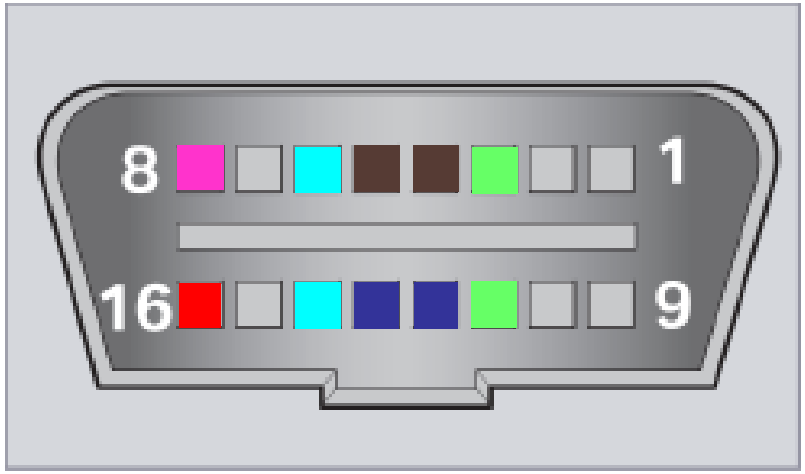
Ethernet port

As there were enough free pins in the diagnostic socket it was possible to integrate the Ethernet port in this socket.

This installation location is the optimal solution for the vehicle access. The further advantage lies in that D-CAN as well as Ethernet can be connected to Autologic diagnostic system to diagnose and programming systems via the vehicle OBD port.

Five pins are needed for the Ethernet port in the diagnostic socket.

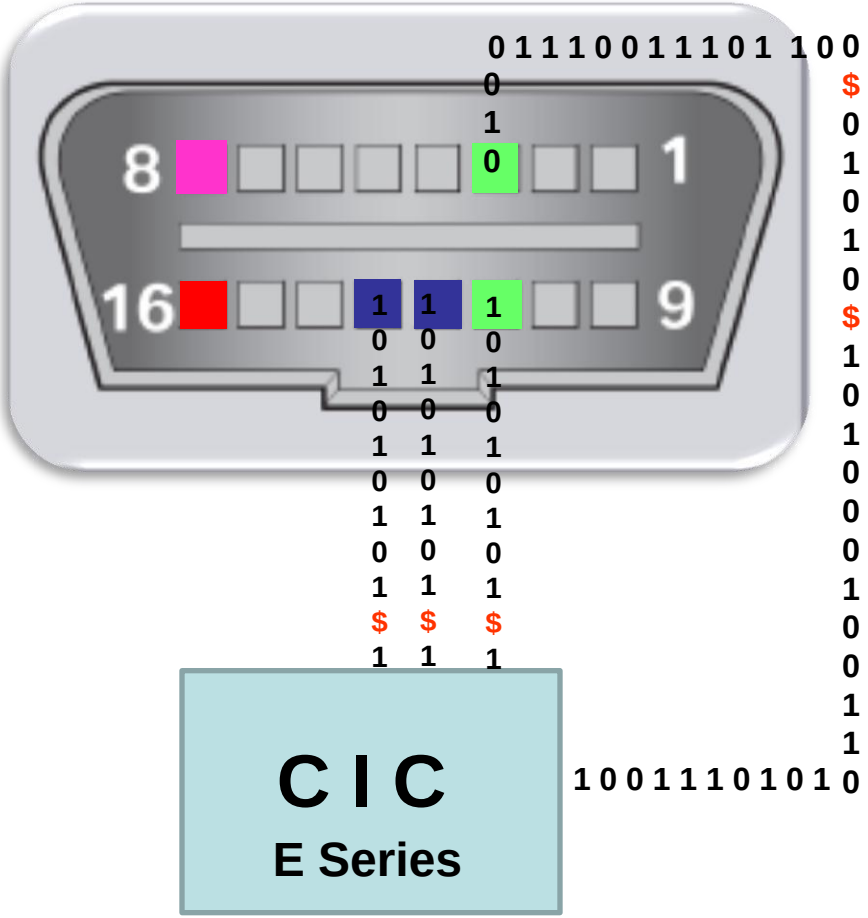
.Ethernet

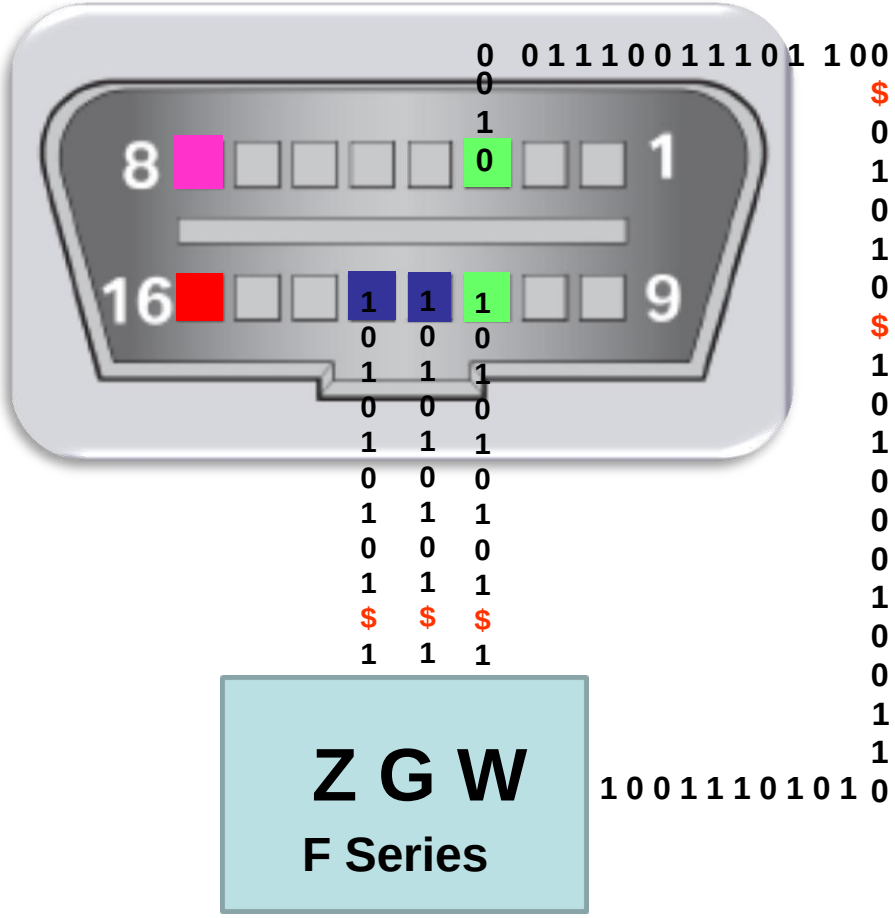


Ethernet requires five pins in the diagnostic socket

Pin	Explanation
1	Not assigned
2	Not assigned
3	**Ethernet Rx+**
4	**Terminal 31**
5	**Terminal 31**
6	**D-CAN High**
7	Not assigned
8	**Ethernet activation**
9	Engine speed
10	Not assigned
11	**Ethernet Rx-**
12	**Ethernet Tx+**
13	**Ethernet Tx –**
14	**D-CAN Low**
15	Not assigned
16	**Terminal 30F**

.Ethernet





Five lines are routed from the diagnostic socket to the central gateway module (ZGW) on a F series vehicle. One of the five lines transmits the activation signal. The remaining four lines are twisted pair and are used for data transmission.

Ethernet

Activation of the Ethernet access

The Ethernet access is switched off in normal operation. It must be activated prior to every usage and then deactivated after it has been used.
Upon communication of the Autologic, the activation line (Pin 8) is connected to terminal 30B (Pin 16) and this activates the Ethernet access.
The Ethernet module in the ZGW receives the signal (voltage level of terminal 30B) via the activation line.
When communication is complete the Ethernet access is deactivated. When the customer is in driving mode the Ethernet access is always deactivated.

Each user in an Ethernet is assigned an identification number that is unique throughout the world, the MAC address (Media Access Control). A user in a network is uniquely identifiable via the MAC address. The MAC address of the vehicle is located in the ZGW and CIC and can not be changed.
The VIN (Vehicle Identification Number) identifies the vehicle to the Autologic programming system. Before communication with the vehicle can take place, just the same as for a computer network in the office it is necessary for each device in an IP-based network to have received a logical identification, called the IP address.

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Ethernet

Activation of the Ethernet access

The IP address is only unique in the respective network segment (sub network) and it can be assigned dynamically or statically. After activation of the Ethernet connection and establishment of the physical connection the central gateway module and CIC are assigned the IP address from the Autologic. Through a special process, the so-called "vehicle identification", the IP address, VIN and MAC are exchanged between the Autologic systems and the ZGW. This allows unique identification of the vehicle and therefore a communication connection can also be established.

Ethernet

Activation of the Ethernet access

The function of an IP address in a network corresponds to a phone number in the telephone network. Assignment of this IP address is performed per DHCP (Dynamic Host Configuration Protocol).
Data enters into the vehicle and is distributed in the vehicle via the Ethernet access over the central gateway module.
The Ethernet connection does not have any effect upon the operation and time response of the D-CAN connection. Simultaneous operation of the D-CAN and Ethernet access must be prevented, as this makes collisions of diagnostics commands within the vehicle probable and therefore communication via both accesses would create a problem.

Ethernet

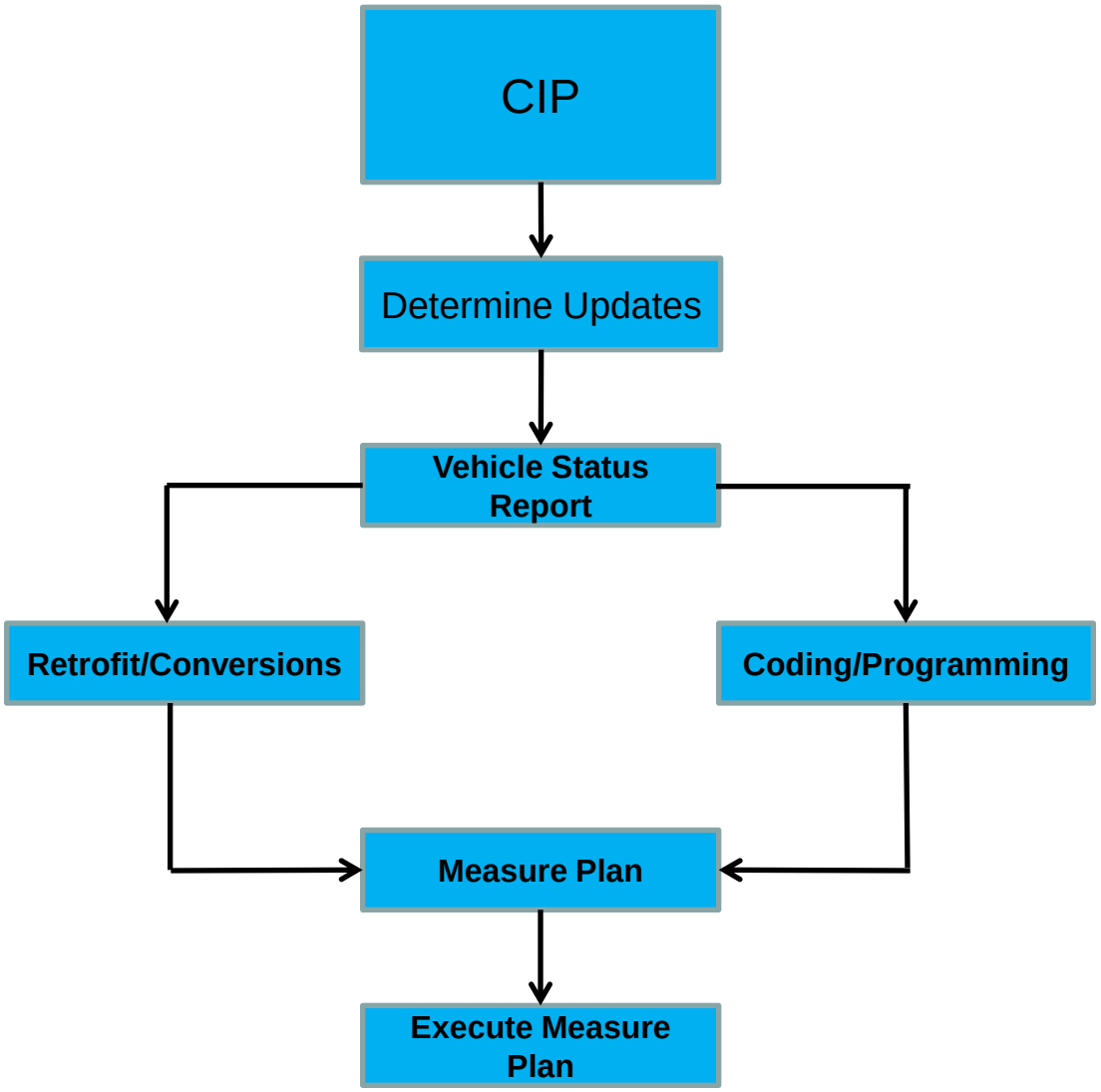
Features of Ethernet

- Very high data rate of 100 MBit/s
- System start time with connection setup and address assignment under three seconds, sleeping under one second
- System access only via Programming.

Functions of Ethernet

- Faster programming of the vehicle in Service
- Transmission of media data between CIC and RSE.

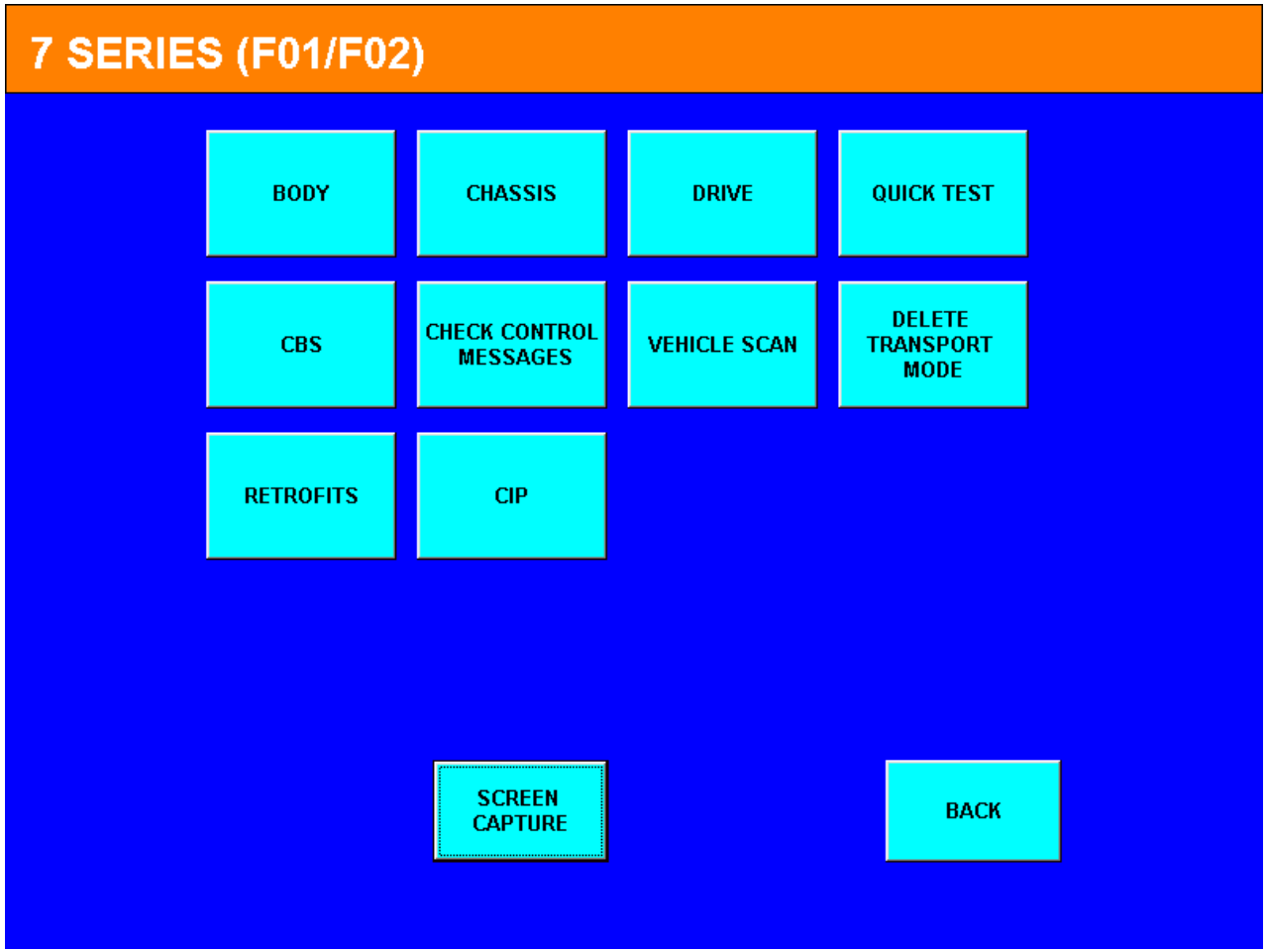
F Series Programming



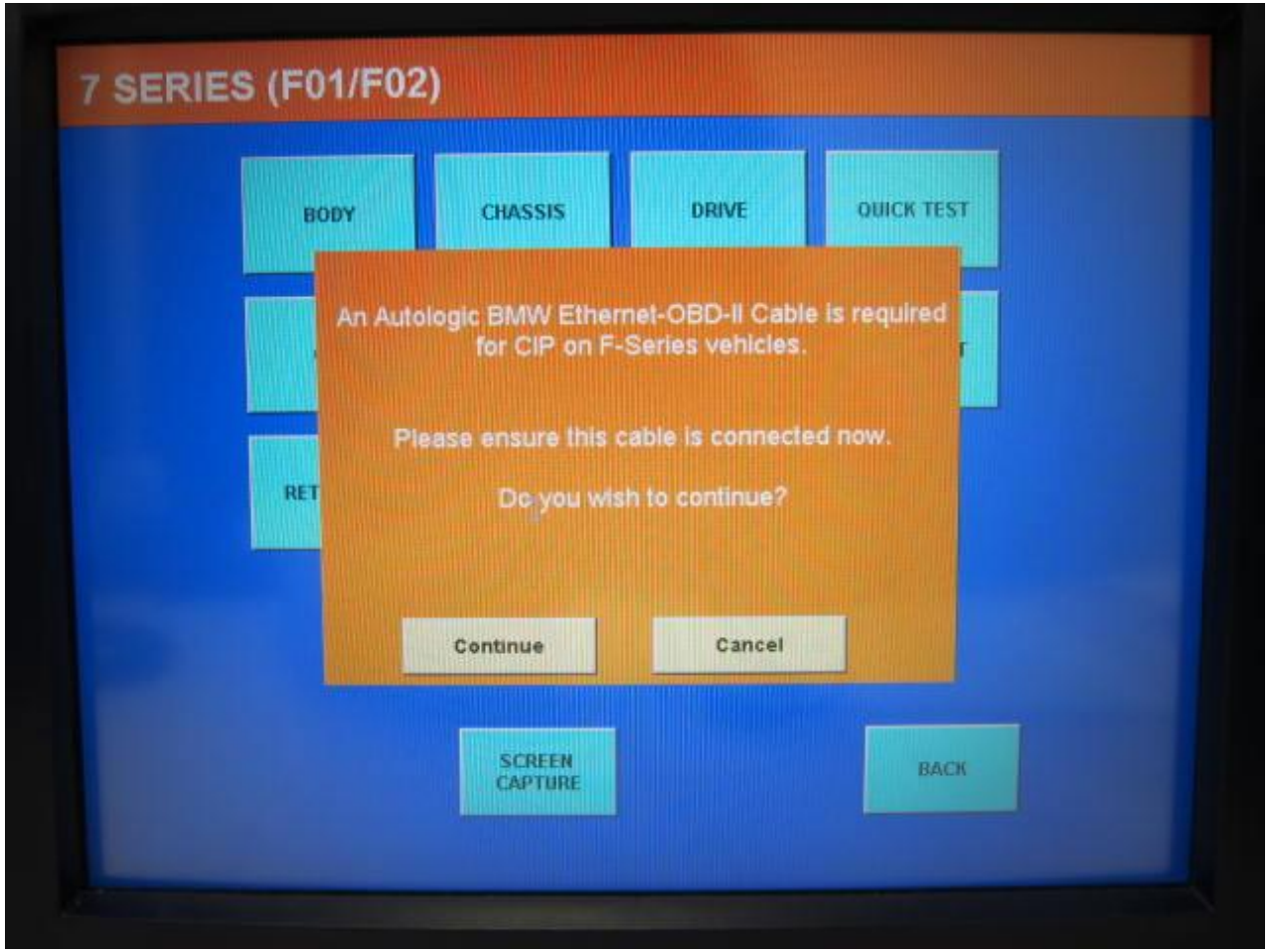
.Programming

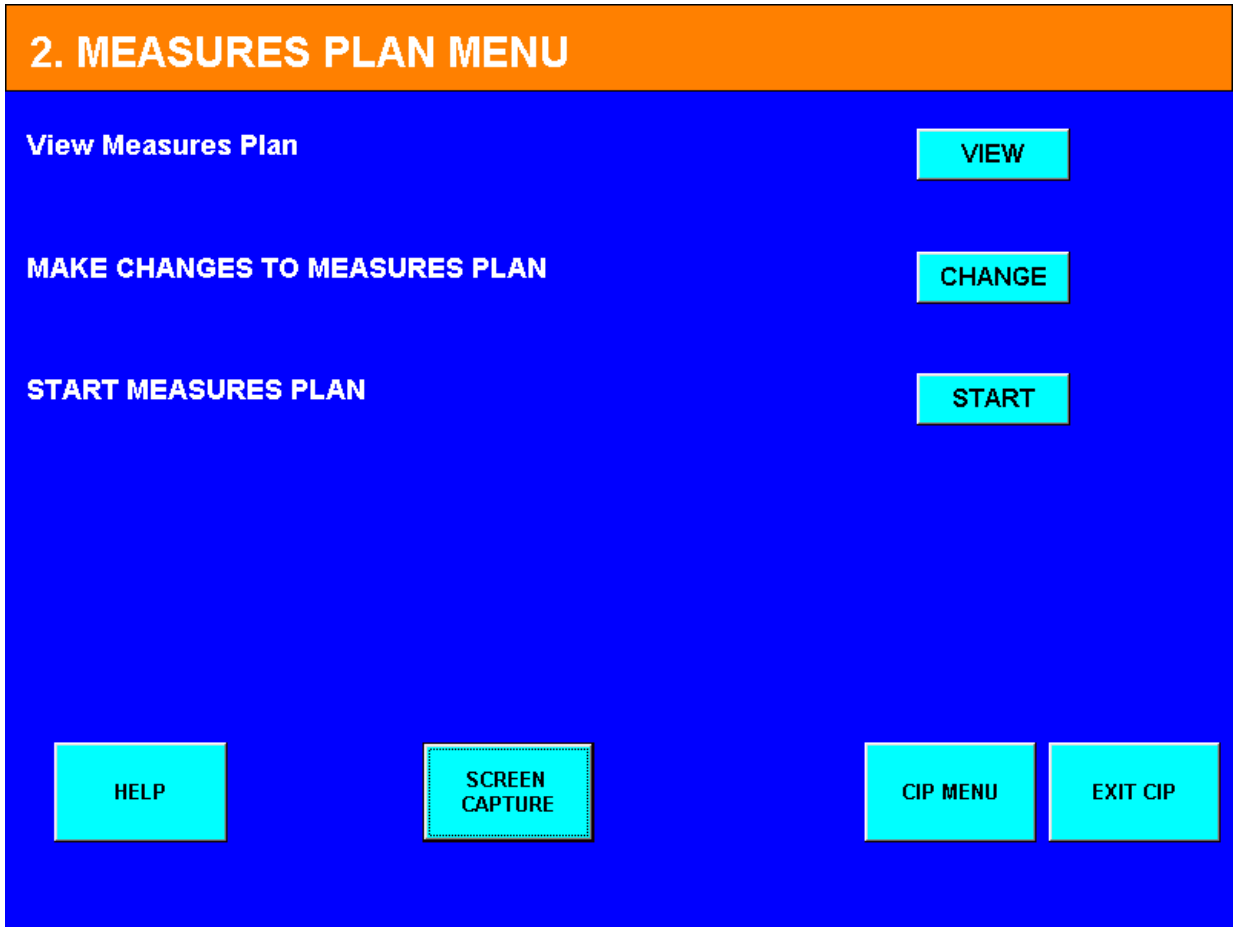
- Vehicle Set up for programming is Essential
- The correct Power supply/charging device
- Organise the vehicle so that while Programming the vehicle is left alone
- Regular checks on the vehicle while Programming must be carried out

F Series Programming

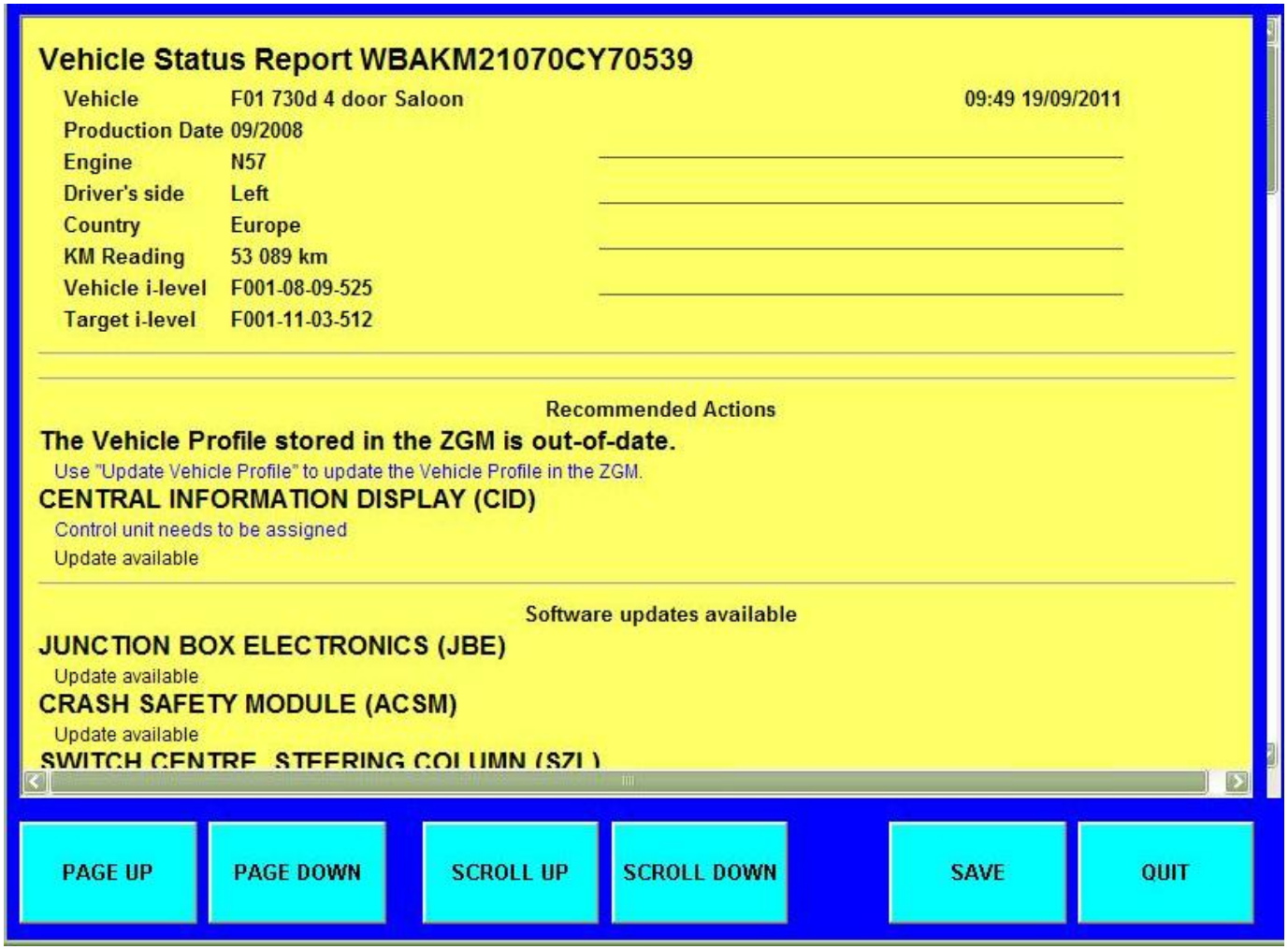


F Series Programming




2. MEASURES PLAN MENU
View Measures Plan
VIEW
MAKE CHANGES TO MEASURES PLAN
CHANGE
START MEASURES PLAN
START
HELP
SCREEN CAPTURE
CIP MENU
EXIT CIP

F Series Programming



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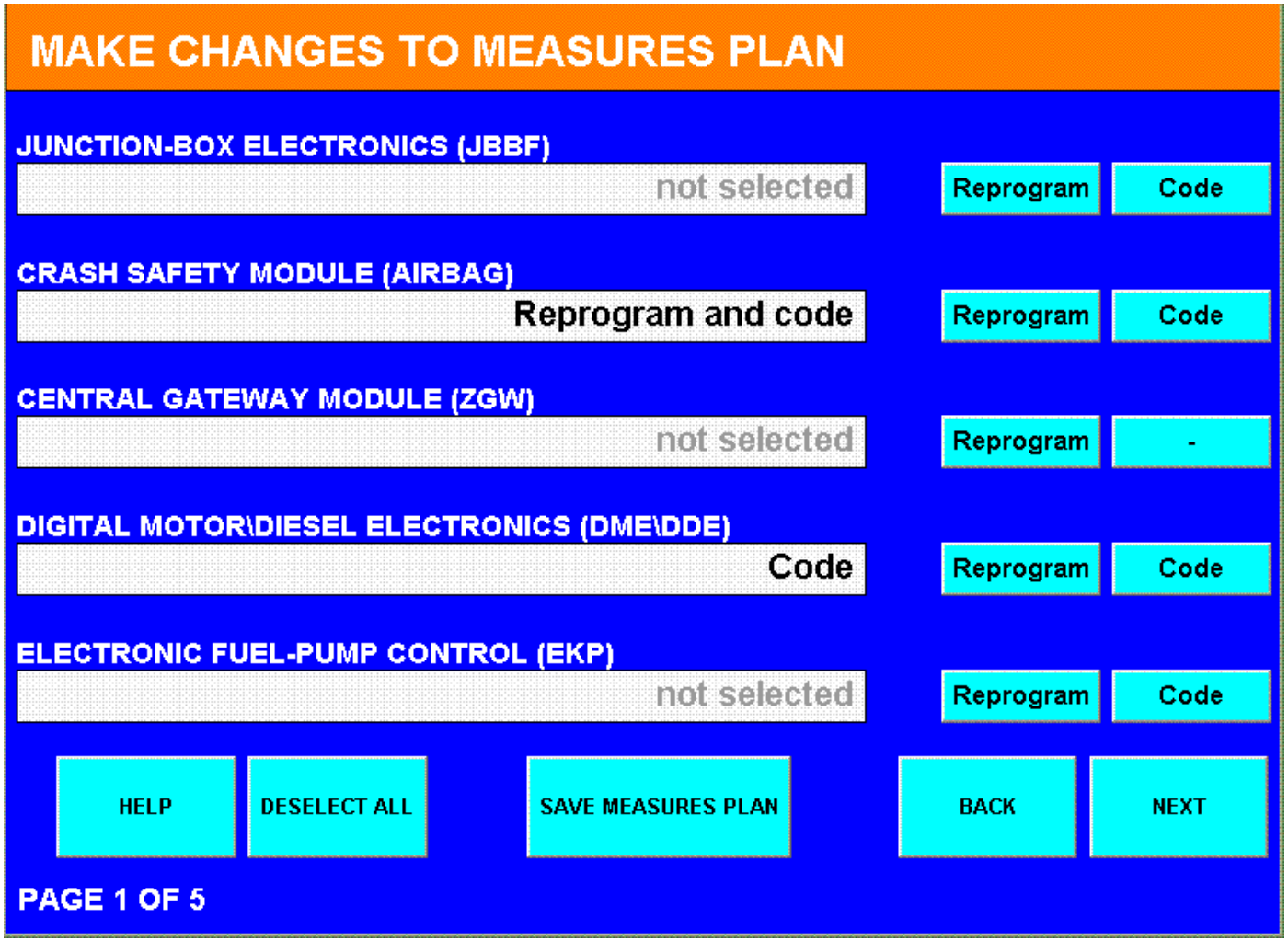

F Series Programming

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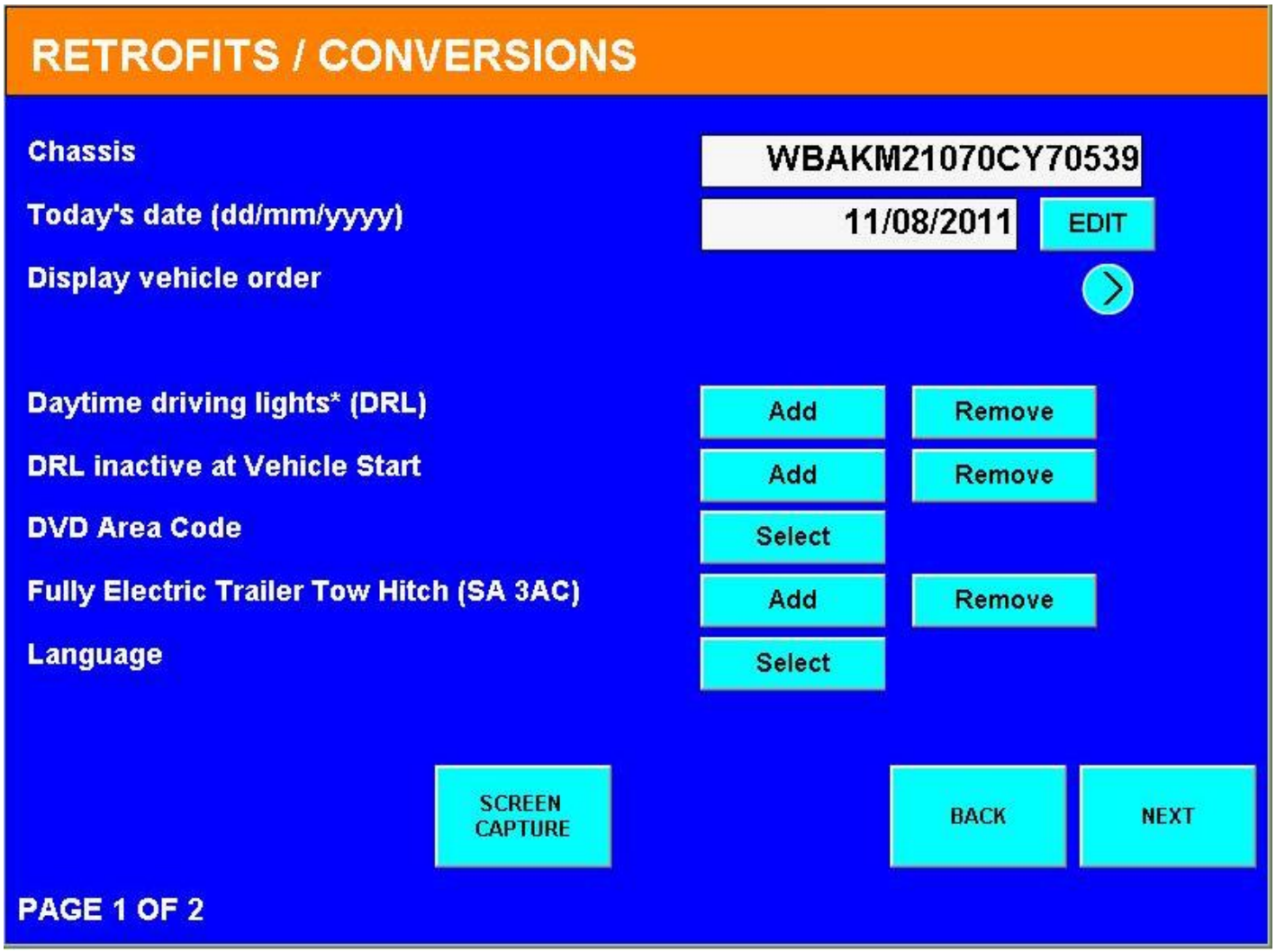
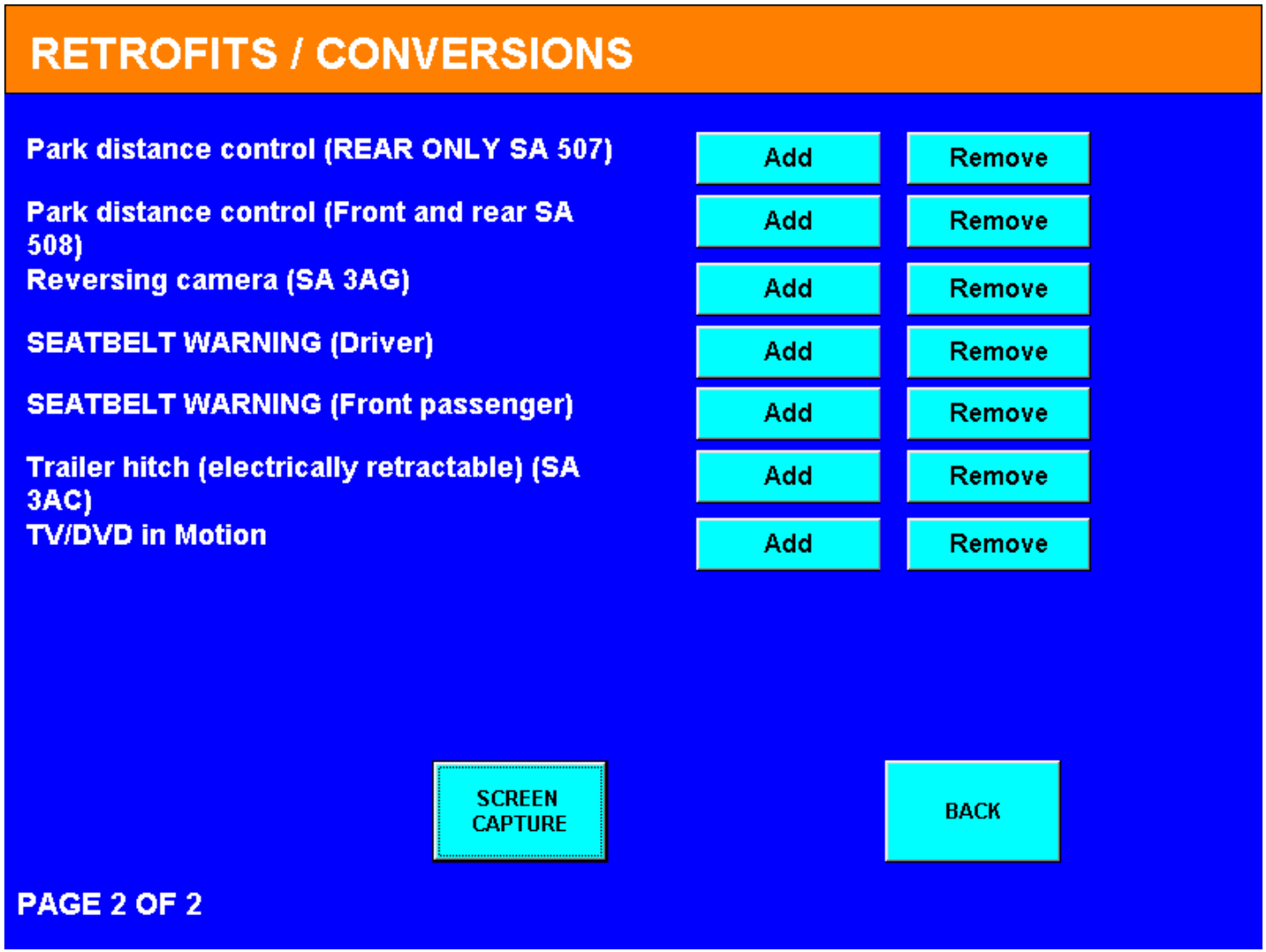


F Series Programming



F Series Programming

.F Series Programming

New Ethernet Programming Cable