Functional Description

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Revisions

Rev.1   37XX   March 2008   Andreas Gombert
Rev.2   65x   October 2009   Jonas Bergqvist

Contents

Introduction

The document "Functional Description 650" contains detailed descriptions of all electrical systems and subsystems that are connected to the vehicles' busses. There are also references to other documents due to including them would go beyond the scope of this document. These are for example Data Dictionaries and manuals.

The base for this document is vehicle state in October 2009 of 65x MY10,75. Thus some MY11 subsystems are not included like Rear View Camera (RVC) and Side Blinde Zone Alert (SBZA).

The systems will be split up into their network belonging:

- High Speed CAN
  (including Chassis Expansion Bus)

- Mid Speed CAN / Infotainment

- Low Speed

- LIN

In addition, main functions will be explained separately, such as gateway functionality, lighting, locking, sport mode, rear seat entertainment etc.

The information included in this document correspond to the actual state of the vehicle's systems by the time of going to press. Please do always check if changes have been made to the systems! There is no guarantee for accuracy and completeness of the following information!

Saab 650 Serial Data Architecture
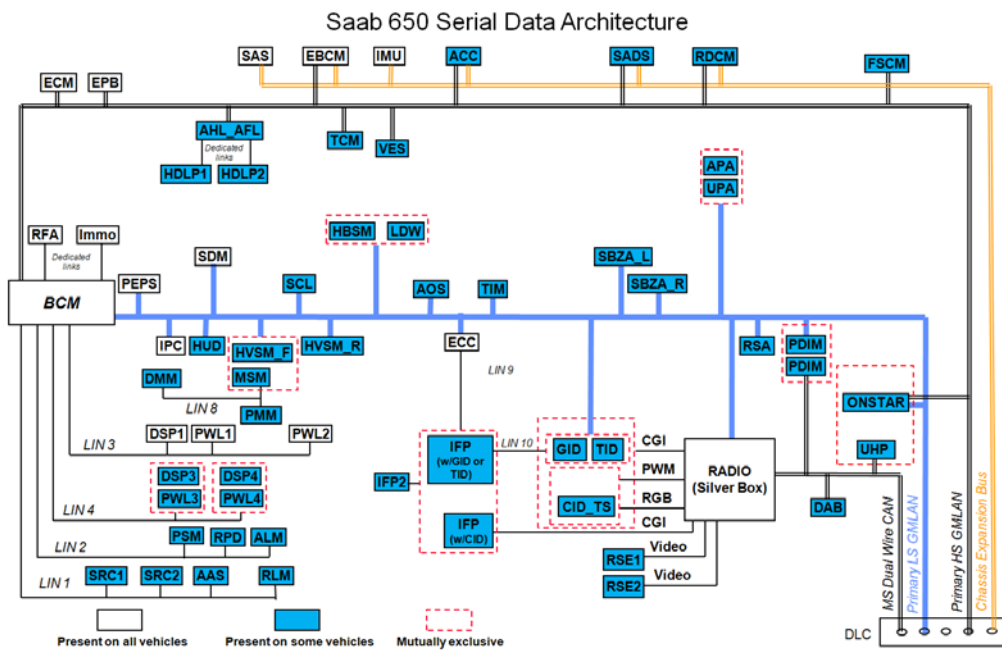
General issues

Abbreviations

AAS	Auxiliary Alarm Sensor
ABS	Anti-Lock Braking System
AC	Air Condition
AFL	Advanced Front Lighting
AFS	Active Front Steering
ALM	Auto-Learn Module
AOS	Automatic Occupant Sensing Module
APA	Advanced Parking Aid
AT	Automatic Transmission
BCM	Body Control Module
CAN	Controller Area Network
CE-Bus	Chassis Expansion-Bus
CGI	CAN Graphics Interface Bus
Chime	Chime Module
DAB	Digital Audio Broadcast
DLC	Diagnostic Link Connector
CID	Colour Info Display
DMM	Driver Memory Mirror
DMS	Driving Mode Selection (Sport mode, etc.)
EBCM	Electronic Brake Control Module
ECC	Electronic Climate Control
ECM	Engine Control Module
ECU	Electronic Control Module
EHS	Auxiliary Heater System
EHU	Entertainment Head Unit
EPB	Electronic Park Break
(E)SCL	(Electrical) Steering Column Lock
FSCM	Fuel System Control Module
FSR-ACC	Full Speed Range - Adaptive Cruise Control
GID	Graphic Info Display
GMLAN	General Motors Local Area Network
GND	Ground
GPS	Global Positioning System
HBSM	High Beam Select Module
HDLP	Headlamp
HSCAN	High-speed Controller Area Network
HUD	Head Up Display
HVAC	Heating, Ventilation and Air Condition
HVSM F/R	Heated / Ventilated Seat Module Front/Rear
ICS	Integrated Center Stack
IFP	Infotainment Faceplate
Immo	Immobilizer

IMU	Inertia Measurement Unit
IPB	Image Processing Bundle
IPC	Instrument Panel Cluster
ISRVM	Inside Rear View Mirror
LDW	Lane Departure Warning
LHD	Left Hand Driven
LIN	Local Interconnected Network
LSCAN	Low-speed Controller Area Network
MSCAN	Mid-speed Controller Area Network
MSM	Memory Seat Module
MTA	Manual Transmission Automatically Shifted
NA	Not Applicable
NC	Not Connected
OSRVM	Outside Rear View Mirror
PDIM	Preferred Device Interface Module
PEPS	Passive Entry Passive Start
PMM	Passenger Memory Mirror
PSM	Power Sounder Module
PTM	Power Tailgate Module
PWL	Power Window Lifter
PWM	Pulse With Modulation
RDCM	Rear Drive Control Module
RF	Radio Frequency
RFA	Remote Function Actuation
RHD	Right Hand Driven
RPD	Remote PRNDL Display
RSH	Rear Seat Heat
RVC	Rear View Camera
RSA	Rear Seat Audio
RSE	Rear Seat Entertainment
RSM	Rain/Light Sensing Module
SADS	Semi Active Damping System
SAS	Steering Angle Sensor
SBZA L/R	Side Blind Zone Alert Left/Right
SDM	Sensing & Diagnostic Module
SRC	Sunroof Controller
TCM	Transmission Control Module
TID	Text info Display
TIM	Trailer Interface Module
TPMS	Tire Pressure Monitoring System
TSM	Traffic Sign Memory
UHP	Universal Hands-Free Phone
UPA	Universal Parking Aid
VES	Variable Effort Steering

Description of given information

Every chapter consists of the following elements:
- Block diagram
- Functional description (of main functions)
- Connectors and pin assignment

The pin assignment table includes the following information:

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color

For information about the CAN frame structure please refer to the Data Dictionaries.

Pin assignment of diagnose jack
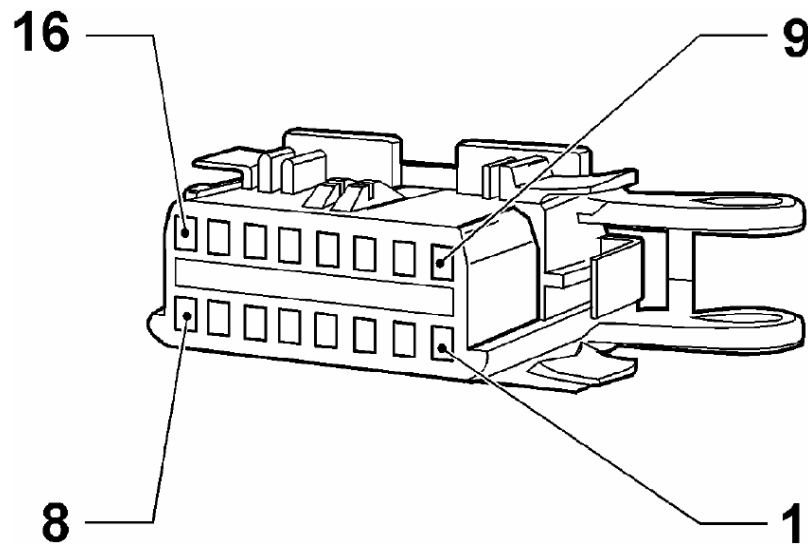
Cavity	Signal
1	Single-wire CAN_High
2	-
3	Mid-speed CAN_High
4	Ground (Terminal 31)
5	Signal ground (Terminal 31)
6	High-speed CAN_High
7	-
8	Offboard diagnostic for radio and telematics
9	-
10	-
11	Mid-speed CAN_Low
12	-
13	-
14	High-speed CAN_Low
15	-
16	Power supply (Terminal 30)

High Speed CAN

ECU arrangement

HS
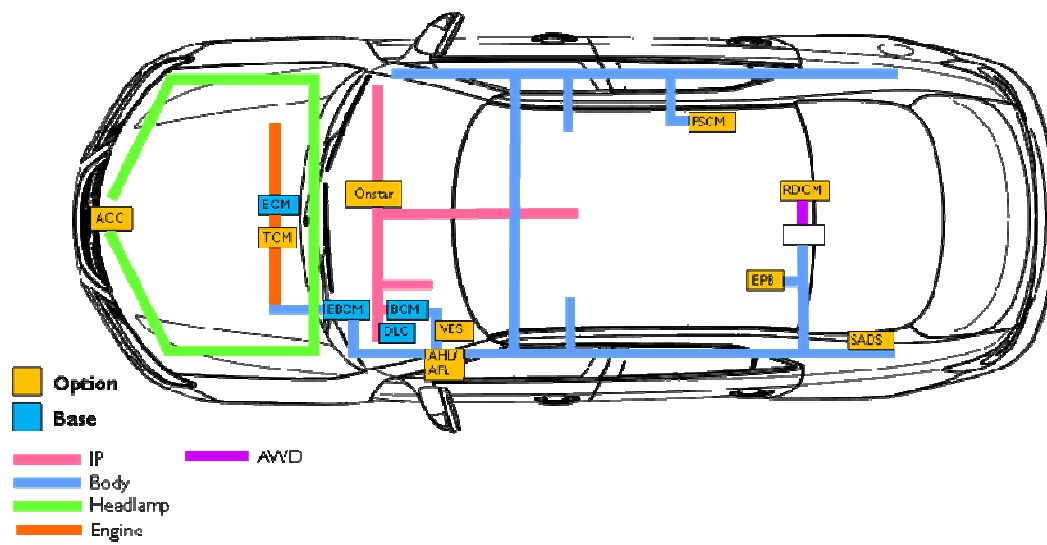
Advanced Forward Lighting (AFL)

The AFL is a system that automatically controls the headlamps in order to optimize the lighting comfort for the driver as well as oncoming traffic. Based on on-board information related to vehicle motion and ambient light conditions, the AFL system provides different light distribution modes dynamically. It also levels the headlamps vertically to avoid dazzling. By determining different driving situations, it constantly strive to provide best possible field of vision without dazzling any other road-users.

The AFL system distinguishes daylight and evening/night-light and will only adapt the light distribution during evening and night, i.e. at dark ambient conditions. Ambient light condition is provided by the Rain/Light Sensor Module (RLM)

As an option, the AFL system can be equipped with a light sensitive forward looking camera, adding the ability to automatically control activation/deactivation of high beam. This functionality is referred to as "Smartbeam". In vehicles with such functionality, the driver has the choice of either controlling the high beam manually or let the system run in automatic mode. Camera based light source detection is provided either by High Beam Select Module (HBSM) or Image Processing Bundle. (IPB)

Feature: Bending Lights

Bending lights is a feature that makes the headlamps swivel in order to light up the road in curves. Based on vehicle speed, steering wheel angle and yaw rate, the swivel angle is calculated for optimal light distribution through the curve.
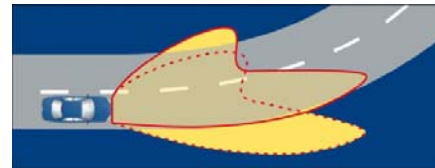
Feature: Dynamic Automatic Headlamp Leveling (AHL)

Automatic headlamp leveling is a feature that dynamically controls the vertical low beam light distribution based on vehicle longitudinal inclination in order to avoid dazzling of oncoming traffic. Leveling control is based on inclination information measured on front and rear axle level sensors as well as by acceleration/deceleration information and vehicle speed.

Light distribution: Town Light

Town light is active at vehicle speeds below 50 km/h.

It provides a relative short but wide light distribution adapted for driving in town.

Xenon power: 32W

Light range: ~60 meters

Left swivel: -8 deg

Right swivel: 5 deg

Light distribution: Country Light

Country light is active between 50 – 100 km/h. It provides a light distribution that illuminates the right hand side of the road more than the left hand side. This is to be able to see distant hazards such as animals and not dazzle oncoming traffic.

An eventual "fail safe" mode of the AFL system enters country light.

Xenon power: 35W

Light range: ~130 meters

Left swivel: 0 deg

Right swivel: 0 deg

Light distribution: Motorway Light

Motorway light is activated due to several different driving situations in speeds above 90 km/h. Depending on vehicle speed, driving path radius and timing conditions, either 35W or 38W will be supplied to the headlamps.
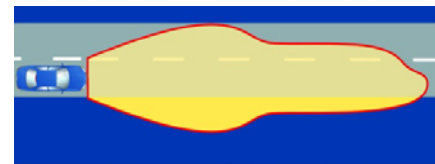
Other technical documentation specifies this more in detail.

Xenon power: 35 or 38W

Light range: ~170 meters

Left swivel: 0 deg

Right swivel: 0 deg

Adverse Weather Light

Adverse weather light is activated at vehicle speeds below 70 km/h if the windscreen wipers have been activated for at least 2 minutes.

The HID bulbs will be powered with different values and the swivel angles will enter different positions.

Left headlamp light distribution corresponds to townlight.

Right headlamp light distribution corresponds to countrylight.
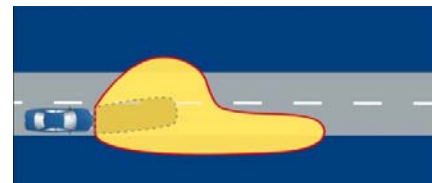
The main advantage is that reflections on the wet ground are reduced to a minimum. This is noticeable for oncoming road-users as well for the driver. In front of the car a less illuminated area is realized.

Xenon power: 38W

Light range: ~130 meters

Left swivel: -15 deg

Right swivel: 0 deg

Tourist Mode

The tourist mode functionality provides the ability to adapt the headlamps positions for left hand traffic and right hand traffic. The purpose is to not dazzle oncoming road users when the vehicle is used in countries that have an opposite traffic regulation than where it is normally used.

The functionality is switched on/off with the "flash to pass" stalk.

The stalk needs to be activated while ignition is switched on and it shall be kept activated until a telltale in the IPC starts flashing (4 sec) and an acoustic indication is sent. The activation period takes about 3 seconds.

The AFL system remembers the tourist mode setting over ignition cycles and each time the ignition is turned on while tourist mode is activated, the IPC telltale will flash to remind the driver of the tourist mode.

Deactivation is performed with the same sequence as for activating the tourist mode.

Headlamp Range Error Position Adjustment

Based on the diagnostic failsafe strategy, the headlamp leveling motors is moved to a programmable error position to avoid dazzling the oncoming traffic. A display warning is given.

It is also possible to automatically switch off the bulb that is out of order. However, the AFL system will never switch off both bulbs, even if they are both not working correct.

AFL component overview

Connectors and pin assignment AFL

X1

X2
NOT
USED
FOR
Saab
65x
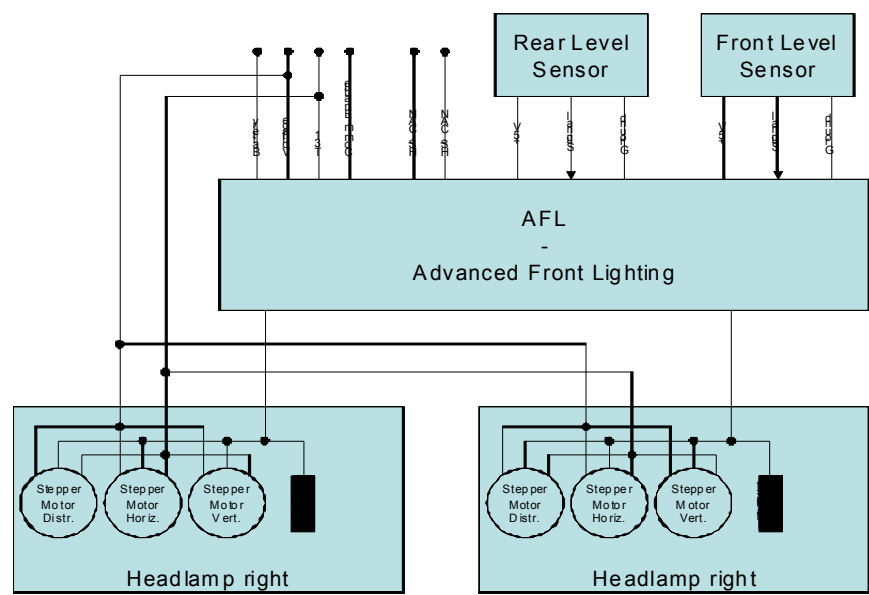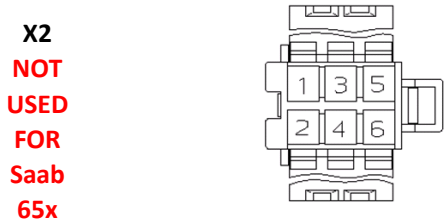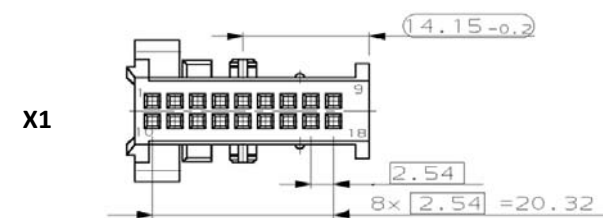
Cavity	Circuit	Circuit Description
X1-1	A50	Terminal 31, GND
X1-2	2165	VLS +5V supply rear
X1-3	2185	VLS GND rear
X1-4	2500	CAN L

X1-5	2501	CAN H
X1-6	2184	VLS signal rear
X1-7	5986	Comm Enable Line Pin
X1-8		n.c.
X1-9		n.c.
X1-10	A40	Power supply Terminal 30
X1-11	7524	VLS +5V supply front
X1-12	7626	VLS GND front
X1-13	2500	CAN-L
X1-14	2501	CAN-H
X1-15	7525	VLS signal front
X1-16		n.c.
X1-17	7530	LIN-Bus right
X1-18	7529	LIN-Bus left
X2-1	A40	Supply SBL right / Power supply Terminal 15
X2-2	A40	Supply SBL left / Power supply Terminal 15
X2-3		n.c.
X2-4		n.c.
X2-5	58	SBL right
X2-6	57	SBL left

EBCM (Electronic Brake Control Module)

The Electronic Brake Control Module is a component of the brake system and contains an integrated Traction Control System (TCS) with brake- and engine intervention and an integrated Electronic Stability Control (ESC).

Block diagram EBCM

1   ABS telltale
2   Wheel speed sensors, rear
3   Hydraulic modulator with ABS control unit
4   Wheel speed sensors, front
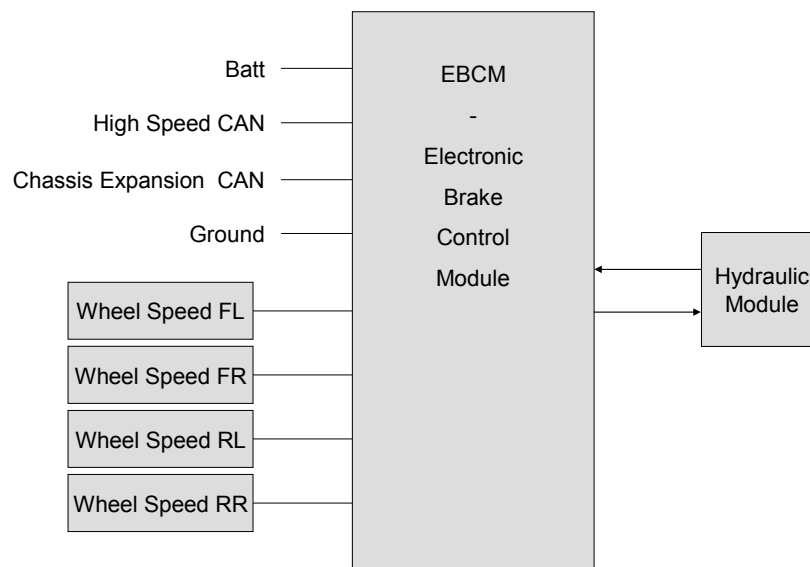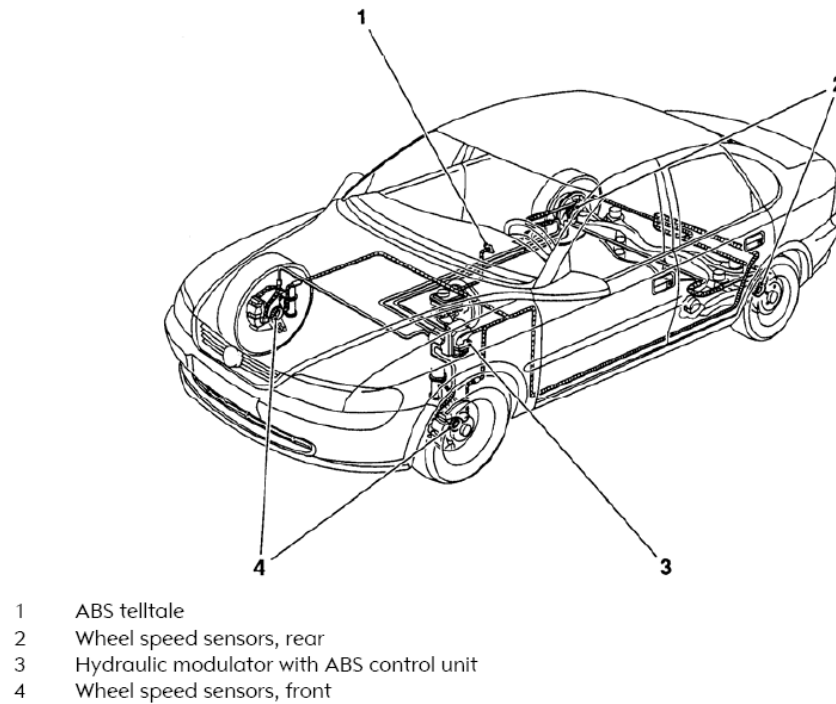
Functional description EBCM

EBCM includes three main functions regarding brake assistance:
- ABS
- TC
- ESC

Every brake intervention of the EBCM is indicated by a telltale.

TC and ESP can be switched off manually. To disable TC, the driver has to push the corresponding switch in the IP stack. For disabling ESP, the same switch has to be pressed for several seconds. It the switch is pushed again, all systems will be reactivated.

In addition to brake features, EBCM is the gateway for High-speed and Chassis Expansion Bus.

Anti-Lock Braking System

ABS is a system which prevents the wheels from locking while braking. The anti-locking braking system allows the driver to maintain steering control under heavy braking by preventing a skid and allowing the wheel to continue to forward roll and create lateral control, as directed by driver steering inputs.

Traction Control

TC prevents loss of traction (and therefore the control of the vehicle) when excessive throttle or steering is applied by the driver. The system will vary the engine torque and the brake moment of the powered wheels.

Electronic Stability Control

The ESC is used to stabilize the vehicle when driving close to the physical limits. The system compares the driver's intended direction by measured steering angle (SAS) to the vehicle's actual direction represented by lateral acceleration and yaw rate (IMU) as well as individual wheel speeds (WSS, directly connected to EBCM). If the vehicle is not going where the driver is steering, ESC brakes individual wheels and/or reduces excess engine power as needed to help correct under- or oversteer. In comparison to ABS and TC, ESC additionally incorporates yaw rate control.

Gateway HS ←→ CE

EBCM will gate the necessary messages from HS to CE bus and vice versa. These are mainly sensor data taken by the Inertia Measurement Unit IMU and the Steering Angle Sensor SAS.

Connectors and pin assignment EBCM

X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge / Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	A40	Battery Positive Voltage						
3	872	Wheel Speed Sensor Signal Right Front		D55				
4	7065	Wheel Speed Sensor Supply Voltage Right Front		D55				
5	2500	High Speed GMLAN Serial Data (+) (2)		A40				
6	2501	High Speed GMLAN Serial Data (-) (2)		A40				
8	2501	High Speed GMLAN Serial Data (-) (1)		B40				
9	2500	High Speed GMLAN Serial Data (+) (1)		B40				
10	7128	Wheel Speed Sensor Supply Voltage Right Rear		F55				
11	882	Wheel Speed Sensor Signal Right Rear		F55				
13	A50	Ground						
25	A42	Battery Positive Voltage						
27	830	Wheel Speed Sensor Signal Left Front		C55				
28	7064	Wheel Speed Sensor Supply Voltage Left Front		C55				
29	333	Brake Fluid Level Sensor Signal						
33	5986	Serial Data Communication Enable						
34	1903	AAS Wheel Speed Sensor Signal Left Front						
35	7127	Wheel Speed Sensor Supply Voltage Left Rear		E55				
36	884	Wheel Speed Sensor Signal Left Rear		E55				
38	A50	Ground						

ECM (Engine Control Module)

This is the description of all available Engine Control Modules. Depending on the engine, different ECMs will be used.

Engine Denomination

The following table explains the characters used in the engine name:

Gasoline Engines	
A	Exhaust Emission Limits
16	Engine Size
X	Compression Ratio
E	Fuel Mixture System
R	Design Specifics

Diesel Engines	
A	Exhaust Emission Limits
20	Engine Size
D	Fuel Mixture System
T	Design Specifics
L	Design Specifics

These are the meanings of the abbreviations:

Exhaust Emission Limits	
A	EC 2010 (Euro 5)

Compression Ratio	
N	$9,0 < e \leq 9,5$
X	$10,0 < e \leq 11,5$

Fuel Mixture System	
D	Diesel
E	Fuel Injection
H	Homogeneous Gasoline Direct Injection

Design Specifics	
H	High Output / Charge
L	Low Output / Charge
R	Raised Performance
T	Turbo

Engine Data

A20NHT	
ECM	E 69
Transmissions	F40WR F40CR-AWD AF40 AF40-AWD
Output	162 kW at 5300RPM
Torque	350 Nm at 2000-4000 RPM
Top Speed (5th gear)	240 / 230 / 235 / 230 km/h
Top Speed (6th gear)	
Acceleration: 0 - 100 km/h	7,9 / 8,0 / 8,5 / 8,8 s
** 40 - 100 km/h**	NA s
** 80 - 120 km/h**	10,6 / 9,8 / … / … s
Fuel consumption (combined)	8,4 / 9,3 / 9,5 / 9,7 l/100km
CO_2 emission	198 / 218 / 223 / 228 g / km
vehicle range (fuel tank capacity: 70 l))	833 / 753 / 737 / 722 km

A28NER	
ECM	E77
Transmissions	AF40-AWD
Output	221 kW at 5500 RPM
Torque	400 Nm at 1850-4500 RPM
Top Speed (5th gear)	250 km/h
Top Speed (6th gear)	250 km/h
Acceleration: 0 - 100 km/h	6,9 s
40 - 100 km/h	NA s
80 - 120 km/h	NA s
Fuel consumption (combined)	11,4 l/100km
CO_2 emission	269 g/km
vehicle range (fuel tank capacity: 70 l))	614 km

A20DTH	
ECM	E91
Transmissions	F40WR
	AF40
Output	117 kW at 4000 RPM
Torque	350 Nm at 1750-2500 RPM
Top Speed (5th gear)	215 / 210 km/h
Top Speed (6th gear)	
Acceleration: 0 - 100 km/h	9,9 / 10,1 s
40 - 100 km/h	NA s
80 - 120 km/h	11,9 s
Fuel consumption (combined)	5,3 / 6,8 l/100km
CO_2 emission	139 / 169 g/km
vehicle range (fuel tank capacity: 70 l))	1320 / 1029 km

Block Diagram ECM

Block diagrams of ECM subfunctions can be found in PPEI specification. This document will only provide the pinouts of all ECMs.

General Functions ECM

All ECMs provide several general features and functions, which will be explained below.

Driver Information (Displays and Gauges)

ECM sends some information to the platform representing the actual status of the engine or by ECM monitored systems. E.g. the following information will be presented or used as input to information presented in the driver compartment:

- Low Engine Oil Level
- Engine Oil Life Warning (oil change)
- Engine Oil Remaining Life
- Engine Oil Pressure
- Engine Non-Emissions Related Malfunction Indicator
- Engine Emissions Related Malfunction Active
- Engine Hot / Stop Engine indication
- Engine Hot Fuel Enrichment Indication On
- Fuel Consumption
- Generator Failed
- Reduced Engine Power
- Engine recommended Upshift Indication (US, ACC-MT)
- Engine Recommended Downshift Indication On (ACC-MT)
- Vehicle Speed
- Fuel Level
- Engine Boost Pressure
- Engine Speed
- Engine Coolant Temperature
- Diesel Particulate Filter warning (Diesel)
- Glow Plug status (Diesel)
- Water in Fuel Warning (Diesel)
- Driver Preference mode (E.g. sport Mode, provided by ECM in MT)
- Cruise Engaged
- Cruise Active
- Cruise Driver Selected Speed

Engine Power Management

Electronic Accelerator Pedal Control

Powertrain will control engine performance by means of the engine control system. Platform provides the primary driver intent engine performance request by means of the electronic accelerator pedal module.

Engine Speed Control

The Generator and HVAC subsystems may request engine speed changes from Powertrain via the GMLAN signal Platform Minimum Idle Boost Level Request.

Engine Accessory Drive Load Management

The Air Conditioning Compressor subsystem communicates to Powertrain when accessory drive load changes are anticipated due to A/C compressor load changes.

Vehicle Top Speed Limiting (not upcoming MY11 speedlimiter functions)

Powertrain arbitrates between the Platform top speed limit request (e.g. tire speed index) and other Powertrain top speed limiting conditions (e.g. engine error codes) and limit vehicle speed to the lowest value.

Engine Torque Management

The Traction Control System, Vehicle Stability Enhancement System, and Brake Torque Management System may request the Powertrain controller for changes in engine output torque.

Engine Power Limiting

Powertrain electronics may limit powertrain performance for certain failure conditions, engine protection, transmission protection or customer safety.

Regulated Voltage Control (RVC)

In the RVC system, a body controller on the Platform side of the interface determines the optimal setpoint voltage based on battery state-of-charge, battery temperature, and battery charge current. The optimal setpoint is transmitted to Powertrain as a duty cycle through a serial data signal.
ECM passes the setpoint command to the generator through a PWM interface to the generator L-terminal.

Some Powertrain components and subsystems on certain applications under specific (temporary) operating conditions may require the system voltage to be higher than the Platform commanded voltage. The ECM can then perform an override of the platform requested setpoint.

A/C Compressor management

In ECVD systems, the compressor control driver is provided by the Platform HVAC controller. The HVAC controller has the responsibility for algorithms to control the compressor based on inputs from its own subsystem as well as inputs it receives from Powertrain over serial data.
On all A/C systems, ECM has the primary responsibility for algorithms to protect the compressor components based on inputs from its own subsystem as well as inputs it receives from Platform over serial data.

Starter Control
PEPS start
ECM controls the engine start procedure.. Once engine start is requested from the PEPS

system (Passive Start) due to a driver initiated start request via start button and the criteria to start the engine has been met, ECM will on the received start request ,go on starting the engine as long as the engine hasn't reach running status or one of the following break conditions occurred:

- Clutch pedal released (manual transmissions)
- The transmission is not in gear (automatic transmissions)
- Timeout occurred
- Theft Deterrent Algorithms has determined start is not longer allowed (IMMO)
- Run/crank hardwired signal transition to inactive (Ignition transitioned out of Run or Crank State)

ECM Engine Start enable criteria:

- Crank request is sent for a minimum period
- Ignition has been cycled out crank since last start
- Engine is not rotating
- Theft Algorithms has determined start is allowed (IMMO)
- Transmission is not in gear (Park/Neutral in Automatic Transmission, clutch pressed in Manual Transmission)
- Ice Break mode is not active

The ECM provide information to the PEPS system on the platform side. Typical information provided by ECM and used by the PEPS system is clutch, Engine running status, Crank abort request.

Remote Vehicle Start (US – Automatic Transmissions)

ECM controls the engine start procedure.. Once engine remote start is requested , and the criteria to remotely start the engine has been met, ECM will go on starting the engine as long as it either runs or one of the following break conditions occurred:

- The transmission is not in gear (automatic transmissions)
- Timeout occurred
- Theft Algorithms has determined start is not longer allowed (IMMO)
- Run/crank hardwired signal transition to inactive (Ignition transitioned out of Run or Crank State)

Engine Remote Start enable criteria:

- Remote_Vehicle_Start_Request received over serial data transitions from "Inactive" to "Active" (the default state is "Inactive").

- System_Power_Mode in vehicle is equal to "Off".

- The Malfunction Indicator Lamp is not illuminated.

- Vehicle_Speed is equal to zero.

- Transmission_Shift_Lever_Position is equal to PARK.

- The vehicle has an automatic transmission.

- Remaining_Remote_Starts > 0 (Calibration determines the maximum number of Remote Starts that is allowed after a transition from Run to Off Vehicle Power Mode)

- Fuel_Level greater than low threshold if Remaining_Remote_Starts = 1.

Vehicle Theft Deterrent (Immobilizer)

ECM will interact with fuel, spark and starter control based on the output from immobilizer algorithms. The Vehicle Theft Deterrent functionality is partitioned in both platform Controllers/devices and ECM.

On Board Diagnostics

The ECM detects failure modes by onboard diagnostics (EOBD, OBDII) and provides diagnostic services via serial data communication with a Generic Scantool to retrieve detected faults and information etc in order to facilitate trouble shooting and repair.

Enhanced Diagnostics (Workshop)

The ECM provides (enhanced) diagnostic services via serial data communication with Saab workshop dedicated testers to retrieve detected faults and information etc in order to facilitate trouble shooting and repair.
Enhanced Diagnostic services do also provide ECM calibration and software reprogramming capability

Driver Preference Mode Functionality

If supported, the driver can select between a number of driver preference modes by a momentary rotary switch e.g. Sport Mode. The ECM will interpret the mode selected by the driver via switches (serial data from BCM) and inform the vehicle of the currently selected driving mode.
ECM is only an interpreter of driver selected mode and will not directly use the selected mode to adapt any characteristics but, if supported/calibrated, the ECM may indirectly be requested by platform to change accelerator pedal gain profile (Pedal Map) when certain Driver preference mode(s) is active.
In each new ignition cycle the driver preference mode will be reset to the default (normal) mode.

The functionality to interpret the Driver Preference Mode switches is only performed by ECM in Manual Transmission vehicles. In Automatic transmission vehicles functionality is performed by the TCM.

Cruise Control

Handling the Cruise Control is up to the ECM. Conventional Cruise Control controls the vehicle speed to an operator selectable speed.

The operator applies cruise mode switches to enable and engage cruise as well as select and adjust the driver-selected speed. The cruise control subsystem controls to the driver selected speed using the electronic throttle control subsystem.

The disabling and disengagement of the subsystem is affected via operator application of the brake pedal, On/Off switch, clutch switch or Clutch Pedal Position sensor (manual transmission only), as well as other defined disengagement criteria.

The ECM will provide the following information to platform for driver indication purposes:
- Cruise On
- Cruise Engaged
- Cruise Driver Selected Speed

Remark: before CC is applicable, the driver has to step on the brake or alternatively on a Manual Transmission vehicle press the clutch (top of travel) to ensure that the sensor(s) is working correctly and CC deactivation may be recognized.

Adaptive Cruise Control (ACC)/ Full Speed Range ACC (FSRA)

The ECM take part in the ACC functionality by delivering requested axle torque and as part of a rationality check monitor several key signals. The ECM processing this information redundant to the ACC module enhances the system's robustness. The signals monitored includes key enable and disengagement criteria, such as the (adaptive) cruise switch states, brake pedal apply states and vehicle speed.

Full Speed Range Adaptive Cruise Control (FSRA) extends the operation of ACC to a stopped condition. Once stopped, driver action is required prior to resuming speed control. In addition to the rationality check implemented for ACC, the ECM shall redundantly require seeing an appropriate driver action occurs prior to allowing resumption of control from a stop.

Fan Control

The cooling fans are primarily used for powertrain cooling and also provide cooling for other underhood components. The cooling fan control algorithm is executed by Powertrain Controller. Platform may optionally request a fan speed change via serial data for electrical load management or other platform-specific reasons.

The fans provide discrete inputs, PWM is not supported. Based on the number of installed fans (basically depending on the used engine), different fan steps are available

Fuel Management

Fuel Supply

There are two ways to provide fuel to the engine: via conventional Mechanical Returnless Fuel System or by using the FSCM (if available). For detailed FSCM information, please refer to the according chapter within this document.

If no FSCM is used, ECM has to control the fuel pump. There is no controlling algorithm since the amount of delivered fuel can't be influenced. But there are still some conditions that prevent fuel pump enabling:
- empty fuel tank
- collision – indicated by a SDM message (Post-collision), the fuel pump will be switched off

Fuel Level Determination

ECM determining the amount of fuel remaining in the fuel tanks of a dual fuel tank system as well as a single fuel tank system. ECM also run the logic behind hill mode strategy and fuel consumption strategy.

Hill mode strategy is a way to improve fuel gauge performance when parked on an incline and is done by monitoring the fuel level for a certain time after the vehicle has been turned OFF, to determine the fuel monitored value. When the vehicle is turned ON again a check is made between the fuel monitored value and the new fuel sender value.

Fuel consumption strategy takes into consideration the accumulated fuel consumption from injectors and auxiliary heaters when the vehicle is running low on fuel. This is more accurate than using the fuel sender value at low fuel levels because of the sender dead band.

Vehicle Speed

The ECM calculate vehicle speed either based on Transmission Output sensor TOSS (wired to ECM in MT vehicles or TCM on AT vehicles) or, if no TOSS is available, on wheel rotational information received from EBCM.

Connectors and pin assignment E69
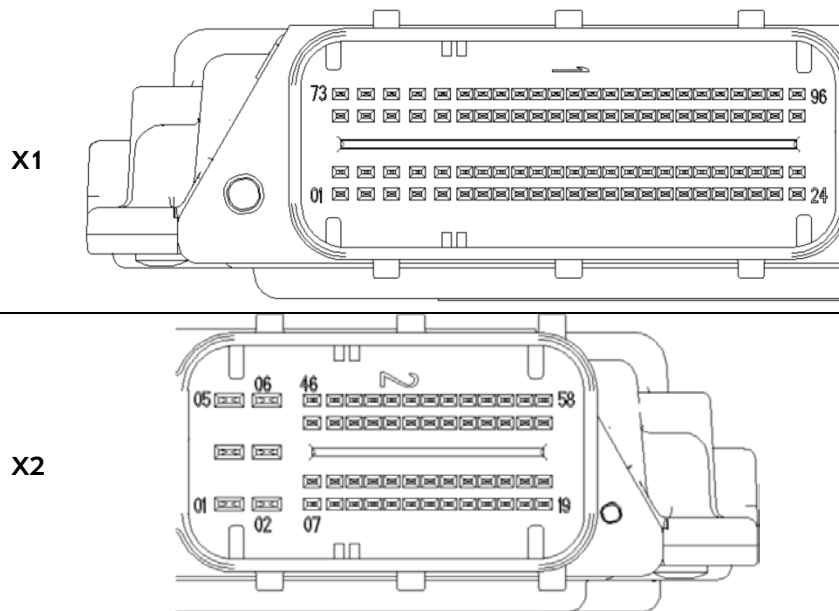
X1

X2

Cavity	Circuit Description
X1-01	Camshaft Phaser Exhaust 1
X1-02	Camshaft Phaser Intake 1
X1-03	
X1-04	
X1-05	High Pressure Fuel Pump Actuator HS
X1-06	Canister Purge Valve (PWM)
X1-07	Cam Position Sensor Intake 1
X1-08	
X1-09	
X1-10	Alternator L-Terminal
X1-11	Oil Condition Sensor / Level Switch
X1-12	Crank Housing Ventilation Valve
X1-13	Igniter EST Reference Ground Even Bank
X1-14	
X1-15	Sensor Supply (Camshaft Position)
X1-16	Turbo Bypass Control Valve (Overrun Air Valve)
X1-17	Oil Pressure Switch
X1-18	Waste Gate Control (PWM)
X1-19	
X1-20	Manual Transmission Oil Cooling Pump
X1-21	Fuel Tank Vapor Temperature
X1-22	Fan 3
X1-23	
X1-24	ETC Motor throttle valve position terminal

Cavity	Circuit Description
X1-25	Turbo Boost Pressure Gauge Output
X1-26	SIDI Injector Valve 3 Lo LNF
X1-27	SIDI Injector Valve 3 Hi LNF
X1-28	SIDI Injector Valve 4 Lo LNF
X1-29	SIDI Injector Valve 4 Hi LNF
X1-30	Alternator F-Terminal
X1-31	
X1-32	
X1-33	
X1-34	Cam Position Sensor Exhaust 1
X1-35	Engine Position Sensor (Crank)
X1-36	Fuel Rail Pressure Sensor
X1-37	Manifold Absolute Pressure
X1-38	Sensor Supply (Fuel Rail Pressure)
X1-39	Sensor Supply (ETC throttle position)
X1-40	Sensor Supply (Oil Pressure, Air Pump Pressure)
X1-41	Sensor Reference Ground Engine Digital (CAMs)
X1-42	Sensor Reference Ground Engine Analog (Oil Pressure, Air Pressure, Oil Temperature, Coolant Temperature, TRAD)
X1-43	Sensor Reference Ground Engine (SAIR)
X1-44	
X1-45	Sensor Supply (Engine Position (Crank))
X1-46	Sensor Reference Ground Engine (Engine Crank Sensor)
X1-47	Diagnosis K-Line
X1-48	ETC Motor Throttle Valve Negative Terminal
X1-49	Electric Controlled Thermostat
X1-50	
X1-51	SIDI Injector Valve 1 Lo LNF
X1-52	SIDI Injector Valve 2 Lo LNF
X1-53	SIDI Injector Valve 2 Hi LNF
X1-54	Malfunction Indicador Light (B) for LED
X1-55	Igniter Driver 1
X1-56	Igniter Driver 3
X1-57	
X1-58	Power Steering Pressure Switch
X1-59	
X1-60	
X1-61	Oil Pressure Sensor
X1-62	
X1-63	Engine Radiator Temperature
X1-64	Sensor Reference Ground Manifold
X1-65	
X1-66	Turbo Manifold Absolute Pressure Input
X1-67	O2 Sensor Pre 1 Reference Ground

Cavity	Circuit Description
X1-68	O2 Sensor Pre 1 Input Pump Current
X1-69	
X1-70	
X1-71	
X1-72	
X1-73	High Pressure Fuel Pump Actuator LS
X1-74	
X1-75	SIDI Injector Valve 1 Hi LNF
X1-76	
X1-77	
X1-78	Igniter EST Reference Ground Odd Bank
X1-79	Igniter Driver 2
X1-80	Igniter Driver 4
X1-81	
X1-82	Engine (Coolant) Temperature
X1-83	
X1-84	
X1-85	
X1-86	Turbo Boost Air Temperature (from TMAP-Sensor)
X1-87	Air Pump Pressure Sensor 1
X1-88	ETC Throttle Valve Position Reference Ground
X1-89	ETC Throttle Valve Position Sensor 2
X1-90	ETC Throttle Valve Position Sensor 1
X1-91	O2 Sensor Pre Pump Current 1
X1-92	O2 Sensor Pre 1 Hi
X1-93	
X1-94	
X1-95	Sensor Supply ((Turbo) Manifold Air Pressure)
X1-96	O2 Sensor Pre 1 Heater
X2-01	Ground Power 1
X2-02	Ground Power 2
X2-03	Switched Battery 1 (P/T Main Relay)
X2-04	Ground Power 3
X2-05	Switched Battery 1 (P/T Main Relay) 2
X2-06	Switched Battery 1 (P/T Main Relay) 3
X2-07	O2 Sensor After 1 Heater
X2-08	Air Pump Relay (protect for low pressure fuel shot off valve)
X2-09	Fuel Tank Sensors Ref Ground
X2-10	Fuel Pump Control (PWM/Relay)
X2-11	Reference Ground Vehicle (AC Pressure, Brake Boost Vac., Clutch Apply Sensor)
X2-12	Starter Control Relay LSD
X2-13	Mass Air Flow Digital 1
X2-14	Sensor Supply (Fuel Tank Pressure, Clutch Apply)
X2-15	ETC Pedal 1 Sensor Signal

Cavity	Circuit Description
X2-16	Cruise Disable – Clutch Switch (Top Of Travel)
X2-17	Clutch / Park Neutral Start Pulled High)
X2-18	Reverse Switch Gear Input (Manual Transmission)
X2-19	Fuel Tank Vent / Canister Close Valve
X2-20	Brake Boost Vacuum Pump Relay Output
X2-21	Malfunction Indicator Light A
X2-22	Mass Air Flow Reference Ground
X2-23	O2 Sensor After 1 Reference Ground
X2-24	
X2-25	ETC Pedal 2 Sensor Signal
X2-26	Fuel Tank Level 2
X2-27	Fuel Tank Pressure Sensor
X2-28	Air Valve Relay
X2-29	Brake Boost Vacuum Sensor (Analog)
X2-30	Mass Air Flow Digital 2
X2-31	Clutch / Park Neutral Start Pulled Low
X2-32	Brake Switch, Cruise / TCC
X2-33	Fuel Pump Control Module Reference Ground
X2-34	ETC Pedal 1 Reference Ground
X2-35	Sensor Supply (AC Compressor Pressure, Brake Boost)
X2-36	Fuel Level 1
X2-37	Clutch Position Sensor (Manual Transmission)
X2-38	O2 Sensor After 1 Hi
X2-39	AC Compressor Pressure
X2-40	Transmission Output Speed Sensor Neg.
X2-41	Accessory / Unlock
X2-42	CAN1 High
X2-43	Wheel Speed Sensor
X2-44	AC Clutch Relay
X2-45	Fan 2
X2-46	Fan 1 (PWM)
X2-47	ETC Pedal 2 Reference Ground
X2-48	Sensor Supply ETC Pedal 2
X2-49	Sensor Supply ETC Pedal 1
X2-50	Induction Air Temperature
X2-51	
X2-52	Brake Light Switch
X2-53	Transmission Output Speed Sensor Pos.
X2-54	Ignition Switch Run / Crank
X2-55	CAN1 Low
X2-56	Continuous Battery
X2-57	Starter Control Relay HSD
X2-58	Powertrain Main Relay Control

Connectors and pin assignment E77
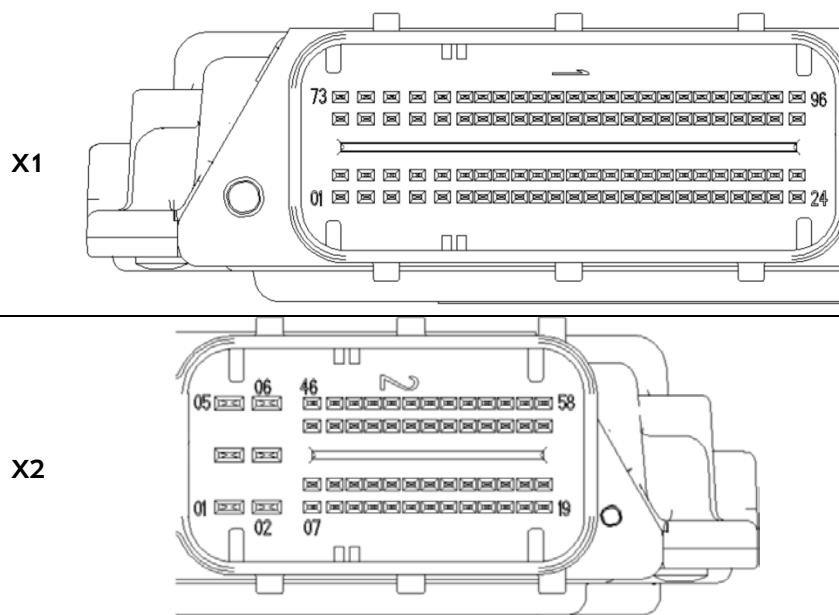
X1

X2

Cavity	Circuit Description
X1-01	Camshaft Phaser Exhaust 1
X1-02	Camshaft Phaser Intake 1
X1-03	n.c.
X1-04	Injector Valve 6
X1-05	Canister Purge Valve (PWM)
X1-06	n.c.
X1-07	Cam Position Sensor Intake 1
X1-08	n.c.
X1-09	Cam Position Sensor Exhaust 2
X1-10	Alternator L-Terminal
X1-11	Oil Condition Sensor / Level Switch
X1-12	Variable Intake Manifold PWM Driver Signal Output
X1-13	Reference Ground Igniter EST Even Bank
X1-14	Two Step Valve Control 1
X1-15	Sensor Supply 2a
X1-16	Overrun Air Valve (Turbo Bypass)
X1-17	Oil Pressure Switch / Oil Level Switch
X1-18	Waste Gate Control
X1-19	n.c.
X1-20	Two Step Valve Control 2
X1-21	Spare Analog Temperature Input
X1-22	n.c.
X1-23	n.c.
X1-24	ETC Motor throttle valve positive Terminal
X1-25	Camshaft Phaser Exhaust 2

Cavity	Circuit Description
X1-26	Injector Valve 3
X1-27	n.c.
X1-28	Injector Valve 5
X1-29	n.c.
X1-30	Alternator F-Terminal
X1-31	n.c.
X1-32	n.c.
X1-33	Cam Position Sensor Intake 2
X1-34	Cam Position Sensor Exhaust 1
X1-35	Engine Position Sensor (Crank)
X1-36	Fuel Rail Pressure Sensor
X1-37	Manifold Absolute Pressure
X1-38	Sensor Supply 1b
X1-39	Sensor Supply 3a
X1-40	Sensor Supply 1c
X1-41	Reference Ground Sensors Engine 2 (CAM)
X1-42	Reference Ground Sensors Engine 3
X1-43	Reference Ground Sensors Engine 1
X1-44	Reference Ground Oil Sensor
X1-45	Sensor Supply 3c
X1-46	Reference Ground Sensors Engine 4
X1-47	Diagnosis K-Line ALDL
X1-48	ETC Motor throttle valve negative Terminal
X1-49	Camshaft Phaser Intake 2
X1-50	Injector Valve 4
X1-51	Injector Valve 1
X1-52	Injector Valve 2
X1-53	n.c.
X1-54	n.c.
X1-55	Igniter driver 1
X1-56	Igniter driver 3
X1-57	Igniter driver 5
X1-58	n.c.
X1-59	Knock Sensor 1A
X1-60	Knock Sensor 2B
X1-61	Oil Pressure Sensor
X1-62	AIR Pump Pressure Sensor 2
X1-63	n.c.
X1-64	Reference Ground Sensors Manifold
X1-65	VIM Position Sensor
X1-66	TMAP - Manifold Absolute Pressure
X1-67	O2 Sensor Pre1 LO (LSF) / Ref. Gnd O2 Sensor Pre1 (LSU)
X1-68	O2 Sensor Pre1 Pump Current Input (LSU)
X1-69	O2 Sensor Pre2 Pump Current (LSU)

Cavity	Circuit Description
X1-70	O2 Sensor Pre2 HI (LSF / LSU)
X1-71	n.c.
X1-72	O2 Sensor Pre2 Heater (LSF/LSU)
X1-73	n.c.
X1-74	n.c.
X1-75	n.c.
X1-76	n.c.
X1-77	n.c.
X1-78	Reference Ground Igniter EST Odd Bank
X1-79	Igniter driver 2
X1-80	Igniter driver 4
X1-81	Igniter driver 6
X1-82	Engine (coolant) Temperature 1
X1-83	Knock Sensor 1B
X1-84	Knock Sensor 2A
X1-85	Oil Temperature Sensor
X1-86	TMAP - Temperature / Engine (coolant) Temperature 2
X1-87	AIR Pump Pressure Sensor 1
X1-88	Reference Ground Throttle Valve Position
X1-89	ETC Throttle Valve Position Sensor2
X1-90	ETC Throttle Valve Position Sensor1
X1-91	O2 Sensor Pre1 Pump Current (LSU)
X1-92	O2 Sensor Pre1 HI (LSF / LSU)
X1-93	O2 Sensor Pre2 LO (LSF) / Ref. Gnd O2 Sensor Pre 2 (LSU)
X1-94	O2 Sensor Pre2 Pump Current Input (LSU)
X1-95	Sensor Supply 1a
X1-96	O2 Sensor Pre1 Heater (LSF/LSU)
X2-01	Ground Power 1
X2-02	Ground Power 2
X2-03	Switched Battery 1 (P/T Main Relay) 1
X2-04	Ground Power 3
X2-05	Switched Battery 1 (P/T Main Relay) 2
X2-06	Switched Battery 1 (P/T Main Relay) 3
X2-07	O2 Sensor After1 Heater (LSF)
X2-08	AIR Pump Relay
X2-09	Reference Ground Fuel Tank Sensors
X2-10	Fuel Pump Control PWM / Relay
X2-11	Reference Ground Sensors Vehicle 1
X2-12	Malfunction indicator light for LED
X2-13	MASS Air Flow digital 1
X2-14	Sensor Supply 1d
X2-15	ETC Pedal 1 Sensor Signal
X2-16	Cruise Disable - Clutch Switch (Top of Travel)
X2-17	Clutch Switch (Start) / Park Neutral

Cavity	Circuit Description
X2-18	Reverse Gear Switch Input (Man Trans)
X2-19	Canister Close Valve / Fuel Tank Vent
X2-20	O2 Sensor After2 Heater (LSF)
X2-21	Malfunction indicator light for BULB
X2-22	Reference Ground MASS Air Flow
X2-23	Reference Ground O2 Sensor After 1
X2-24	Reference Ground O2 Sensor After 2
X2-25	ETC Pedal 2 Sensor Signal
X2-26	Fuel Level 2
X2-27	Fuel Tank Vapor Pressure Sensor
X2-28	AIR Valves Relay
X2-29	Brake Boost Vaccum sensor
X2-30	Fuel Pump Control Module Diagnosis
X2-31	MASS Air Flow digital 2
X2-32	Brake Switch, Cruise/TCC
X2-33	Reference Ground Fuel Pump Control Module
X2-34	Reference Ground ETC Pedal 1
X2-35	Sensor Supply 3d
X2-36	Fuel Level 1
X2-37	Clutch Position Sensor - Manual Trans
X2-38	O2 Sensor After1
X2-39	A/C Compressor Pressure
X2-40	Transmission Output Speed Sensor B
X2-41	Accessory / Unlock
X2-42	CAN High (GMLAN) Pin 1
X2-43	Wheel Speed sensor
X2-44	A/C Clutch control Relay
X2-45	Fan 2
X2-46	Fan 1 (PWM)
X2-47	Reference Ground ETC Pedal 2
X2-48	Sensor Supply 3b
X2-49	Sensor Supply 2b
X2-50	Intake AIR Temperature
X2-51	O2 Sensor After2
X2-52	Brake Light Switch (Stop LP Signal)
X2-53	Transmission Output Speed Sensor A
X2-54	Ignition Switch Run/Crank
X2-55	CAN Low (GMLAN) Pin 1
X2-56	Continuous Battery
X2-57	Starter Control Relay (HSD)
X2-58	Powertrain Main Relay Control

Connectors and pin Assignment E91

X1

X2
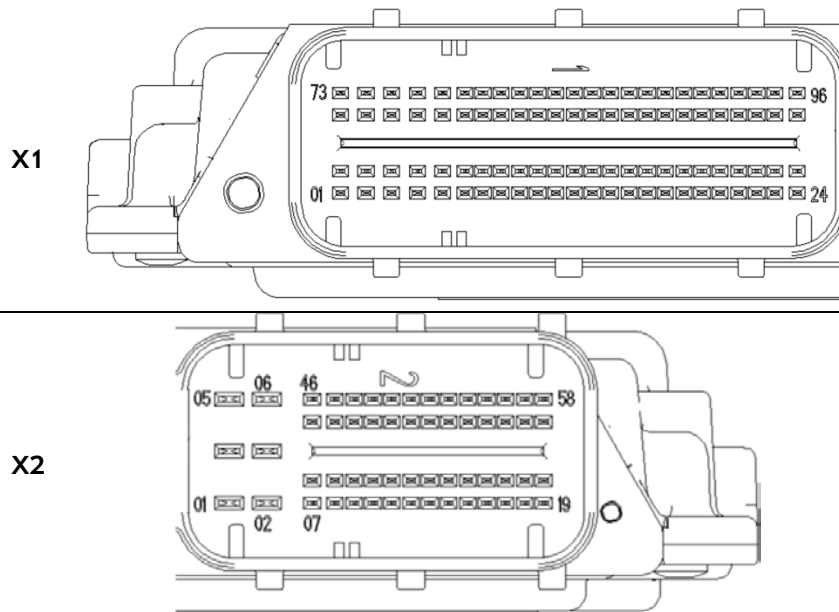
Cavity	Circuit Description
X1-01	Injector 1 "high" Bank 2
X1-02	Injector 2 "high" Bank 2
X1-03	Throttle plate actuator (ULU) motor plus
X1-04	N.C.
X1-05	N.C.
X1-06	Rail pressure sensor supply
X1-07	Boost pressure sensor supply
X1-08	Segment (camshaft) speed sensor supply
X1-09	N.C.
X1-10	N.C.
X1-11	N.C.
X1-12	N.C.
X1-13	EGR position sensor supply
X1-14	Boost pressure actuator feedback sensor supply
X1-15	Throttle position sensor supply
X1-16	Injector 1 "high" Bank 1
X1-17	Injector 2 "high" Bank 1
X1-18	Throttle plate actuator (ULU) motor minus
X1-19	N.C.
X1-20	Boost pressure sensor ground
X1-21	N.C.
X1-22	N.C.
X1-23	N.C.

Cavity	Circuit Description
X1-24	N.C.
X1-25	N.C.
X1-26	N.C.
X1-27	N.C.
X1-28	Crankshaft speed sensor signal plus
X1-29	Crankshaft speed sensor signal minus
X1-30	Fuel metering unit supply from BAT+a
X1-31	Injector 2 "low" Bank 2
X1-32	Throttle plate actuator (valve) feedback ground
X1-33	Injector 2 "low" Bank 1
X1-34	EGR motor plus
X1-35	Segment (camshaft) speed sensor ground
X1-36	Coolant temperature sensor signal
X1-37	Exhaust gas temperature sensor 1 signal
X1-38	Throttle plate actuator (valve) feedback signal
X1-39	Boost pressure actuator feedback sensor signal
X1-40	Rail pressure sensor ground
X1-41	Boost pressure actuator feedback sensor ground
X1-42	Air-mass sensor signal (Hot-film)
X1-43	Variable swirl position feedback signal
X1-44	Variable swirl actuator
X1-45	Crankcase Ventilation Heater
X1-46	Injector 1 "low" Bank 2
X1-47	Injector 1 "low" Bank 1
X1-48	Intake air temperature sensor ground
X1-49	EGR motor minus
X1-50	Coolant temperature sensor ground
X1-51	Engine temperature sensor signal
X1-52	Rail pressure sensor signal
X1-53	EGR position sensor signal
X1-54	Boost pressure sensor signal
X1-55	Exhaust gas temperature sensor 1 ground
X1-56	Intake air temperature sensor signal
X1-57	EGR position sensor ground
X1-58	Segment (camshaft) speed sensor signal
X1-59	EGR cooling bypass
X1-60	Fuel metering unit
X2-01	Battery + a via main relay
X2-02	Battery minus 1
X2-03	Battery + b via main relay
X2-04	Battery minus 2
X2-05	Battery + c via main relay
X2-06	Battery minus 3
X2-07	Lambda sensor heating

Cavity	Circuit Description
X2-08	N.C.
X2-09	N.C.
X2-10	Fuel Tank 2 level sensor signal
X2-11	N.C.
X2-12	N.C.
X2-13	Exhaust gas temperature sensor 2 signal
X2-14	Fuel temperature sensor signal
X2-15	Clutch pedal signal (Torque converter)
X2-16	N.C.
X2-17	Air conditioning compressor pressure sensor ground
X2-18	Fuel Tank 2 level sensor ground
X2-19	N.C.
X2-20	N.C.
X2-21	Alternator "L" signal
X2-22	Accelerator pedal position sensor 2 supply
X2-23	N.C.
X2-24	Clutch switch supply
X2-25	N.C.
X2-26	Air conditioning compressor pressure sensor supply
X2-27	Particle filter, differential pressure sensor supply
X2-28	Accelerator pedal position sensor 1 supply
X2-29	N.C.
X2-30	N.C.
X2-31	N.C.
X2-32	Air conditioning compressor pressure sensor signal
X2-33	Exhaust gas temperature sensor 2 ground
X2-34	N.C.
X2-35	N.C.
X2-36	N.C.
X2-37	Fuel Tank 1 level sensor signal
X2-38	Brake main switch signal
X2-39	Fuel Tank 1 level sensor ground
X2-40	Vehicle speed sensor input signal
X2-41	N.C.
X2-42	Glow plug relay
X2-43	Engine speed output signal
X2-44	N.C.
X2-45	Wake-up input signal
X2-46	Terminal 15 (switched BAT+)
X2-47	Main relay
X2-48	Clutch pedal ground (Torque converter)
X2-49	N.C.
X2-50	N.C.
X2-51	N.C.

Cavity	Circuit Description
X2-52	N.C.
X2-53	N.C.
X2-54	Oil level sensor input signal
X2-55	Clutch switch signal (Torque converter)
X2-56	Water level sensor signal
X2-57	Glow time feed back input signal, state
X2-58	Accelerator pedal position sensor 2 ground
X2-59	Particle filter, differential pressure sensor signal
X2-60	Accelerator pedal position sensor 2 signal
X2-61	Lambda sensor voltage nernst
X2-62	Lambda sensor current pump
X2-63	N.C.
X2-64	N.C.
X2-65	Controller Area Network 0 (low)
X2-66	Controller Area Network 0 (high)
X2-67	Accelerator pedal position sensor 1 ground
X2-68	Malfunction indication lamp (MIL)
X2-69	N.C.
X2-70	A/C compressor relay AC/OUT
X2-71	N.C.
X2-72	N.C.
X2-73	Boost pressure actuator (EPW)
X2-74	Clutch switch 1 signal (Torque converter)
X2-75	Reverse gear switch signal
X2-76	Electric fuel pump, pre supply pump (high-side)
X2-77	Alternator "F" signal
X2-78	Redundant brake switch signal
X2-79	Starter relay high
X2-80	Particle filter, differential pressure sensor ground
X2-81	Accelerator pedal position sensor 1 signal
X2-82	Oil pressure sensor (switch) input signal
X2-83	Lambda sensor, virtuelle ground
X2-84	Lambda sensor current adjust
X2-85	Fuel temperature sensor ground
X2-86	N.C.
X2-87	N.C.
X2-88	N.C.
X2-89	Fuel filter heating relay
X2-90	Motor fan relay 2
X2-91	Motor fan relay 3
X2-92	N.C.
X2-93	N.C.
X2-94	Motor fan relay 1

EPB (Electronic Park Brake)

The Electronic Park Brake consists of an actuator and the control unit in one housing. It is able to apply the park brake by CAN request.

Block diagram EPB
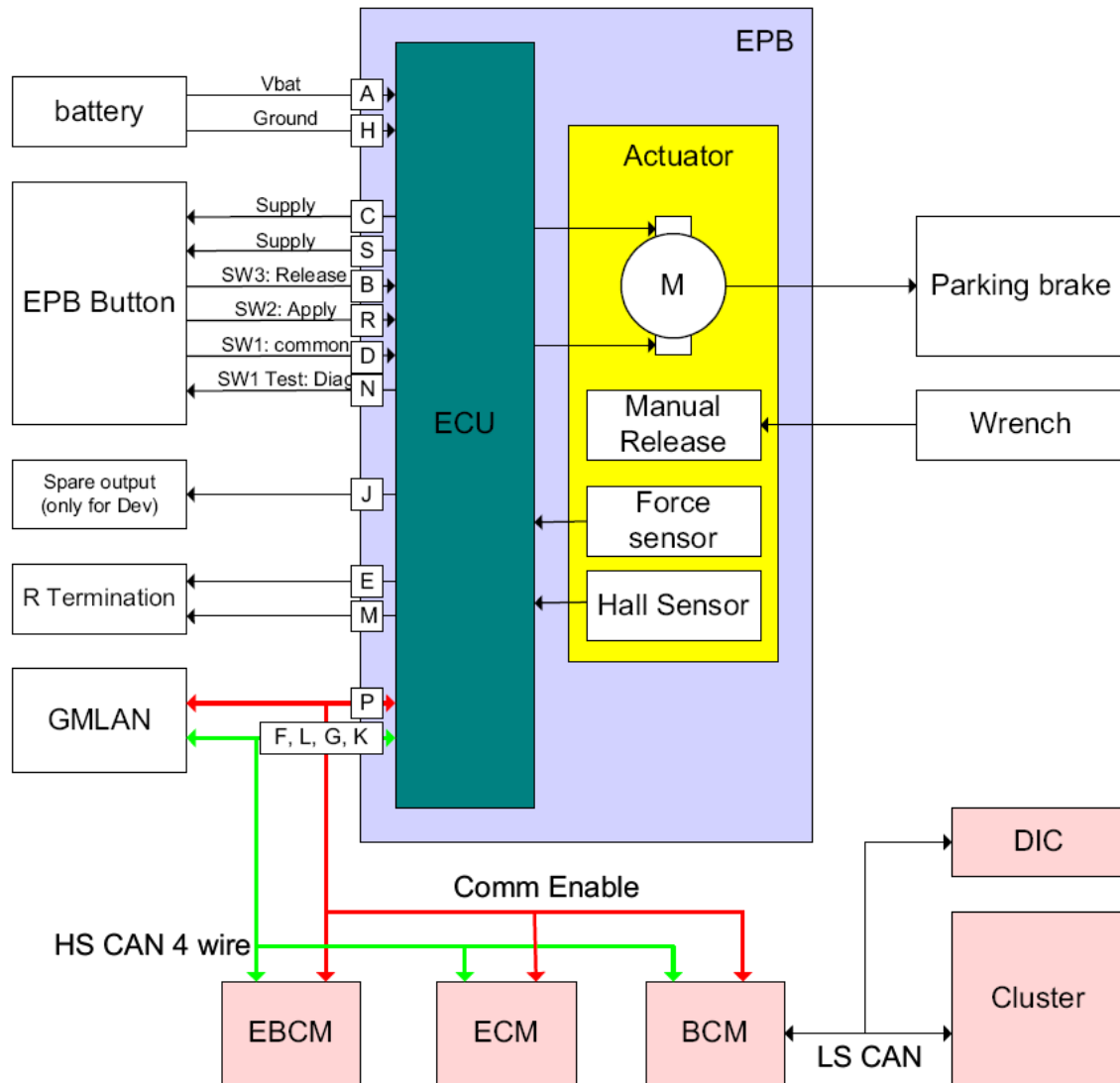
Functional description EPB

The Electronic Park Brake replaces the conventional manual park brake. It can be installed in the car as an option.

Layout

The module consists of several parts:
1. Actuator
    a. Motor
    b. Spindle
2. Electronic Control Unit

The force of the motor is distributed to the spindle via transmission. The spindle is connected to the brake cable of the brakes. So turning the motor means applying or releasing brake torque.
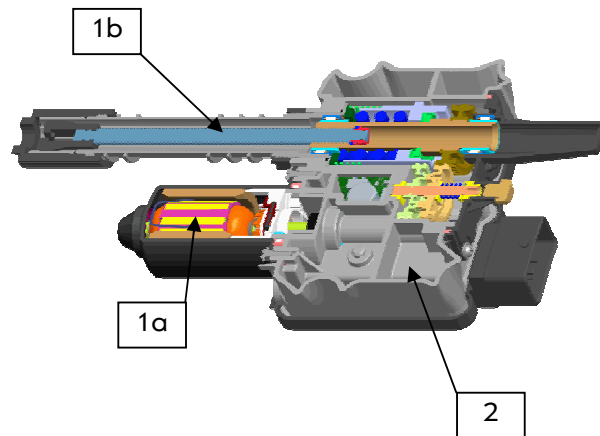
The included ECU controls the motor's torque and speed and therefore the force distributed to the brakes. This is needed due to the fact that EPB is able to apply brakes percentaged.

Functions

The functions of the EPB can be split into four sections:
1. Manual mode
    a. Static apply
    b. Static release
    c. Dynamic braking
2. Automatic mode
    a. Drive away (including hill holder)
3. Service mode
    a. Assembly adjustment
    b. Normal operation adjustment
    c. Maintenance mode
    d. Brake test mode
4. Failure mode

Each mode will be explained below.

Static Apply

When the vehicle is in static mode and the driver activates the EPB button, the actuator must apply the nominal force to the parking brake, which is necessary to hold the loaded vehicle securely at a slope up to 30%. EPB can be applied in every power state, even if the key is not in.

Static Release

This function releases the EPB upon the driver's request. Key must be in power on mode and brake pedal has to be pressed.

Dynamic braking

When the vehicle is moving and the driver activates the EPB by pulling the button, the actuator may react in different ways depending on the actual wheel speed. When wheel speed is over 6 km/h, EBCM will apply brakes with 0.6g. EPB will not apply. As soon as the driver releases the EPB button, the EBCM stops braking. When wheel speed is below 6 km/h, EPB will apply 100%.

Drive away

This function releases the EPB during drive off maneuvers. The EPB system allows the driver to depart without giving any additional command to the EPB system. Drive away function is triggered by clutch pedal and throttle. The brake torque on the parking brake will be released in what the driver perceives as a comfortable and convenient way.
It is also possible to use the drive away function on slopes. EPB will hold the car and automatically release the brake torque when clutch and gas pedal are in a defined position. The detection of uphill or downhill driving direction is included.

Assembly adjustment

It must be possible to instruct the actuator to do the assembly stroke and perform 5 apply/release cycles to accommodate for the initial compression of the cable jacket (incl. calibration).

Normal operation adjustment

EPB motor control definition guarantees a continuous self-adjustment to cable wear.

Service mode

This mode is needed to exchange the brake cable. A full release can be performed, which is necessary to unhook the cable.

Brake test mode

This mode is used during parking brake efficiency tests on rolling test benches.

Failure mode

EPB is able to handle some failure modes. Here are some examples. For a full list please see the specs.
- EBCM failed / not available: EPB will take the dynamic brake function as best as possible.
- Wheel sensors not available during dynamic mode: EPB will use a ramp-up to apply brake torque.

Connectors and pin assignment EPB
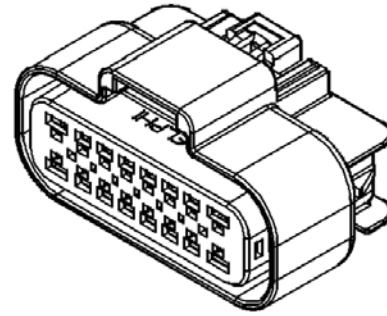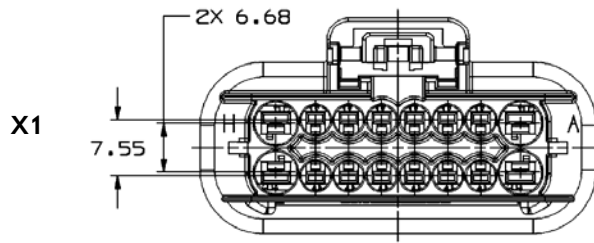
Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
A	A40	Battery Positive Voltage (VBAT+)	4						
B	7683	Park Brake Release Switch Voltage Reference (SW NC Release)	0.5						
C	1134	Park Brake Switch Signal (SW NO)	0.5						
D	7684	Park Brake Apply Switch Voltage Reference (SW NC Apply)	0.5						
E	2500	R_Termination_1	0.5		C40				
F	2500	High Speed GMLAN Serial Data (+) (1) (CANH 1)	0.5		B40				
G	2500	High Speed GMLAN Serial Data (+) (2) (CANH 2)	0.5		A40				
H	A50	Ground (VBAT-)	4						
J		Spare Out	0.5						
K	2501	High Speed GMLAN Serial Data (-) (2) (CANL 2)	0.5		A40				
L	2501	High Speed GMLAN Serial Data (-) (1) (CANL 1)	0.5		B40				
M	2501	R_Termination_2	0.5		C40				
N	1492	Park Brake Switch Supply Voltage (SW TL NO)	0.5						
P	5986	Serial Data Communication Enable (COMM EN)	0.5						
R	6107	Park Brake Apply Switch Signal (SW Supply A)	0.5						
S	6108	Park Brake Release Switch Signal (SW Supply R)	0.5						

Fuel System Control Module)

The Fuel System Control Module powers the fuel pump by PWM signal and provides fuel pressure requested by ECM.

Block diagram FSCM
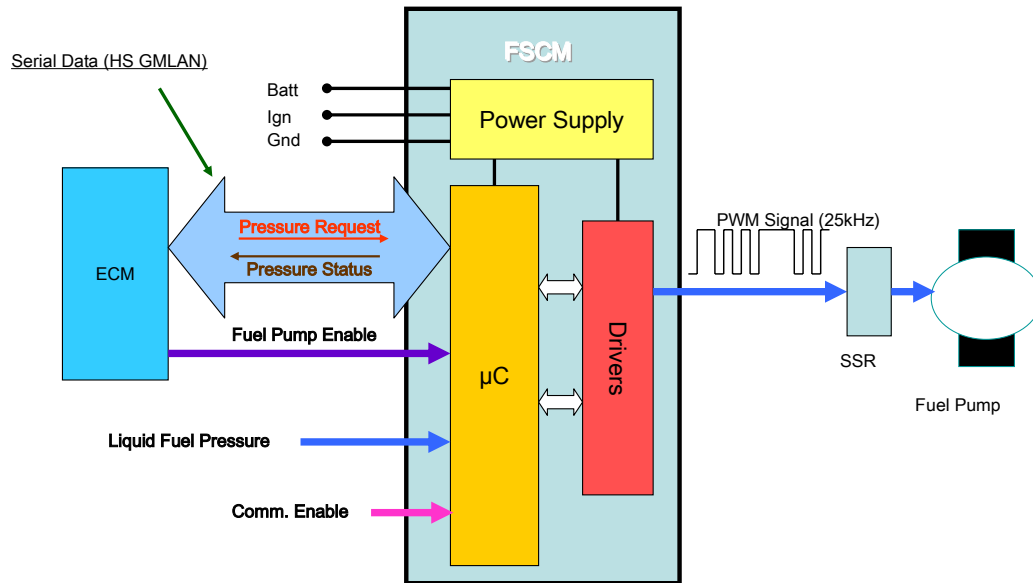
Functional description FSCM

The Fuel System Control Module is the controller for the fuel pump in the Electronic Returnless Fuel System ERFS (shown below).
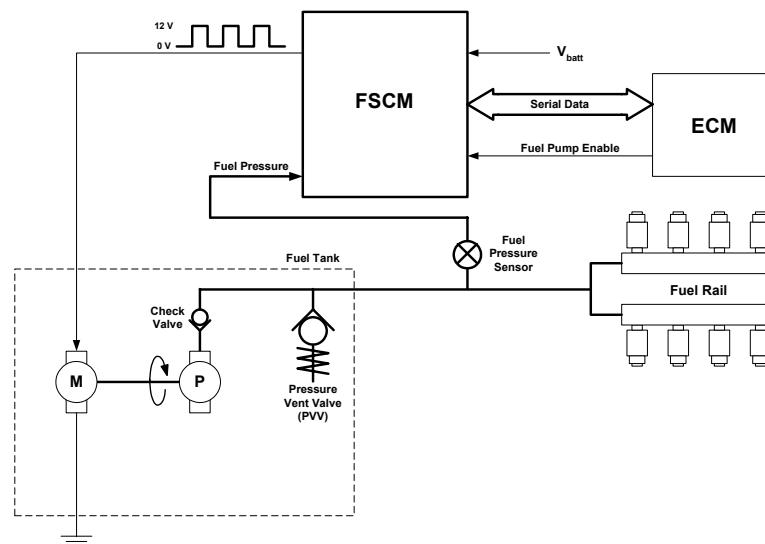
ERFS is an enhancement of the Mechanical Returnless Fuel System MRFS. MRFS consisted of less parts and was therefore less complex. The ECM directly drove a relay which activated the fuel pump. The pump constantly delivered a certain amount of fuel. The pressure distributed to the fuel rail(s) was regulated by a valve (similar to PVV shown above concerning position).

The most important change in ERFS is that the fuel pump is no longer driven by a relay, but by a 25kHz PWM signal. That means, that the fuel pressure can be influenced by FSCM by changing the duty cycle of the PWM signal. The valve that was needed with ERFS is of no regulatory importance any more. It is just used as an over pressure security device.

FSCM is responsible for providing the pressure requested by the ECM. To ensure that the right pressure is provided, FSCM has to control the fuel pump. This is done by a closed loop including a PID controller. The fuel pressure delivered to the fuel rail(s) is measured by a sensor. This sensor is connected to the FSCM and therefore gives the FSCM the opportunity to react on differences between requested and provided fuel pressure. The fuel pump signal's duty cycle will be adapted.

FSCM has some other advantages:
- fuel economy improvement through reduced electrical load on alternator
  - Eliminates liquid recirculation in fuel tank
  - Reduced rail pressure under most operating conditions
- Mitigate hot fuel handling issues through on-demand, increased fuel delivery pressure
- Mitigate fuel injector dynamic range issues on high performance applications
- Enables potential improvement in air/fuel ratio control and emission performance

Connectors and pin assignment FSCM
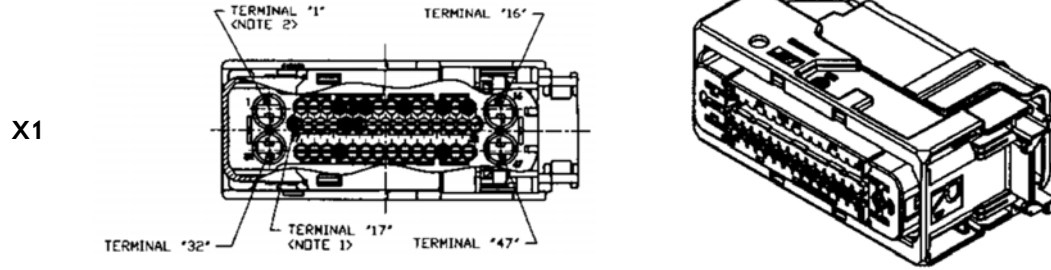
X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	A50	Ground (GND1)							
5	7447	Fuel Line Pressure Sensor Low Reference							
6	2501	High Speed GMLAN Serial Data (-) (2)			B				
7	2500	High Speed GMLAN Serial Data (+) (2)			B				
10	7446	Fuel Line Pressure Sensor Signal							
13	465	Fuel Control Enable / Fuel Pump Primary Relay Control							
15	A39	Run/Crank Ignition 1 Voltage (R_C_1)							
16	1580	Fuel Pump Low Reference			C	A			
17	5986	Serial Data Communication Enable							
21	2501	High Speed GMLAN Serial Data (-) (1)			A				
22	2500	High Speed GMLAN Serial Data (+) (1)			A				
32	A40	Battery Positive Voltage (SRC1)							
36	7445	Fuel Line Pressure Sensor 5V Reference							
44	7444	Fuel System Control Module Shield				A			
47	120	Fuel Pump Supply Voltage			C	A			

IPB (Image Processing Bundle)

The Image Processing Bundle combines two systems in one box:
- LDW (Lane Departure Warning)
- TSM (Traffic Sign Memory)

The Lane Departure Warning is a vision-based lane detection system capable of warning the driver in case of inadvertent lane change.

Traffic Sign Memory is able to determine traffic signs and displays them in the instrument cluster.

Block diagram IPB
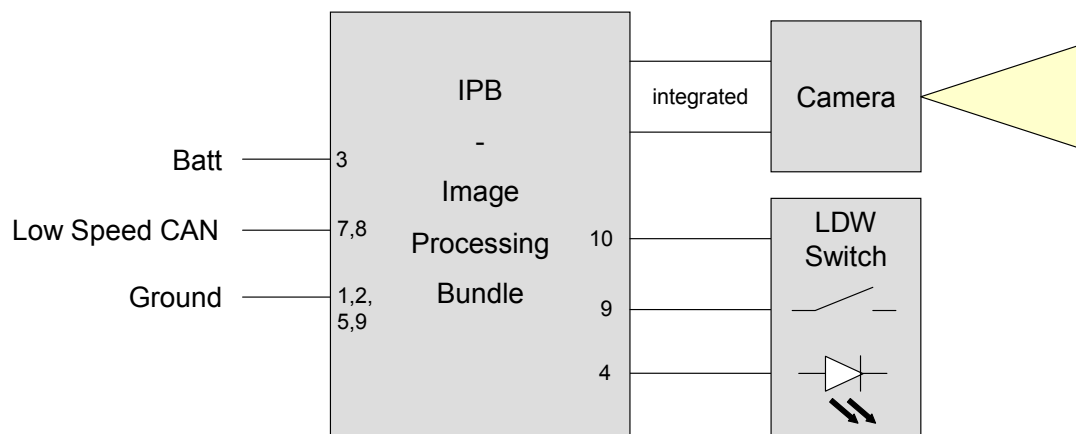
Functional description IPB

The Image Processing Bundle provides an integrated camera module, located on the windshield behind rearview mirror. It is therefore able to see lanes and traffic signs.

The pictures taken from the camera are sent through a signal processing unit. After that, LDW and TSM algorithms are performed. Now the module has determined if an inadvertent lane change is performed or if the driver is to pass a traffic sign.

Functional description LDW

LDW needs some conditions to be fulfilled for being able to work properly:
- Vehicle speed greater than 55 km/h
- camera detecting at least one good lane marking
- clean windshield
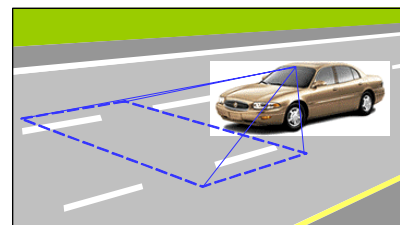
- good environmental conditions (i.e. no rain, snow, direct sunlight, shadows)

If LDW is active, a green telltale will indicate this state. Within an alert, this telltale will change its color to amber and start flashing. In addition, a chime sound is activated.

The whole system is inhibited with one of three methods:
- Turn Signals
- Over Steering
- Significant Acceleration
- Break activation

The telltale will turned off if no lane marking could be detected.

Functional description TSM

TSM is specified to work in Europe only. It is actually able to recognize the signs shown on the right.

Speed limits

For proper working, some conditions have to be fulfilled:
- clean windshield
- clean signs (i.e. not snow-covered, dirty)
- good environmental conditions (i.e. no rain, snow, direct sunlight, shadows)

No passing

Connectors and pin assignment IPB

X1
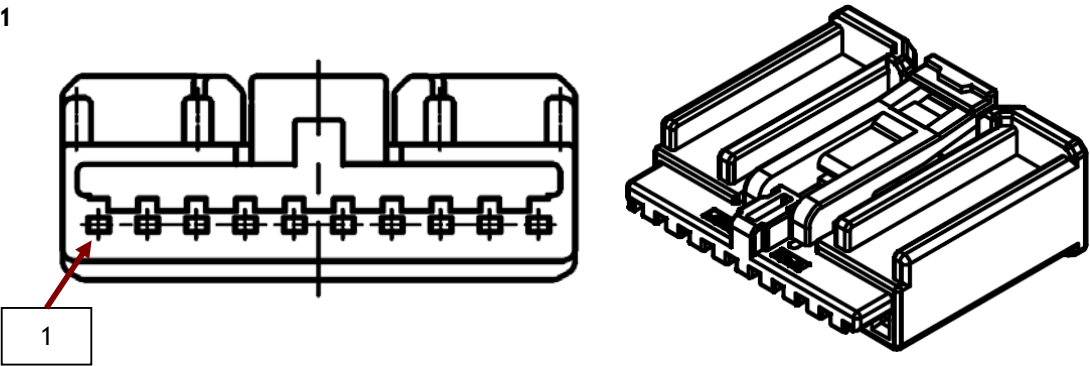
Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	A51	Ground							
2	A51	Ground							
3	A40	Battery							
4	3152	Lane Departure Warning Indicator Control							
5	A51	Ground							
6		n.c.							
7	5060	GMLAN_1							
8		GMLAN_2							
9	A51	LDW Switch GND (n.c., common switch ground is used)							
10	3153	Lane Departure Warning Disable Switch Signal							

RDCM (Rear Drive Control Module)

The Rear Drive Control Module handles the all wheel drive functionality of the car.

Block diagram RDCM

Transmission

Engine

PTU

MOTOR | PUMP | ACCUMU-LATOR

RDCM

ECU | CONTROL VALVES

(Rear Drive Control Module)

OVERFLOW VALVE *

TTD

RDM

REAR AXLE TORQUE LIMITER 2700NM

eLSD

Power Take-off Unit PTU

Torque Transfer Device TTD

Rear Drive Module RDM

Propshaft

Electronically Controlled Limited Slip Differential eLSD
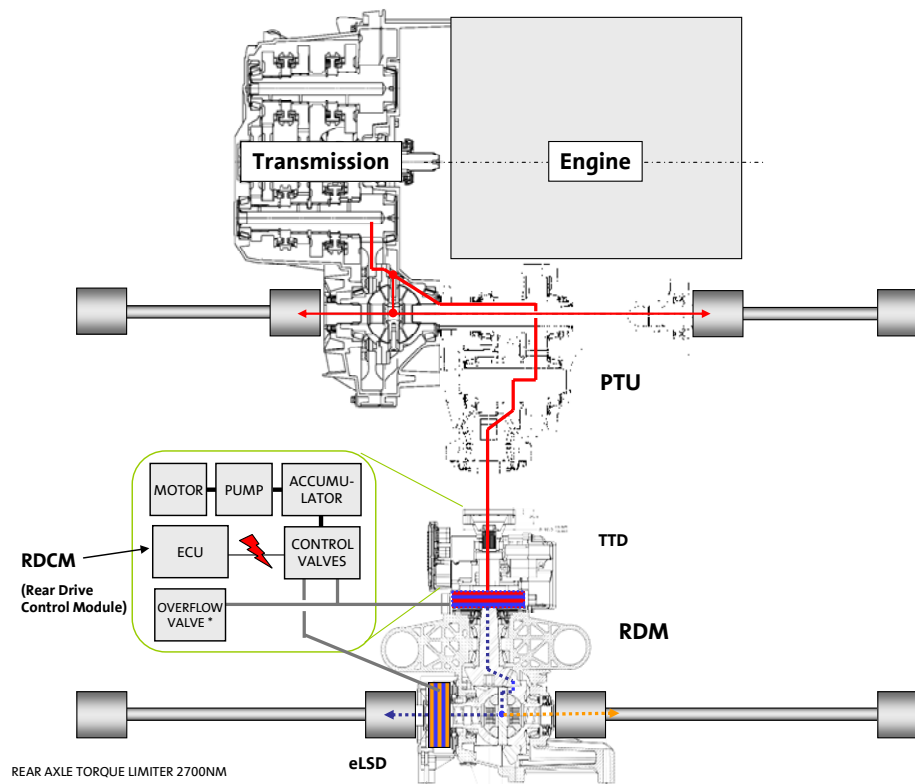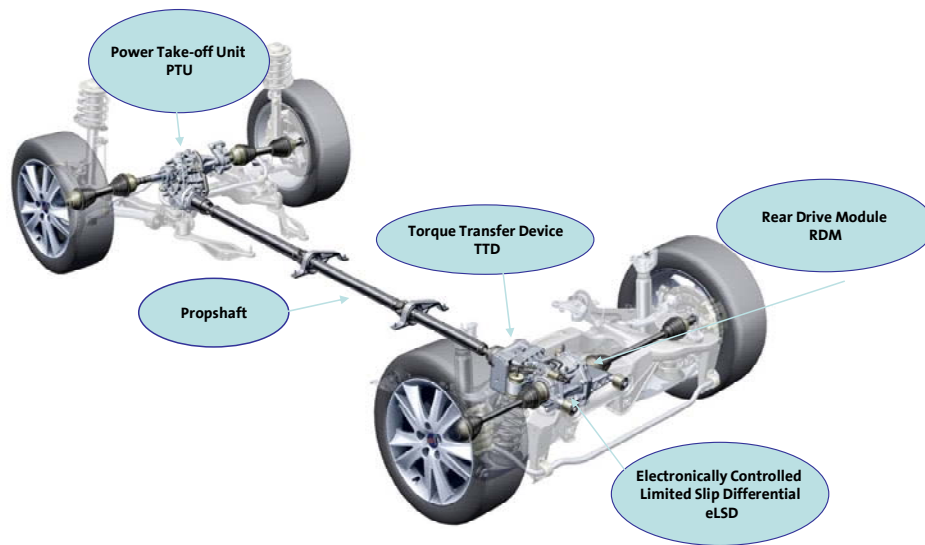
Functional description RDCM

RDCM provides several functions:

- The Control Strategy is during normal driving based on Acceleration capability and Pre emptive. Acceleration capability is mainly calculated from Engine torque and driver requested torque. Other Control parts is Slip control, Yaw damping, Braking and Handbrake
- The Pre emptive functionality adds the possibility to lock both TTD and eLSD couplings up to fully locked when standing still or driving without any delta speed.
- The eLSD can be used for traction and for Yaw damping during, for example, throttle of and high side accelerations
- RDCM has a torque based interface to ESC system, The RDCM sends out actual torques, and the ESC can send torque request back to RDCM for control of TTD and eLSD, ESC request is always master.
- It is also possible to use the ESC active flag to open the rear drive couplings.
- ABS active flag opens the couplings

Obviously, RDCM controls several units to provide all wheel drive functions. All of these will be explained below briefly.

Power Take-Off Unit (PTU)

The Power Take-Off Unit is installed at the front axle. It provides torque via connected propshaft to the rear drive units. PTU is available in two versions due to different transmissions:

- F40 AF40/55
- X22F

Torque Transfer Device (TTD)

TTD controls the torque at the rear wheels. It is adjustable from 0..100% clutch state, maximum torque of the unit is 1000Nm, resulting in 2700Nm on the rear wheels. The unit is sealed, oil change is not necessary during its life length.

The electronic control unit for the all wheel drive devices, RDCM, is installed at the TTD.

Rear Drive Module (RDM)

RDM transmitts input power to the rear wheels. Output power is split by the differential.

Electronically Controlled Limited Slip Differential (eLSD)

eLSD is an optional device. It provides another clutch, installed at the rear halfshaft leading to the rear left wheel. eLSD allows to control the slip difference between the rear wheels continuously between 0..100%. The maximum locking capacity for the eLSD is 1200Nm.

Connectors and pin assignment RDCM

X1

X2
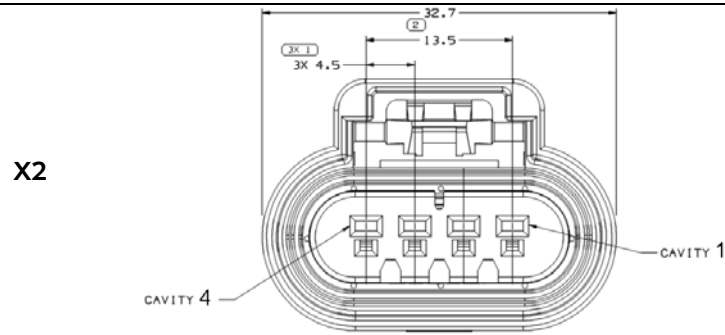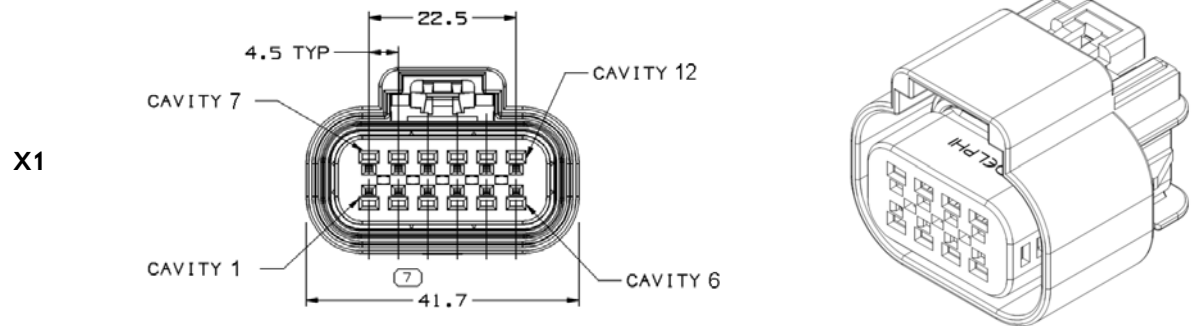
X3   internal connection

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
X1-1	A40	Battery Positive Voltage		2					
X1-2	A50	Ground		2					
X1-3	2500	High Speed GMLAN Serial Data (+) (1)			A40				
X1-4	2500	High Speed GMLAN Serial Data (+) (1)			B40				
X1-5	6105	High Speed GMLAN Serial Data (+) (2)			C40				
X1-6	6105	High Speed GMLAN Serial Data (+) (2)			D40				
X1-7	5986	Serial Data Communication Enable							
X1-8	A50	ECU Housing ground	1						
X1-9	2501	High Speed GMLAN Serial Data (-) (1)			A40				
X1-10	2501	High Speed GMLAN Serial Data (-) (1)			B40				
X1-11	6106	High Speed GMLAN Serial Data (-) (2)			C40				
X1-12	6106	High Speed GMLAN Serial Data (-) (2)			D40				
X2-1	933	Rear Drive Motor Control							
X2-2	987	Rear Drive Motor Return							
X2-3	934	Limited Slip Diff. valve Control							
X2-4	935	Limited Slip Diff. Valve Return							
X3-1		Torque transfer device valve Control High							
X3-2		Torque transfer device valve Control Low							

SADS (Semi-active Damping System)

The semi-active damping system's purpose is to damp chassis movements caused by bumpy roads and driving conditions. Its benefits are therefore better ride and handling capabilities and improved comfort.

Block diagram SADS

1 body acceleration FR
2 body acceleration FL
3 body acceleration R
4 wheel acceleration FR
5 wheel acceleration FL
6 ECU
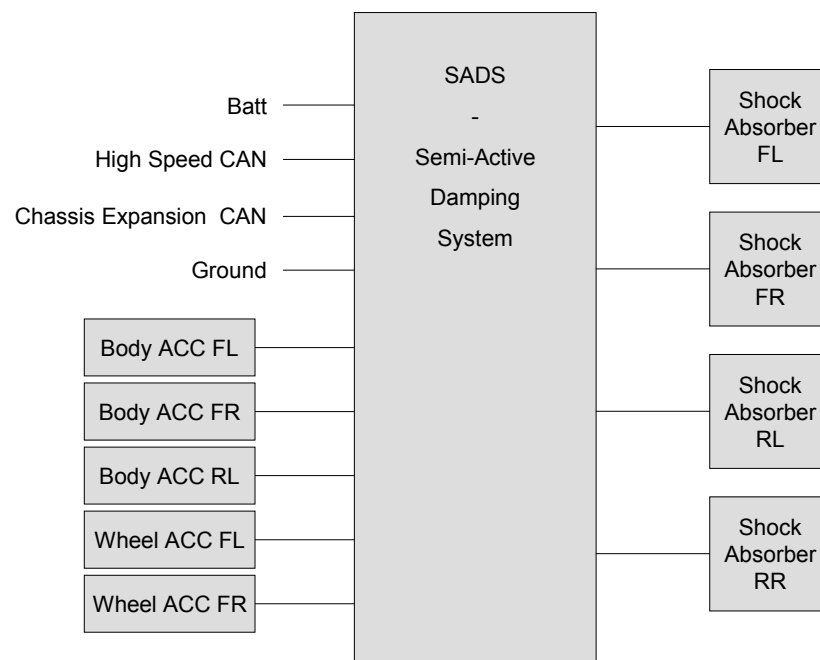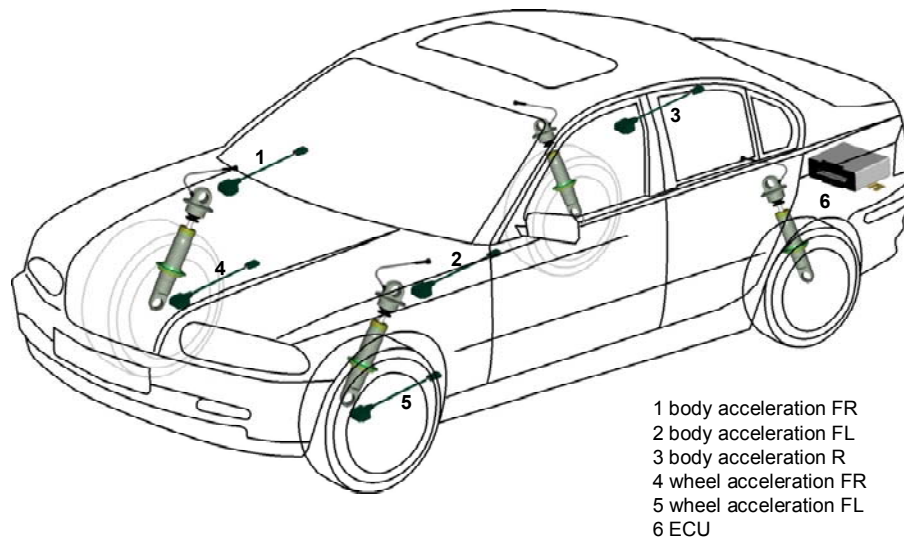
Functional description SADS

SADS is an electronic damping system that increases driving performance, comfort, and dynamics by adjusting damping forces optimally for each individual wheel. A control unit calculates the requisite damping forces within milliseconds and adjusts the dampers. Vehicle sensors monitor values such as body and wheel acceleration in z-direction, and use them to generate the ideal damping forces for each individual wheel on a continuous basis.

The benefits of SADS are:
- Enhanced performance thanks to optimized wheel damping
- Enhanced driving comfort and dynamics
- Reduced roll, pitch, and vertical motion
- Continuous adjustment of the dampers in real time
- Better control and handling during lane changes

The ECU of SADS provides some functions which will be explained below.

System mode request

The driver is able to select a different behavior of the vehicles chassis. This driver selection is processed by the Driving Mode Control 2, DMC II.
The DMC-II is an automatic control algorithm which is not part of the CDC system. This algorithm sends out the DMC-II status request on the CAN bus.

The CDC system can operate in three different control modes. This is achieved by three different parameter settings, each of them selectable by the DMC-II status request on the CAN bus.

Parameter settings:

Mode	Name	Description
1	Comfort	Floating body behavior, all adaptive modules are working
2	Intelligent	Pure Skyhook provides good Body Control and good comfort
3	Sport	Further decreased Body Amplitudes, increased Body accelerations
(4)*	Demo	Extremely firm Damping. * Not used in 65x.

Body stability

The body of the vehicle shall make only small movements (body to wheel displacement, body vertical speed and body acceleration). SADS reduces the spectral density in the body resonance frequency range. The SACHS Advanced Skyhook control algorithm is used to stabilize the body independently from the actual load situation of the car. Therefore the body vertical speed and the wheel vertical speed are calculated.

Heave, pitch and roll stability by road input

To get a good driving comfort SADS minimizes the heave, roll and pitch movement caused by road input and independent of various load situations. This is achieved by the SACHS

Advanced Skyhook control algorithm which allows controlling and tuning all three modal movements of the car separately.

Body acceleration

The vehicle shall have low body acceleration in all driving situations. SADS improves the body acceleration spectral density in the seat ride frequency range (3 to 8 Hz). The SACHS Advanced Skyhook control algorithm is used to get an optimized body acceleration performance. To guarantee the best possible body acceleration control independently from the actual load situation of the car, body accelerometers are used to get the most direct information.

Wheel load variation

To get good stability, self-steering behavior, traction, braking behavior and high possible lateral acceleration it is essential to minimize the wheel load variation. A wheel acceleration sensor at each front wheel is used to measure the direct vertical wheel movement. The SACHS Advanced Skyhook control algorithm minimizes the wheel load variation by controlling the damping force in an adequate manner.

Brake dive prevention

The function "Brake Dive Prevention" minimizes the diving while braking by intervention of SADS resulting in a positive influence on braking behavior of the system. By optimization of the force at center of tire contact on bad roads or gravel an improved contact to the road will be provided. Customer benefit will be a more comfort oriented braking as the passengers are not forced to follow the diving. SADS uses the master cylinder brake pressure for evaluating the tendency of pitching.

Cornering stability

During maneuvers like lane change and cornering with a certain amount of lateral acceleration SADS will optimize the general roll behavior of the car body. SADS uses the steering wheel angle sensor signal or lateral acceleration signal from the CAN Bus and the vehicle speed to calculate the damper setting according the actual driving maneuver.

Brake distance reduction

EBCM can use the measured z-accelerations of the front wheel acceleration sensors of SADS giving information about the condition or kind of driven road. It can analyze vertical wheel acceleration values of SADS and the master cylinder pressure to assess the braking status.

By using the additional information of the road condition, EBCM can improve the braking performance of the car.

Acceleration performance

During longitudinal accelerating SADS shall improve the pitch behavior of the car body. The function "Acceleration Performance" shall also assist the driver in improving the traction. EBCM analyzes vertical wheel acceleration values of SADS and the wheel acceleration signals to assess the acceleration status.
By using the additional information of the road condition, EBCM improves the acceleration performance of the car.

Pothole function

By monitoring the wheel acceleration sensors potholes can be detected by SADS. In this case the damping can be increased in order to improve the wheel control. As a result lateral und longitudinal traction are optimized.

Reaction to different road surfaces

SADS wants to keep the vehicle behavior regardless of the road quality. Therefore SADS measures the wheel acceleration and calculates a road quality signal. This signal is used to influence the system behavior by modifying a set of system parameters continuously.

Vehicle speed dependency

The comfort feeling of the car depends on the vehicle speed. The frequency of the vertical excitation of the wheel depends on the vehicle speed and the wavelength of the road unevenness. The input frequency for SADS depends significantly on the vehicle speed. Therefore it is necessary to adapt the system to the actual driving speed. SADS adapts many of the tuning parameters continuously to the actual driving speed.

SADS damper control

SADS dampers are controlled by a hydraulic/electromagnetic proportional valve. The dampers are hydraulically tuned with respect to the softest and firmest setting. The range between these two corner settings is controlled by the proportional valve. The control is realized by a current control loop, which provides a constant current according to the request of the SADS advanced skyhook algorithm. This algorithm updates the nominal current every 10 ms. The current control loop has to follow this nominal valve as fast as possible. Therefore it is essential, that high driving speeds of the magnetic valve are possible. Care must be taken to reach nearly identical rise and fall times for step inputs. The damping rate of the SADS damper is controlled in an open loop (i.e. current control only, not damping rate control). This requires a high precision current control with a total deviation of less than 5%. Below 100 mA an absolute tolerance of +/- 20 mA is required.

Connectors and pin assignment SADS
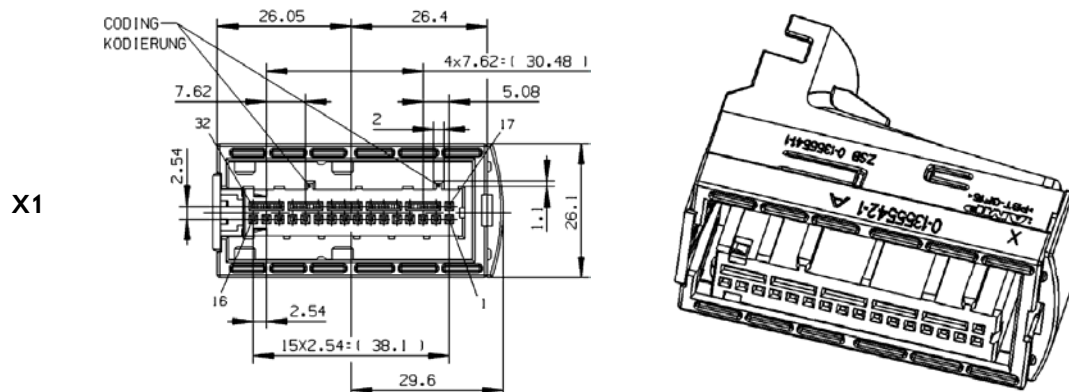
X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	A40	Battery Positive Voltage		2,5A					
2	1119	Right Rear Damping Servo Control		-2A	A20				
3	1118	Right Rear Damping Servo Supply Voltage		2A	A20				
4	1114	Left Rear Damping Servo Supply Voltage		2A	B20				
5	1115	Left Rear Damping Servo Control		-2A	B20				
6	5986	Serial Data Communication Enable		10mA					
7	3256	Rear Accelerometer Signal		2mA					
8	3259	Left Front Accelerometer Signal		2mA					
9	3253	Right Front Accelerometer Signal		2mA					
10	1100	Left Front Wheel Damping Accelerometer Signal		2mA					
11	1106	Right Front Wheel Damping Accelerometer Signal		2mA					
12	1817	Left Front Wheel Accelerometer Voltage Reference		50mA					
12	1819	Right Front Wheel Accelerometer Voltage Reference		50mA					
12	3258	Left Front Accelerometer Voltage Reference		50mA					
12	3252	Right Front Accelerometer Voltage Reference		50mA					
12	3255	Rear Accelerometer Voltage Reference		50mA					
13	1113	Left Front Damping Servo Control		-2A	C20				
14	1107	Left Front Damping Servo Supply Voltage		2A	C20				
15	1116	Right Front Damping Servo Supply Voltage		2A	D20				
16	1117	Right Front Damping Servo Control		-2A	D20				
17	A40	Battery Positive Voltage		2,5A					

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
18	A51	GND		-2,5A					
19	A51	GND		-2,5A					
20	1099	Left Front Wheel Damping Accelerometer Low Reference		-50mA					
20	1105	Right Front Wheel Damping Accelerometer Low Reference		-50mA					
20	3260	Left Front Accelerometer Low Reference		-50mA					
20	3254	Right Front Accelerometer Low Reference		-50mA					
20	3257	Rear Accelerometer Low Reference		-50mA					
21	2500	CAN Termination + (1)		10mA					
22	2500	High Speed GMLAN Serial Data (+) (1) Out		10mA	E40				
23	2500	High Speed GMLAN Serial Data (+) (1) In		10mA	F40				
24	2501	High Speed GMLAN Serial Data (-) (1) In		10mA	F40				
25	2501	High Speed GMLAN Serial Data (-) (1) Out		10mA	E40				
26	2501	CAN Termination - (1)		10mA					
27	NC	CAN Termination + (2)		10mA					
28	6105	High Speed GMLAN Serial Data (+) (2) Out		10mA	G40				
29	6105	High Speed GMLAN Serial Data (+) (2) In		10mA	H40				
30	6106	High Speed GMLAN Serial Data (-) (2) In		10mA	H40				
31	6106	High Speed GMLAN Serial Data (-) (2) Out		10mA	G40				
32	NC	CAN Termination - (2)		10mA					

TCM (Transmission Control Module)

The Transmission Control Module is the responsible device for shift gears in automatic transmissions.

Block diagram TCM
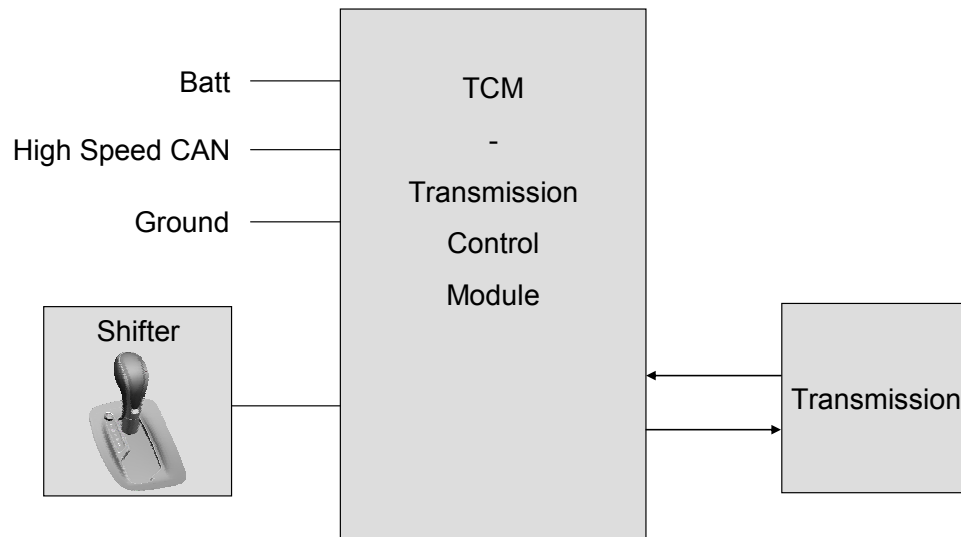
Functional description TCM

Diagnostics

For diagnostic purposes the transmission control module (TCM) communicates with the serial tester via HSCAN bus.

Driver Information (Displays and Gauges)

TCM sends some information to platform representing the actual status of the transmission. The following information will be shown or used as input to information shown in the driver compartment:

- Service Transmission
- Transmission Gear information (Selected, Commanded…)
- Transmission Shift Lever Position
- Driver Preference mode (E.g. sport Mode)
- Transmission Oil Temperature

Function Drive Position Selection / Manual Sequential Shift

Drive Position Selection

The selected drive position in the automatic shift lane is transmitted mechanically via an installed bowden cable from the shift lever position switch to the automatic transmission. The shift lever position switch recognizes the actual position of the shift lever and transmits it to the TCM.

Manual Sequential Shift (Tiptronic mode)

The selection of the manual shift lane right beside the automatic shift lane for manual shifting cannot be supervised mechanically and is therefore transmitted by a CAN message. The selection of the Tiptronic mode is detected by the BCM and will be transmitted via CAN to the TCM. The information from the shift lever to the BCM is hardwire coded and under platform responsibility. In the BCM this information is transferred into a HSCAN message and received by the TCM. The Tap Up/Tap Down request is sent via HSCAN message as well.

Function Drive Position Selection Display

The actual gear position is sent by the TCM and received by the BCM via HSCAN. In the BCM this information is transferred into a LSCAN message and received by the IPC. Upon reception of certain necessary CAN signals the IPC will show the actual gear position in the IPC display.

Backup light

The actual gear position is sent by the TCM and received by the BCM via HSCAN. The BCM will activate the backup lights as long as the message "reverse gear engaged" is sent by the TCM.

Driver Preference Mode Functionality

If supported, the driver can select between a number of driver preference modes by a momentary rotary switch e.g. Sport Mode. The TCM will interpret the mode selected by the driver via switches (serial data from BCM) and inform the vehicle of the currently selected driving mode.

In each new ignition cycle the driver preference mode will be reset to the default (normal) mode.

Upon detecting the alternate driving mode requested the TCM may adapt the shift lines e.g. when Sport Mode is selected the shift lines are adapted in order to enable a more progressive driving.

Starter Control

The starter control relay is connected with the shift lever module. Only as long as the selected drive position is "P" (Park) or "N" (Neutral) the relay will be engaged upon start.

Emergency program

In case the TCM detects a failure it will go into emergency mode. During emergency mode the functionality of the transmission will be limited due to self protection. On the other hand there will be obtained a maximum possible functional availability in order to restrain the driver as less as necessary.

On Board Diagnostics

The ECM detects failure modes by onboard diagnostics (EOBD, OBDII) and provides diagnostic services via serial data communication with a Generic Scantool to retrieve detected faults and information etc in order to facilitate trouble shooting and repair.

Enhanced Diagnostics (Workshop)

The ECM provides (enhanced) diagnostic services via serial data communication with Saab workshop dedicated testers to retrieve detected faults and information etc in order to facilitate trouble shooting and repair.
Enhanced Diagnostic services do also provide ECM calibration and software reprogramming capability

## Connectors and pin assignment TCM
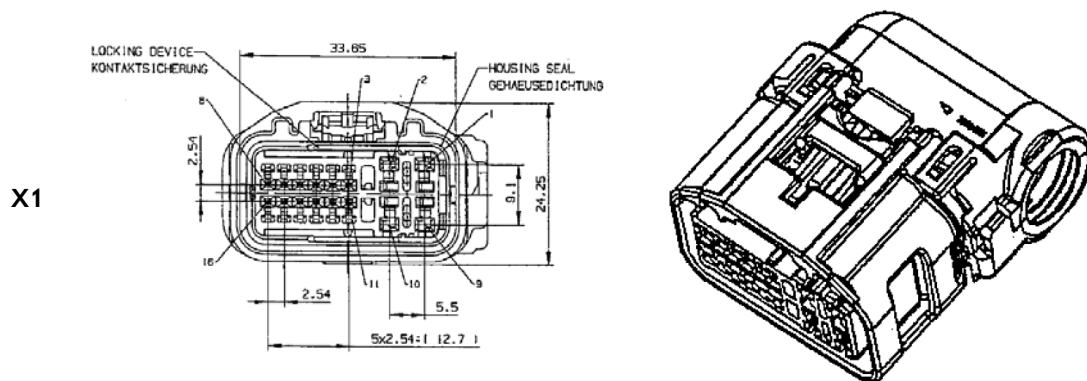
X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	340	Battery Positive Voltage							
2									

3										
4										
5	275	Park Neutral Position Switch Park Signal								
6	2501	High Speed GMLAN Serial Data (-) (1) - (in)			B					
7	2500	High Speed GMLAN Serial Data (+) (1) - (in)			B					
8	2500	High Speed GMLAN Serial Data (+) (1) - (out)			A					
9	150	Ground								
10										
11	339	Run/Crank Ignition 1 Voltage								
12	206	Accessory/Run/Crank Ignition 0 Voltage								
13										
14	2501	High Speed GMLAN Serial Data (-) (1) - (out)			A					
15										
16										

VES (Variable Effort Steering)

The Variable Effort Steering uses an electromagnetic force to vary the amount of required steering effort in relation to vehicle speed.

Block diagram VES

Functional block diagram:
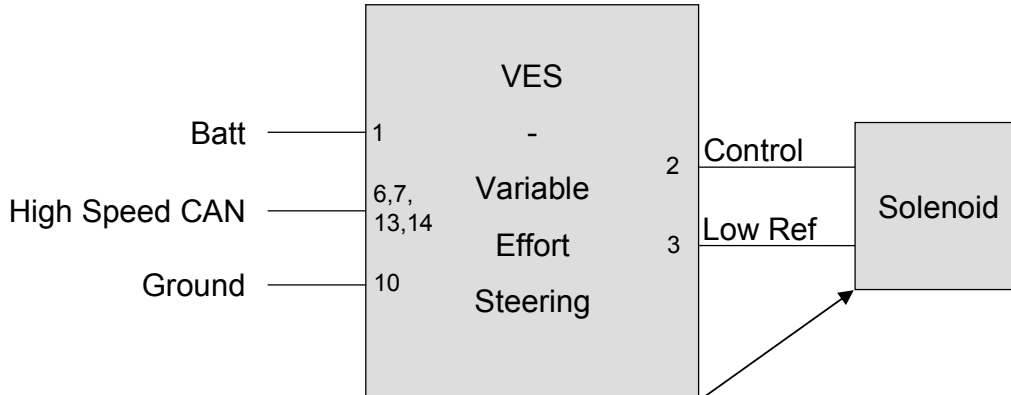
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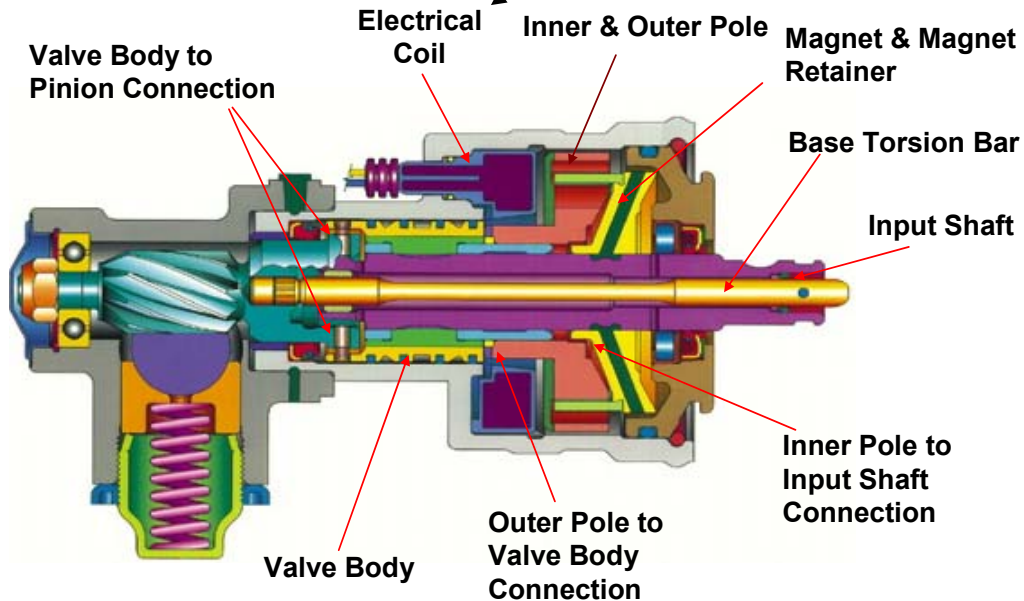
Functional description VES

The Variable Effort Steering varies the torsional rotation rate of the steering gear. An electromagnet inside the steering gear produces the variable torsional rate.

During low speeds and parking, VES reduces the torsional rate at the valve, reducing steering effort. The strong repelling forces inside the solenoid aid column rotation.

At mid speeds, the magnetic effect is overridden, resulting in conventional powered steering effort feeling. This is the turning point from increased to reduced steering effort.

At high speed, the electromagnets are fully energized, so extra force is required to overcome the magnetic force. Torsional rate increases, enhancing steering system sensitivity and road feel.

Connectors and pin assignment VES
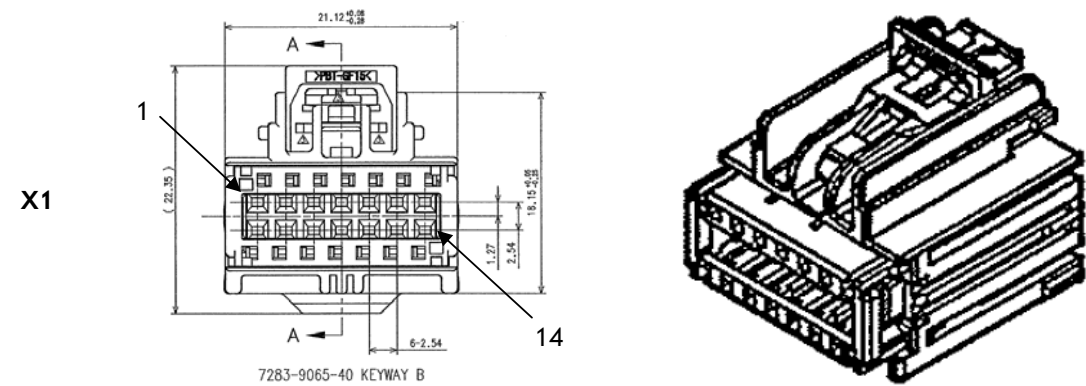

```
7283-9065-40 KEYWAY B
```

X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	A40	Battery Positive Voltage							
2	1295	Variable Effort Steering Solenoid Control			A20				
3	6641	Variable Effort Steering Solenoid Low Reference			A20				
5	5986	Serial Data Communication Enable							
6	2500	High Speed GMLAN Serial Data (+) (1) (IN)			B40				
7	2501	High Speed GMLAN Serial Data (-) (1) (IN)			B40				
10	A50	Ground							
13	2500	High Speed GMLAN Serial Data (+) (1) (OUT)			C40				
14	2501	High Speed GMLAN Serial Data (-) (1) (OUT)			C40				

FSRACC (Full Speed Range Adaptive Cruise Control)

The FSRACC is a system comprising of not only the FSRACC module itself but also several other ECU's and actuators to be able to function correct. The FSRACC module itself is a RADAR ECU with its bracket situated behind a protective surface in the grille of the vehicle.

FSRACC includes two main feauters:
- FSRACC – Full Speed Range Adaptive Cruise Control
- FCA – Forward Collision Alert
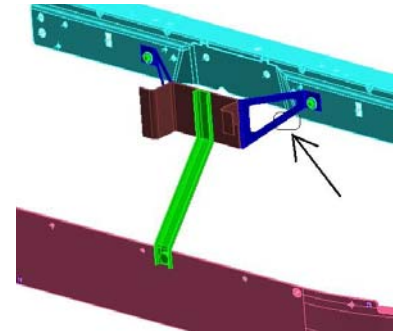
Block diagram FSRACC
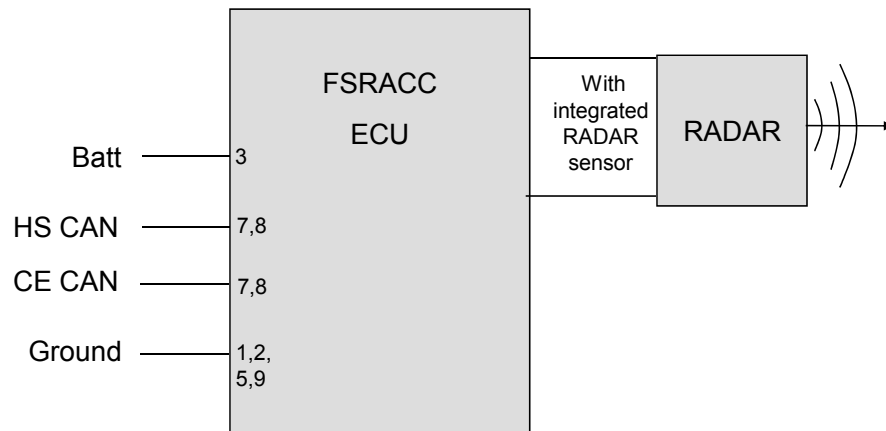
Functional description FSRACC

FSRACC includes two main functions:
- FSRACC – Full Speed Range Adaptive Cruise Control
- FCA – Forward Collision Alert

Every brake intervention of the EBCM is indicated by a telltale.

TC and ESP can be switched off manually. To disable TC, the driver has to push the corresponding switch in the IP stack. For disabling ESP, the same switch has to be pressed for several seconds. It the switch is pushed again, all systems will be reactivated.

In addition to brake features, EBCM is the gateway for High-speed and Chassis Expansion Bus.

Adaptive Cruise Control

ABS is a system which prevents the wheels from locking while braking. The anti-locking braking system allows the driver to maintain steering control under heavy braking by preventing a skid and allowing the wheel to continue to forward roll and create lateral control, as directed by driver steering inputs.

Forward Collision Alert

TC prevents loss of traction (and therefore the control of the vehicle) when excessive throttle or steering is applied by the driver. The system will vary the engine torque and the brake moment of the powered wheels.

Connectors and pin assignment EBCM

X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	A40	Battery Positive Voltage							
3	872	Wheel Speed Sensor Signal Right Front			D55				
4	7065	Wheel Speed Sensor Supply Voltage Right Front			D55				
5	2500	High Speed GMLAN Serial Data (+) (2)			A40				
6	2501	High Speed GMLAN Serial Data (-) (2)			A40				
8	2501	High Speed GMLAN Serial Data (-) (1)			B40				
9	2500	High Speed GMLAN Serial Data (+) (1)			B40				
10	7128	Wheel Speed Sensor Supply Voltage Right Rear			F55				
11	882	Wheel Speed Sensor Signal Right Rear			F55				
13	A50	Ground							
25	A42	Battery Positive Voltage							
27	830	Wheel Speed Sensor Signal Left Front			C55				
28	7064	Wheel Speed Sensor Supply Voltage Left Front			C55				
29	333	Brake Fluid Level Sensor Signal							
33	5986	Serial Data Communication Enable							
34	1903	AAS Wheel Speed Sensor Signal Left Front							
35	7127	Wheel Speed Sensor Supply Voltage Left Rear			E55				
36	884	Wheel Speed Sensor Signal Left Rear			E55				
38	A50	Ground							

Chassis Expansion CAN

ECU arrangement

CE
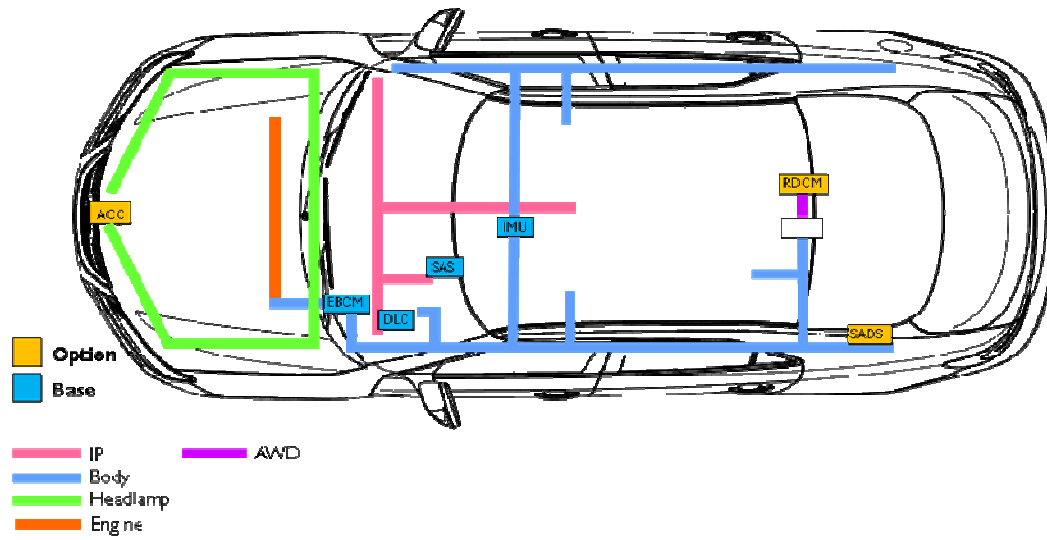
IMU (Inertia Measurement Unit)

The Inertia Measurement Unit measures the vehicle's acceleration.

Block diagram IMU
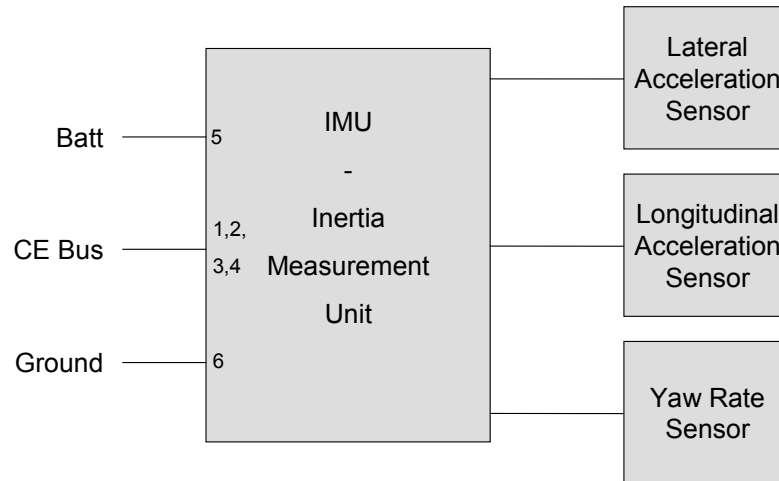
Functional description IMU

IMU provides three internal sensors, which get information about the vehicles acceleration. These are:

- lateral acceleration
- longitudinal acceleration
- yaw rate

The values are sent via Chassis Expansion Bus. It is the base information for most of the chassis systems, such as Semi-Active Damping System or Electronic Brake Control Module.

Connectors and pin assignment IMU

X1
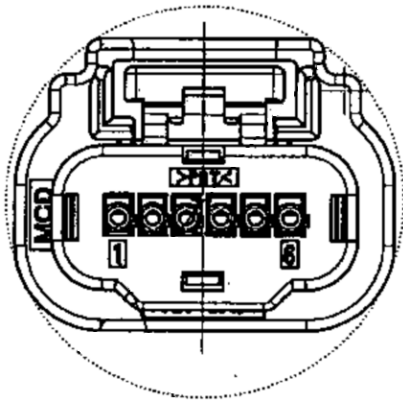
Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	6106	High Speed GMLAN Serial Data(Chassis exp) (-) (2)			A40				
2	NC	High Speed GMLAN Serial Data (Chassis exp)(-) (1)			B40				
3	6105	High Speed GMLAN Serial Data(Chassis exp) (+) (2)			A40				
4	NC	High Speed GMLAN Serial Data(Chassis exp) (+) (1)			B40				
5	2087	Combined Vehicle Inertial Sensor Supply Voltage							
6	A51	Signal Ground							

SAS (Steering Angle Sensor)

The Steering Angle Sensor (SAS) may be used POA with a module associated with the steering column, or may be mounted as a standalone component in the lower end of the steering column. It will be used to measure the angle and angle velocity of the vehicle steering column, or driver intent steering angle.

Connectors and pin assignment SAS
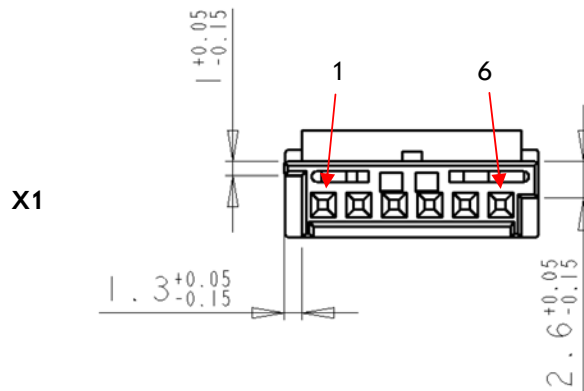
X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	6106	High Speed GMLAN Serial Data (CE Bus) (-) (1)			B25				
2	6106	High Speed GMLAN Serial Data (CE Bus) (-) (2)			A25				
3	6105	High Speed GMLAN Serial Data (CE Bus) (+) (1)			B25				
4	6105	High Speed GMLAN Serial Data (CE Bus) (+) (2)			A25				
5	2087	Combined Vehicle Inertial Sensor Supply Voltage	0,35						
6	A51	Ground	0,35						

Mid Speed CAN

ECU arrangement

MS-CAN

Option
Base

IP
Body
Headlamp
Engine
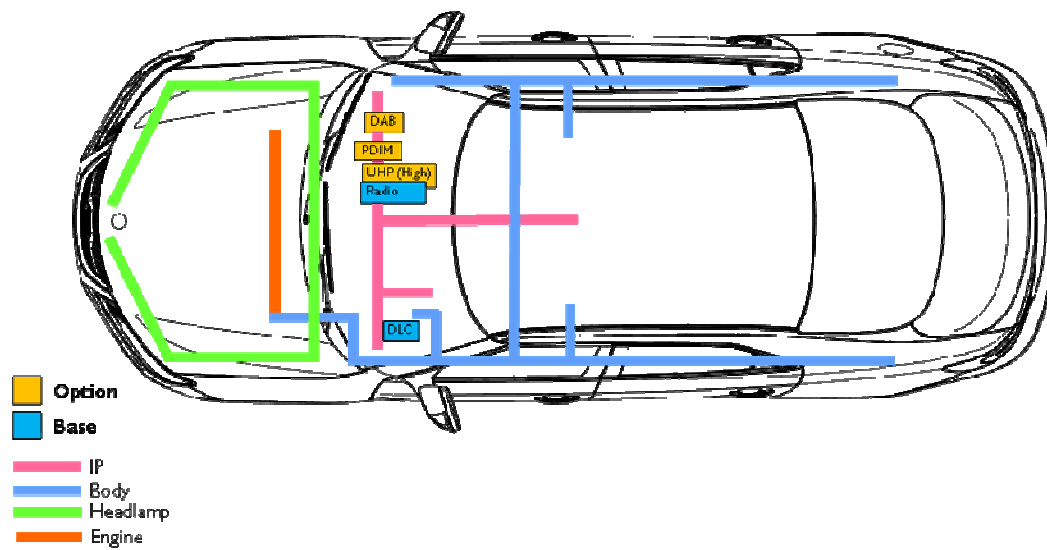
DAB (Digital Audio Broadcasting)

Digital Audio Broadcasting is a digital technology for broadcasting radio stations. This standard offers several benefits over existing analogue FM radio, such as higher-fidelity audio, more stations in the same broadcast spectrum, and increased resistance to noise, multipath, fading, and co-channel interference.

The DAB Module is equipped in order to receive digital radio stations. It is only available in Uplevel CD Radios and Navis and only in Europe.

DAB is controlled by the Radio.

DAB Block diagram
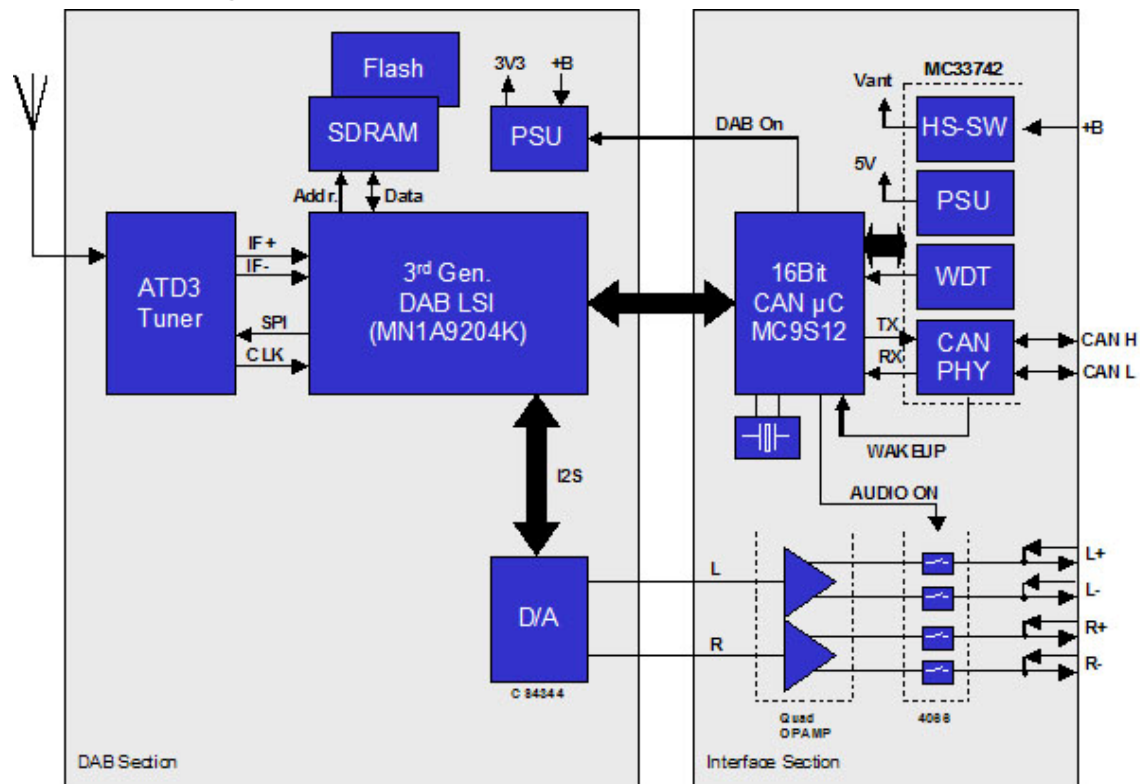
## Connectors and pin assignment DAB
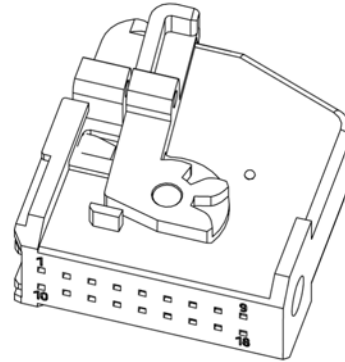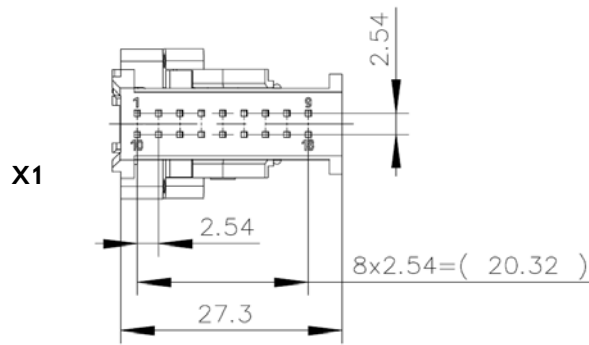
X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1		N.C.					SN		
2	5169	Mid Speed GMLAN Serial Data (+)	0,35mm²		D20		SN		
3	5169	Mid Speed GMLAN Serial Data (+)	0,35mm²		A20		SN		
4	A40	+12V, Clamp 30	1A max.				SN		
5	1573	Shield (out)	(shield)			B	SN		
6	367	Remote Radio Left Audio Signal	0,35mm²		B20	B	SN		
7	372	Remote Radio Audio (-)	0,35mm²		B20	B	SN		
8	368	Remote Radio Right Audio Signal (1)	0,35mm²		C20	B	SN		
9	388	Remote Radio Right Audio Signal (2)	0,35mm²		C20	B	SN		
10		N.C.					SN		
11	5170	Mid Speed GMLAN Serial Data (-)	0,35mm² - twisted with CAN H		D20		SN		
12	5170	Mid Speed GMLAN Serial Data (-)	0,35mm² - twisted with CAN H		A20		SN		
13	A50	Chassis GND, Clamp 31	1A max.				SN		
14	3296	Coaxial Antenna DAB Drain Wire	(shiield)			A	SN		
15	5337	Left TV Audio Signal	0,35mm²		E20	A	SN		
16	3358	Left TV Audio Return	0,35mm²		E20	A	SN		
17	5338	Right TV Audio Signal	0,35mm²		F20	A	SN		
18	3359	Right TV Audio Return	0,35mm²		F20	A	SN		

Radio

This chapter contains a summary of all available radios, containing the following information for each radio:
- o picture of faceplate
- o picture of display
- o standard functions
- o optional functions

Subsequently, all available antennas are shown.

Uplevel CD Radio

Uplevel CD Radio Faceplate

Uplevel CD Radio Display - GID
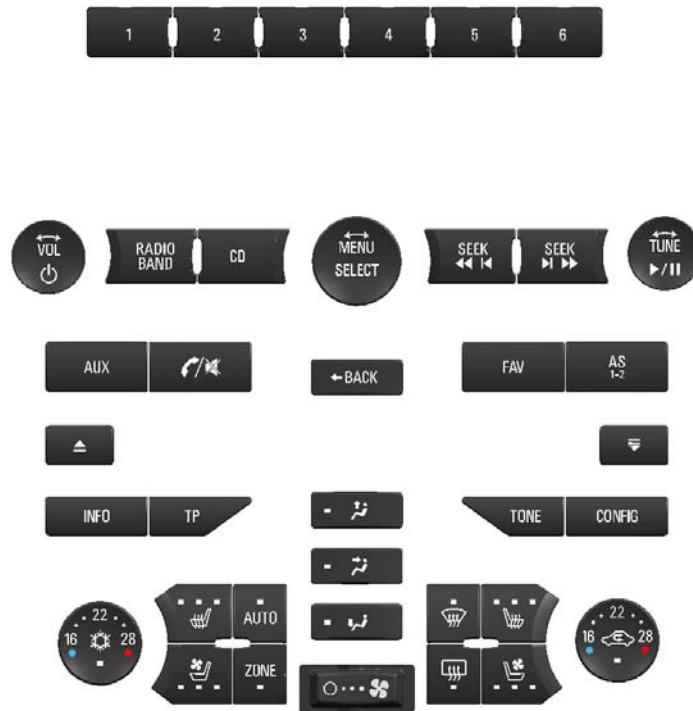
Uplevel CD Radio Faceplate - Buttons

The Uplevel CD Radio includes the following functions as standard:
- o Graphic Info Display (GID)
- o FM/AM radio with RDS/EON
- o CD-ROM
- o MP3/WMA support
- o Div. Backlight FM/AM
- o Aux Jack
- o USB connection
- o 4X20W, 9 speakers
- o Remote Amplifier supported
- o Second FM tuner

These functions are optionally available:
- o Steering wheel control
- o Div. Backlight FM/AM and DAB (in case of DAB or UHP)
- o Digital Audio Broadcasting (DAB)
- o Sharkfin phone
- o 8x45 W, 11 speakers (branded stereo)
- o Universal Hands-free Phone (UHP) Embedded

High Navigation Radio

High Navigation Radio Faceplate
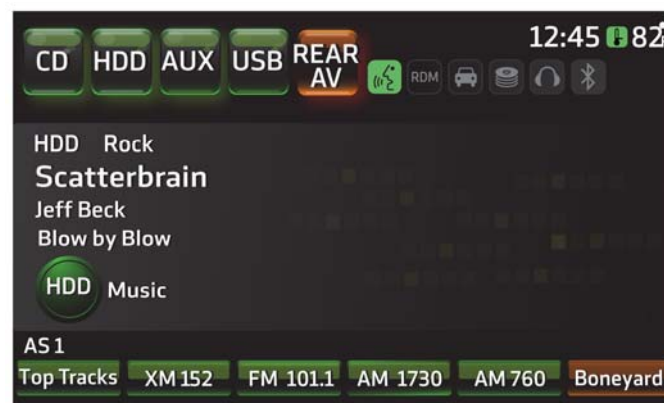
High Navigation Radio Display – CID 8''

The High Navigation Radio includes the following functions as standard:
- o 8'' (800x480) WVGA Color Info Display (CID)
- o FM/AM double tuner radio with RDS/EON/TMC
- o DVD/CD Drive for Audio CD. Audio CD also supports MP3 and WMA.
- o HDD for Mapdata and Audio storage
- o Antenna Diversity, Rear screen glass & Sharkfin antenna
- o AUX Jack Input
- o USB Connection to support mobile USB mass storage devices, Apple Ipod Control
- o Navigation incl. dynamic route guidance (TMC)
- o Output 4 X 20W, 9 speakers
- o Steering wheel control
- o Voice Control
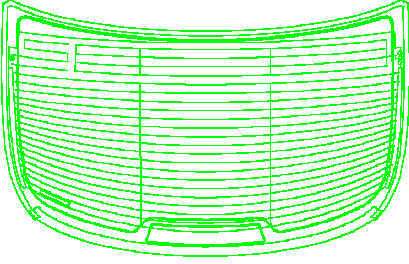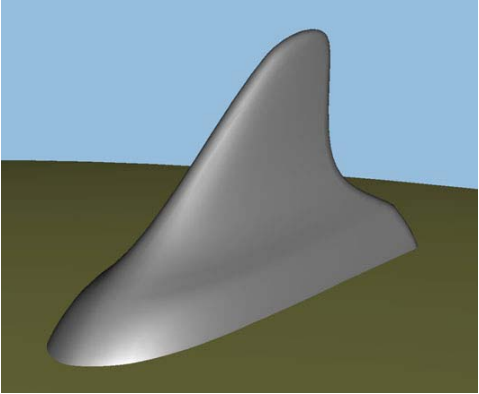
These functions are optionally available:
- o Digital Audio Broadcasting (DAB)

- o   8x45 W, 11 speakers (branded stereo)
- o   Universal Hands-free Phone (UHP)

Antennas

This section gives an overview of different antennas.

Antenna type	Radio type
 Rear screen glass	FM/AM radio with or without DAB
 Sharkfin	GSM/Phone and GPS/Navi

CAN/LIN Send/Receive signals

No CAN/LIN signal table included in this document. Please see Data Dictionary.

Connectors and pin assignment Uplevel CD Radio

Connector & Cavity	Circuit Number	Circuit Description	Comment & Clarification (sq.mm)	Output Driver			Circuit Properties	Mating Harness				Pigtail Information			
				Power Source	Output Driver Current Rating (amps)	Internal Circuit Protection Value (amps)		Terminal Properties	Maximum Wire Resistance (mohms)	Twist Group & Rate	Shield Group	Pigtail Wire Gauge	Pigtail Wire Color	Twist Group & Rate	Shield Group
X1-1	1574	Rear Audio Drain Wire	SHIELD					Sn	450	Cs	2				
X1-2	7459	Integrated Center Stack Serial Data Low	0.34STP mm² min					Sn	450	J20	5				
X1-3	7460	Integrated Center Stack Serial Data Shield	SHIELD					Sn	450	Js	5				
X1-4	6761	n.c.													
X1-5	6762	n.c.													
X1-6	659	Cellular Telephone Voice Low Reference	0.34STP mm² min					Sn	450	H20	8				
X1-7	388	Remote Radio Right Audio Signal (2)	0.34STP mm² min					Sn	450	K20	6				
X1-8	372	Remote Radio Audio (-)	0.34STP mm² min					Sn	450	L20	6				
X1-9	1573	Front Audio Drain Wire	SHIELD					Sn	450	_	6				
X1-10	5841	Right Auxiliary Audio Signal (2)	0.34STT mm² min					Sn	450	M20	7				
X1-11	2060	Auxiliary Detection Signal	0.34 mm² min					Sn	450	_	_				
X1-12	3352	Rear Seat Audio Common Signal	0.34STT mm² min					Sn	450	C20	2				
X1-13	3291	Integrated Center Stack Wake Up Signal	0.34 mm² min					Sn	450	_	_				
X1-14	5060	Low Speed GMLAN Serial Data (2)													
X1-15	-	n.c. (TelephonMute for Aftersales Kit)													
X1-16	7458	Center Integrated Center Stack Serial Data High	0.34STP mm² min					Sn	450	J20	5				
X1-17	5842	Auxiliary Audio Drain Wire (1)	SHIELD					Sn	450	_	7				
X1-18	6760	n.c.													
X1-19	6763	n.c.													
X1-20	658	Cellular Telephone Voice Signal Mono +	0.34STP mm² min					Sn	450	H20	8				
X1-21	368	Remote Radio Right Audio Signal (1)	0.34STP mm² min					Sn	450	K20	6				
X1-22	367	Remote Radio Left Audio Signal	0.34STP mm² min					Sn	450	L20	6				
X1-23	5843	Auxiliary Jack Audio Common Signal	0.34STT mm² min					Sn	450	M20	7				
X1-24	5839	Left Auxiliary Audio Signal (2)	0.34STT mm² min					Sn	450	M20	7				
X1-25	5312	Left Rear Seat Audio Signal	0.34STT mm² min					Sn	450	C20	2				
X1-26	5313	Right Rear Seat Audio Signal	0.34STT mm² min					Sn	450	C20	2				
X1-27	3290	Integrated Center Stack Reset Signal	0.34 mm² min					Sn	450	_	_				
X1-28	5060	Low Speed GMLAN Serial Data (1)													
X1-29	2011/2012	Left/Right Front Audio Drain Wire*	SHIELD					Sn	450	_	4				
X1-30	2046/2099	Left/Right Rear Audio Drain Wire*	SHIELD					Sn	450	_	3				
X1-31	117 / 1546	Right Front Speaker Signal (-) (1) / Front Low Level Audio (-)	0.75TP mm² min					Sn	200	F20	4				
X1-32	118 / 1947	Left Front Speaker Signal (-) (1) / Left Front Low Level Audio (-)	0.75TP mm² min					Sn	200	G20	4				
X1-33	115 / 1946	Right Rear Speaker Signal (-) / Right Rear Low Level Audio (-)	0.75TP mm² min					Sn	200	D20	3				
X1-34	116 / 1999	Left Rear Speaker Signal (-) / Left Rear Low Level Audio (-)	0.75TP mm² min					Sn	200	E20	3				
X1-35	5169	Mid Speed GMLAN Serial Data (+)	0.34TP mm² min					Sn	450	I40	-				
X1-36	5170	Mid Speed GMLAN Serial Data (-)	0.34TP mm² min					Sn	450	I40	-				
X1-37	6978	Amplifier Control	0.34 mm² min					Sn	300		_				
X1-38	A50	Ground	1.5 mm² min					Sn	150		_				
X1-39	200 / 512	Right Front Speaker (+) (1) / Right Front Low Level Audio Signal	0.75TP mm² min					Sn	200	F20	4				
X1-40	201 / 511	Left Front Speaker (+) (1) / Left Front Low Level Audio Signal	0.75TP mm² min					Sn	200	G20	4				
X1-41	46 / 546	Right Rear Speaker (+) / Right Rear Low Level Audio Signal	0.75TP mm² min					Sn	200	D20	3				
X1-42	199 / 599	Left Rear Speaker (+) / Left Rear Low Level Audio Signal	0.75TP mm² min					Sn	200	E20	3				
X1-43	7066	Entertainment Remote Enable Signal	0.34 mm² min					Sn	450	_	_				
X1-44	A40	Battery Positive Voltage	1.5 mm² min					Sn	150	_	_				
X2-1	6001	Antenna RF Signal	0.34 mm² min					Sn	450	-	-				
X2-2	6015	Antenna RF Drain Wire	0.34 mm² min					Sn	450	-	-				
X3-1	6130	Coaxial Antenna XM Signal	0.34 mm² min					Sn	450	-	-				
X3-2	6131	Coaxial Antenna XM Drain Wire	0.34 mm² min					Sn	450	-	-				

Connectors and pin assignment High Nav Radio

Pinout-J1

Cavity	Circuit #	Circuit Description	Optioncode	*1 Minimum Wire Gauge (mm2)	*2 Maximum Wire Resistance	*3 Twist Group & Rate	*4 Shield Group	*5 Terminal Plating	*6 Pigtail Wire Gauge	*7 Pigtail Wire Color
		Harness Mating Connector Information								
1	1574	Rear Audio Drain Wire		0,34	0,45	-	2	SN		
2	7459	Integrated Center Stack Serial Data Low		0,34	0,45	J20	5	SN		
3	7460	Integrated Center Stack Serial Data Shield		0,34	0,45	-	5	SN		
4	6761	Center Channel Low Level Audio Signal (-)		0,34	0,45	B20	1	SN		
5	6762	Subwoofer Low Level Audio (-)		0,34	0,45	A20	1	SN		
6	659	Cellular Telephone Voice Low Reference		,34STP	0,45	H20	-	SN		
7	388	Remote Radio Right Audio Signal (2)		0,34	0,45	K20	6	SN		
8	372	Remote Radio Audio (-)		0,34	0,45	L20	6	SN		
9	6759	Discrete Audio Drain Wire		0,34	0,45	-	1	SN		
10	5841	Right Auxiliary Audio Signal (2)		0,34	0,45	M20	-	SN		
11	2060	Auxiliary Detection Signal		0,34	0,45	-	-	SN		
12	3352	Rear Seat Audio Common Signal		0,34	0,45	C20	2	SN		
13	3291	Integrated Center Stack Wake Up Signal								
14	5060	Low Speed GMLAN Serial Data 2		,34STP	0,45	-	-	SN		
15	693	Cellular Telephone Mute Signal		0,34	0,45	-	-	SN		
16	7458	Center Integrated Center Stack Serial Data High		0,34	0,45	J20	5	SN		
17	5842	Auxiliary Audio Screen (2)		0,34	0,45	-	6	SN		
18	6760	Center Channel Low Level Audio Signal		0,34	0,45	B20	1	SN		
19	6763	Subwoofer Low Level Audio Signal		0,34	0,45	A20	1	SN		
20	658	Cellular Telephone Voice Signal		,34STP	0,45	H20	-	SN		
21	368	Remote Radio Right Audio Signal (1)		0,34	0,45	K20	6	SN		
22	367	Remote Radio Left Audio Signal		0,34	0,45	L20	6	SN		
23	5843	Auxiliary Audio Common Signal		0,34	0,45	M20	-	SN		
24	5839	Left Auxiliary Audio Signal (2)		0,34	0,45	M20	-	SN		
25	5312	Left Rear Seat Audio Signal		0,34	0,45	C20	2	SN		
26	5313	Right Rear Seat Audio Signal		0,34	0,45	C20	2	SN		
27	3290	Integrated Center Stack Reset Signal		0,34	0,45	-	-	SN		
28	5060	Low Speed GMLAN Serial Data 1		,34STP	0,45	-	-	SN		
29	2011/2012	Left/Right Front Audio Drain Wire*		0,34	0,45	-	4	SN		
30	2046/2099	Left/Right Rear Audio Drain Wire*		0,34	0,45	-	3	SN		
31	117 / 1546	Right Front Speaker Signal (-) (1) / Front Low Level Audio (-)		1	0,2	F20	4	SN		
32	118 / 1947	Left Front Speaker Signal (-) (1) / Left Front Low Level Audio (-)		1	0,2	G20	4	SN		
33	115 / 1946	Right Rear Speaker Signal (-) / Right Rear Low Level Audio (-)		1	0,2	D20	3	SN		
34	116 / 1999	Left Rear Speaker Signal (-) / Left Rear Low Level Audio (-)		1	0,2	E20	3	SN		
35	5169	Mid Speed GMLAN Serial Data (+)	UXY, UXG, UYT, UYX	0,34	0,45	I20	-	SN		
36	5170	Mid Speed GMLAN Serial Data (-)	UXY, UXG, UYT, UYX	0,34	0,45	I20	-	SN		
37	6978	Amplifier Control		0,75	0,3	-	-	SN		
38	A50	Ground		1,5	0,15	-	-	SN		
39	200 / 512	Right Front Speaker (+) (1) / Right Front Low Level Audio Signal		1	0,2	F20	4	SN		
40	201 / 511	Left Front Speaker (+) (1) / Left Front Low Level Audio Signal		1	0,2	G20	4	SN		
41	46 / 546	Right Rear Speaker (+) / Right Rear Low Level Audio Signal		1	0,2	D20	3	SN		
42	199 / 599	Left Rear Speaker (+) / Left Rear Low Level Audio Signal		1	0,2	E20	3	SN		
43	7066	Entertainment Remote Enable Signal		0,34	0,45	-	-	SN		
44	A40	Battery Positive Voltage		1,5	0,15	-	-	SN		

Pinout-J3

Cavity	Circuit #	Circuit Description	Optioncode	Minimum Wire Gauge *1	Maximum Wire Resistance *2	Twist Group & Rate *3	Shield Group *4	Terminal Plating *5	Pigtail Wire Gauge *6	Pigtail Wire Color *7
Harness Mating Connector Information										
1	5826	Left DVD Audio Signal (+)	&UWG, &UDT	0,34	0,45	A20	1	SN		
2	6979	DVD Audio Common	&UWG, &UDT	0,34	0,45	A20	1	SN		
3	2059	Left Auxiliary Audio Signal (1)	&UWG, &UDT	0,34	0,45	B20	2	SN		
4	5844	Video Bright Control	&UWG, &UDT	0,34	0,45	-	-	SN		
5	5845	Video Module Signal	&UWG, &UDT	0,34	0,45	-	-	SN		
6	5831	Remote Infra Red Signal (+)	&UWG, &UDT	0,34	0,45	-	6	SN		
7	2056	Auxiliary Video High Signal	&UWG, &UDT	0,34	0,45		3	SN		
8	7396	DVD Video Signal 2 (+)	&UWG, &UDT	0,34	0,45	D20	4	SN		
9	6976	DVD Video Drain Wire	&UWG, &UDT	0,34	0,45	-	5	SN		
10	6975	DVD Video Signal (+)	&UWG, &UDT	0,34	0,45	E20	5	SN		
11	5828	Right DVD Audio Signal (+)	&UWG, &UDT	0,34	0,45	A20	1	SN		
12	5345	Auxiliary Audio Drain Wire (1)	&UWG, &UDT	0,34	0,45	-	1	SN		
13	2058	Right Auxiliary Audio Signal (1)	&UWG, &UDT	0,34	0,45	B20	2	SN		
14	5843	Auxiliary Audio Common Signal	&UWG, &UDT	0,34	0,45	-	2	SN		
15	7395	Video Mode 2 Signal	&UWG, &UDT	0,34	0,45	-	-	SN		
16	5830	Remote Infra Red Signal (-)	&UWG, &UDT	0,34	0,45	-	6	SN		
17	2057	Auxiliary Video Low Signal	&UWG, &UDT	0,34	0,45	-	3	SN		
18	7394	DVD Video Signal 2 (-)	&UWG, &UDT	0,34	0,45	D20	4	SN		
19	5818	Video Drain Wire	&UWG, &UDT	0,34	0,45	-	4	SN		
20	5335	DVD Video Signal (-)	&UWG, &UDT	0,34	0,45	E20	5	SN		

Pinout-J4

Cavity	Circuit #	Circuit Description	Option Codes	*1 Minimum Wire Gauge	*2 Maximum Wire Resistance	*3 Twist Group & Rate	*4 Shield Group	*5 Terminal Plating	*6 Pigtail Wire Gauge	*7 Pigtail Wire Color
		Harness Mating Connector Information								
1	5383	VICS Data (+)	&UYW	0,34	0,45	A20	1	SN		
2	5384	VICS Data (-)	&UYW	0,34	0,45	A20	1	SN		
3	5385	VICS Bus Req.	&UYW	0,34	0,45	-	1	SN		
4	3361	Pop Up Display Control		0,34	0,45	-	-	SN		
5	6972	Camera Signal #2 +		0,34	0,45	B20	2	SN		
6	655	Cellular Telephone Microphone Signal		0,34	0,45	C20	3	SN		
7	5837	Amplifier Audio Prompt Signal (+)		0,34	0,45	D20	4	SN		
8	3368	Touch Screen Display Drain Wire		0,34	0,45	-	5	SN		
9	3369	Touch Screen Display Signal (+)		0,34	0,45	E20	5	SN		
10	3364	Navigation Display Reset Signal (Touch screen reset)		0,34	0,45	-	-	SN		
11	1782	VICS Data Gnd	&UYW	0,34	0,45	-	1	SN		
12	-	Not Used	&UYW	0,34	0,45	-	1	SN		
13	3362	Pop Up Display Position Signal		0,34	0,45	-	-	SN		
14	3363	Navigation Display Dimming Control		0,34	0,45	-	-	SN		
15	6973	Camera Signal #2		0,34	0,45	B20	2	SN		
16	654	Cellular Telephone Microphone Low Reference		0,34	0,45	C20	3	SN		
17	5836	Amplifier Audio Prompt Signal (-)		0,34	0,45	D20	4	SN		
18	5838	Amplifier Audio Prompt Drain Wire		0,34	0,45	-	4	SN		
19	3370	Touch Screen Display Signal (-)		0,34	0,45	E20	5	SN		
20	817	Vehicle Speed Signal		0,34	0,45	-	-	SN		

Pinout-J5

Cavity	Circuit #	Circuit Description	*1 Minimum Wire Gauge	*2 Maximum Wire Resistance	*3 Twist Group & Rate	*4 Shield Group	*5 Terminal Plating	*6 Pigtail Wire Gauge	*7 Pigtail Wire Color
		Harness Mating Connector Information							
1	3367	Navigation Display Signal (-)	0,34	0,45	-	1	SN		
2	3366	Navigation Display Signal (+)	0,34	0,45	-	1	SN		
3	3365	Navigation Display Drain Wire	0,34	0,45	-	1	SN		

Pinout-J7

Cavity	Circuit #	Circuit Description	*1 Minimum Wire Gauge	*2 Maximum Wire Resistance	*3 Twist Group & Rate	*4 Shield Group	*5 Terminal Plating	*6 Pigtail Wire Gauge	*7 Pigtail Wire Color
		Harness Mating Connector Information							
	3145	USB Serial Data Drain Wire	0,34	0,45	-	6	SN		
	3146	USB D(+) Serial Data	0,34	0,45	A20	6	SN		
	3147	USB D(-) Serial Data	0,34	0,45	A20	6	SN		
	3148	USB Serial Data Low Reference	0,34	0,45	-	6	SN		
	3149	USB Serial Data Supply Voltage	0,34	0,45	-	6	SN		

Pinout-J8

Cavity	Circuit #	Circuit Description	*1 Minimum Wire Gauge	*2 Maximum Wire Resistance	*3 Twist Group & Rate	*4 Shield Group	*5 Terminal Plating	*6 Pigtail Wire Gauge	*7 Pigtail Wire Color
		Harness Mating Connector Information							
1	6001	Antenna RF Signal	0,34	0,45	-	1	SN		
2	6015	Antenna RF Drain Wire	0,34	0,45	-	1	SN		

Pinout-J9

Cavity	Circuit #	Circuit Description	Option Codes	Minimum Wire Gauge *1	Maximum Wire Resistance *2	Twist Group & Rate *3	Shield Group *4	Terminal Plating *5	Pigtail Wire Gauge *6	Pigtail Wire Color *7
		Harness Mating Connector Information								
1	6130	Coaxial Antenna XM Signal	UYS	0,34	0,45	-	1	SN		
2	6131	Coaxial Antenna XM Drain Wire	UYS	0,34	0,45	-	1	SN		

Pinout-J10

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge *1	Maximum Wire Resistance *2	Twist Group & Rate *3	Shield Group *4	Terminal Plating *5	Pigtail Wire Gauge *6	Pigtail Wire Color *7
		Harness Mating Connector Information							
1	6758	Coaxial Antenna GPS 2 Signal	0,34	0,45	-	1	SN		
2	6757	Coaxial Antenna GPS 2 Drain Wire	0,34	0,45	-	1	SN		

PDIM (Preferred Device Interface Module)

The vehicle has an auxiliary input jack and a USB jack located in the center console. Possible auxiliary audio sources include:

- Ipod
- MP3 player
- USB devices

PDIM is available in two different versions depending on region. PDIM 1A Low Speed for US/CA and PDIM 1A Mid Speed for RoW. The differences are Low Speed Versus Mid Speed bus.

PDIM provides an USB and AUX connection and control interface for USB memory devices and iPod music players.

PDIM Block diagram
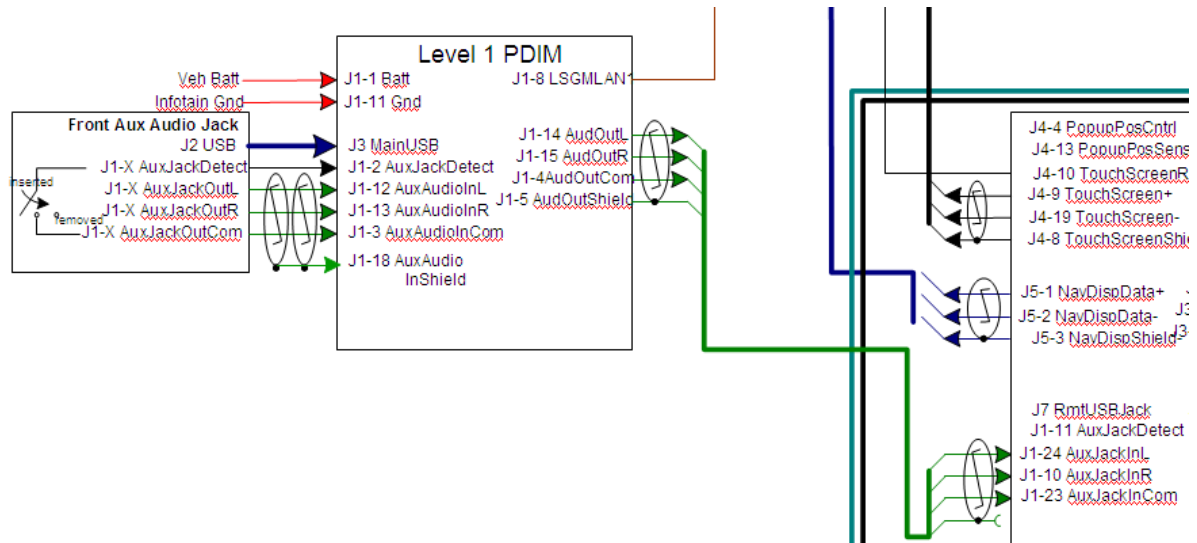
Figur 1 LS PDIM Mechanization

Functional Description

The PDIM is controlled using the face plate and display. PDIM control menu is accessed when pressing AUX and a supported USB device is connected to the USB port in the floor console storage bin. If a supported USB device is connected the Display will switch to PDIM menu. A message will also be displayed if an unsupported device is connected.
Drivers are encouraged to set up any auxiliary device while the vehicle is in P (Park).

Connectors and pin assignment

Connectors:
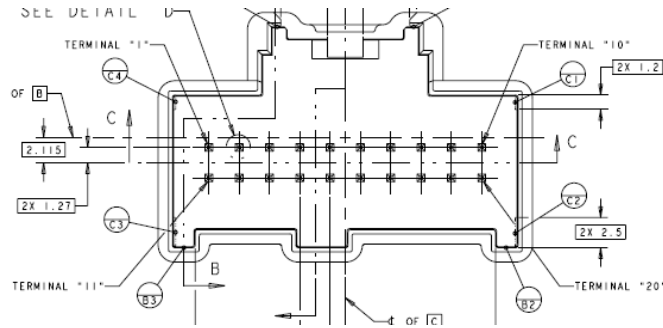
Figur 2 Main Connector
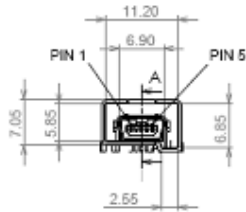
Figur 3 USB connector on PDIM

Pin assignment:

Connector & Cavity	Circuit Number	Circuit Description	Minimum Wire Guage	Max Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Guage	Pigtail Wire Color
X1-1	A40	Battery Positive Voltage							
X1-2	2060	Auxiliary Detection Signal							
X1-3	3374	Auxiliary Audio Common Signal (2)			F30	B			
X1-4	3376	Auxiliary Audio Common Signal (3)			E30	A			
X1-5	3375	Auxiliary Audio Drain Wire (3)(AudioAutoShield)							
X1-6	nc	MicIn+			J30	D			
X1-7	nc	MicIn-			J30	D			
X1-8	5060	Low Speed GMLAN Serial Data(LSGMLAN1)							
X1-8	nc	N/C - Reserved							
X1-9	nc	N/C - Reserved							

X1-9	5170	Mid Speed GMLAN Serial Data (-)			G				
X1-10	nc	N/C - Reserved							
X1-10	5170	Mid Speed GMLAN Serial Data (-)			H				
X1-11	A50	Ground							
X1-12	5839	Left Auxiliary Audio Signal (2)			F30	B			
X1-13	5841	Right Auxiliary Audio Signal (2)			F30	B			
X1-14	3377	Left Auxiliary Audio Signal (3)			E30	A			
X1-15	3378	Right Auxiliary Audio Signal (3)			E30	A			
X1-16	nc	MicPassThruOut+			E30	L			
X1-17	nc	MicPassThruOut-			E30	L			
X1-18	5842	Auxiliary Audio Screen (2)				B			
X1-19	nc	N/C - Reserved							
X1-19	5169	Mid Speed GMLAN Serial Data (+)(MSGMLAN1+)			G				
X1-20	nc	N/C - Reserved							
X1-20	5169	Mid Speed GMLAN Serial Data (+)(MSGMLAN2+)			H				
		PDIM USB CONNECTOR							
X2-1	3149	USB Serial Data Supply Voltage							
X2-2	3147	USB Serial Data Data (-)							
X2-3	3146	USB Serial Data Data (+)							
X2-4	3148	USB Serial Data ID Data							
X2-5	3145	USB Serial Data Drain Wire							

UHP (Universal Hands-Free Phone)

The Universal Hands-Free Phone module is available in two configurations
UHP high:

- Call Lists
- Call Handling
- Steering wheel control
- Status messages
- Phone book
- Bluetooth
  - HFP (Hands-Free Phone profile 1.5)
  - PBAP (Phone book access profile 1.0)
- Speech Recognition, including adaptive Echo and Noise reduction algorithm

I UHP embedded. This module provides an internal GSM module and comes therefore with additional features.

- Bluetooth rSAP (Remote SIM Access Profile)
- Direct phone antenna connection due to integrated GSM module
- SMS handling, such as receiving, editing and sending messages
- Key Pad / Speller

All phone interaction and data transmission to UHP is done via Bluetooth.

UHP Block Diagram

UHP High
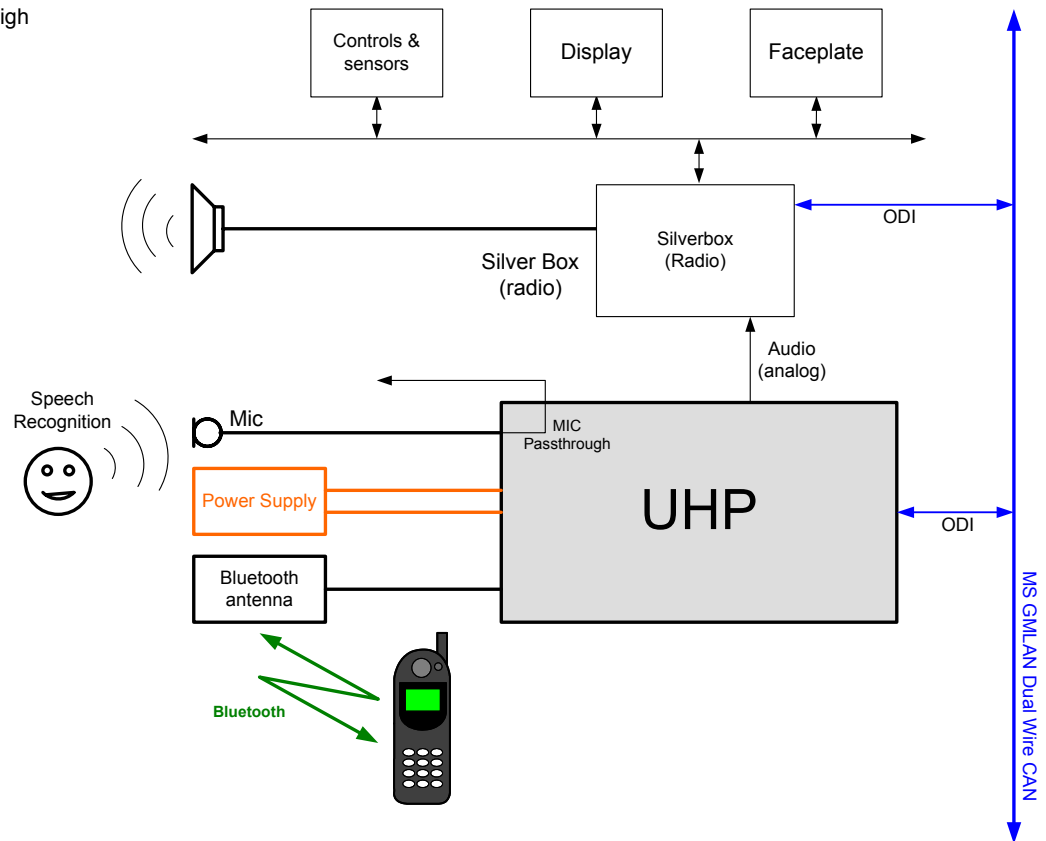
UHP Embedded
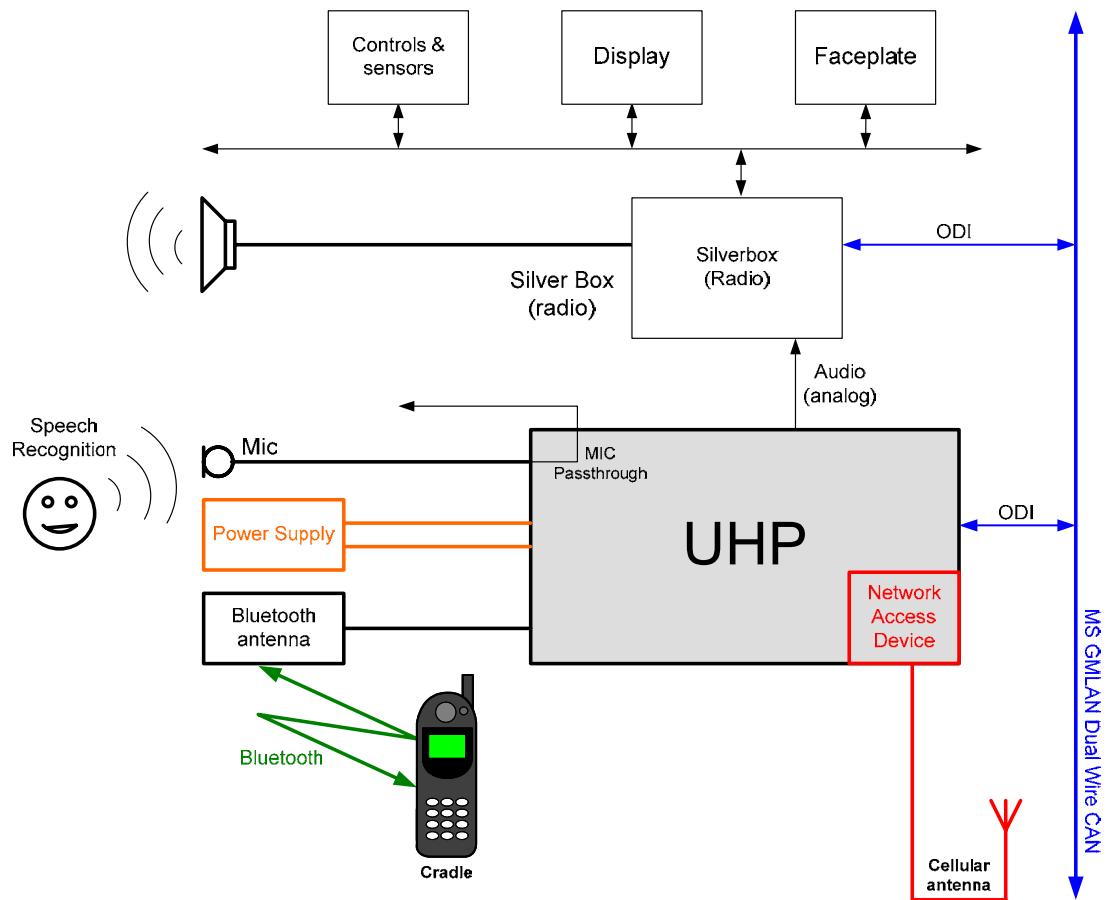
Connectors and pin assignment UHP

X1
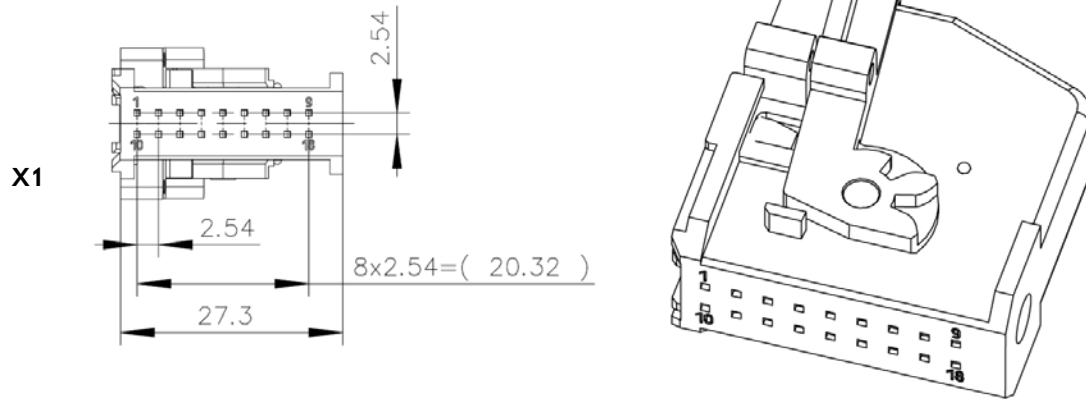
X2 is not used on Saab 650

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
X1-1	A40	Battery Positive Voltage (CL.30 Vbatt)	0.6mm2						
X1-2	I51	Signal Ground (CL.31 Ground)	0.6mm2						
X1-3	5169	Mid Speed GMLAN Serial Data (+) (GMLAN-H)	0.14mm²		A55				
X1-4	5170	Mid Speed GMLAN Serial Data (-) (GMLAN-L)	0.14mm²		A55				
X1-5	1782	Drain Wire (Mono Audio Shield)				P5			
X1-6	658	Cellular Telephone Voice Signal (Mono Audio +)	0.14mm²		C55	P5			
X1-7	1792	Drain Wire (Microphone Shield)				P7			
X1-8	654	Cellular Telephone Microphone Low Reference (Microphone Common)	0.14mm²		P8-P9	P7			
X1-9	655	Cellular Telephone Microphone Signal (Microphone Signal)	0.14mm²		P8-P9	P7			
X1-10		Not connected							
X1-11		Not connected							
X1-12	5169	Mid Speed GMLAN Serial Data (+)	0.14mm²		B55				

		GMLAN-H-out (passthrough)							
X1-13	5170	Mid Speed GMLAN Serial Data (-) GMLAN-L-out (passthrough)	0.14mm²		B55				
X1-14		Not connected							
X1-15	659	Cellular Telephone Voice Low Reference (Mono Audio -)	0.14mm²		C55	P5			
X1-16	1792	Drain Wire (External Microphone Shield)				P16			
X1-17	5152	Voice Recognition Audio Low Reference (External Microphone Common)	0.14mm²		P17-P18	P16			
X1-18	5149	Voice Recognition Audio Signal (External Microphone Tx Signal +)	0.14mm²		P17-P18	P16			

Low Speed CAN

ECU arrangement

LS
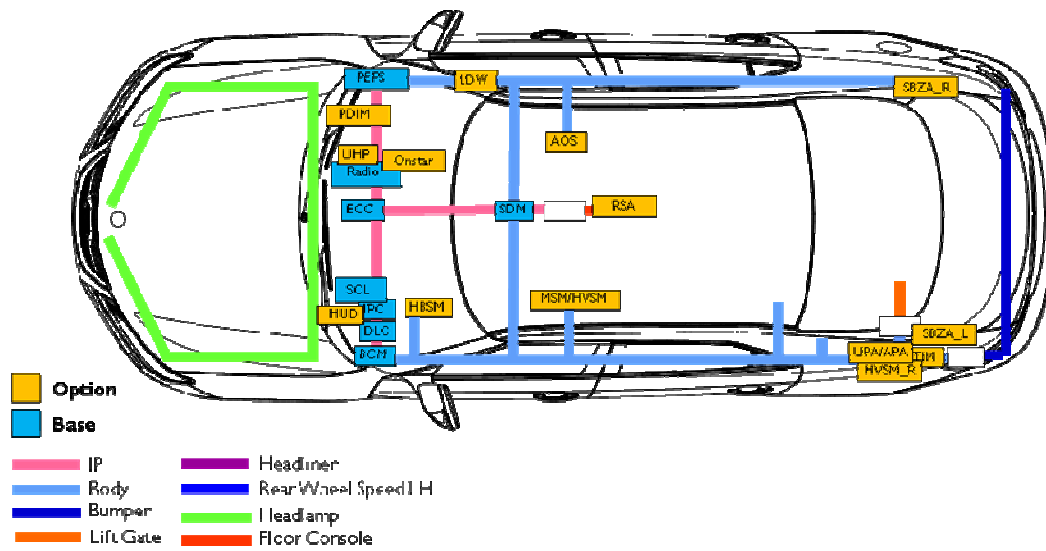
AOS (Automatic Occupant Sensing)

Automatic Occupant Sensing consists of a sensor (including a ECU) located in the front passenger seat. It constantly checks the seats occupancy and sends its information to the SDM.

AOS will only be assembled in cars that are sold in North America.

Block diagram AOS
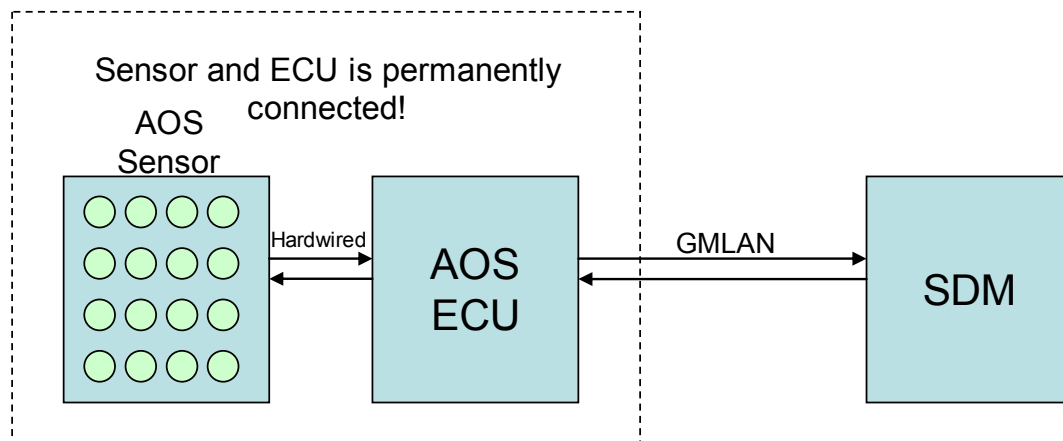
Functional description AOS

The AOS gets through multiple steps to determine the seat's occupancy. They will be explained in this chapter.

The sensor mat consists of discrete pressure sensors, shown on the right. In the beginning of an identification process, the responses of the sensors have to be analyzed by the ECU. Based on this information the software generates a pressure profile for the seat. The first step eventually is to convert an identified object into a digital pressure profile.
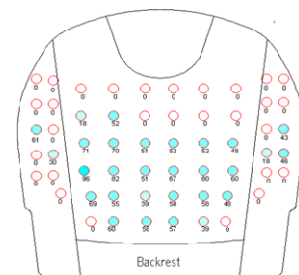
The pressure profile is the base for the following object classification. The AOS distinguishes between three classes:

- Class 0: Empty seat
- Class 1: CRS (Child Restraint Seat) or child
- Class 2: Adult

Class 0 and 1 will send a message to suppress the passenger airbag. Class 0 will also turn off the passenger seat belt reminder function.
Class 2 sends the message to enable passenger airbag.

In the classification algorithm several steps will be performed by the ECU. In a first step, the software classifies the seat as "occupied". After that the CRS detection is run. If no CRS could be found, the algorithm decides which kind of human is sitting in the seat. AOS can distinguish whether a child or an adult is located in the seat.

Some examples of the classification process are shown below - the lower pictures show the sensor mat's state of activation, the upper ones represent the corresponding generated digital pressure profile.

| **Childseat** | **62 lbs.** | **110 lbs.** |
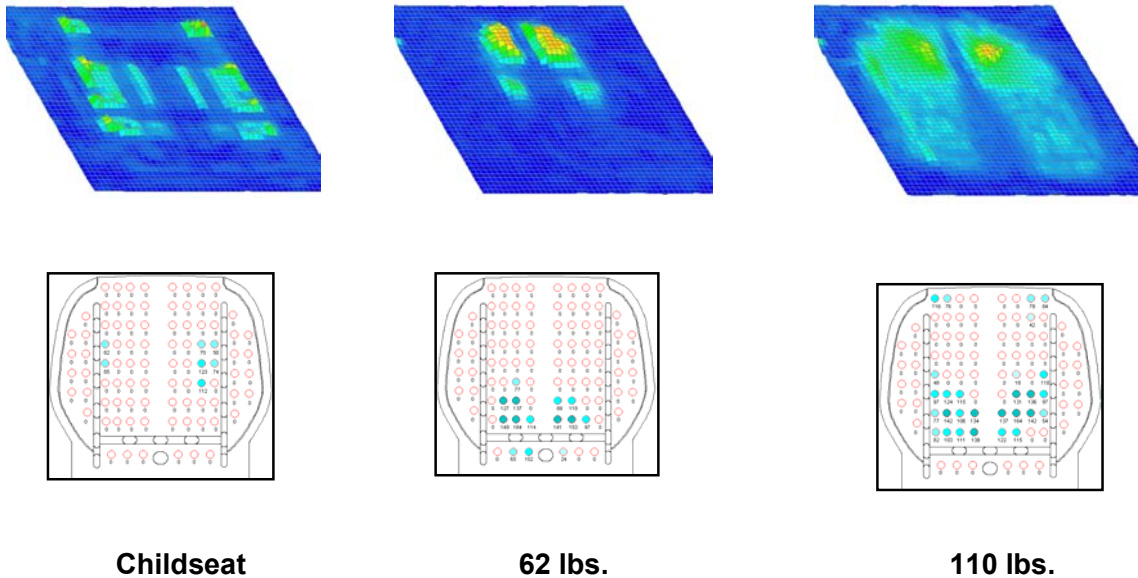
The result of the AOS occupancy detection is stored in the memory of the AOS ECU and thereafter sent to the SDM. Please note that finally the SDM has the duty to decide whether passenger airbag is switched off or not. AOS just sends a classification.

Connectors and pin assignment AOS
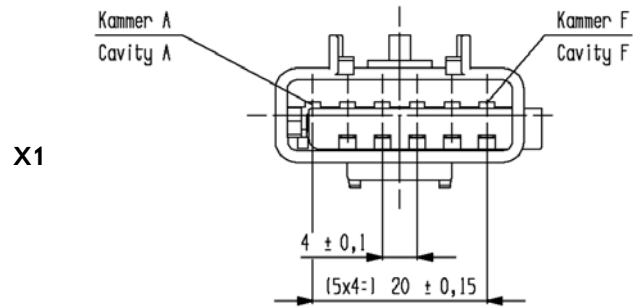
X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
A	A40	Battery Positive						0,35	red
B	5060	Low Speed GMLAN Serial Data 1						0,35	yellow
C	5060	Low Speed GMLAN Serial Data 2						0,35	white
D	A51	Battery GND						0,35	brown
E		Spare							
F		Spare							

BCM (Body Control Module)

The Body Control Module is the main controller for all body electronics.

Block diagram BCM

RF Receiver ↔ BCM - Body Control Module ↔ Locks

Immo ↔ Dimming

TPMS / ALM ↔ Backlight

Current Sensor / EPM ↔ Interior Lighting

HS CAN / LS CAN ↔ Gateway ↔ BCM ↔ Exterior Lighting

Inadvertent Load

Logistic Mode

Sensors → BCM → Window Lifter (non-LIN)
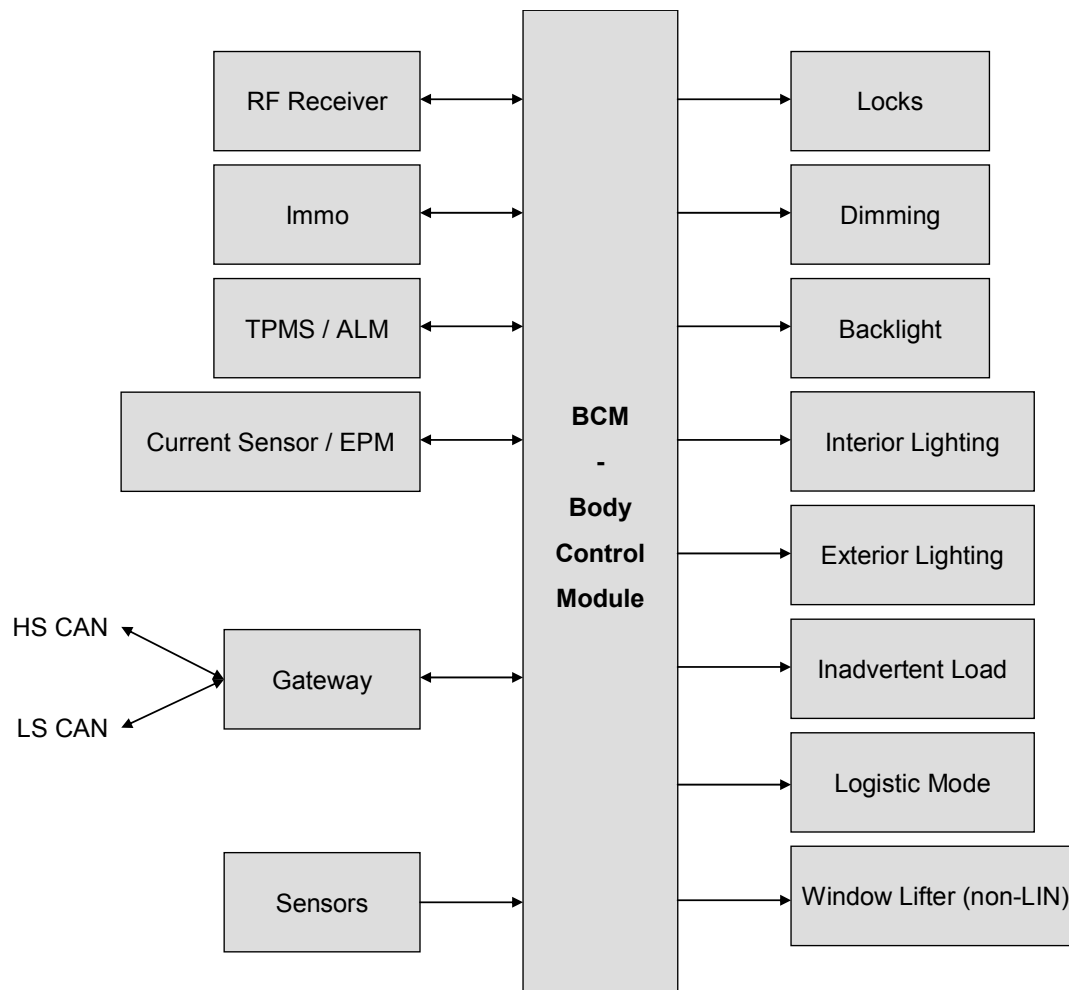
Functional description BCM
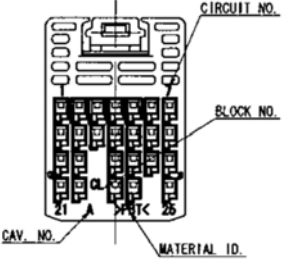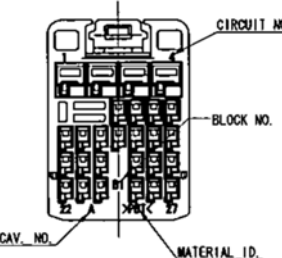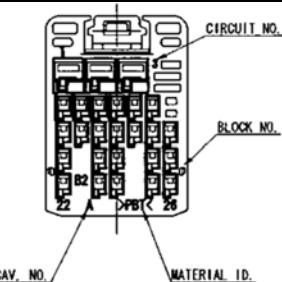
The Body Control Module is the master device for several functions.

All these functions are explained in separate chapters.
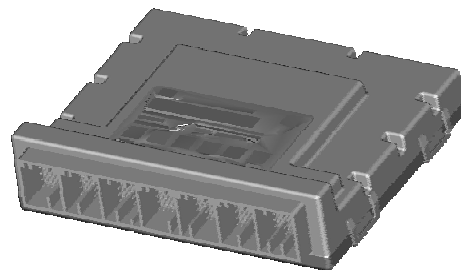
Connectors and pin assignment BCM

X1	white (IP1)
X2	blue (IP2)
X3	green (CL)
X4	black (UH1)
X5	brown (UH2)
X6	pink (BD1)
X7	grey (BD2)

Cavity	Circuit Description	RPO 650 MY10
X1-01	Power/Ground Distribution Ground #1 - Module and Logic	IN
X1-02	Power/Ground Distribution Battery #4 - Low Beam/HID Ballast Right	IN
X1-03	Power/Ground Distribution Battery #3 - Low Beam/HID Ballast Left	IN
X1-04	Power/Ground Distribution Battery #2 - Logic, High-side Relay Drivers, Dimming, Shared Logic-Related Loads (with VBATT01)	IN
X1-05	Lights Interior LED Indicator Lights Dimming	IN
X1-06	Transmission Parklock Shifter Lock Soft Pull/Release Control	&MM1
X1-07		
X1-08		IN
X1-09	Lights Interior Dim Up, Dim Down, Front Fog, Rear Fog	IN
X1-10	Brake Controls Park Brake Applied Switch	NC
X1-11	Lights Exterior Head/Park Main Lighting Switch "OFF" Position	IN
X1-12		
X1-13		
X1-14	Lights Interior Lights Interior Defeat (Courtesy Defeat)	IN
X1-15		IN
X1-16	Lights Exterior Head/Park Main Lighting Switch "HEADLAMP" Position	IN
X1-17	Lights Interior Hazard Switch Illumination	IN
X1-18		
X1-19	Brake Controls Brake Pedal BASS Sensor Return	IN
X1-20		IN
X1-21	VASS Theft Deterrent CTD Indicator Central Door Lock #1/Security LED	&UTJ
X1-22	Lights Exterior Head/Park Main Lighting Switch "PARKLAMP" Position	IN
X1-23	Lights Interior Ambient Lighting Color 2	IN
X1-24	Serial Data GMLAN High Speed Hi IP	&UE1
X1-25	Serial Data GMLAN High Speed Lo IP	&UE1
X1-26	VASS Remote Function Receiver Interface Tx	IN
X2-01	Power/Ground Distribution Battery #1 - Logic/High-Side Relay Drives, Indicators, Dimming, Puddle, Shared Logic-Related Loads (with VBATT02)	IN
X2-02	Power/Ground Distribution Ground #2 - Module and Logic	IN
X2-03	Power/Ground Distribution Battery #5 - Parklamp Right, Park/Stop Left, Front Turn Left/Right, BTSI/Parklock	IN
X2-04	Power/Ground Distribution Battery #8 - Door Lock/Unlock Relays	IN
X2-05	Lights Interior Automatic Lights Interior Illumination (Courtesy Lamps)	IN
X2-06		IN
X2-07	Brake Controls Brake Pedal BASS Sensor Signal	IN
X2-08	Lights Interior LED Display & Switch Backlighting I	IN
X2-09		
X2-10	Lights Exterior Head/Park Ambient Light Sensor	&T83
X2-11	Transmission Tap-Up/Tap-Down/Range Select Control Switch Signal Primary	&MM1
X2-12	Wipe/Wash Rear Wiper Select Switch (not for sedan)	NC
X2-13	Brake Controls Brake Pedal BASS Sensor Reference	IN

Cavity	Circuit Description	RPO 650 MY10
X2-14	Brake Controls w/ABS Vehicle Dynamics Switch (Traction On/Off Switch)	IN
X2-15	Wipe/Wash Front Wiper Automatic (Rain Sense) On/Off Switch	NC
X2-16	VASS Remote Function Receiver Interface Ground	IN
X2-17		IN
X2-18		IN
X2-19		&BTM&ULS
X2-20		
X2-21	Serial Data LIN #4: Door Switch Panel 3 (DSP3), Power Window Lifter 3 (PWL3), Door Switch Panel 4 (DSP4), Power Window Lifter 4 (PWL4), Rear Wiper Module (RWM), Slouch Seat Module (SSM)	IN
X2-22		IN
X2-23	Serial Data GMLAN High Speed DLC Stub Lo	IN
X2-24	Serial Data GMLAN High Speed DLC Stub Hi	IN
X2-25	VASS Remote Function Receiver Interface Power	IN
X2-26	Lights Exterior Stop/Turn Hazard Switch Input	IN
X2-27	VASS Remote Function Receiver Interface Rx	IN
X3-01	VASS Theft Deterrent Immobilizer Receiver Return	IN
X3-02	VASS Theft Deterrent Immobilizer Receiver Data (LIN)	IN
X3-03	VASS Theft Deterrent Immobilizer Receiver Switched Power	IN
X3-04	Steering Wheel Controls Infotainment/Transmission/Lighting Switch Power	IN
X3-05	Power Mode DLIS Accessory Signal	IN
X3-06	Power Mode DLIS Run/Crank Signal	IN
X3-07	VASS Theft Deterrent Key Capture Solenoid	NC
X3-08	Steering Wheel Controls Infotainment Steering Wheel Control Signal	&W1Y
X3-09	Steering Wheel Controls Conventional Cruise Control Switch Signal	&K34
X3-10	Wipe/Wash Front Wiper Select Switch Return	IN
X3-11	Lights Exterior Head/Park High/Low Beam Select Switch	IN
X3-12	Lights Exterior Stop/Turn Turn Switch Left Input	IN
X3-13	Wipe/Wash Front Wiper Select Switch	IN
X3-14	Shift Select Switch Performance Signal (Transmission Shift Pattern 1 Tow/Haul Switch)	&URC
X3-15	Power Mode DLIS Off/Run/Crank Signal	NC
X3-16		NC
X3-17	Lights Exterior Head/Park Flash-to-Pass Switch	IN
X3-18	Horns Main Horn Pad Switch	IN
X3-19		
X3-20	Wipe/Wash Front Wiper High Switch	IN
X3-21	Transmission Tap-Up/Tap-Down/Range Select Control Switch Signal Secondary	&WZI
X3-22	Power Mode DLIS Switch Reference	NC
X3-23		NC
X3-24	Lights Exterior Stop/Turn Turn Switch Right Input	IN
X3-25	Wipe/Wash Front Washer On Switch	IN

Cavity	Circuit Description	RPO 650 MY10
X4-01	Lights Exterior Head/Park Low Beam Right Driver/Right Dedicated DRL	&TT2&CV3/EF7/Z49 = 7539 &TT4 = 312
X4-02	Lights Exterior Head/Park Low Beam Left Driver/Left Dedicated DRL	&TT2&CV3/EF7/Z49 = 7538 &TT4 = 712
X4-03	Lights Exterior Stop/Turn Turn Lamp Right Front/Side Repeater	IN
X4-04	Lights Exterior Stop/Turn Turn Lamp/Stop Right Rear Lamp Driver	-CV3/EF7/Z49 = 1335 &CV3/EF7/Z49= 7541
X4-05	Lights Exterior Head/Park Park Lamp or Position Lamp Right Driver	IN
X4-06	Lights Exterior Head/Park Park Lamp or Position Lamp Left Driver	IN
X4-07	Lights Exterior Head/Park Park/Stop Rear Left Lamp PWM Driver	-CV3/EF7/Z49
X4-08	VASS Rear Closure Liftgate Release Relay High (only for station wagon)	NC
X4-09	Power Mode Logistics Mode Relay Open/Reset	&V9B
X4-10	Wipe/Wash Rear Wiper Relay (not for sedan)	NC
X4-11	Lights Exterior Stop/Turn LED CHMSL & Brake Lamp Relay Driver	IN
X4-12	Power Mode Accessory/Rap State/Relay	IN
X4-13	Lights Exterior Head/Park Park Lamp Europe License and Side Marker Lamps	IN
X4-14	Wipe/Wash Front Washer Relay	IN
X4-15	Power Mode Run/Crank Relay	IN
X4-16	Wipe/Wash Front Wiper Enable On/Off Relay	IN
X4-17	Wipe/Wash Front Wiper Park Switch	IN
X4-18	Charging System Regulated Voltage Control Current Sensor Signal	IN
X4-19		
X4-20	Charging System Regulated Voltage Control Battery Voltage Sense Battery Positive	IN
X4-21	Charging System Regulated Voltage Control Current Sensor Reference	IN
X4-22	Power Mode PCM Communications Enable	IN
X4-23	Serial Data GMLAN High Speed Communications Enable	IN
X4-24	VASS Closure Status Hood Open/Closed (only sedan)	&UTJ/BTV
X4-25		
X4-26	Charging System Regulated Voltage Control Battery Voltage Sense Battery Negative	IN

Cavity	Circuit Description	RPO 650 MY10
X5-01	Lights Exterior Stop/Turn Turn Lamp/Stop Left Rear Lamp Driver	- CV3/EF7/Z49 =1334 &CV3/EF7/Z49 = 7542
X5-02	Lights Exterior Stop/Turn Turn Lamp Left Front/Side Repeater	IN
X5-03	Power/Ground Distribution Battery #7 - Park Lamp Left. Turn Lamp Right Front, Turn/Stop Left Rear, Park/Stop Right Rear	IN
X5-04	Power/Ground Distribution Battery #6 - CHMSL/Stoplamp, Backup, Inadvertent/Interior Lights	IN
X5-05	Lights Exterior Fog Lamp Rear Direct Drive	&T79
X5-06	Charging System Regulated Voltage Control Current Sensor Return	IN
X5-07	Lights Exterior Head/Park Park/Stop Rear Right Lamp PWM Driver	- CV3/EF7/Z49
X5-08	Transmission Shift Pattern 2 Sport Indicator	&URC
X5-09	Hot Shot	NC
X5-10	Lights Exterior Fog Lamp Front Relay Driver (used with Cornering)	&T96
X5-11	VASS Rear Closure Release Relay (Trunk/Liftglass)	IN
X5-12	Brake Controls Brake Pedal Apply (to PCM)	IN
X5-13	Lights Exterior Head/Park Low Beam Relay (w/Xenon)	&TT2/TT6
X5-14	Power Mode Run Relay	IN
X5-15	Lights Exterior Head/Park Low Beam/DRL Right Select Relay	NC
X5-16	Heated Wash Enable	IN
X5-17	Transmission Shift Pattern 1 Tow/Haul Indicator	&URC
X5-18	Lights Exterior Head/Park High Beam Relay Control Driver	IN
X5-19	Horns Main Horn Relay	IN
X5-20		&URC
X5-21	Lights Exterior Head/Park Low Beam/DRL Left Select Relay	NC
X5-22		
X5-23	VASS Theft Deterrent CTD Auxillary Horn Relay	NC
X5-24	Wipe/Wash Front Wiper Low/High Speed Select Relay	IN
X5-25		NC
X5-26	Wipe/Wash Headlamp Washer Relay	&CE4
X6-01	VASS Power Locks Internal Driver/Fuel Door Lock Relay	IN
X6-02	VASS Power Locks Internal Non-Driver Door Lock Relay	IN(3271)
X6-03	VASS Power Locks Relay/Motor Ground	IN
X6-04	VASS Power Locks Internal All Any Door Unlock Relay	IN
X6-05	VASS Closure Status Ajar Switch Rear Closure/Liftgate/Liftglass	IN
X6-06		-
X6-07	Lights Interior Incandescent Display & Switch Backlighting	NC
X6-08		

Cavity	Circuit Description	RPO 650 MY10
X6-09	Serial Data LIN #2: Remote Compass Module (RCM), Alarm Power Siren Module (APSM), Remote PRNDL Display (RPD), Auto Learn Module (ALM)	&MM1/UJN/UTR
X6-10	Serial Data LIN #3: Door Switch Panel 1 (DSP1), Power Window Lifter 1 (PWL1), Door Switch Panel 2 (DSP2), Power Window Lifter 2 (PWL2)	IN
X6-11		
X6-12	Driver Door Key Unlock	NC
X6-13	VASS Theft Deterrent CTD Glass Breakage Sensor	NC
X6-14	VASS Rear Closure Release Switch Interior	NC
X6-15	VASS Rear Closure Release Switch Exterior Trunk, Liftgate, Endgate, Hatch	IN
X6-16	Serial Data LIN #1: Sunroof Controller 1 (SRC1), Sunroof Controller 2 (SRC2), Auxillary Alarm Sensor (AAS), Rain or Rain/Light Sensor Module (RSM)	&UTV/TTW/CE1/C3U
X6-17		
X6-18		NC
X6-19		NC
X6-20		
X6-21		
X6-22	Transmission Sport Switch (Shift Pattern 2)	&URC
X6-23		
X6-24	Serial Data GMLAN High Speed Hi BD	IN
X6-25	Serial Data GMLAN High Speed Lo BD	IN
X6-26		
X6-27	VASS Closure Status Ajar Switch Left Rear Door	NC
X7-01	Interior Lamps Relay	IN
X7-02	Lights Interior Inadvertent Load (with IDLWF Feedback)	IN
X7-03	Lights Exterior Reverse/Backup Lamps Direct Drive	IN
X7-04	VASS Power Locks External Theft Security Relay	&UTT
X7-05		&ATH
X7-06	Transmission Parklock Shifter Lock Solenoid (Assert for Release)	&MM1
X7-07	Lights Interior Rear Cargo or Trunk Lamp Driver	IN
X7-08		&DWJ/DWD
X7-09	Lights Interior LED Display & Switch Backlighting B	IN
X7-10	VASS Power Locks External Fuel Door Relay	&UTT
X7-11	VASS Closure Status Ajar Switch Right Rear Door	NC
X7-12	VASS Power Locks Courtesy Lock Switch All/Driver Door	IN
X7-13	VASS Theft Deterrent Shifter Park Switch	&MM1
X7-14		IN
X7-15	VASS Power Locks Latch Lock Status Driver Door	NC
X7-16	Power Mode Logistics Mode Relay Close/Set	&V9B
X7-17		&ATH
X7-18	VASS Power Locks Courtesy Unlock Switch All/Driver Door	IN
X7-19	Lights Interior Lights Interior On (Courtesy On)	IN
X7-20		

Cavity	Circuit Description	RPO 650 MY10
X7-21		
X7-22	Lights Interior Ambient Lighting Color 1	IN
X7-23		IN
X7-24	Driver Door Key Lock	NC
X7-25		IN
X7-26		

Send/Receive functions BCM

The BCM is connected to the following busses:
- High-speed CAN
- Low-speed CAN
- LIN 1
- LIN 2
- LIN 3
- LIN 4
- RFA bus
- Immobilizer bus

ECC (Electronic Climate Control)

The Electronic Climate Control is responsible for complete HVAC functionality. Further information is given in the following subsections.

Block diagram ECC
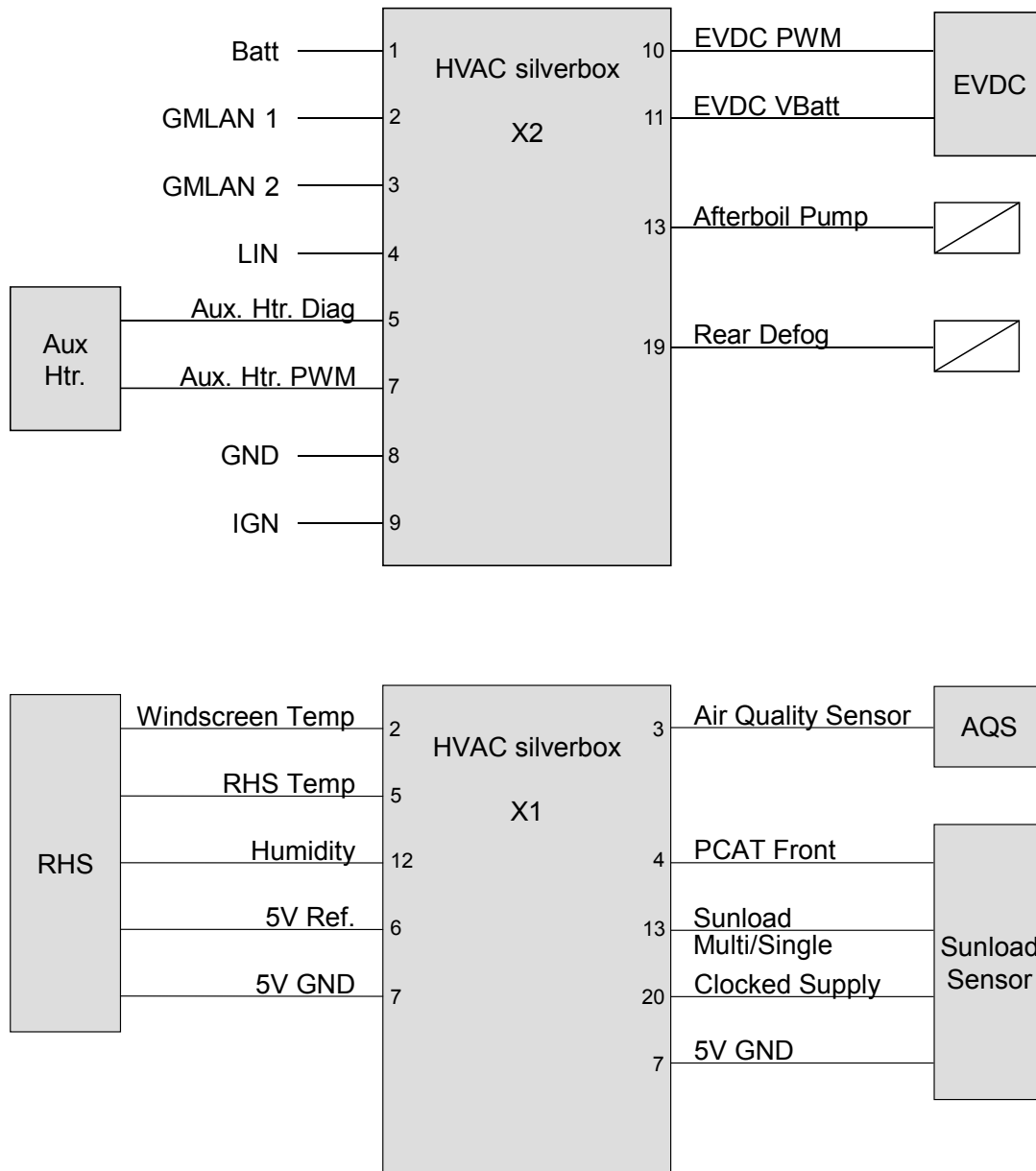
Legend

EVDC = Electronic Variable Displacement Compressor/Clutch
RHS = Relative Humidity Sensor
PCAT = Passenger Compartment Air Temperature Sensor

Front Zone:

DAT1 – LH Upper	X3-1	(Control 1..4)	X3-2..5	Stepper Mode 1

DAT1 – LH Upper
X3-1

DAT2 – LH Lower
X4-11

DAT3 – RH Upper
X4-9

DAT4 – RH Lower
X4-12

Evaporator
X3-20

5V GND
X3-9

HVAC silverbox
Front Zone

(Control 1..4)
X3-2..5
Stepper Mode 1

(Control 1..4)
X4-1..4
Stepper RAM

(Control 1..4)
X3-11..14
Stepper Temp 1

(Control 1..4)
X4-5..8
Stepper Temp 2

(Control 1..4)
X3-16..19
Stepper Recirc

Stepper Supply
X3-15

Front Blower Motor
X2-15
LPM Front

Rear Switches (option)

5V Ref.
X2-17

Blower
X1-8

Mode
X1-9

Temp.
X1-10

5V GND
X2-18

DAT5 - Rear Upper
X1-18

DAT6 - Rear Lower
X1-19

GND
X3-9

HVAC silverbox
Rear Zone
(only CJ4)

(Control 1..4)
X4-13..16
Stepper Rear Mode

Stepper Supply
X4-10

(Control 1..4)
X4-17..20
Stepper Rear Temp

Rear Blower Motor
X2-16
LPM Rear

Legend

DAT   =   Discharge/Duct Air Temperature Sensor
LPM   =   Linear Power Module (= controller of blower motor)
Stepper = Stepper Motor:

     Stepper Mode   =   controls air distribution mode by moving a vent flap
     Stepper Temp   =   controls outlet air temperature by moving a vent flap which mixes hot and cold air
     Stepper RAM   =   controls the amount of outside air by moving the flap
     Stepper Resirc   =   controls the amount of recirculation of compartment air by moving the flap

Functional description ECC

The functionality of the ECC is parted into several sub functions. Every sub function is briefly explained below.

A/C Compressor run-in

The A/C Compressor provides refrigerant mass flow to the Air conditioning refrigerant system if enabled. When the A/C Compressor is newly installed and the system is charged with refrigerant the compressor manufacturers require a low speed break-in period of operations. Therefore in the assembly plant the A/C Compressor needs to run for a certain period of time below a defined maximum operating speed. When the HVAC control is triggered to perform the A/C compressor Run-In operation, the HVAC controller shall monitor the engine speed and switch off the compressor operation if the engine speed exceeds a defined threshold. The controller shall have a timer which accumulates the time the compressor is running in this monitored speed mode. Once the timer reaches the required duration time for run-in, this operation shall be suspended and a diagnostic flag shall be set to indicate that the run-in was successful. During compressor run-in the A/C switch shall not command compressor operation. The Run-In operation shall also have a suspension mode to accommodate certain assembly operations. The refrigerant pressure shall be monitored during the run-in and minimum and maximum pressures shall be recorded.

After blow

The HVAC system is awakened from sleep mode after a period of time following ignition off and pulses the blowers for a period of time (front & rear) in order to remove moisture from the evaporator thus preventing mold growth. During the blower operation the vehicle ultrasonic theft detection must be disabled. Function is not activated by default. Need to be set by aftermarket.

Air conditioning

The A/C Compressor provides refrigerant mass flow to the Air conditioning refrigerant system when enabled. The requirement for the Air conditioning function can be initiated directly from the user (by button press), from operation interlocks with other customer control actions (e.g. customer request for defrosting), and from remote start events. The A/C compressor has the potential to utilize a fair amount of vehicle power and is typical driven

on the engine accessory drive. As such the power train ECM/PCM owns the hardware and software for compressor engagement. The HVAC function can issue a request for compressor but this request is always arbitrated by power train logic. The logic implemented for the Air conditioning function for both the HVAC control head as well as the PCM depend on the style of hardware implementation for the compressor. The PPEI interface specification is the basic document for this operation.

Air distribution mode

The HVAC system controls the direction of airflow into the vehicle based on user input using the buttons on the front of the HVAC controller. It can also be controlled due to Remote Start, Park Heater, Afterblow and Auto Climate control. The modes available for air direction are
- panel
- floor
- Bi-level
- Defog
- Windshield
- Tri-Level
- Hi-Level (panel + windshield)

Air recirculation

Air Recirculation is turned on via user input or due to remote start, comfort algorithm operation, Park heater operation or Auxiliary heater operation.

Auxiliary Heater

The electrical auxiliary heater (AHS) is utilized to provide enough heat quantity in the vehicle compartment at low outside temperatures. It provides support to the heat exchanger at low coolant temperatures. The system consists of Positive Temperature Coefficient semiconductors (PTC) that are controlled by an electrical control module and electrical power distributor.

Blower setting control

The HVAC system controls fan Blower Setting based on user input on the faceplate. Blower may also be activated for afterblow, park heater, rest heat, comfort algorithm, load shed or Remote Start. Blower setting is adjusted for OnStar hands free calling and air bag deployment.

Comfort control

The HVAC comfort control system collects user HVAC control settings information along with sensor information and other control function status information. With that information the comfort control determines the required state of the HVAC actuators, blowers, pumps etc. It also defines what information will be displayed or indicated back to the customer.

Comfort control handles these determinations for both front and auxiliary HVAC modules and associated control elements.

Data manager / Fail soft

The HVAC Data Manager / Fail Soft (FS) function provides basic input and strategic input fail soft values for the HVAC. CCA (Climate Comfort Application) should input signals that are missing or invalid. Data signals into the CCA which require filtering or failsofting will be passed from this routine. The routine shall also provide a validity flag for each signal passed into subsequent CCA routines to be used to trigger additional Fail Soft logic where the validity of a certain signal is critical to the function.

Driver personalization

Driver personalization includes the following two items:
1. Controller stores individual settings for multiple drivers
2. Controller allows settings to be customized by the driver either through a vehicle user interface or via a test tool at the dealership.

Driver temperature control

The HVAC system controls the driver temperature based on input from the user or comfort algorithm. It is also adjusted due to remote start, Park Heater, REST and afterblow.

Heater pump control

The mechanization defined in this section is applicable to all vehicle applications using a electrically driven coolant pump with Global A electrical architecture.

The Heater Core Coolant Pump Control is used to assist coolant flow for three major functions:
1. In Hybrid Vehicles this control will command the coolant pump to circulate engine coolant when the engine is off (Auto-stopped) and heat is required in the cabin for comfort.
2. In vehicles with REST functionality and coolant pump hardware, this control will command the coolant pump to circulate engine coolant when the engine is off and the REST function is active.
3. In conventional vehicles requiring heater core flow assist at idle, this control will command the coolant pump to circulate engine coolant in extremely cold conditions to supplement the mechanical engine coolant pump.

Idle boost

Upon entering the run power mode and vehicle speed above a calibratable value, the HVAC idle boost request level is constantly calculated. That calculation uses head pressure cals and the actual head pressure. Once the vehicle drops below a calibratable vehicle speed, the last calculated HVAC idle boost level is used as the AC request idle boost output.

Note: For HVAC controls without the capability to receive or transmit serial data, this idle boost functionality shall be implemented in another ECU, typically the BCM or IP Cluster ECU.

Lighting

The ECC controls both button and display backlight.

Load shed

The Load Shed feature reduces or eliminates loads controlled by the HVAC system. System loads are shed in an effort to preserve vehicle battery life.

Parking heater

The Parking Heater module provides heating to the passenger compartment when the vehicle is in off power mode. It is a fuel operated coolant heater combined with a coolant pump that circulates warm coolant through the heater core. The park heater can be activated through a timer or remote key fob.
The Parking Heater module can also be used as an auxiliary heater when the engine is running.

Passenger temperature control

The HVAC system controls the Passenger temperature based on input from the user or comfort algorithm. It is also adjusted due to remote start, Park Heater, REST and afterblow.

Rear blower setting

Rear Blower Setting can be controlled through two facets. The driver can deactivate the rear blower via controls in the front (zone button) and the rear passengers can control the rear blower via controls in the rear. There are two types of rear controls, one set is a discrete control and the other is 'smart' controls controlling a display.

Rear defog

The Rear Defog Control System utilizes a single zone backlight design, driven with a single or dual relay (tied to glass breakage feature) configuration. Additionally, up to two outside rear view mirrors can be heated if required. A switch for the customer to control the system is provided within the HVAC control head. Also included in the HVAC control head is an indicator to provide the customer with the current state of the system. The system is only operational when the ignition switch is in the run position and engine is running or during remote start.

Rear air distribution mode

Rear Air Distribution Mode is controlled through either Rear Discrete controls or through Rear Smart controls. Three modes are available to the rear occupants:
- floor
- vent
- Bi-Level.

Rear temperature control

The HVAC system controls the Rear temperature based on the input from the user or comfort algorithm. It is also adjusted due to remote start, Park Heater, REST and afterblow.

Regulated voltage control

The HVAC system will request a voltage boost if certain conditions exist. This can happen due to the current blower state, cooling operations, or rear defog operation.

Remote start

The Remote Vehicle Start function allows the customer to start the vehicle without using the ignition switch. It also allows starting up the vehicle heating or air conditioning system and other vehicle systems to provide the customer with a comfortable vehicle when they enter it.

Connectors and pin assignment ECC

X1…4
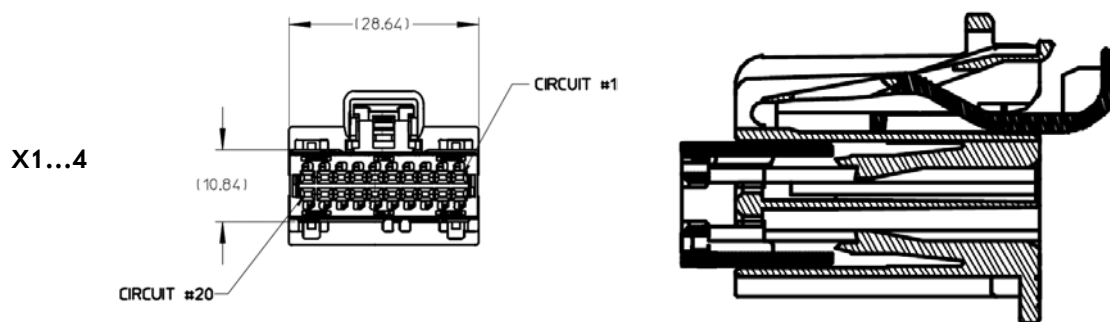
The four connectors are polarized. They differ in the position of their nibs and the connectors' color. Used colors are:

X1	X2	X3	X4
green	brown	black	gray

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
			mm²	Ω				mm²	
X1-1	7562	Pressure suction Sensor	Not connected in Saab 9-5						
X1-2	7565	Windscreen Temperature							
X1-3	5203	Air Quality Sensor							
X1-4	734	PCAT Front							
X1-5	3197	Humidity sensing temp signal							
X1-6	597	5V Ref. (Sensors)							
X1-7	7566/6102	5V GND (Sensor/Electrical)							
X1-8	760	Rear Blower Switch Position							
X1-9	2615	Rear Mode Switch Position							
X1-10	2214	Rear Temp Switch position							
X1-11	N/A	LSD Spare	Not connected in Saab 9-5						
X1-12	7564	Humidity							
X1-13	1783	Sun load: Multi zone/Single zone							
X1-14	N/A	Spare Analog 2	Not connected in Saab 9-5						
X1-15	N/A	Spare Analog 3	Not connected in Saab 9-5						
X1-16	A50	GND (option)	Not connected in Saab 9-5						
X1-17	N/C		Not connected in Saab 9-5						
X1-18	404	DAT 5 Rear Upper (or DAT2 with C68)							
X1-19	405	DAT 6 Rear Lower							
X1-20	590	Sun load clocked Supply							
X2-1	A40	BATT							

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge mm²	Max. Wire Resistance Ω	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge mm²	Pigtail Wire Color
X2-2	5060	GMLAN1							
X2-3	5060	GMLAN2							
X2-4	7531	LIN							
X2-5	3196	Auxiliary Heater Status Signal (Diagnostics)							
X2-6	N/A	LED out (PWM) Spare	Not connected in Saab 9-5						
X2-7	3195	Auxiliary Heater Control Signal (LSD PWM 150Hz only)							
X2-8	A50	GND							
X2-9	A41	IGN							
X2-10	7574	EVDC Compressor Drive LSD PWM							
X2-11	7573	EVDC Compressor VBATT							
X2-12	204	A/C Low Pressure Sensor Signal	Not connected in Saab 9-5						
X2-13	5127	Water pump/After Boil Pump LSD							
X2-14	N/A	HSD Spare	Not connected in Saab 9-5						
X2-15	754	Blower Motor Speed Control(LPM front)							
X2-16	2211	Rear Blower Motor Speed Control (LPM)							
X2-17	597	5V Ref. (Rear switches)							
X2-18	6559 [With RSA options] and 407 [w/o RSA option]	5V GND (Rear switches)							
X2-19	193	Rear Defog HSD							
X2-20	1596 and 3437	Water Valve/Thermal EXP HSD // Aero shutter							
X3-1	516	DAT 1 front upper left							
X3-2	3167	Actuator - Mode-1 (Control-1)							
X3-3	3165	Actuator - Mode-1 (Control-2)							
X3-4	3168	Actuator - Mode-1 (Control-3)							
X3-5	3166	Actuator - Mode-1 (Control-4)							
X3-6	N/A	Actuator - Air Inlet A	Not connected in Saab 9-5						
X3-7	N/A	Actuator - Air Inlet B	Not connected in Saab 9-5						
X3-8	N/A	Actuator - Air Inlet (Feedback)	Not connected in Saab 9-5						
X3-9	407	5V Gnd (Front Bi Directional motors, Evap)							
X3-10	598	5V Ref (Front Bi Directional motors, Evap)	Not connected in Saab 9-5						
X3-11	3169	Actuator Temp-1 (Control-1)							
X3-12	3170	Actuator Temp-1 (Control-2)							
X3-13	3171	Actuator Temp-1 (Control-3)							
X3-14	3172	Actuator Temp-1 (Control-4)							
X3-15	7572	Stepper Signal-Front							

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge mm²	Max. Wire Resistance Ω	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge mm²	Pigtail Wire Color
X3-16	3173	Actuator Air Inlet-1 (Control-1)							
X3-17	3174	Actuator Air Inlet-1 (Control-2)							
X3-18	3175	Actuator Air Inlet-1 (Control-3)							
X3-19	3176	Actuator Air Inlet-1 (Control-4)							
X3-20	6137	EVAP Core Temp							
X4-1	3177	Actuator - Mode-2 (Control-1)							
X4-2	3178	Actuator - Mode-2 (Control-2)							
X4-3	3179	Actuator - Mode-2 (Control-3)							
X4-4	3180	Actuator - Mode-2 (Control-4)							
X4-5	3181	Actuator - Temp-2 (Control-1)							
X4-6	3182	Actuator - Temp-2 (Control-2)							
X4-7	3183	Actuator - Temp-2 (Control-3)							
X4-8	3184	Actuator - Temp-2 (Control-4)							
X4-9	517	DAT3 - Front Upper Right (Pass)							
X4-10	7572	Stepper Signal-Rear							
X4-11	518	DAT2 - Front Lower Left (Driver) (Connected to X1 with C68)							
X4-12	520	DAT4 - Front Lower Right (Pass)							
X4-13	3185	Actuator - Mode-3 rear (Control-1)							
X4-14	3186	Actuator - Mode-3 rear (Control-2)							
X4-15	3187	Actuator - Mode-3 rear (Control-3)							
X4-16	3188	Actuator - Mode-3 rear (Control-4)							
X4-17	3189	Actuator -Temp-3 rear (Control-1)							
X4-18	3190	Actuator - Temp-3 rear (Control-2)							
X4-19	3191	Actuator -Temp-3 rear (Control-3)							
X4-20	3192	Actuator -Temp-3 rear (Control-4)							

EHS (Electrical Heater System)

The Electrical Heater System provides an auxiliary heater installed in the ventilation unit. Its purpose is to heat up the air flowing into passenger compartment while the engine is still heating up and not providing enough heated air.

Block diagram EHS
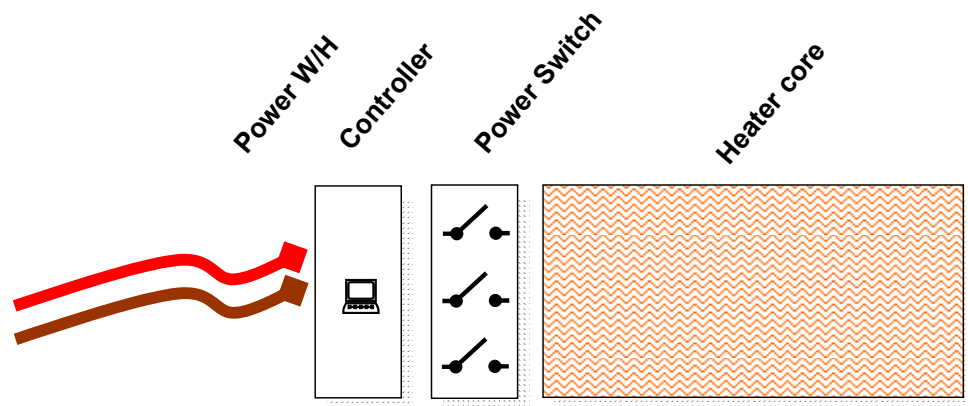
Functional description EHS

The Electric Heater System is controlled by the HVAC silverbox. It gets a PWM signal from ECC. EHS needs some requirements to be fulfilled to work. Otherwise the device will be disabled.

The requirements are:
- Outside Air Temperature <11°C
- Coolant Temperature <75°C
- Ignition "on"
- Engine Running "on"
- Engine Speed >500 rpm
- Engine Running Time <1h
- Battery Voltage between 9.2 and 16.1 V
- Temperature Mix Flap > 90% open
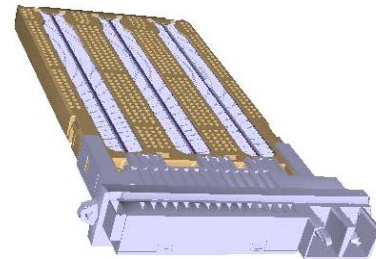
If all requirements are fulfilled, EHS is in "forced mode", which means that PWM signal has 100% duty cycle

In some cases, the PWM signal which powers the EHS will be reduced to a value lower than 95%. This is the so called controlled mode. Possible values to reduce PWM cycle are:

- battery state of charge sinks below 60%
- battery state of charge critically low bit is set

- battery load shedding level not 0 (level 1 – 80%, level 2 – 50%, level 3 – off)

Connectors and pin assignment EHS
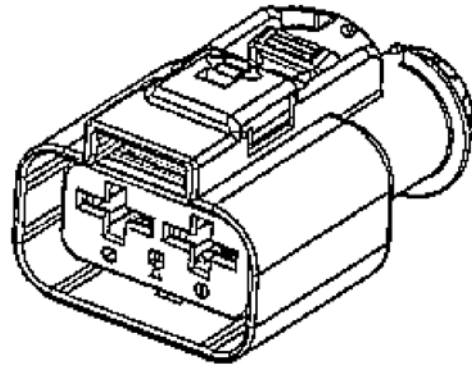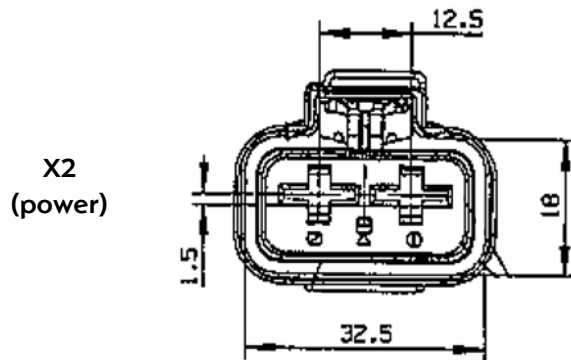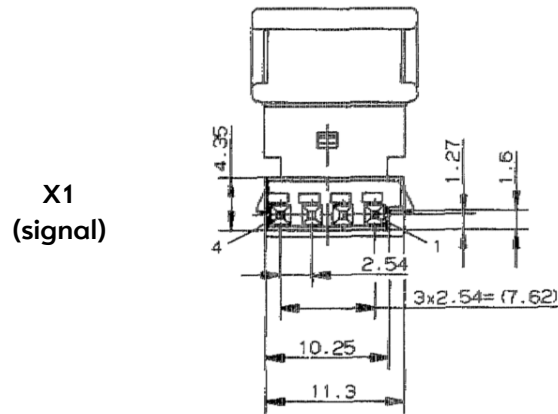
X1 (signal)

X2 (power)

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
X1-1	3195	Auxiliary Heater Control (PWM-signal)							
X1-2	A39	Battery Positive Voltage							
X1-3									
X1-4	3196	Auxiliary Heater Status Signal							
X2-1	A39	Battery							
X2-2	A50	Ground							

Smartbeam (HBSM)

HBSM (High Beam Select Module) includes the "smartbeam" functionality that automates the task of switching between high and low beam headlamp functions in response of detecting light sources, for instance the presence or absence of oncoming and preceding vehicles.

Detection is performed by a forward looking camera located in the inside rear view mirror.

Detection range > 400 meters.

The system only operates in "night" ambient light conditions and is functional when the main lighting switch is AUTO position.

High beams turn on when vehicle speed is above 40 km/h.

For systems that have a Bi-Xenon headlamp, the BCM will control the activation/deactivation of the high beams based on requests from the HBSM.

Inputs

Light source detection (HBSM)

Main Light Switch

Flash to Pass / High beam select stalk

Vehicle speed

| Smartbeam |
| Automatic High Beam Control |
| (BCM) |

Outputs

Smartbeam telltale

High Beam activation / deactivation

Activation/Deactivation of Smartbeam function

Presuming the ambient light condition is "night" and the Main Light Switch is in AUTO position, the Smartbeam functionality is activated when the ignition is turned to RUN.

The driver can deactivate the system manually by activating high beam via high beam stalk. It can be reactivated by pushing the high beam switch twice within two seconds.

Activation of either front or rear fog lamps also deactivates the Smartbeam.

The following conditions turn off the high beam:

- oncoming traffic detection
- preceding traffic detection
- village detection
- ambient light level too high (E.g. due to towns or twilight situations)
- vehicle speed < 22km/h

If the system detects fog or snow conditions, the smartbeam functionality is deactivated for 2 minutes. (No automatic high beam activation)

Smartbeam remembers its state (auto or manual) over ignition cycles.

Flowchart
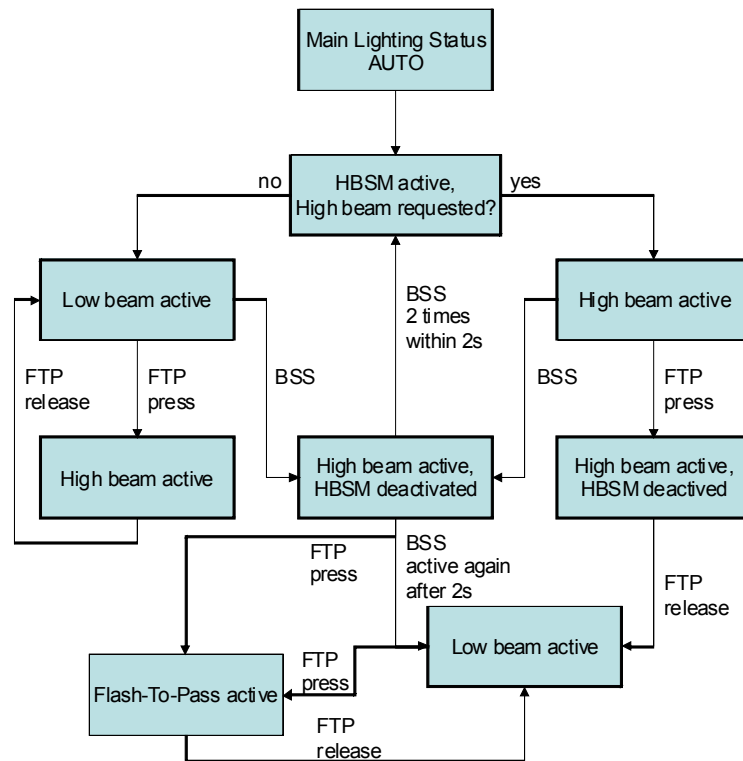
Smartbeam Telltale

The status of HBSM is shown by a green telltale in the IPC. If Smartbeam is active, the telltale will be switched on continuously. If the driver deactivates the system, the telltale will switch off.

Tourist mode

The tourist mode functionality switches the headlamps into a non dazzling mode, if the traffic regulation moves from Left Hand Traffic (LHT) to Right Hand Traffic (RHT) and vice versa.

Please see the description of AFL for further information on how to activate tourist mode.

Connectors and pin assignment HBSM
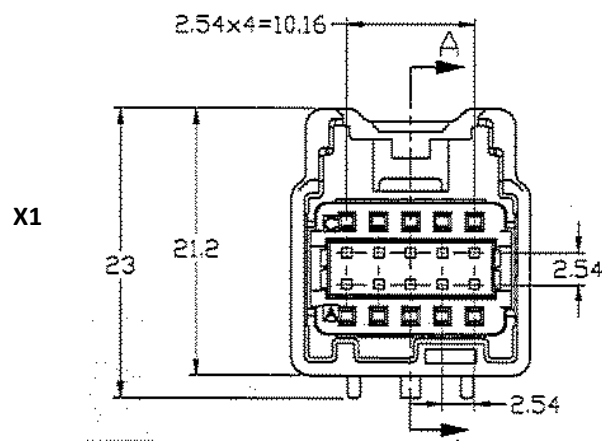

X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1		GMLAN In						0,35	
2	x51	Ground						0,35	
3	2514	Reserved for OnStar Keypad Out						0,35	
4	2515	Reserved for OnStar Keypad Power						0,35	
5		GMLAN Out						0,35	
6	2516	Reserved for OnStar Enabled (Green LED)						0,35	
7	2517	Reserved for OnStar Fault (Red LED)						0,35	
8	1691	OEC (-)						0,35	
9	1690	OEC (+)						0,35	
10		Battery						0,35	

HVSM + MSM (Heated/Ventilated Seat Module and Memory Seat Module)

The driver and passenger seat can be equipped with several features:
- memory function
- heating
- ventilation
-

These features are implemented by the Heated/Ventilated Seat Module and the Memory Seat Module. This chapter explains how the features work and which module will be assembled in order to fulfill customer's requests.

Block diagram HVSM

HVSM

BATTERY
BATTERY
FUSE
J1-2

GROUND A
J1-1

GMLAN 1 — J3-1
GMLAN 2 — J3-12

SPARE ANALOG INPUT 1 — J3-7
SPARE ANALOG GROUND RETURN — J3-15
SPARE LS INPUT 1 — J3-10
SPARE LS INPUT 2 — J3-9

VEHICLE BATTERY
LOGIC
Seat 1 Vent Motr Signal — J3-6

VEHICLE BATTERY
LOGIC
Seat 2 Vent Motr Signal — J3-5

J2-5 — Seat 2 Cushion Heat
J2-6 — Seat 2 Back Heat
J2-3 — Seat 1 Cushion Heat
J2-7 — Seat 1 Back Heat
J3-1 — Seat 1 Back Heat Temperature Sensor (See Note 1)
J2-11 — Seat 1 Back Heat Temp Sensor Ground (See Note 1)
J3-3 — Seat 1 Cushion Heat Temperature Sensor
J2-13 — Seat 1 Cushion Heat Temp Sensor Ground
J3-2 — Seat 2 Back Heat Temperature Sensor (See Note 1)
J2-12 — Seat 2 Back Heat Temp Sensor Ground (See Note 1)
J3-4 — Seat 2 Cushion Heat Temperature Sensor
J2-14 — Seat 2 Cushion Heat Temp Sensor Ground
J3-8 — Seat 2 Cushion Heat Temperature Redundant Sensor (See Note 2)
J2-15 — Seat 2 Cushion Heat Temperature Redundant Sensor Ground (See Note 2)
J2-1 — Seat 1 Back Heat Return
J2-9 — Seat 1 Cushion Heat Return
J2-2 — Seat 2 Back Heat Return
J2-10 — Seat 2 Cushion Heat Return

Single-Mode Heat

Dual-Mode Heat

Note 1 — These NTC sensors are only used for Dual-mode heat
Note 2 — This NTC sensor is optional

Block diagram MSM

Battery — 25A FUSE — BATTERY — J4-1
25A CKT BREAKER — POWER RAIL 1 BATTERY — J4-5

GROUND A — J4-3
GROUND B — J4-6
GMLAN-1 — J2-18
GMLAN-2 — J2-9
LIN — J1-11
SPARE ANALOG INPUT 1 — J2-6
SPARE ANALOG INPUT 2 — J1-14
SPARE ANALOG GROUND RETURN — J3-9
SPARE LS INPUT 1 — J2-2
SPARE LS INPUT 2 — J2-3
SPARE HS PWM — J2-10

Open (Not Connected)
Seat 1 Forward Switch — J2-1
Seat 1 Rearward Switch — J2-11

DRIVER SEAT POSITION SWITCH
Seat 1 Cushion Front Upward Switch — J1-2
Seat 1 Cushion Front Downward Switch — J1-12
Seat 1 Cushion Rear Upward Switch — J1-3
Seat 1 Cushion Rear Downward Switch — J1-4
Seat 1 Back Forward Switch — J1-7
Seat 1 Back Rearward Switch — J1-8

ADJUSTABLE PEDAL SWITCH
Pedals Forward Switch — J1-5
Pedals Rearward Switch — J1-6

DRIVER SEAT MEMORY SWITCH
Memory Switch Analog Ground — J3-7
Memory Set Position Switch — J2-4
SET
MEM1 MEM2 MEM3
Memory Seat Switch — J2-14

VEHICLE BATTERY
LOGIC
Seat 1 Vent Motor Signal — J1-10

VEHICLE BATTERY
LOGIC
Seat 2 Vent Motor Signal — J1-1

MSM LOW

J5-2 — Seat 1 Forward Motor
J5-1 — Seat 1 Rearward Motor
J1-15 — Seat 1 Forward/Rearward Position
J4-7 — Seat 1 Cushion Front/Tilt Upward Motor
J4-8 — Seat 1 Cushion Front/Tilt Downward Motor
J1-17 — Seat 1 Cushion Front/Tilt Upward/Downward Position
J5-4 — Seat 1 Cushion Rear/Cushion Height Upward Motor
J5-3 — Seat 1 Cushion Rear/Cushion Height Downward Motor
J1-16 — Seat 1 Cushion Rear/Cushion Height Upward/Downward Position
J5-5 — Seat 1 Back Forward Motor
J5-6 — Seat 1 Back Rearward Motor
J1-18 — Seat 1 Back Forward/Rearward Position
J1-13 — Motor Hall Position Sensor Power

J5-7 — Pedals Forward Motor
J5-8 — Pedals Rearward Motor
J2-5 — Pedals Forward/Rearward Position
J2-13 — Pedals Forward/Rearward Position Tracking
J1-9 — Motor Position Sensor Analog Reference Voltage
J3-8 — Motor Position Sensor Ground Return

J3-10 — Seat 2 Cushion Heat
J3-15 — Seat 2 Back Heat
J3-1 — Seat 1 Cushion Heat
J3-16 — Seat 1 Back Heat
J3-17 — Seat 1 Back Heat Temperature Sensor (See Note 1)
J3-14 — Seat 1 Back Heat Temp Sensor Ground (See Note 1)
J3-16 — Seat 1 Cushion Heat Temperature Sensor
J3-12 — Seat 1 Cushion Heat Temp Sensor Ground
J3-8 — Seat 2 Back Heat Temperature Sensor (See Note 1)
J3-13 — Seat 2 Back Heat Temp Sensor Ground (See Note 1)
J3-7 — Seat 2 Cushion Heat Temperature Sensor
J3-1 — Seat 2 Cushion Heat Temp Sensor Ground
J3-15 — Seat 2 Cushion Heat Temperature Redundant Sensor (See Note 2)
J3-2 — Seat 2 Cushion Heat Temperature Redundant Sensor Ground (See Note 2)
J3-6 — Seat 1 Back Heat Return
J3-5 — Seat 1 Cushion Heat Return
J3-4 — Seat 2 Back Heat Return
J3-3 — Seat 2 Cushion Heat Return

Single-Mode Heat

Dual-Mode Heat

Note 1 – These NTC sensors are only used for Dual-mode heat
Note 2 – This NTC sensor is optional

Functional description HVSM + MSM

Depending on requested options, different modules will be assembled. Both HVSM and MSM may provide seat heating and ventilation but only the MSM provides Memory functionality. The decision process to determine which module is assembled is shown in the picture on the right. The modules are mutually exclusive, so either a MSM or a HVSM will be assembled.

If a memory function is not desired, HVSM will be assembled. It provides both heat and ventilation functionality. The customer can choose between either heated or heated + ventilated seats.
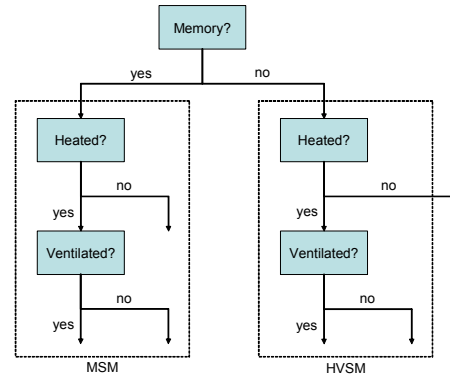
If a memory function shall be available, MSM has to be assembled. It has the same functions as HVSM and in addition MSM provides a memory function. So the available options are

- only memory function
- memory function + heated seats
- memory function + heated + ventilated seats

Heating and the memory function are available for all types of seats, but ventilation will only be allowed in perforated leather seats. Again, ventilation will only be available for the driver's seat.

Heating and Ventilation

The seats can be equipped with heating modules and a ventilator. The driver activates these devices with corresponding buttons on the HVAC faceplate. There are 3 activation steps for every function. Activated heating excludes ventilation and vice versa.

Memory function

The seats and mirrors are movable electrically. Memory function allows to save the actual seat and mirror position. By request, these settings can be restored. Therefore, switches are located at the seat.

On "Ignition Off", the actual seat and mirror position are saved.

Driver Easy Exit *

On "Ignition Off", the seat will move back for 8cm when the door is opened.

Comfort Closing (Mirror Folding) *

Mirrors will fold if the "comfort close" button is pressed on the remote key.

*Parking Tilt Mirrors ***

When the transmission goes into reverse gear, the mirrors will tilt down. Therefore, the driver has a better look on the curb. If reverse gear is left, the mirrors go back into "normal" position.

*Memory Remote Unlock Recall ***

If the doors are unlocked via remote key, the seats move back into the position that was saved on "Ignition Off". MSM will save different positions for every key.
Memory recall via remote will happen when the driver door is unlocked and open but not later than 2 minutes after unlock.

* These functions can be switched on/off via customization.

Connectors and pin assignment HVSM
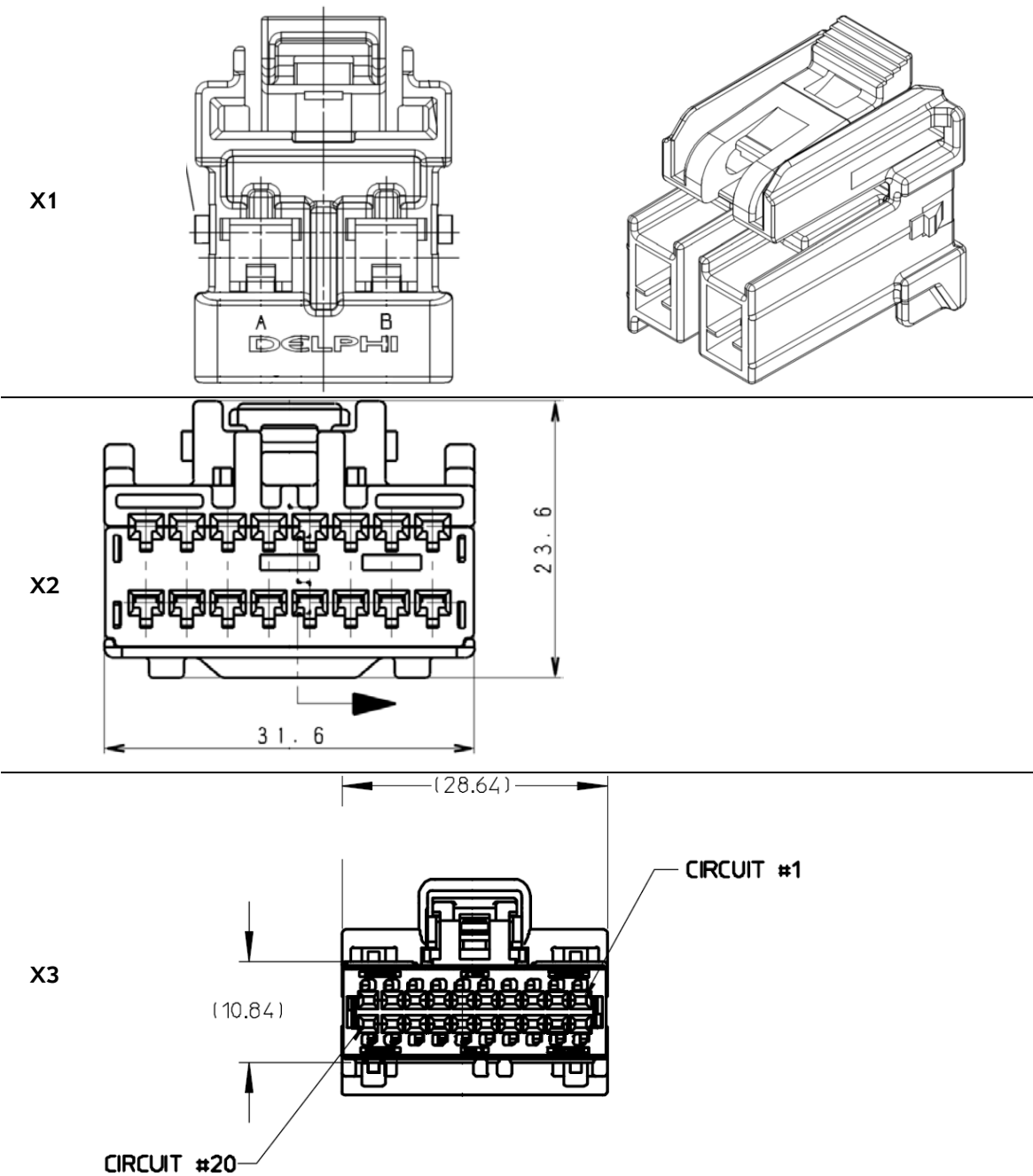
X1

X2

X3

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
X1-A	A50	Ground 1							

X1-B	A40	Battery Positive Voltage
X2-1	2424	Driver Heated Back Element Low Ref.
X2-10	NC	NC
X2-11	NC	NC
X2-12	NC	NC
X2-13	2080	Driver Heated Seat NTC Low Ref.
X2-14	2435	Pass. Heated Seat NTC Low Ref.
X2-15	NC	Pass. Heated Seat NTC 2 Low Ref.
X2-16	NC	Spare Analog Ground Return
X2-2	2433	Pass. Heated Back Element Low Ref.
X2-3	2077	Driver Heated Cushion Element Supply Volt.
X2-4	NC	NC
X2-5	2479	Pass. Heated Cushion Element Supply Volt.
X2-6	NC	NC
X2-7	NC	NC
X2-8	NC	NC
X2-9	NC	NC
X3-1	NC	NC
X3-10	NC	Spare LS Input 1
X3-11	5060	GMLAN 1
X3-12	NC	GMLAN 2
X3-2	NC	NC
X3-3	2079	Driver Heated Seat NTC Signal
X3-4	2434	Pass. Heated Seat NTC Signal
X3-5	5908	Pass. Seat Vent Motor Control **
X3-6	5906	Driver Seat Vent Motor Control **
X3-7	NC	Spare Analog Signal
X3-8	NC	Pass. Heated Seat NTC 2 Signal
X3-9	NC	Spare LS Input 2

** only connected for ventilated seats

Connectors and pin assignment MSM

X1 and X2

X3

X4 and X5

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
X1-1	5908	Pass. Seat Vent Motor Control 1 **							
X1-2	1518	Driver Seat Front Up Switch							

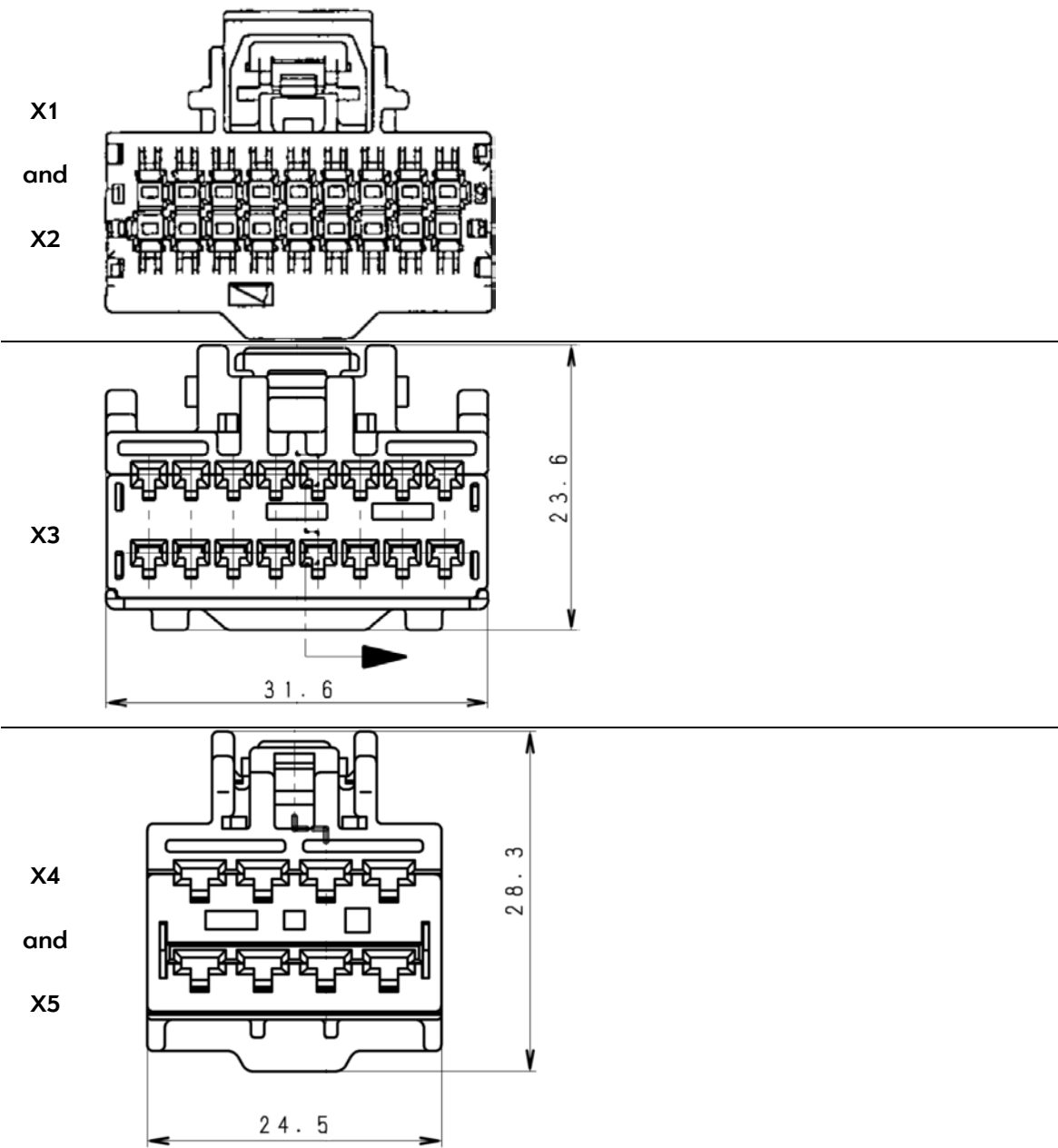| Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
X1-3	1519	Driver Seat Rear Up Switch							
X1-4	1521	Driver Seat Rear Down Switch							
X1-5	NC	NC							
X1-6	NC	NC							
X1-7	1269	Driver Recline Forward Switch							
X1-8	1270	Driver Recline Rearward Switch							
X1-9	NC	NC							
X1-10	5906	Driver Seat Vent Motor Control 1 **							
X1-11	7530	LIN Bus							
X1-12	1520	Driver Seat Front Down Switch							
X1-13		Hall Sensor Power							
X1-14	NC	Spare Analog Input							
X1-15	569	Driver Seat Horiz. Sensor							
X1-16	568	Driver Seat Rear Vertical Sensor							
X1-17	557	Driver Seat Front Vertical Sensor							
X1-18	570	Driver Seat Recline Sensor							
X2-1	1522	Driver Seat Horiz. Forward Switch							
X2-2	NC	Spare LS Input							
X2-3	NC	Spare LS Input							
X2-4	614	Memory Set Switch							
X2-5	NC	NC							
X2-6	NC	Spare Analog Input							
X2-7	2434	Pass. Heated Seat NTC Signal ***							
X2-8	NC	NC							
X2-9	NC	GMLAN 2							
X2-10	NC	Spare HS PWM							
X2-11	1523	Driver Seat Horiz. Rearward Switch							
X2-12	NC	NC							
X2-13	NC	NC							
X2-14	615	Memory Recall Switch Signal							
X2-15	NC	Pass. Heated Seat NTC 2 Signal ***							
X2-16	2079	Driver Heated Seat NTC Signal ***							
X2-17	NC	NC							
X2-18	5060	GMLAN 1							

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
X3-1	2435	Pass. Heated Seat NTC Low Ref. ***							
X3-2	NC	Pass. Heated Seat NTC 2 Low Ref. ***							
X3-3	NC	NC							
X3-4	2433	Pass. Heated Back Element Low Ref. ***							
X3-5	NC	NC							
X3-6	2424	Driver Heated Back Element Low Ref. ***							
X3-7	NC	Spare Analog Ground Return 1							
X3-8	NC	Spare Analog Ground Return 2							
X3-9	NC	Spare Analog Ground Return							
X3-10	2479	Pass. Heated Seat Element Supply Volt. ***							
X3-11	2077	Driver Heated Seat Element Supply Volt. ***							
X3-12	2080	Driver Heated Seat NTC Low Ref. ***							
X3-13	NC	NC							
X3-14	NC	NC							
X3-15	NC	NC							
X3-16	NC	NC							
X4-1	A40	Battery Feed							
X4-2	5978	Memory Recall Switch Return							
X4-3	NC	Ground							
X4-4	NC	NC							
X4-5	A40	Battery Feed 1							
X4-6	A50	Ground							
X4-7	286	Driver Seat Front Cushion Motor Up							
X4-8	287	Driver Seat Front Cushion Motor Down							
X5-1	284	Driver Seat Horiz. Motor Rearward							
X5-2	285	Driver Seat Horiz. Motor Forward							
X5-3	283	Driver Seat Rear Cushion Motor Down							
X5-4	282	Driver Seat Rear Cushion Motor Up							
X5-5	276	Driver Seat Recline Motor Forward							
X5-6	277	Driver Seat Recline Motor Rearward							
X5-7	NC	NC							
X5-8	NC	NC							

** only connected for ventilated seats
*** only connected for heated seats

IPC (Instrument Panel Cluster)

The Instrument Panel Cluster gives feedback about the status of the vehicle to the driver. For example, it displays velocity and engine speed as well as error messages and service hints.

Block diagram IPC

	Instrument Panel Cluster	
		Low Coolant Level
		Heated Washer
Batt →		Sensor Signal ← Outside Ambient Temperature
Run / Crank →		Low Reference →
GND →		Check Engine ←
GMLAN ↔		Low Washer Fluid ←
Wait to start →		Set/Clear, Up/Down Switch Signal ← DIC Switches
		Menu Switch Signal ←
		Low Reference →
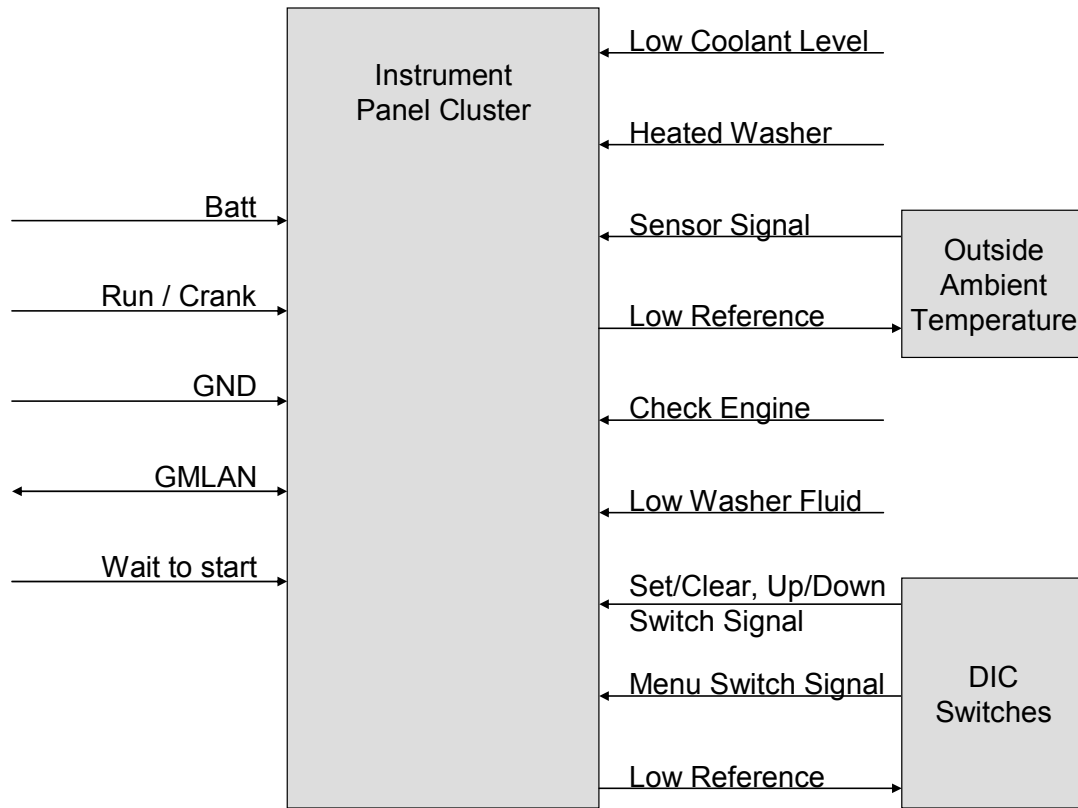
Functional description IPC

The IPC is parted into several sections. There are 3 round elements which display the following data (from left to right):

- engine speed
- vehicle speed
- fuel level in the lower left section, turbo speed in the upper section and engine coolant temperature in the lower right section
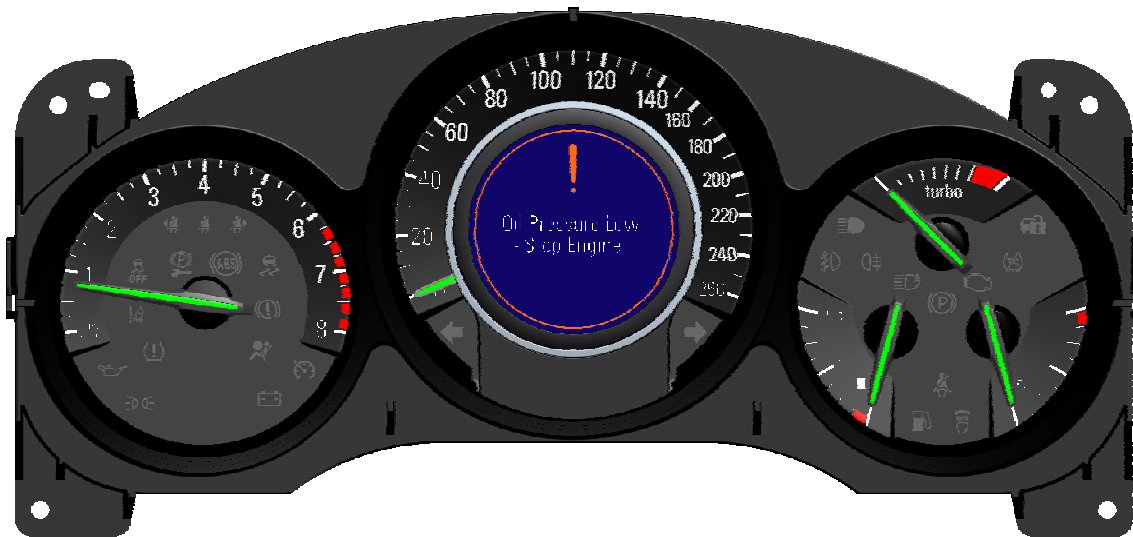
The telltales are included in these elements. In this chapter, the telltales will just be named. For more detailed information about them please see the chapters of the module or system they belong to.
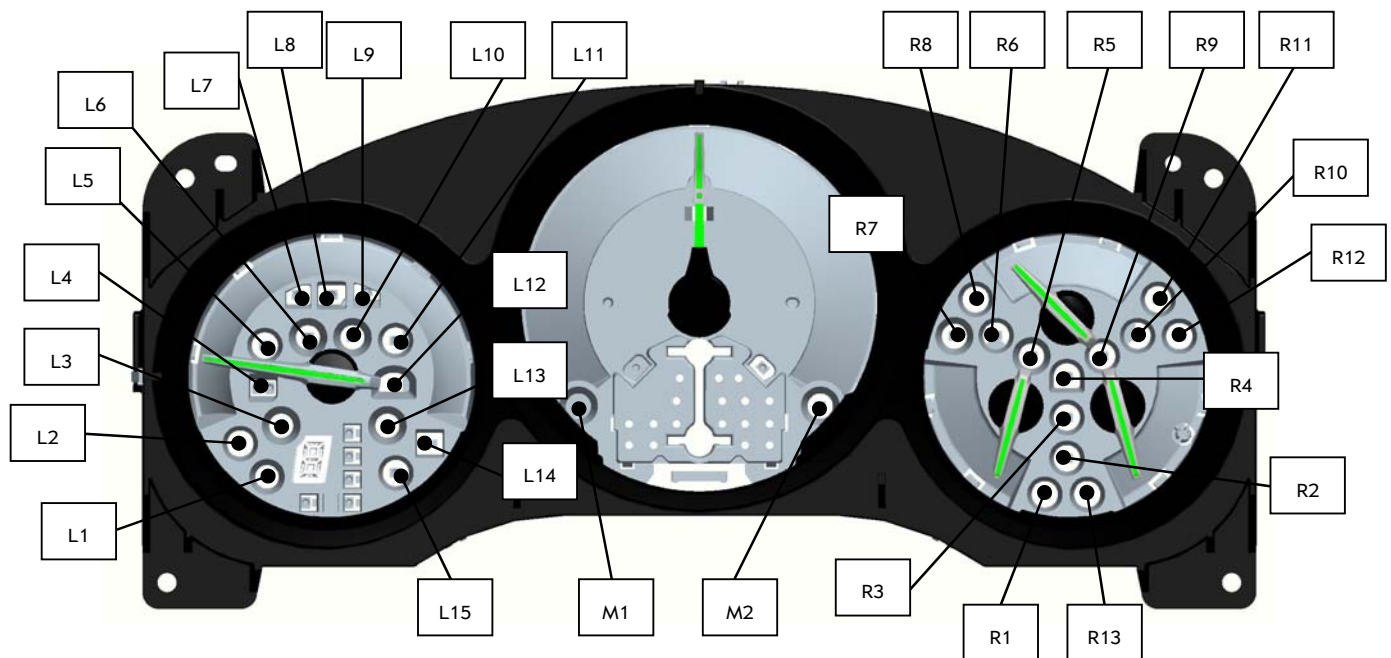
L1	Lights On (green)		**M1**	Turn Signal Left (green / white)
L2	Oil Pressure Low (red)		**M2**	Turn Signal Right (green)
L3	Tire Pressure Low (amber)		**R1**	Fuel Level Low (amber)
L4	Lane Departure Warning (green / amber)		**R2**	Driver Seat Belt (red)
L5	ESC Off (Vehicle Dynamic Caution) (amber)		**R3**	- - - - -
L6	Electrical Park Brake Service (amber)		**R4**	Electrical Park Brake On (red)
L7	Rear Passenger Seatbelt (red)			Electrical Park Brake On (red)
L8	Rear Passenger Seatbelt (red)		**R5**	Automatic Smart Beam (green)
L9	Rear Passenger Seatbelt (red)		**R6**	Rear Fog Lamps (amber)
L10	ABS (amber)		**R7**	Front Fog Lamps (green)
L11	ESC (Vehicle Dynamics Caution) (amber)		**R8**	High Beam (blue)
L12	Brake (red)		**R9**	Service Engine Soon (amber)
L13	Airbag (red)		**R10**	Traction Control Off (amber)
L14	Cruise Engaged (green)		**R11**	Security (amber)
L15	Battery (red)		**R12**	- - - - -
			R13	AFL Failure (amber)

This description represents telltale arrangement in Saab 9-5.

In the middle of the instrument, an additional display is installed. It's task is to give additional information, such as an odometer or error messages. This part of the IPC is available in 2 different variants, monochrome and color.

Monochrome	Color
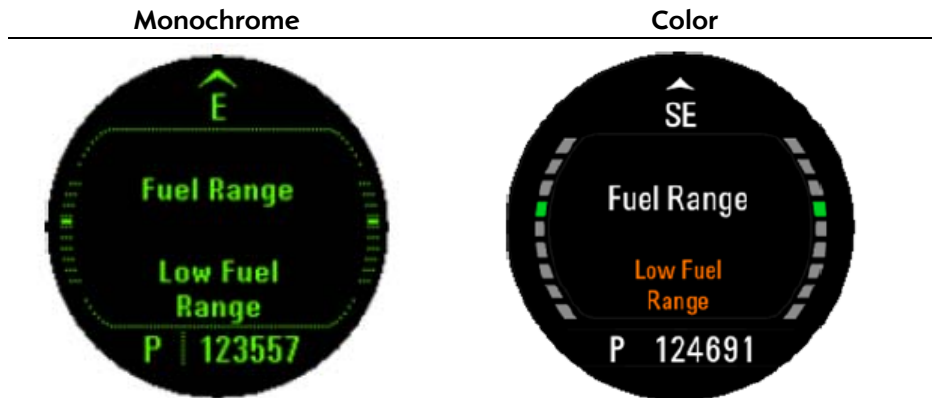
- Displaying Text & Icons
- Board computer
- Check messages
- Turn by Turn
- Compass, AFL, RSBR

- Displaying Text & Icons
- Board computer
- Check messages
- Turn by turn
- Traffic sign recognition
- Compass, AFL, etc.
- Trip/fuel information
- Distance to destination

Connectors and pin assignment IPC
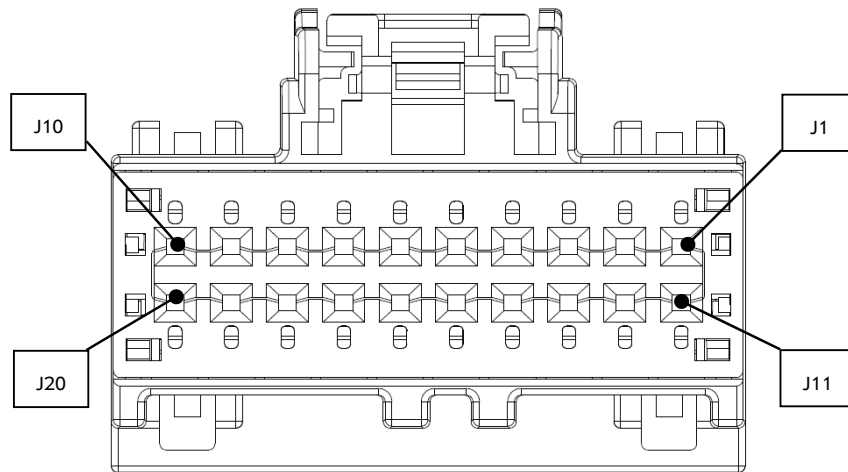
Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Maximum Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
		Harness Mating Connector Information							
1	5060	GM LAN - Low Speed GMLAN Serial Data							
2	5060	GM LAN - Low Speed GMLAN Serial Data							
3		Spare Digital Input							
4	1358	Analog DIC switch - Driver Information Center Switch Signal							
5	897	Analog DIC Return - Driver Information Center Switch Low Reference							
6	61	OAT Return - Outside Ambient Temperature Sensor Low Reference							
7	636	OAT Signal - Outside Ambient Air Temperature Sensor Signal							
8		Spare Analog Input							
9	1478	Low Coolant - Coolant Level Switch Signal - NOT USED							
10	1650	Ground - Ground1							
11	915	Cruise - Event - Active LED (Adaptive Cruise) - NOT POPULATED FOR FAMILY 3							
12	917	Cruise -Veh Ahd - Object Detected (Adaptive Cruise) - NOT POPULATED FOR FAMILY 3							
13	916	Cruise - Alert - Alert LED (Adaptive Cruise) - NOT POPULATED FOR FAMILY 3							
14	7594	Heated Washer - Heated Wash Indicator Control							
15	185	Washer Fluid - Low Washer Fluid Indicator Control							
16	893	Digital DIC Switch - Driver Information Center Select Menu Switch Signal							
17	419	Service Engine/MIL- Check Engine Indicator Control							
18	507	Glow Plug - Wait To Start Indicator Control - NOT USED							
19	139	Run/Start - Run/Crank Ignition 1 Voltage							
20	2840	Battery - Battery Positive Voltage							

PEPS (Passive Entry Passive Start)

The Passive Entry Passive Start subsystem provides enhanced customer convenience and security via a customer carried, passively enabled User Identification Device (UID). A valid UID allows access to the vehicle's passenger compartment, access to the vehicle's cargo compartment, and use of the vehicle's start / ignition interface.

Block diagram PEPS
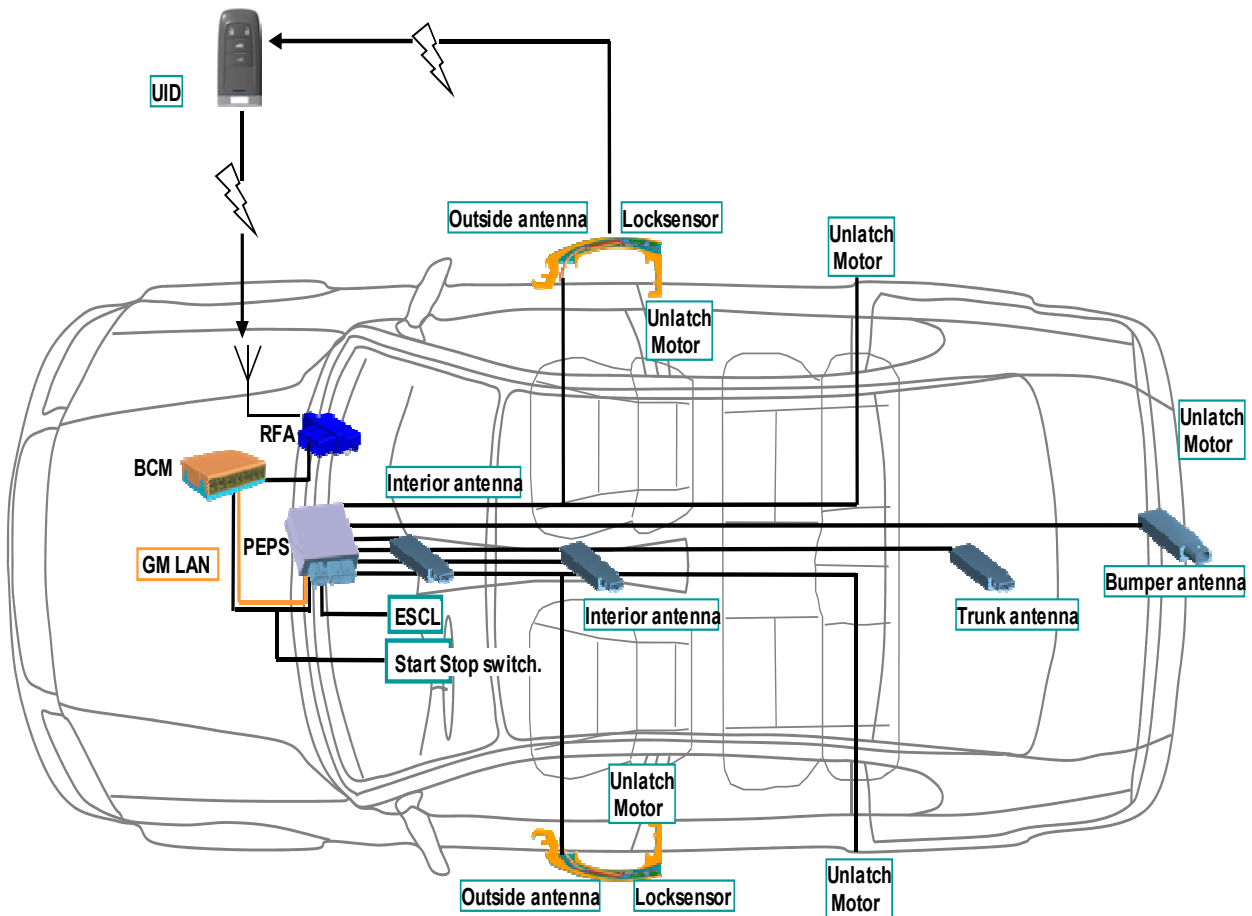
In Low Level variant, only the interior antennas will be utilized. See description starting on the next page for further information.

Functional description PEPS

The PEPS subsystem is responsible for authenticating the vehicle user through communication between the vehicle and the UID. Proper authentication in the presence of other customer inputs will then allow the user to control access to the vehicle as well as provide authorization to the Vehicle State Manager and Vehicle Theft Deterrent subsystems to control vehicle operation.

There are two versions of PEPS:
1. Low Level PEPS
   ⇨ provides "Passive Start"

2. High Level PEPS
   ⇨ provides "Passive Entry" and "Passive Start"

Powermoding

The figure below shows the User Interface Device (UID) authentication communication between the PMM and PEPS modules. This is needed to prevent unauthorized Power Moding changes upward from PM=OFF to ACC, RUN or CRANK REQUEST without a valid UID. It also is used to signal an absence of a valid UID. The PMM will send a serial data request to PEPS requesting UID authentication when needed.
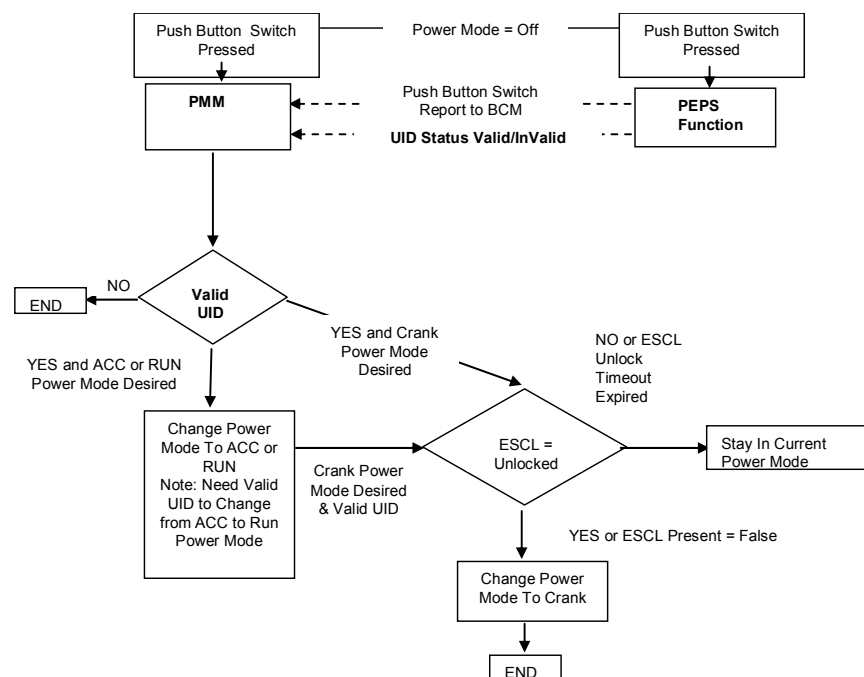
Open & Start Operation

Open the car:

UID is in Outside Detection Area and one door handle or trunk lid is pulled (anyone !)
⇨ Car unlocks

Note:
Car can be un-locked and locked as well from further distance by pressing buttons on UID (Remote function)

Operate the car:
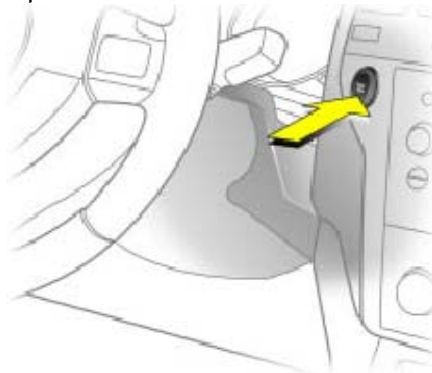
UID is in Inside Detection Area, Clutch pedal and/or brake engaged (Automatic in "P") and Start/Stop Button is pressed
⇨ Engine starts

Engine is running and Start/Stop Button is pressed
⇨ Engine stops

Close the car:

UID is in Outside Detection Area and Lock sensor on driver or co-driver handle is pushed
⇨ Car locks

Note:
Car can be un-locked and locked as well from further distance by pressing buttons on UID (Remote function)

Connectors and pin assignment PEPS

X1

X2

X3*

X4*
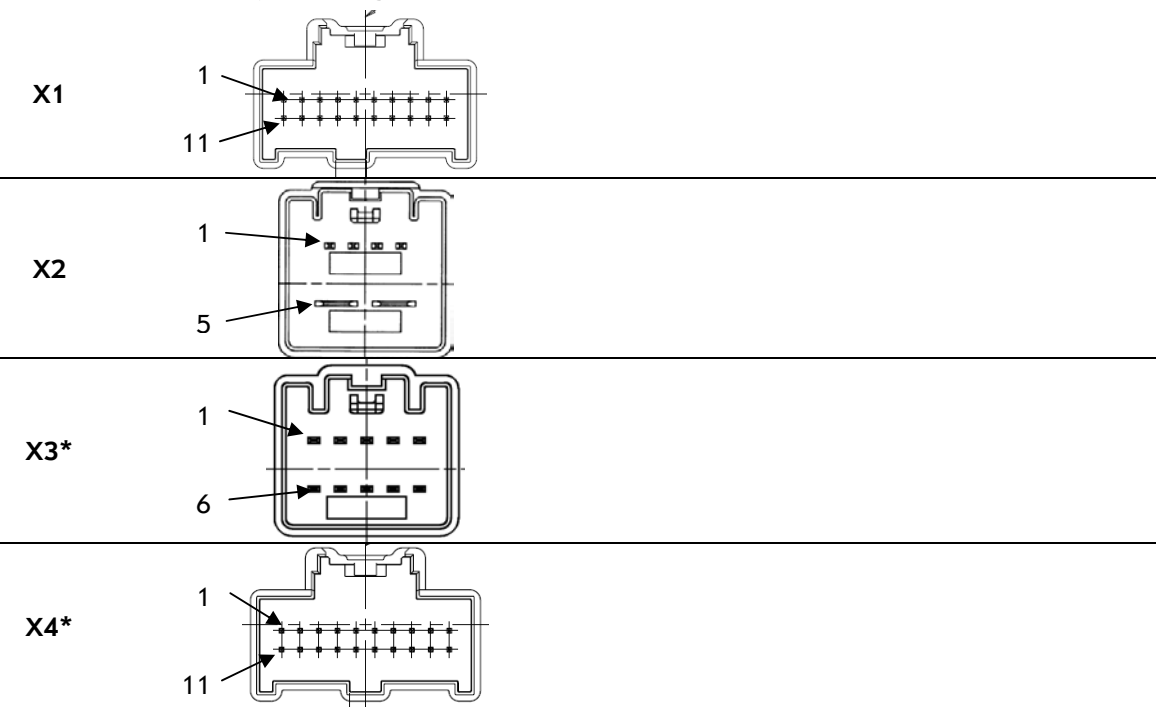
* only available in High Level PEPS

Cavity	Circuit #	Circuit Description
X1-01	1601	ESCL (Steering Column Lock Signal)
X1-02		n.c.
X1-03	5060	Low Speed GMLAN1 Serial Data
X1-04	5060	Low Speed GMLAN2 Serial Data
X1-05		n.c.
X1-06		Spare_HA1
X1-07		Spare_LA2
X1-08		Spare_LA1
X1-09	126	Driver_Door_Open (Left Front Door Open Switch Signal)
X1-10	1177	Co_Driver_Door_Open (Right Front Door Open Switch Signal)
X1-11	5724	Start_Stop_Switch (Ignition Mode Switch Mode Control)
X1-12	1798	Start_Stop_Reference
X1-13		n.c.
X1-14		n.c.
X1-15	6649	Interior Antenna2 Lo (Keyless Antenna Low Reference (7))

X1-16	6645	Interior Antenna1 Hi (Keyless Antenna Signal (6))
X1-17	6652	Interior Antenna1 Lo (Keyless Antenna Low Reference (6))
X1-18	6647	Interior Antenna3 Hi (Keyless Antenna Signal (8))
X1-19	6648	Interior Antenna3 Lo (Keyless Antenna Low Reference (8))
X1-20	6646	Interior Antenna2 Hi (Keyless Antenna Signal (7))
X2-01	1140	VBatt1 (Battery Positive Voltage)
X2-02	A51	Gnd1
X2-03	4	Accessory
X2-04	3	Run_Crank
X2-05	A40	VBatt2 (Battery Positive Voltage)
X2-06	1050	Gnd2
X3-01	6129	Rear_Closure_Unlatch_Hi (Rear Closure Unlatch Motor Latch Control) NOT USED
X3-02	6670	Right_Rear_Door_Unlatch_Hi (Right Rear Door Unlatch Motor Latch Control)
X3-03	6672	Left_Rear_Door_Unlatch_Hi (Left Rear Door Unlatch Motor Latch Control)
X3-04	6673	Co Driver_Door_Unlatch_Hi (Passenger Door Unlatch Motor Latch Control)
X3-05	6671	Driver_Door_Unlatch_Hi (Driver Door Unlatch Motor Latch Control)
X3-06	6128	Rear_Closure_Unlatch_Lo (Rear Closure Unlatch Motor Unlatch Control) NOT USED
X3-07	6669	Right_Rear_Door_Unlatch Lo (Right Rear Door Unlatch Motor Unlatch Control)
X3-08	6667	Left_Rear_Door_Unlatch Lo (Left Rear Door Unlatch Motor Unlatch Control)
X3-09	6668	Co_Driver_Door_Unlatch_Lo (Passenger Door Unlatch Motor Unlatch Control)
X3-10	6666	Driver_Door_Unlatch_Lo (Driver Door Unlatch Motor Unlatch Control)
X4-01	6658	Right_Rear_Door_Handle_Switch (Right Rear Door Unlatch Switch Signal)
X4-02	6656	Left_Rear_Door_Handle_Switch (Left Rear Door Unlatch Switch Signal)
X4-03	694	Driver_Door_Unlatch_Enable (Driver Door Unlatch Switch Signal)
X4-04	7576	Rear_Closure_Lock_Switch (Rear Passenger Door Lock Switch Lock Signal)
X4-05	244	Co_Driver_Door_Lock_Switch (Passenger Door Lock Switch Lock Control)
X4-06	218	Antenna_Driver_Door_Hi (Keyless Entry Antenna Signal (1))
X4-07	219	Antenna_Driver_Door_Lo (Keyless Entry Antenna Low Reference (1))
X4-08	5713	Antenna_Right_Rear_Lo (Keyless Entry Antenna Low Reference (4))
X4-09	5711	Antenna_Co_Driver_Door_Lo (Keyless Entry Antenna Low Reference (2))
X4-10	5712	Antenna_Left_Rear_Lo (Keyless Entry Antenna Low Reference (3))
X4-11	6657	Co_Driver_Door_Handle_Switch (Passenger Door Unlatch Switch Signal)
X4-12	6655	Driver_Door_Handle_Switch (Driver Door Unlatch Switch Signal)
X4-13		n.c.
X4-14	195	Non_Driver_Door_Unlatch_Enable (Door Lock Control)
X4-15	780	Driver_Door_Lock_Switch (Driver Door Lock Switch Lock Signal)
X4-16	5710	Ant_Rear_Closure_Hi (Keyless Entry Antenna Signal (5))
X4-17	5709	Antenna_Right_Rear_Hi (Keyless Entry Antenna Signal (4))
X4-18	5714	Ant_Rear_Closure_Lo (Keyless Entry Antenna Low Reference (5))
X4-19	5708	Antenna_Left_Rear_Hi (Keyless Entry Antenna Signal (3))
X4-20	5707	Antenna_Co_Driver_Door_Hi (Keyless Entry Antenna Signal (2))

PTM (Power Tailgate Module, only for 651 Wagon)

The Power Tailgate Module's main function is controlling the latch of the tailgate and reading the opening angle. As an option, PTM may be used to hydraulically open and close the tailgate.

Block diagram PTM
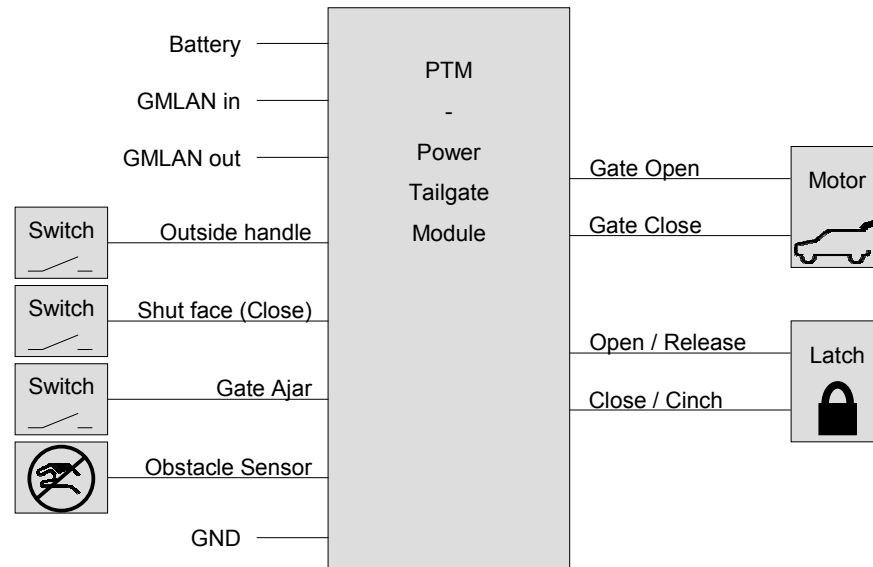
Functional description PTM

The Power Tailgate Module is available in two options:
- manual tailgate
- hydraulically powered tailgate

If a manual tailgate is desired, PTM is assembled because of its ability to release and cinch the latch. If the customer closes the tailgate and it is nearby the fully closed position, the latch "pulls" the tailgate into the lock. This prevents the tailgate from not being closed properly. PTM is also responsible for releasing the latch.

If the customer orders a powered tailgate, PTM additionally controls a hydraulic pump to open and close the tailgate. Motion requests may be initiated by various sources:
- outside handle switch (open)
- shut-face close switch (close)
- Key FOB (open and close)
- Switch in the passenger compartment (open and close)

In powered version, the power tailgate module also comes with an obstacle detection which is split into two functions:

- Sensing elements around the border of the tailgate
- Obstacle detection through counterforce determination

If an obstacle is detected, the tailgate will move on in reverse direction.

Beside the normal operation mode (power open and close), PTM provides some additional functions in powered version:

- Possibility to stop the tailgate in mid-travel position by pressing a switch
- Garage height programming by pressing the shut-face switch for at least 3 seconds
- manual open and close feature

Connectors and pin assignment PTM
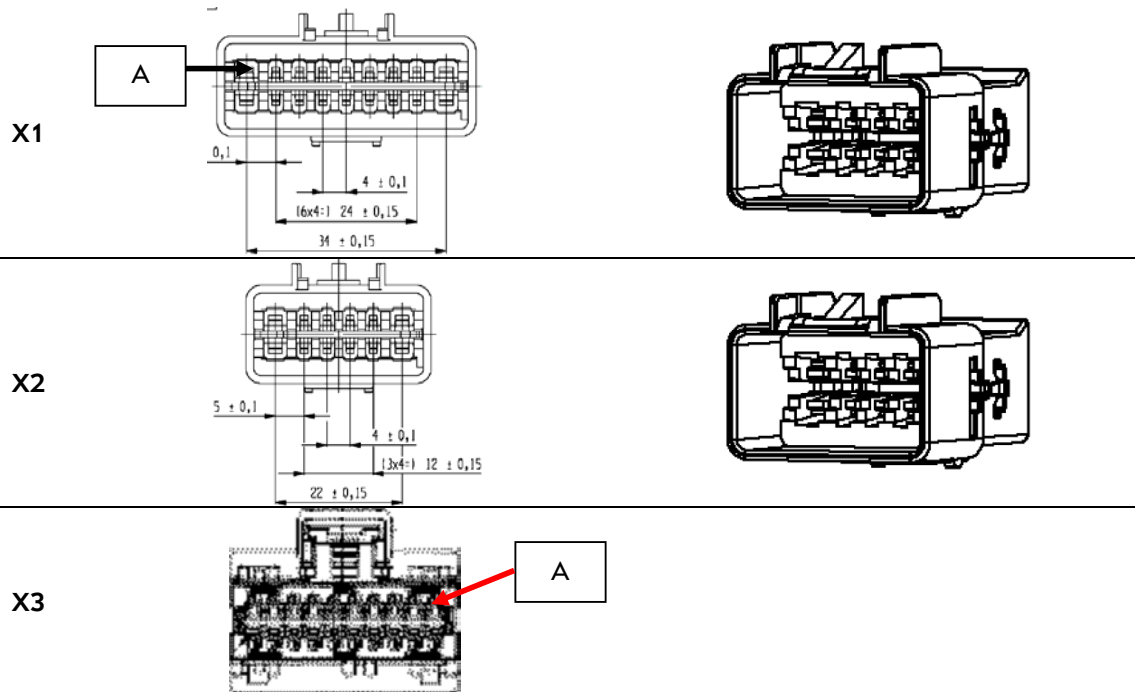
Cavity	Circuit #	Circuit Description	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
X1-A		Switch Return			Tin reflow	20	
X1-B	7000	Pawl Switch			Tin reflow	20 / 0,5mm²	
X1-C		Spare Discrete Input #2 *			Tin reflow	20	
X1-D	5512	Sector Switch			Tin reflow	20 / 0,5mm²	
X1-E		Liftglass Ajar Switch *			Tin reflow	20	
X1-F	5797	Liftgate Outside Handle Switch			Tin reflow	20 / 0,5mm²	
X1-G		Chime/Spare Output *			Tin reflow	20	
X1-H	5790	Latch Open/Release	A	C	Tin reflow	16 / 1mm²	
X1-J	5791	Latch Close/Cinch	A	C	Tin reflow	16 / 1mm²	
X1-K	6000	Ratchet Switch/Gate Ajar			Tin reflow	20 / 0,5mm²	
X1-L		Spare Discrete Input #1 *			Tin reflow	20	
X1-M	6126	Obstacle Sensor Signal			Tin reflow	20 / 0,5mm²	
X1-N		Drain (shield) wire for latch release & cinch		C	Tin reflow	16 / 1mm²	
X1-P	5797	Close Switch (Shut Face)			Tin reflow	20 / 0,5mm²	
X1-R		Liftgate Ajar Signal (to Wiper Module) *			Tin reflow	20	
X1-S		N/C					
X1-T		N/C					
X1-V		N/C					

X2-A	5060	GMLAN In			Tin reflow	20 / 0,5mm²	
X2-B		GMLAN Out			Tin reflow	20 / 0,5mm²	
X2-C		Garage Position/Spare Analog Input					
X2-D	6112	Open/Close Switch			Tin reflow	20 / 0,5mm²	
X2-E	9073	Power On/Off (Disable Switch)			Tin reflow	20 / 0,5mm²	
X2-F	750	GND			Tin reflow	12 / 4mm²	
X2-G		Power Low - VBATT1 (10A latch)			Tin reflow	16 / 1mm²	
X2-H		N/C					
X2-J		N/C					
X2-K		N/C					
X2-L		N/C					
X2-M	840	Power High - VBATT2 (20A liftgate)			Tin reflow	12 / 4mm²	
X3-A		N/C					
X3-B		N/C					
X3-C		N/C					
X3-D		Drain (shield) wire for gate open & close		D	Tin reflow	12	
X3-E		N/C					
X3-F		N/C					
X3-G	5798	Gate Open	B	D	Tin reflow	12 / 4mm²	
XJ3-H	5799	Gate Close	B	D	Tin reflow	12 / 4mm²	

* not use for 3710

SDM (Sensing & Diagnostic Module)

The sensing and diagnostic module recognizes car crashes using acceleration sensors. In case of emergency airbags and seat belt pretensioners are activated.

Block diagram SDM
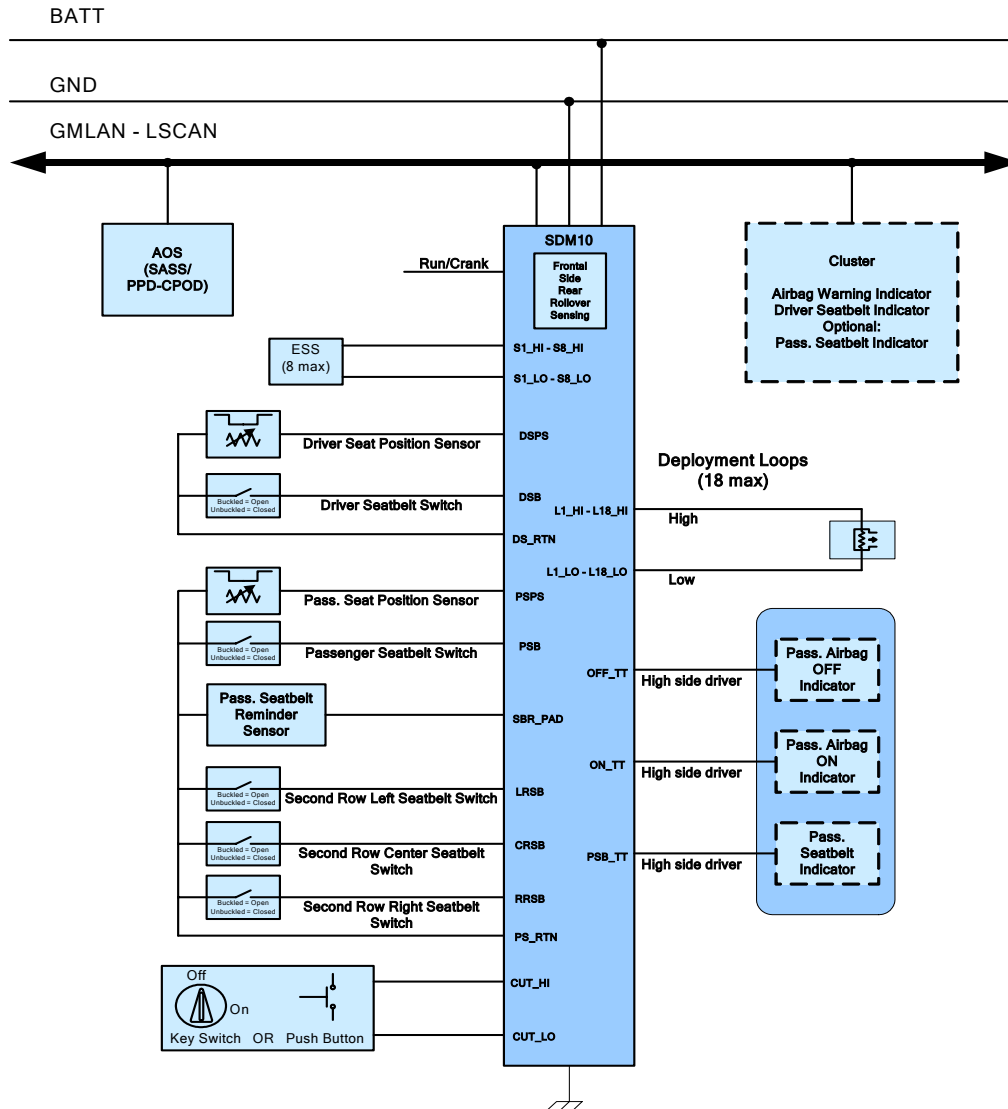
Functional description SDM

The SDM is connected to acceleration sensors located in b-pillar as well as in the front of the car and optionally in c-pillar. There is also an internal acceleration sensor in the module itself. Both sensors and actuators are directly connected to the module. Communication with other modules is realized via LS CAN.

The duty of SDM is to access the passive restraint systems (airbags and seat belt pretensioners). It distinguishes between front, side, roll or rear crash. In a crash up to 12 or 18 fire loops can be activated, depending on the hardware and what is calibrated by Cal-File.

Functions

- system diagnostics
- energy reserve for power supply of the fire loops
- passenger airbag deactivation via key switch
- seat belt reminder for driver, passenger and rear passengers
- immobilizer

Crash detection

SDM has to determine a signal from an external acceleration sensor and the internal sensor to activate a fire loop. Depending on the intensity of the crash, driver and passenger airbag can be activated in two steps.

The SDM consists of one or two microcontroller which evaluate the information of the sensors. Therefore a high level of security regarding the activation system is reached.

Activation of restraint systems

The restraint system is activated within ignition on and switched off through ignition off. The energy reserve of the fire loops is relieved very quickly.

For Saab vehicles based on Global Midsize platform, 16 fire loops can be activated. These are:
- front airbag driver (2 steps)
- front airbag passenger (2 steps, possibility to suppress by manual key switch)
- side airbag driver
- side airbag passenger (possibility to suppress by manual key switch)
- side airbag rear right
- side airbag rear left
- head airbag right
- head airbag left
- two seat belt pretensioners driver
- two seat belt pretensioners passenger
- rear seatbelt pretensioner

Suppress Passenger Airbags

The passenger airbags can be deactivated by using the key switch located at the side of the instrument panel. SDM allows changes of suppressed / not suppressed status in any ignition key condition.

The status of Passenger Airbag Activation is displayed by the two telltales next to Passenger Seat Belt Reminder telltale (see below).

Seat Belt Reminder

SDM provides seat belt reminder function. On "Ignition On" the SDM checks whether the occupants have buckled their seat belts via seat belt switch. The particular seats are checked within different conditions:
- Driver seat is always checked due to the fact that SDM assumes that the driver's seat is always occupied.

Passenger Seat is equipped with a seat occupant sensor ,Seatbelt Reminder Sensor (SBRS) or Automatic Occupant Sensing (AOS).
- It is only checked if the seat is occupied.
- Rear Passenger Seats have no sensor. SDM just checks, if the seat belts are fastened.

Reminder conditions and signaling are different within every seat position.

The seat belt function is provided in four different options, depending on regional requirements. There are two specifications for North America and one for Europe and one for Asia. This document concentrates on the "Euro Reminder".

Driver Seat Belt Reminder

During the first 4 seconds after "Ignition On" the SDM shall not command telltale or chime command. If the driver is still unfastened after this short time, the telltale will be turned on continuously. When the engine is turned on, the telltale will start flashing for 100 seconds and then turn continuously on. If the vehicle speed exceeds 22km/h or the traveled distance exceeds 250m, the telltale will start flashing again for 100 seconds and turn on after that. In addition, a chime command is sent which causes a gong for 100 seconds.

This sequence is started again, if the vehicle's speed is less than 22 km/h again and door lock status changes. In this case, the SDM will reset the traveled distance with unfastened seat belt to zero.
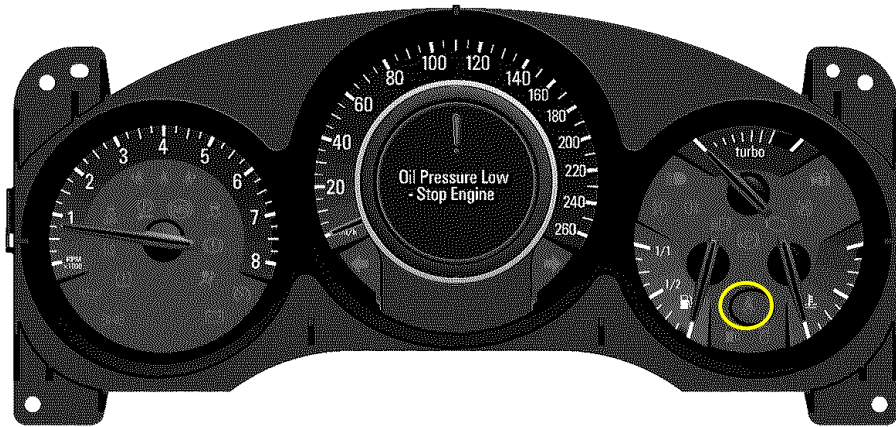
Passenger Seat Belt Reminder
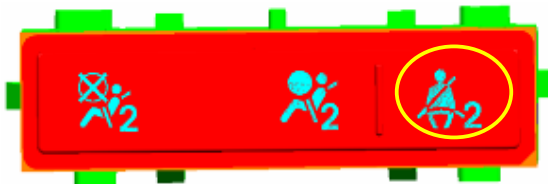
Passenger Seat Belt Reminder is specified with the same values as described in the section "Driver Seat Belt Reminder". Please see this section for detailed information. There are only two difference between the two functions:

- Passenger Seat Belt Reminder uses it's own telltale located in the roof center console of the vehicle.

Rear Passenger Seat Belt Reminder

When the engine is started, fastened rear passengers are announced by a green telltale in the DIC.
When a fastened rear passenger gets unfastened and speed >10 km/h, are it announced by a red telltale in the DIC/IPC and 3 seconds of chime.

Malfunction monitoring – Airbag telltale

On "Ignition On" a system check is done by the SDM. During that time (approx. 4 seconds) the airbag telltale is continuously on. After the check the telltale is switched off if no error has occurred. This check is repeated cyclically due to the specification. On any error the airbag telltale is activated. Depending on the error, the telltale is switched on for the duration of the error, as long as ignition is on or until the garage resets the error.

The airbag system stays active in spite of any error.

Immobilizer

This feature provides the capability to detect if modules have been substituted indicating a potential theft situation. The SDM supports this feature, as a configurable option, by

providing identification check when requested. The SDM stores two identifiers, Immobilizer Identifier (two bytes) and Environment Identifier (two bytes). These identifiers are automatically learned and stored when received over serial data while the SDM is in security access allowed state for vehicle theft deterrent functions. When the SDM is not in security access allowed state for vehicle theft deterrent functions, the SDM will respond with the Immobilizer Identifier / Environment Identifier check when requested.

Connectors and pin assignment SDM

X1

X2

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
	3023	Steering Wheel Module Stage 2 High Control			A*		Gold		
X1-1	3068	Driver Side Impact Module High Control			A*		Gold		
	3022	Steering Wheel Module Stage 2 Low Control			A*		Gold		
X1-2	3069	Driver Side Impact Module Low Control			A*		Gold		
X1-3	3020	Steering Wheel Module Stage 1 Low Control			B*		Gold		
X1-4	3021	Steering Wheel Module Stage 1 High Control			B*		Gold		
X1-5	3025	Passenger IP Module Stage 1 High Control			C*		Gold		
X1-6	3024	Passenger IP Module Stage 1 Low Control			C*		Gold		
	3026	Passenger IP Module Stage 2 Low Control			D*		Gold		
X1-7	3067	Passenger Side Impact Module Low Control			D*		Gold		
	3027	Passenger IP Module Stage 2 High Control			D*		Gold		
X1-8	3066	Passenger Side Impact Module High Control			D*		Gold		
X1-9	xx40	Battery			-		Gold		
X1-10	5234	Passenger Seat Belt Indicator. Notes: if separate AOS Display Module is used then this interface controls indicator directly otherwise uses GMLAN. Refer to mechanization drawing.			-		Gold		

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
X1-11	2307	Passenger Air Bag ON Indication Control			-		Gold		
X1-12	2308	Passenger Air Bag OFF Indication Control			-		Gold		
X1-13	371	Passenger IP Module Disable Switch Signal			-		Gold		
X1-14	7328	Passenger IP Module Disable Switch Return			-		Gold		
X1-15	5060	Low Speed GMLAN Serial Data			-		Gold		
X1-16	5060	Low Speed GMLAN Serial Data			-		Gold		
X1-17	xx39	Ignition Run / Crank - IGN1			-		Gold		
X1-18	N.C.	Not Applicable			-		Gold		
X1-19	xx51	SDM - Ground			-		Gold		
X1-20	N.C.	Not Applicable			-		Gold		
X1-21	3078	Driver Knee Module High Control			E*		Gold		
X1-22	3079	Driver Knee Module Low Control			E*		Gold		
X1-23	3077	Passenger Knee Module Low Control			F*		Gold		
X1-24	3076	Passenger Knee Module High Control			F*		Gold		
X2-1	5155	Left Rear Seat Belt Pretensioner Control			G*		Gold		
X2-2	5156	Left Rear Seat Belt Pretensioner Low Reference			G*		Gold		
X2-3	5226	Right Rear Side Impact SIR Inflator Control			H*		Gold		
X2-4	5225	Right Rear Side Impact SIR Inflator Supply Voltage			H*		Gold		
X2-5	5157	Right Rear Seat Belt Pretensioner Control			I*		Gold		
X2-6	5158	Right Rear Seat Belt Pretensioner Low Reference			I*		Gold		
X2-7	5224	Left Rear Side Impact SIR Inflator Control			J*		Gold		
X2-8	5223	Left Rear Side Impact SIR Inflator Supply Voltage			J*		Gold		
X2-9	3481	Driver Seat Belt Anchor Pretensioner High Control			K*		Gold		
X2-10	3482	Driver Seat Belt Anchor Pretensioner Low Control			K*		Gold		
X2-11	3480	Passenger Seat Belt Anchor Pretensioner Low Control			L*		Gold		
X2-12	3479	Passenger Seat Belt Anchor Pretensioner High Control			L*		Gold		
X2-13	3068	Driver Side Impact Module High Control			M*		Gold		
X2-14	3069	Driver Side Impact Module Low Control			M*		Gold		
X2-15	3067	Passenger Side Impact Module Low Control			N*		Gold		
X2-16	3066	Passenger Side Impact Module High Control			N*		Gold		
X2-17	5019	Left Front Head Curtain Module High Control			O*		Gold		

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
X2-18	5020	Left Front Head Curtain Module Low Control			O*		Gold		
X2-19	2132	Left Front Side Impact Sensing Module Signal			P		Gold		
X2-20	6628	Left Front Side Impact Sensing Module Low Reference			P		Gold		
X2-21	6629	Right Front Side Impact Sensing Module Low Reference			Q		Gold		
X2-22	2134	Right Front Side Impact Sensing Module Signal			Q		Gold		
X2-23	354	Left Front Discriminating Sensor Signal			R		Gold		
X2-23	6618	Middle Front Discriminating Sensor Signal			R		Gold		
	5045	Left Front Discriminating Sensor Low Reference			R		Gold		
X2-24	6619	Middle Front Discriminating Sensor Low Reference			R		Gold		
X2-25	5600	Right Front Discriminating Sensor Low Reference			S		Gold		
X2-26	1409	Right Front Discriminating Sensor Signal			S		Gold		
X2-27	6620	Left Middle Side Impact Sensing Module Signal			T		Gold		
X2-28	6621	Left Middle Side Impact Sensing Module Low Reference			T		Gold		
X2-29	6625	Right Middle Side Impact Sensing Module Low Reference			U		Gold		
X2-30	6624	Right Middle Side Impact Sensing Module Signal			U		Gold		
X2-31	6622	Left Rear Side Impact Sensing Module Signal			V		Gold		
X2-32	6623	Left Rear Side Impact Sensing Module Low Reference			V		Gold		
X2-33	N.C.	Not Applicable			-		Gold		
X2-34	N.C.	Not Applicable			-		Gold		
X2-35	N.C.	Not Applicable			-		Gold		
X2-36	N.C.	Not Applicable			-		Gold		
	3064	Driver Seat Belt Buckle Pretensioner High Control			W*		Gold		
X2-37	3477	Driver Seat Belt Retractor Pretensioner High Control			W*		Gold		
X2-38	3065	Driver Seat Belt Buckle Pretensioner Low Control			W*		Gold		

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
	3478	Driver Seat Belt Retractor Pretensioner Low Control			W*		Gold		
	3063	Passenger Seat Belt Buckle Pretensioner Low Control			X*		Gold		
X2-39	3476	Passenger Seat Belt Retractor Pretensioner Low Control			X*		Gold		
	3062	Passenger Seat Belt Buckle Pretensioner High Control			X*		Gold		
X2-40	3475	Passenger Seat Belt Retractor Pretensioner High Control			X*		Gold		
X2-41	238	Driver Seat Belt Switch Signal			-		Gold		
X2-42	5055	Driver Seat Position Switch Signal			-		Gold		
X2-43	1363	Driver Seat Belt Switch Low Reference + Driver Seat Position Switch Return			-		Gold		
X2-44	1361	Passenger Seat Belt Switch Low Reference + Passenger Seat Position Switch Return + Passenger Seat Belt Reminder Pad Return + Rear Seat Belt Reminder Switch Return			-		Gold		
X2-45	1362	Passenger Seat Belt Switch Signal			-		Gold		
X2-46	5056	Passenger Seat Position Switch Signal			-		Gold		
X2-47	7571	Passenger Seat Belt Reminder Signal			-		Gold		
X2-48	5163	Center Rear Seat Belt Switch Signal			-		Gold		
X2-49	5161	Left Rear Seat Belt Switch Signal			-		Gold		
X2-50	5162	Right Rear Seat Belt Switch Signal			-		Gold		
X2-51	6627	Right Rear Side Impact Sensing Module Low Reference			Y		Gold		
X2-52	6626	Right Rear Side Impact Sensing Module Signal			Y		Gold		
X2-53	5021	Right Front Head Curtain Module High Control			Z*		Gold		
X2-54	5022	Right Front Head Curtain Module Low Control			Z*		Gold		

* Denotes optional twist requirement

TIM (Trailer Interface Module)

The TIM provides high side drivers to supply the trailer or rear end carrier. In the station wagon it also controls the additional lamps in the rear compartment. Therefore two versions of the TIM are developed – TIM1 and TIM2.

Block diagram TIM
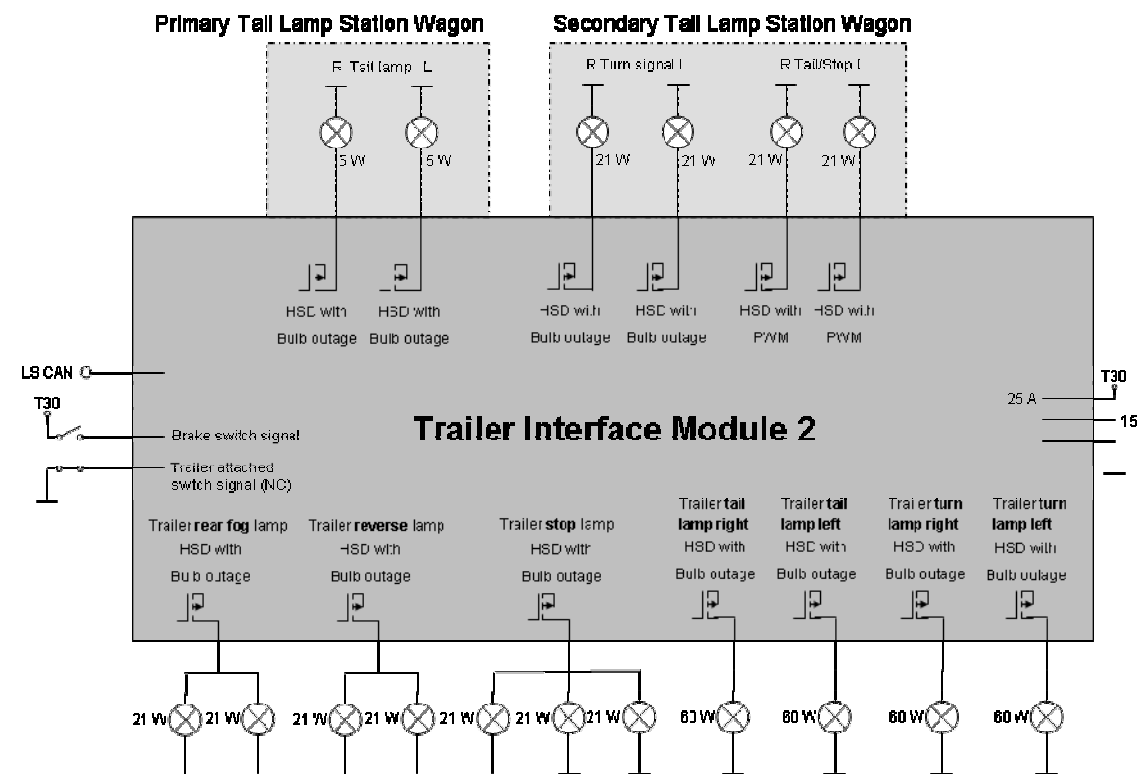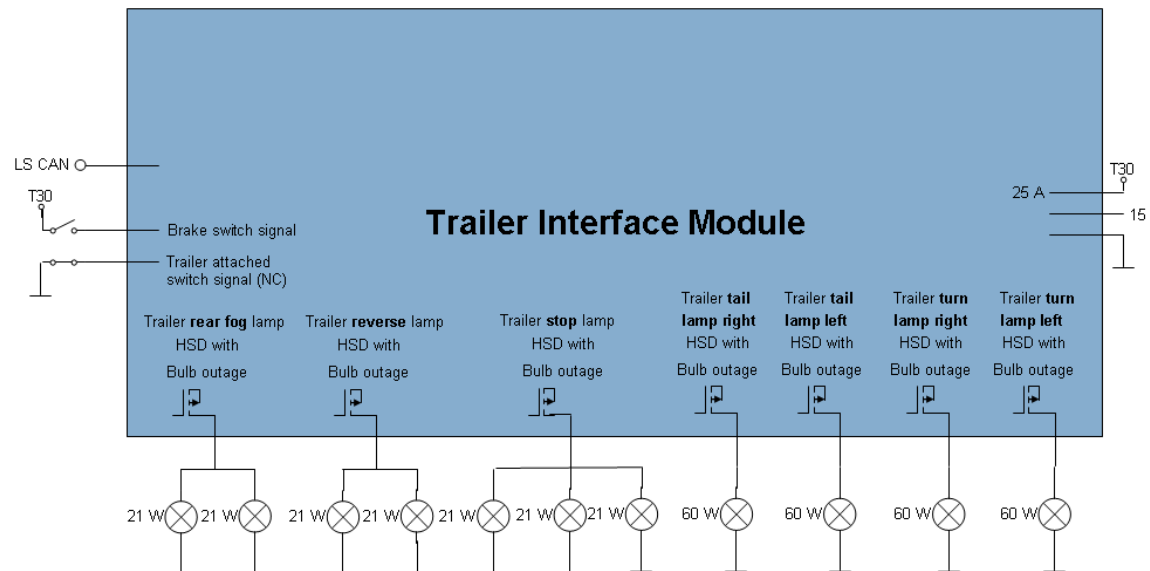
Functional description TIM

There are two different types of the Trailer Interface Module - TIM1 and TIM2.

TIM1 is an optional stand alone unit of body electronics. The unit provides exterior lighting for a trailer or rear end carrier.
It shall convert the CAN bus control commands into analogue signals to drive the connected trailer lamps via trailer hitch socket.
In addition it shall be able to detect whether a trailer is attached.
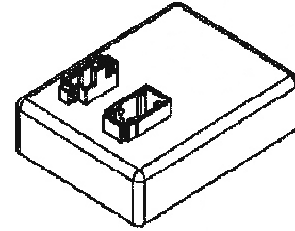
The technical requirements of TIM1 are:
- Provide high side drivers to supply the exterior lighting of the trailer
- Detect attached trailer via bulb outage detection or micro switch located in the rear socket or pin 12 ground feedback
- Bulb outage detection Turn trailer lamps (warm detection and cold detection)
- Receive/transmit low speed single wire CAN bus commands including wake-up feature (29 bit)
- Open load, short to battery, short to ground detection of all inputs and outputs
- Provide GMLAN CAN bus diagnostics (11 bit)

The options, that necessitate TIM1 are:
- VK0 = swivel type trailer hitch
- VQ9 = removable hook type
- D8G = rear end carrier

TIM2 is a body electronics unit that is developed especially for all Global A station wagons. The unit provides exterior lighting for a trailer or rear end carrier and in addition compared to the TIM1 it shall also supply and control the 'secondary tail lamps' of the station wagon that are located in the rear compartment. The necessity of the TIM2 development is based on legal requirements that cannot be fulfilled with the 3710 hatch design otherwise (tail lamps completely located in the tailgate).
It shall convert the CAN bus control commands into analogue signals to drive the connected trailer lamps via trailer hitch socket as well as the secondary tail lamps of the station wagon. In addition it shall be able to detect whether a trailer is attached and monitor the tailgate opening angle. It shall also be able to drive LED as secondary lamps alternatively.

In addition to TIM1 there are more technical requirements:
- Provide high side drivers to supply the primary tail lamps of the station wagon
- Provide high side drivers to supply the secondary tail lamps of the station wagon
- Monitor the opening angle of the tailgate to determine lamps activation
- Request the BCM to disable primary lamps at a calibrateable opening angle of the hatch
- Bulub outage detection of the turn indicators in the secondary lamp and also the primary tail lamps of the vehicle
- Provide a PWM output to control two single filament bulbs (21W each) for tail and stop light in the secondary lamp

TIM2 is assembled in all station wagons.

Connectors and pin assignment TIM
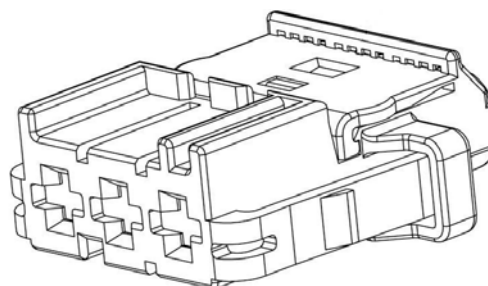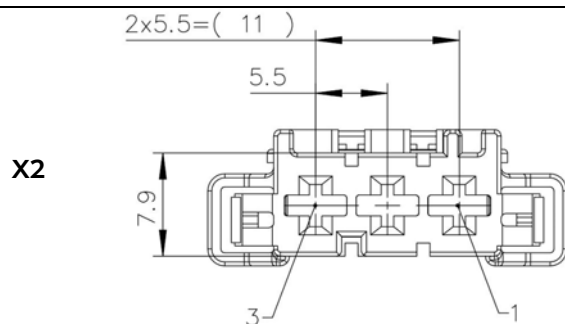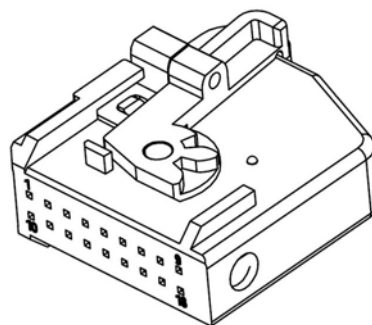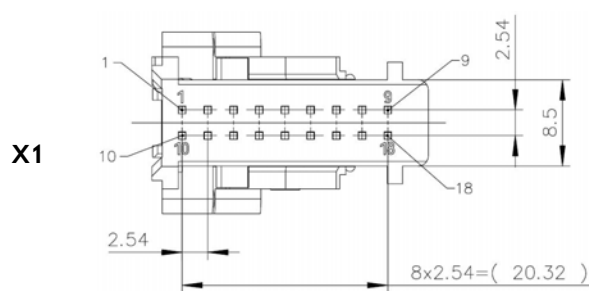
Cavity	Circuit #	Circuit Description	Minimum Wire Gauge mm²	Max. Wire Resistance Ω	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge mm²	Pigtail Wire Color
X1-1	5060	Low Speed GMLAN Serial Data	0,75		n.a.	n.a.	ZnCu36	n.a.	n.a.
X1-2	5187	Right Trailer Turn Signal Lamp	0,75		n.a.	n.a.	SeCu	n.a.	n.a.
X1-3		Right Primary Tail Lamp	2,5		n.a.	n.a.	SeCu	n.a.	n.a.
X1-4	5184	Left Trailer Park Lamp	2,5		n.a.	n.a.	SeCu	n.a.	n.a.
X1-5		TailGate Position Switch (not used)	0,75						
X1-6		Right Secondary Tail/Stop Lamp	0,75						
X1-7	5189	Trailer Backup Lamp	0,75						
X1-8	5190	Trailer Fog Lamp	0,75						
X1-9		Left Secondary Tail/Stop Lamp	0,75						
X1-10	5188	Trailer Brake Lamp	0,75		n.a.	n.a.	ZnCu36	n.a.	n.a.
X1-11		Left Primary Tail Lamp	0,75		n.a.	n.a.	ZnCu36	n.a.	n.a.
X1-12	5992	Trailer Connected Signal	0,75		n.a.	n.a.	ZnCu36	n.a.	n.a.
X1-13	A39	Run/Crank Ignition 1 Voltage	0,75		n.a.	n.a.	ZnCu36	n.a.	n.a.
X1-14	5065	Stop Lamp Relay Coil Supply Voltage	0,75		n.a.	n.a.	ZnCu36	n.a.	n.a.

X1-15		Right Secondary Turn Signal Lamp	0,75		n.a.	n.a.	ZnCu36	n.a.	n.a.
X1-16	5185	Right Trailer Park Lamp	0,75		n.a.	n.a.	ZnCu36	n.a.	n.a.
X1-17	5186	Left Trailer Turn Signal Lamp	0,75		n.a.	n.a.	ZnCu36	n.a.	n.a.
X1-18		Left Secondary Turn Signal Lamp	0,5		n.a.	n.a.	ZnCu36	n.a.	n.a.
X2-1	A50	GND	0,75						
X2-3	A40	Batt	0,75						

UPA (Universal Park Assist) and APA (Advanced Parking Aid)

The universal park assist acoustically indicates the distance to obstacles behind and in the front of the car. APA is able to lead the driver into a parking slot by giving instructions.

This chapter concentrates on both modules. Differences between both modules are outlined.

Block diagram UPA
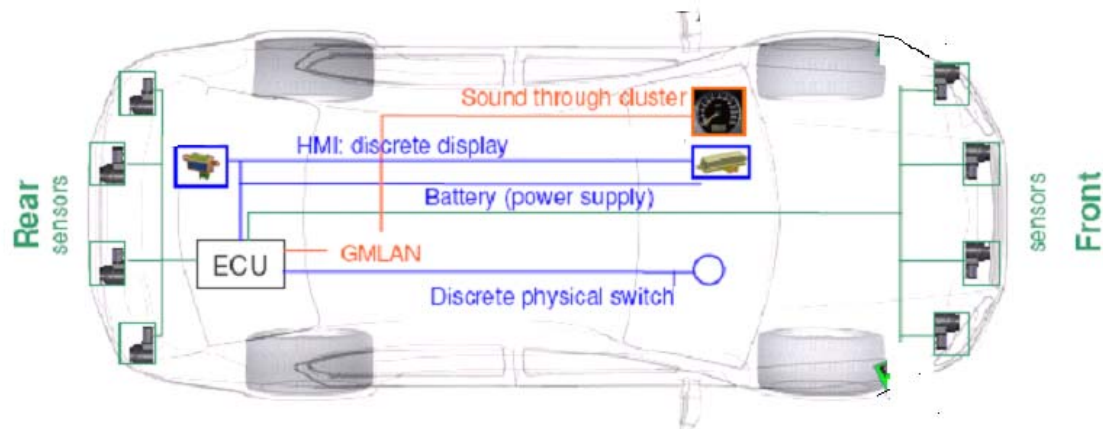
Functional description UPA

The UPA consists of 4 sensors in the front and 4 sensors in the rear of the car. They constantly generate a signal representing the distance to obstacles nearby the car. The UPA module calculates the distance based on the sensors' signal.
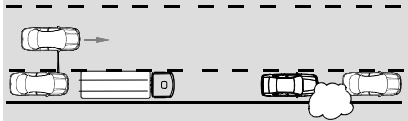
Depending on the distance, a beep sound will be generated. This sound is send out through the vehicles radio system. The nearer an obstacle is, the faster the module sounds.
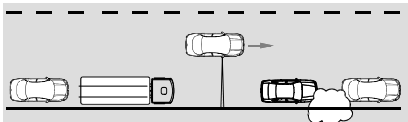
Block diagram APA
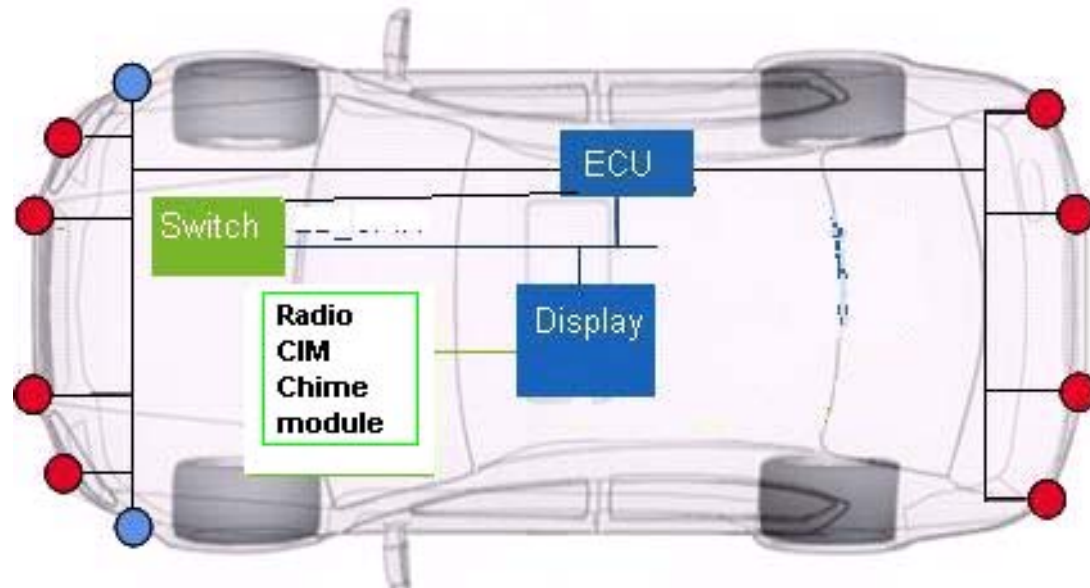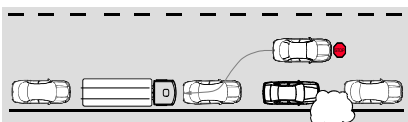
Functional description APA

APA is an enhancement of UPA. It consists of 4 sensors in the front, 4 sensors in the rear of the car and two additional APA sensors at the side. These additional APA sensors are used to measure the parking slot size.

1.		The vehicle passes a row of cars. APA is activated by pushing a button.
2.		APA searches for an appropriate parking slot. If a slot is detected, feedback is given to the driver.
3.		The driver accepts the decision of APA by stopping the vehicle. The system calculates the optimal path into the parking slot. After that it leads the driver into the slot by giving instructions.

Connectors and pin assignment UPA and APA

X1

X2

X3
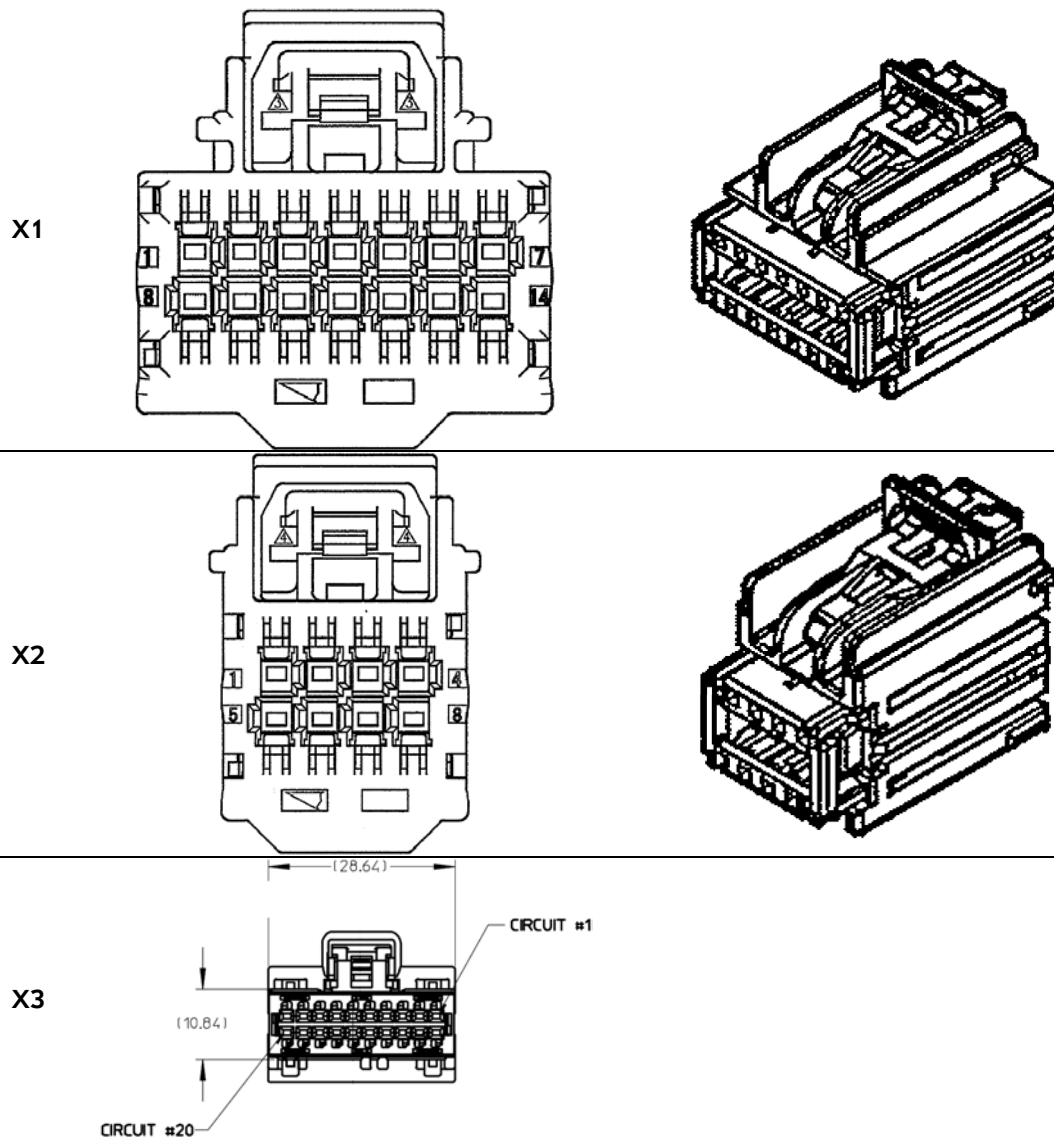
Note: Pins marked by * are only available on APA.

| Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
			mm²	Ω				mm²	
X1-1		Battery Feed		0,2					
X1-2	2370	n.c. (Rear Parking Display Supply Voltage)							
X1-2	1159	External Speaker Signal (+)	0,2	0,4					

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge mm²	Max. Wire Resistance Ω	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge mm²	Pigtail Wire Color
X1-3	5852	Rear Park Assist LED Disable Signal (UPA Disable LED)	0,2	0,4					
X1-4	2371	n.c. (Left Amber Indicator Control)							
X1-5	1160	External Speaker Signal (-)	0,2	0,4					
X1-6		CAN (GMLAN)							
X1-7		Ground Feed		0,2					
X1-8	2555	Rear Park Assist Disable Signal (UPA Disable Switch)	0,2	0,4					
X1-9	2372	n.c. (Center Amber Indicator Control)							
X1-10	2373	n.c. (Rear Parking Assist Red Indicator Control)							
X1-11		n.c.							
X1-12		CAN (GMLAN)							
X2-1	2378	Right Rear Corner Object Sensor Signal	0,33	0,4					
X2-2	2377	Right Rear Middle Object Sensor Signal	0,33	0,4					
X2-3	2376	Left Rear Middle Object Sensor Signal	0,33	0,4					
X2-4	2374	Rear Object Sensor Supply Voltage	0,33	0,4					
X2-5	2375	Left Rear Corner Object Sensor Signal	0,33	0,4					
X2-6*		APA Disable Switch	0,2	0,4					
X2-7*		n.c. (APA Disable LED)	0,2	0,4					
X2-8	2379	Rear Parking Object Sensor Low Reference	0,33	0,4					
X3-1		Front Object Sensor Supply Voltage	0,33	0,4					
X3-2	6581	Front Parking Aid Display Supply Voltage - Not used							
X3-2	980	n.c. (Front UPA Speaker Signal (+), Front Parking Aid Display Supply Voltage)							
X3-3*	983	Left Front Supplemental Object Sensor Signal	0,33	0,4					
X3-4	5215	Front Parking Left Corner Sensor	0,33	0,4					
X3-5	5216	Front Parking Left Mid Sensor	0,33	0,4					
X3-6	7039	n.c. (Front Parking Aid Yellow LED 1)							
X3-7	7041	n.c. (Front Parking Aid Yellow LED 2)							
X3-8	5214	Front Parking Sensor Low Reference	0,33	0,4					
X3-9		n.c.							
X3-10	5218	Front Parking Right Mid Sensor	0,33	0,4					
X3-11	5217	Front Parking Right Corner Sensor	0,33	0,4					
X3-12*	984	Right Front Supplemental Object Sensor Signal	0,33	0,4					

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge mm²	Max. Wire Resistance Ω	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge mm²	Pigtail Wire Color
X3-13	7042	n.c. (Front Parking Aid Red LED)							
X3-14	979	n.c. (Front UPA Speaker Signal (-))							

ESCL (Electrical Steering Column Lock)

Block diagram ESCL
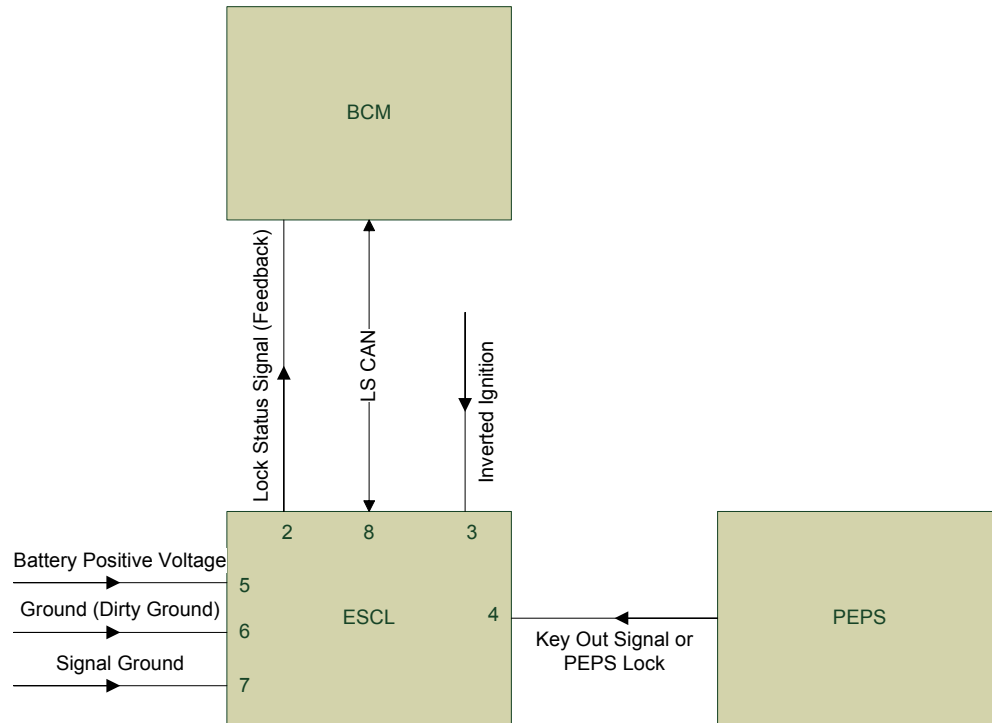
Functional description ESCL

The ESCL locks the steering column when the car is in the following condition:
- Power mode is off
- Wheel ground velocity is 0 from 3 of 4 wheels
- Driver or passenger door is open

The ESCL will unlock when power mode is non off.

The ESCL report its status on a hardwired signal to the BCM and also with a CAN message. Without the PEPS lock signal the ESCL cannot drive the motor in the lock direction, the signal will be active when the door open switch is true and valid, the door switch is at least mounted in the driver door.

Pin assignment ESCL

Cavity	Circuit #	Circuit Description
3	807	OFF /Accessory Voltage (Ignition Inverted)
4	105 or 1601	Ignition Switch Key Out Signal or Steering Column Lock Signal (PEPS Lock)
2	5904	Steering Column Lock Status Signal (Feedback)
6	A50	Ground (Dirty Ground)
7	A51	Signal Ground
5	A40	Battery Positive Voltage (Battery Clean)

RSA (Rear Seat Audio Module)

Vehicles with this feature allow the rear seat passengers to listen to and control any of the music sources: radio, CDs, DVDs, or other auxiliary sources.

RSA can only control music sources that the front seat passengers are listening to, except on radios where dual control is allowed. RSA can function when the front radio is off. X displays on the infotainment system when RSA is on.

Block diagram

Two different levels for RSA module.

Level 2

13290375   &CJ2&ULD

- LSGMLAN Interface
- Power Button
- Seek Up/Down Button
- Source Button
- Program Button
- Display
- 2 Headphone Jacks
- 2 Volume Controls

Level 4

13290374   &CJ4&ULD
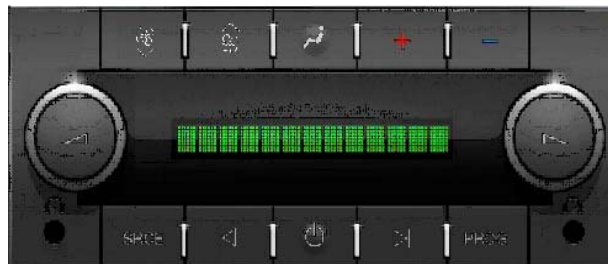
Level 2 Features
- + RHVAC Fan Up/Down Buttons
- +RHVAC Mode Button
- + RHVAC Temp Up/Down Button
- + Display for RHVAC Info
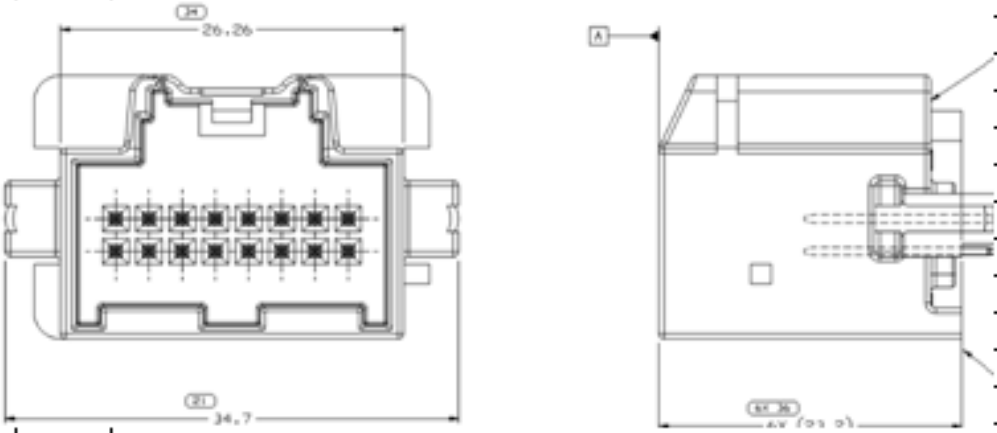
Functional description.

Audio can be heard through wired headphones (not included) plugged into the jacks on the RSA.

If the vehicle has a Rear Seat Entertainment system with wireless headphones, audio can also be heard on Channel 2 of the wireless headphones.

To listen to a portable audio device through the RSA, attach the portable audio device to the auxiliary input, if available. Turn the device on, then choose the front auxiliary input with the RSA SRCE button.

Connectors and pin assignment

		Harness Mating Connector Information
1	5312	Left Rear Seat Audio Signal (LRSAIN+) *(see note)
2	5313	Right Rear Seat Audio Signal (RRSAIN+) *(see note)
3	3352	Rear Seat Audio Common Signal (RSA Common) *(see note)
4	1574	Rear Audio Drain Wire (RSASHIELDIN) *(see note)
5		Unused (GND)
6	5060	Low Speed GMLAN Serial Data (SWGMLAN1)
7		Unused (GND)
8	I51	GND
9	5329	Left Infra Red Audio Signal (LIRTXOUT+) *(see note)
10	5330	Right Infra Red Audio Signal (RIRTXOUT+) *(see note)
11	3360	Infra Red Audio Common Signal (IRTXOUT-) *(see note)
12	5332	Infra Red Audio Drain Wire (RSASHIELDOUT) *(see note)
13		Unused (GND)
14	5060	Low Speed GMLAN Serial Data (SWGMLAN2)
15		Unused (GND)
16	A40	VBATT

Key B Header Connector: Delphi PN: 15496639

HUD (Head Up Display) 650

The Head Up Display gives some information about operation of the vehicle to the driver. This information is projected on the windshield of the vehicle. For example, the HUD displays vehicle speed, engine speed as well as warnings and error messages. HUD also displays what gear that are engaged, turn indicator, cruise control and crash alert indication.

Functional description HUD

The HUD image is parted into two sections. Display section and a Telltale section.

Display section indicates: (Dot matrix display)
- Engine speed
- Vehicle speed
- Gear position (Optional)
- Cruise control
- Turn by turn information (Optional)
- Compass (Optional)
- Outside air temperature
- High beam indicator
- Turn indicator
- Warning messages
- Tap shift gear information (Optional)

Telltale section indicates:
- Red Indicator for forward collision crash alert (Optional)
- Red indicators for front park assistance (Optional)

The HUD information appears as an image focused out toward the front of the vehicle. When the ignition key is turned to ON/RUN, the HUD will display an introductory message for a short time, until the HUD is ready.

The HUD control is located to the left of the steering wheel.
To adjust the HUD image so that items are properly displayed, do the following:
1. Adjust the driver's seat to a comfortable position.
2. Start the engine.
3. Adjust the HUD controls.

Use the following settings to adjust the HUD.

OFF: To turn HUD off, turn the HUD dimming knob fully counterclockwise until the HUD display turns off.
Brightness : Turn the dimming knob clockwise or counterclockwise to brighten or dim the display.
«(Up) :º(Down) : Press the up or down arrows to center the HUD image in your view. The HUD image can only be adjusted up and down, not side to side.

PAGE: Press HUD switch Page button to select the desired display format. If vehicle messages are displayed, pressing PAGE, may clear the message.

Format One: This display gives the speedometer reading (in English or metric units), turn signal indication, high beam indication, transmission positions, outside air temperature, and compass heading.

Format Two: This display includes the information in Format One without the transmission information, the outside air temperature, and compass heading.

Format Three: This display includes all the information in Format One along with a circular tachometer, but without outside air temperature and compass heading.

All formats will show the turn-by-turn navigation information and provide details about the next driving maneuver to be made. When you near your destination, the HUD will display a distance bar that will empty the closer you get to your destination. All navigation information is provided to the HUD by the navigation radio or OnStar® service, for vehicles that have these features.

Block diagram HUD
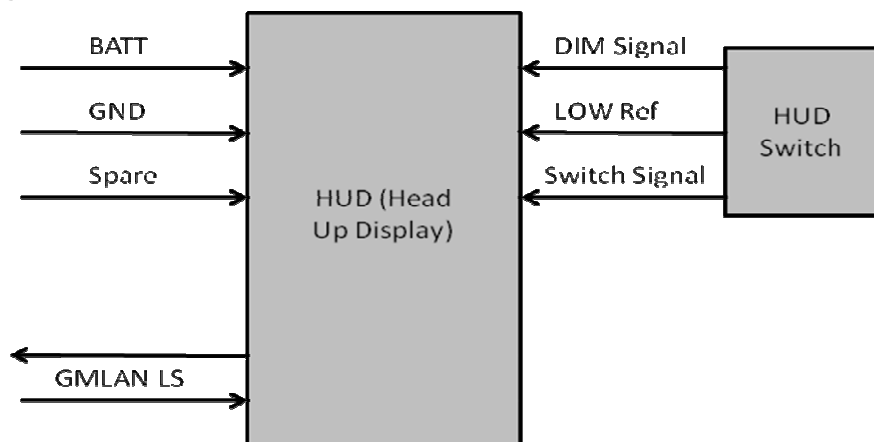
Connectors and pin assignment HUD

Cavity	Circuit #	Circuit Description	*1 Minimum Wire Gauge	*2 Maximum Wire Resistance	*3 Twist Group & Rate	*4 Shield Group	*5 Terminal Plating	*6 Pigtail Wire Gauge	*7 Pigtail Wire Color
		Harness Mating Connector Information							
1	5812	Head Up Display Dimming Signal	0,35	N/A	N/A	N/A		N/A	N/A
2	5699	Head Up Display Switch Low Reference	0,35	N/A	N/A	N/A		N/A	N/A
3	622	Head Up Display Switch Signal (Analog)	0,35	N/A	N/A	N/A		N/A	N/A
4	A40	Battery Positive Voltage	0,35	N/A	N/A	N/A		N/A	N/A
5	N/A	Spare							
6	A51	Signal Ground	0,35	N/A	N/A	N/A		N/A	N/A
7	5060	Low Speed GMLAN Serial Data	0,35	N/A	N/A	N/A		N/A	N/A
8	5060	Low Speed GMLAN Serial Data	0,35	N/A	N/A	N/A		N/A	N/A

LIN

ECU arrangement

LIN
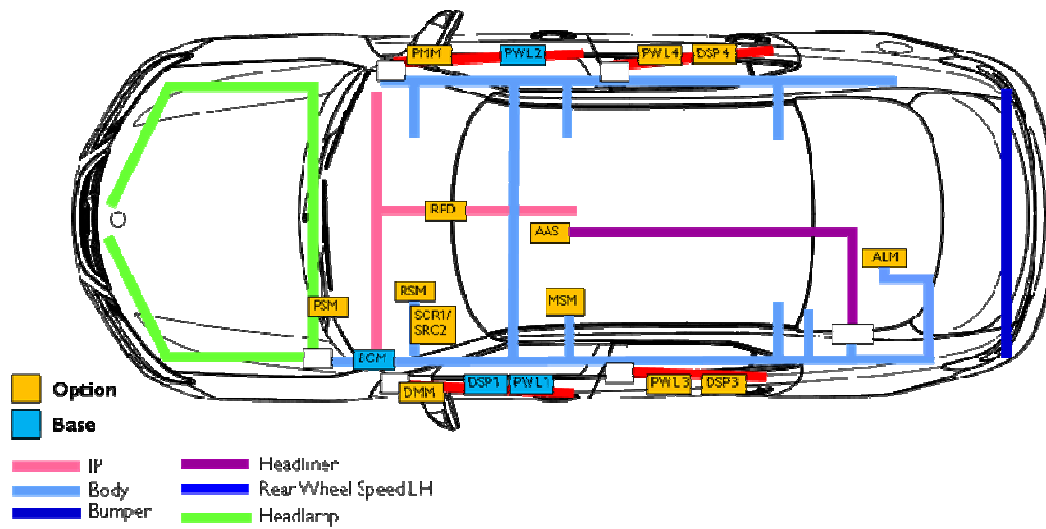
AAS (Auxiliary Alarm Sensor)

The Auxiliary Alarm Sensor AAS supervises the cabin using ultrasonic.

Block diagram AAS
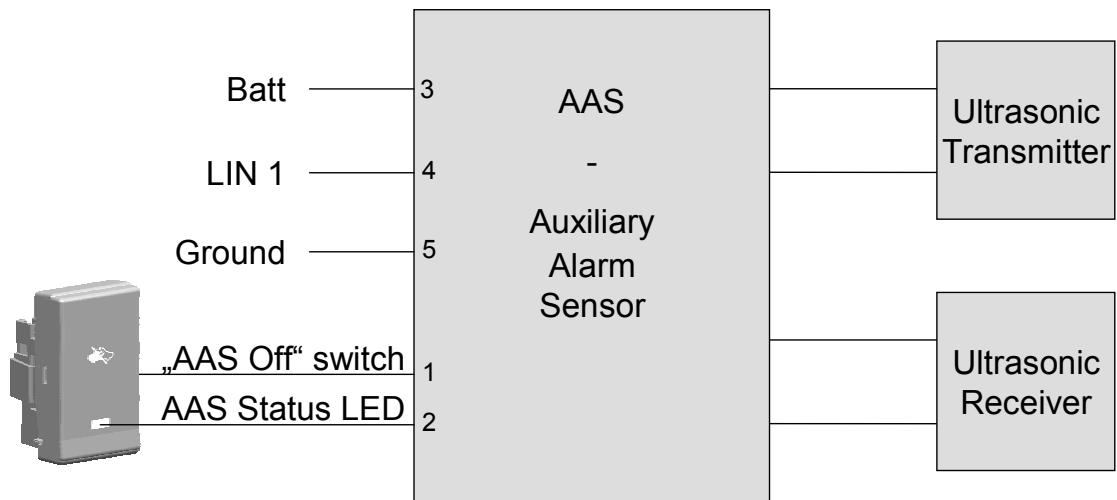
Functional description AAS

When activated, the AAS will continuously send out an ultrasonic signal via the transmitter. The receiver gets this signal and leads it back to the AAS. AAS is now able to compare actual reflections represented by the received signal to previous signals. Any change means that something within the cabin has changed. A message is sent to the BCM.

The AAS can be switched off by pressing the "AAS Off" switch. A LED will indicate switch-off.

Connectors and pin assignment AAS
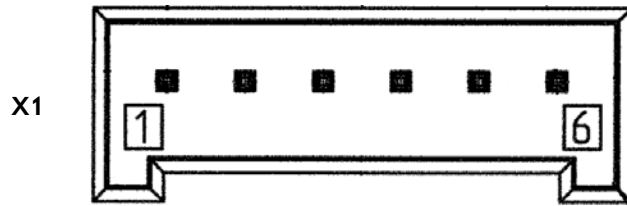

X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	5068	Switch (to disable AAS sensor)							
2	9980	LED (Status of AAS)							
3	A40	Battery T30							
4	6132	LIN 1 (Local Interconnect Network 1)							
5	A50	Ground T31							
6	n.a.	reserved							

LIN1 send functions AAS→ BCM

Frame	Frame Name	Short Name	Long Name
0x1	AASRsp	AuxSnsSt	Aux sensor state
0x1	AASRsp	AuxSlfTstPrgrs	Aux self test progress
0x1	AASRsp	AuxSnsDetSt	Aux sensor detection status
0x1	AASRsp	AuxSnsDis	Aux sensor disable

LIN1 receive functions BCM → AAS

Frame	Frame Name	Short Name	Long Name
0x0	AASCmd	AuxSnsOpReq	Aux sensor operation request

DMM (Driver Memory Mirror)

The DMM is located in the upper front region on the door panel. The DMM is existing on all vehicles; the DMM can exist with and without OSRVM memory, and with and without OSRVM fold.

Block diagram DMM

Global A Window Lifter & Mirror, Up-Level 3
are81035__002 WN01 Windows Door Express UPDown All_Up-Level 3 +
are79304__002 MR01 Mirrors Power OSRVM Memory.

3700 Insignia
650 SAAB

Primary LS **GMLAN**

- BCM *Remote Window Logic (LIN Master)*
- LIN 3
- LIN 4
- Driver Mirror
- DMM
- LIN 8
- MSM (LIN 8 Master)
- DSP1 — Up / Exp / Dwn
- PMM — Up / Exp / Dwn
- Co-Driver Mirror
- #3270 Driver Door Lock Motor Status Control
- #1124 Driver Door Lock Key Switch Unlock Signal
- PWL1 = 7 Pin Window Lifter Motor LF
- PWL2 = 7 Pin Window Lifter Motor RF
- Window Lifter Switch NO LIN
- #745 Left Front Door Ajar Signal
- #746 Right Front Door Ajar Signal
- #747 Left Rear Door Ajar Signal
- PWL3 = 7 Pin Window Lifter Motor LR
- PWL4 = 7 Pin Window Lifter Motor RR
- #748 Right Rear Door Ajar Signal

UP – LEVEL 3
Driver = Epress Up/Down (LIN PWL)
Co-Driver = Epress Up/Down (LIN PWL)
Rear = Epress Up/Down (LIN PWL)

LIN Master   LIN Node   High Current   Window Signal NO LIN

Up / Exp / Dwn — Window Lifter Switch NO LIN

PWL1 = Local Window Logic
PWL2 = Local Window Logic
PWL3 = Local Window Logic
PWL4 = Local Window Logic

Functional description DMM

The DMM is together with the PMM (Passenger Mirror Module) is connected to LIN bus 8 where the MSM (Memory Seat Module) is the master.

The DMM is the switch that controls the mirrors, and the commands for the desired (up/down, left/right or fold/unfold) movement to the MSM via LIN 8 which then sends out the command back on LIN 8 to the DMM&PMM which send out the current to move the mirrors. The mirrors can also be activated and be repositioned by the MSM from the stored position in the MSM memory when the memory buttons on the driver seat is activated.

Connectors and pin assignment DMM
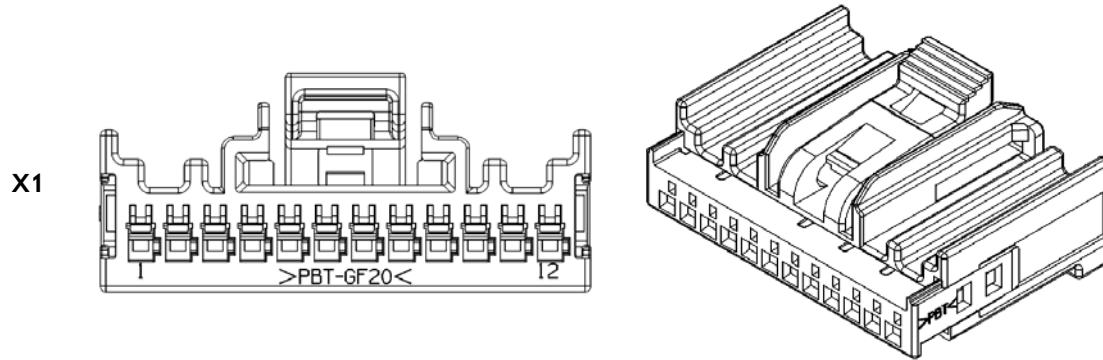
X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Gauge	Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	3390	Driver Mirror Motor Up (+) Down (-) Control								
2	3391	Driver Mirror Motor Common Control								
3	3389	Driver Mirror Motor Right (+) Left (-) Control								
4	A40	Battery Positive Voltage								
5	A50	Ground								
6	7530	Linear Interconnect Network Bus 8								
7	3393	Driver Mirror Position Sensor Low Reference								
8	3394	Driver Mirror Position Sensor Up (+) Down (-) Signal								
9	3395	Driver Mirror Position Sensor Left (-) Right (+) Signal								
10	3392	Driver Mirror Position Sensor High Reference								
11	3411	Driver Mirror Motor Fold Out Control								
12	3412	Driver Mirror Motor Fold In Control								

PMM (Passenger Memory Mirror)

The PMM is located inside DSP2 (Door Switch Panel 2). The PMM is existing only when the vehicle contain OSRVM memory, and exist with or without OSRVM fold.

Block diagram PMM

Global A Window Lifter & Mirror, Up-Level 3
are81035__002 WN01 Windows Door Express UPDown All_Up-Level 3 +
are79304__002 MR01 Mirrors Power OSRVM Memory.

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Primary LS **GMLAN**

BCM
*Remote
Window Logic
(LIN Master)*

LIN 3

Driver Mirror ← DMM ← LIN 8 → MSM (LIN 8 Master)

DSP1
Up
Exp
Dwn

PMM → Co-Driver Mirror
Up
Exp
Dwn

#3270 Driver Door Lock Motor Status Control
#1124 Driver Door Lock Key Switch Unlock Signal

PWL1 = 7 Pin Window Lifter Motor LF

PWL2 = 7 Pin Window Lifter Motor RF

Window Lifter Switch NO LIN

#745 Left Front Door Ajar Signal

#746 Right Front Door Ajar Signal

LIN 4

#747 Left Rear Door Ajar Signal

PWL3 = 7 Pin Window Lifter Motor LR

PWL4 = 7 Pin Window Lifter Motor RR

#748 Right Rear Door Ajar Signal

UP – LEVEL 3
Driver   = Epress Up/Down (LIN PWL)
Co-Driver = Epress Up/Down (LIN PWL)
Rear   = Epress Up/Down (LIN PWL)

LIN Master | LIN Node | High Current | Window Signal NO LIN

Up
Exp
Dwn
Window Lifter Switch NO LIN

Up
Exp
Dwn
Window Lifter Switch NO LIN

PWL1 = Local Window Logic
PWL2 = Local Window Logic
PWL3 = Local Window Logic
PWL4 = Local Window Logic

Functional description PMM

The PMM is together with the DMM (Driver Mirror Module) is connected to LIN bus 8 where the MSM (Memory Seat Module) is the master.

There is no mirror switch in the PMM and hence only execute the commands sent out on the LIN bus 8 from the MSM. The mirrors is controlled either by the driver from the DMM which sends the command for the desired operation (up/down, left/right or fold/unfold) movement to the MSM which then sends out the command to move the mirrors or by the stored position within the memory in MSM when the memory buttons on the driver seat is activated.

Connectors and pin assignment PMM

X1   2D with dimensions   3D

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	3413	Co-Driver Mirror Motor Fold Out Control							
2	3397	Co-Driver Mirror Motor Up (+) Down (							
3	3398	Co-Driver Mirror Motor Common Control							
4	3399	Co-Driver Mirror Position Sensor High Reference							
5	3401	Co-Driver Mirror Position Sensor Up (+) Down (-) Signal							
6	3400	Co-Driver Mirror Position Sensor Low Reference							
7	3414	Co-Driver Mirror Motor Fold In Control							
8	3396	Co-Driver Mirror Motor Right (+) Left (-) Control							
9	7530	Linear Interconnect Network Bus 8							
10									
11	3403	Co-Driver Mirror Position Sensor Left (-) Right (+) Signal							
12									

PSM (Power Sounder Module)

The Power Sounder Module PSM is the device which sounds the alarm on theft detection.

Block diagram PSM

Functional description PSM

The Power Sounder Module provides an integrated piezo speaker and an internal battery. It will sound any alarm discovered by the BCM or by itself: this can be a disconnect of cables or the loss of voltage in the internal battery.

The internal battery is charged by the car's generator. It is used to supply the module even if the car's battery is disconnected.

Connectors and pin assignment PSM
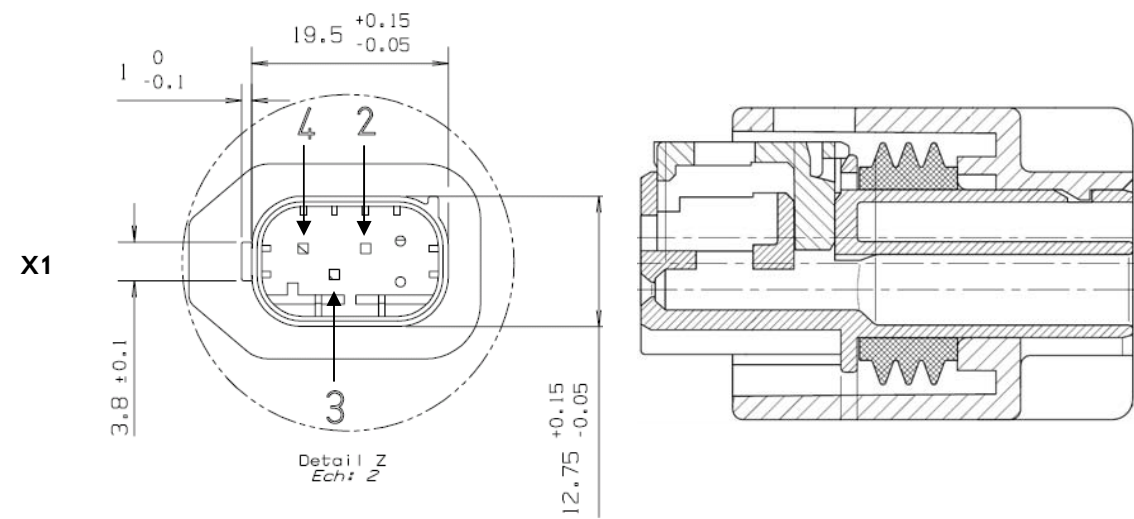
Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
2		SRC							
4		GND							
3	6133	LIN, bus 2 on BCM							

RPD (Remote PRND Display)

The Remote PRND Display is a part of the automatic shift control assembly. It indicates the selected gear:

- P(ark)
- R(ear)
- N(eutral)
- D(rive)

The selected gear is indicated by a LED. RPD communicates with the BCM on the LIN bus LIN2.

Block diagram RPD
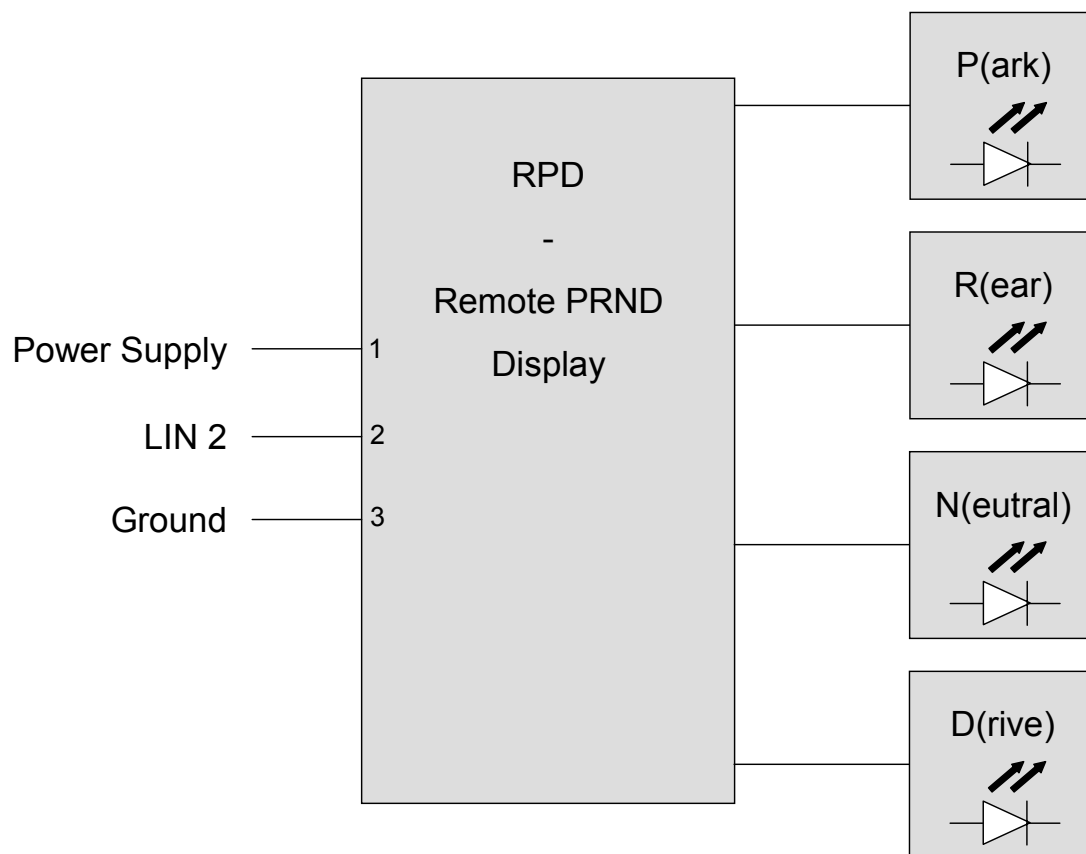
Connectors and pin assignment RPD
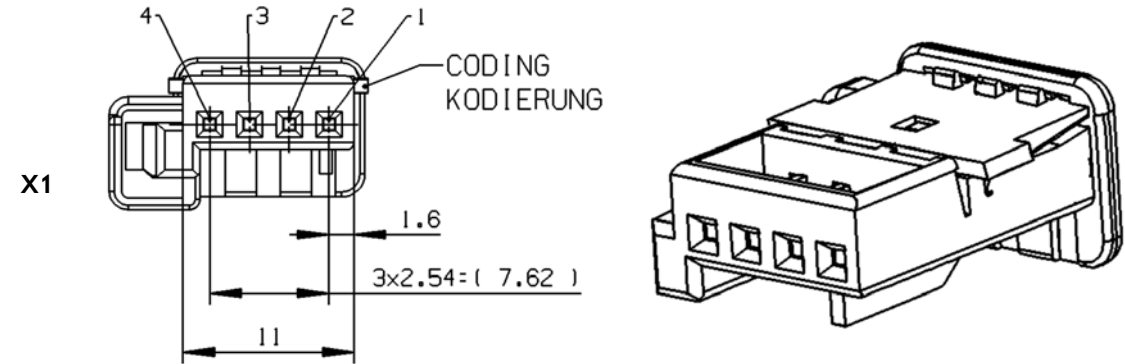
X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	801	Retained Accessory Power Fuse Supply Voltage							
2	6133	Linear Interconnect Network Bus 2							
3	A50	GND							
n.c.	5053	Winter Mode Switch Signal							

Rain Light Module (RLM)

RLM is installed in order to collect information about rain and ambient light. Based on that information, wipers and lights can be switched on.

There are two versions:
- RSM = Rain Sensor Module.   (detection of rain only)
- RLM = Rain/Light Sensor Module.   (detection of both rain and ambient light)

Rain Sensor

Day/Night Sensor

Shade Band

Horizon Sensor
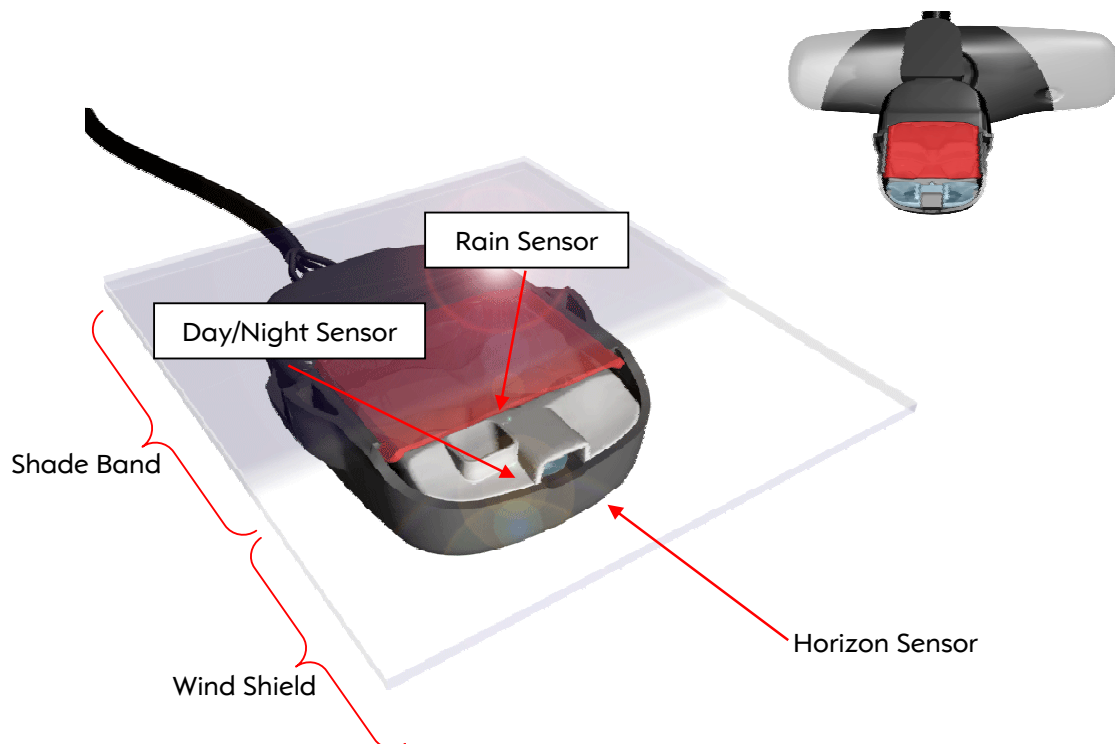
Wind Shield

Functional description RSM

Rain Sensing

Rain sensor automatically activates wipers during rain or splash conditions maintaining maximum visibility.

A light ray is sent out to the windshield. If there are drops on the screen the ray is

.5mm

windshield

coupler

lens   lens
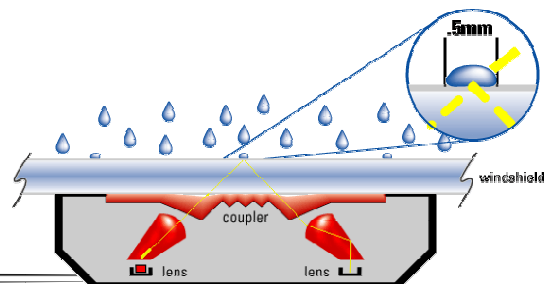
reflected. A receiver installed in the RSM measures the rate of reflection. The optical sensitivity is less than 0,2mm².

Light Sensing

Light sensors are provided to enable automatic headlight activation. To determine the required information both the horizon sensor (for tunnel detection etc.) and the day/night sensor (faced upwards) are used.

There are some features that guarantee the reliability of the module:
- Immune to false headlight On / Off requests caused by street lights, shadows, and oncoming headlights.
- Headlamps remain off when traveling through underpasses or when stopped at an overhead covered ATM or drive through.
- Tunnel entry is detected and headlamps are quickly activated under a wide range of conditions.
- Allows Day /Night sensitivity adjustment of the rain sensor.
- Headlamps switch on when entering a tunnel, garage, or carport.
- Headlamps are not activated by overpasses.

Connectors and pin assignment RSM
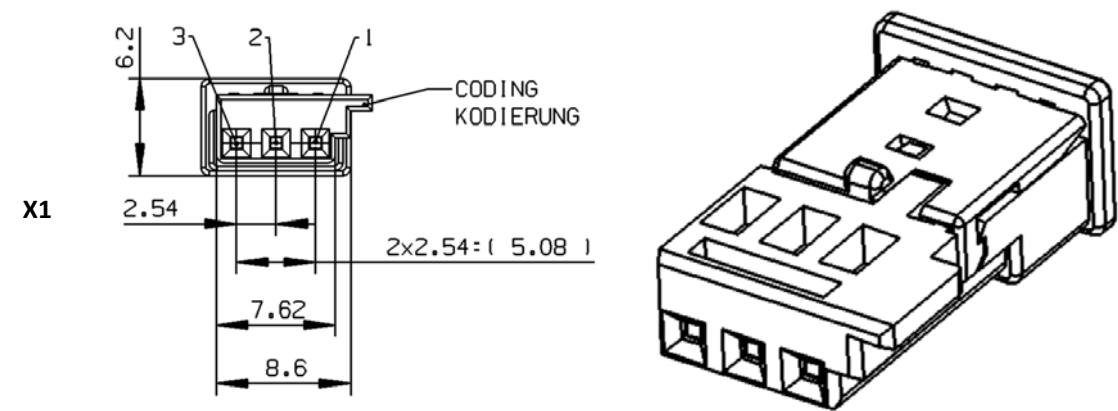
X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	A40	Battery Positive Voltage							
2	A51	GND							
3	6132	Linear Interconnect Network Bus 1							

SRC (Sunroof Controller)

The Sunroof Controller is a functional system for opening and closing both the sunroof and the sunshade. Therefore two versions of the SRC are developed: SRC1 is responsible for the sunshade movement, SRC2 controls the sunroof.

Block diagram SRC
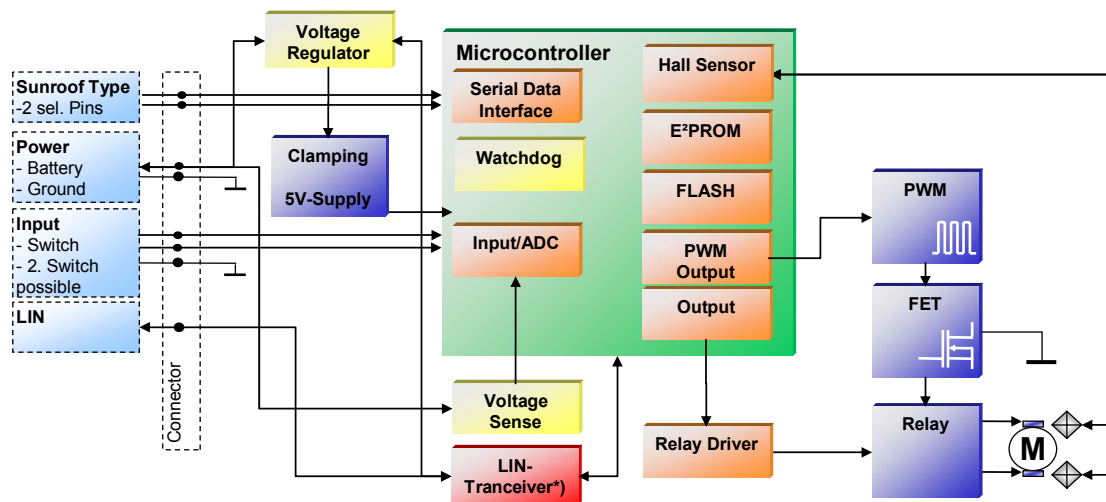
Functional description SRC

There are two different types of sunroofs: spoiler type and tilt/slide type. Spoiler type is a combination of sunroof and sunshade. Therefor two control units are necessary: SRC1 for the sunshade, SRC2 for the sunroof.

Motion requests

Sunroof motion may be initiated by the following components:
- Sunroof switch and Tilt/Vent switch [only tilt/slide type]
- remote request
  - other vehicle systems (e.g. Key Fob, Rain Sense, etc.)
  - service tool

Sunshade movement can be initiated by:
- Sunshade switch
- remote request
  - other vehicle systems (e.g. Key Fob, Rain Sense, etc.)
  - service tool

Remote requests, which are initiated by other vehicle systems, may be cancelled or overridden by the local switches. If a remote request was initiated by a service tool it shall not be affected by the local switches.

The local switches shall take precedence over all sunroof remote requests in the RUN, ACCESSORY and RAP power modes. They shall also take precedence over all sunroof remote requests when Extended Window Power is 'active'. Furthermore, the switches shall be able to stop movement requested remotely by another vehicle system in the OFF power mode when Extended Window Power is 'inactive'. However, the local switches shall not be able to cause movement in this situation.

A "normal open" request may only be initiated if the sunroof is in neutral position (closed). There are two modes of opening the sunroof: normal and express mode. Via "Sunroof open" the sunroof starts to move underneath the roofing. It will stop if the button is released. This is normal mode. Express mode is entered by pushing the "Sunroof express open" switch. The sunroof will start to open and ceases when it reaches the "Fully Open Position".
State order of the sunroof in tilt/slide type is the following:

<div align="center">Vent position ←→ Close state ←→ Open state</div>

Spoiler type

Sunroof open movement

In spoiler type there is only one switch for moving the sunroof. It controls both vent position and open state. Its design is the following:

Sunroof switch
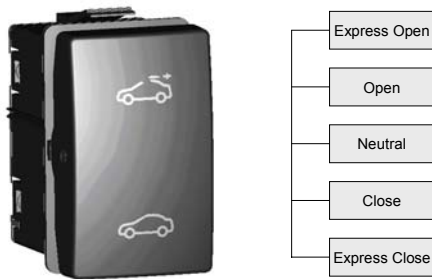
Moving the sunroof into vent position may be initiated by pushing the "Sunroof open" button for no longer than 500ms. The sunroof will cease if vent position is reached.
From vent position the sunroof can be opened further on into open position. The sunroof will move above the roof. This action may be initiated by pushing "Sunroof open" for longer than 500ms or going into express mode via "Sunroof express open". In express mode the sunroof will completely open even if the button is released, normal mode will stop the sunroof on button release.
State order of the sunroof in spoiler type is the following:

Close state ←→ Vent position ←→ Open state

Sunroof close movement

If the sunroof is in vent position, the closing request may be initiated by pushing the "Sunroof close" button. Sunroof will go on moving until it is fully closed.
If the sunroof is in open state, closing may be initiated by pushing the "Sunroof close" button. Sunroof ceases on button release.
Closing of the sunroof in open state may also be initiated by pushing the "Sunroof express close" button. Within this procedure the sunroof moves until it is in close position, even if the button is released. The sunroof doesn's stop in vent position.

In express closing mode and manual closing mode within power mode OFF and ACC, movement is automatically stopped if the blockage detection recognizes a certain force against the movement.

Sunshade movement

The second switch in spoiler type is used for sunshade movement.

Sunshade switch
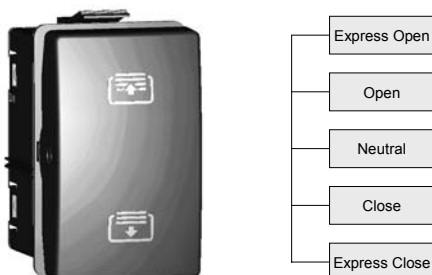
There are two different ways the sunshade may open. In Normal Open Procedure, the sunroof moves as long as the "open" button is pressed. If it is released, the sunroof ceases. If "express open" is pressed, the sunshade doesn't stop on button release. It moves on until the sunshade is completely open. It can be stopped by pressing the "Sunshade close" or "Sunshade express close" button or via "Sunshade open" switch after the sunshade is past the neutral position.

For closing the sunshade there are also two procedures. These are Normal and Express Procedure again.

In both opening and closing mode, the blockage detection is active. The sunshade will automatically cease and go on with an Open movement, if a resistance is detected. As specified in sunroof closing movement section, the obstacle detection is only active in normal mode, while power mode is OFF or ACC and in express mode.

Sunroof Auto Close

If the sunroof is in a position nearby the fully closed position (smaller than 4mm), it shall be closed completely regardless of switch states or remote requests. This feature is available in every type.

Connectors and pin assignment SRC
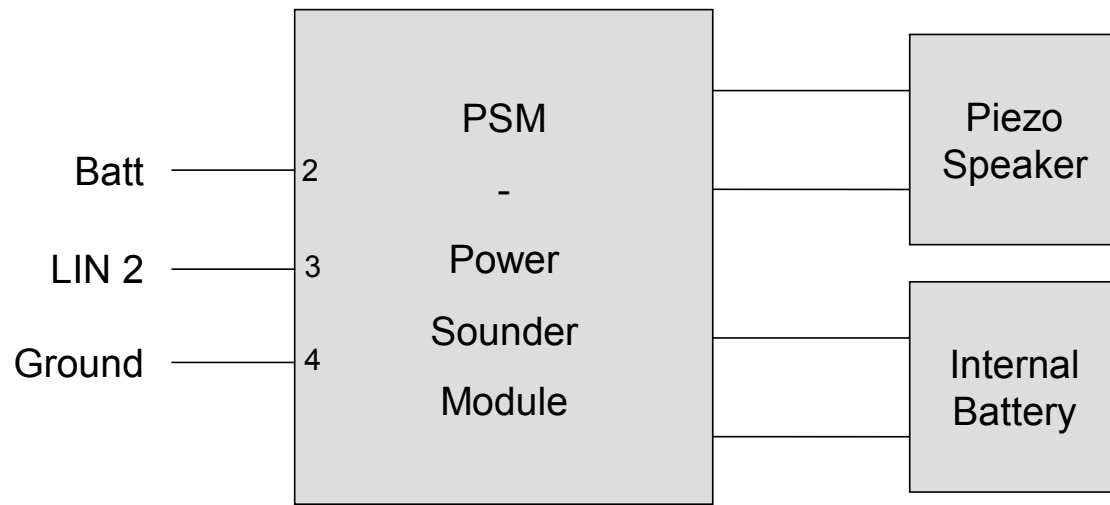

X1
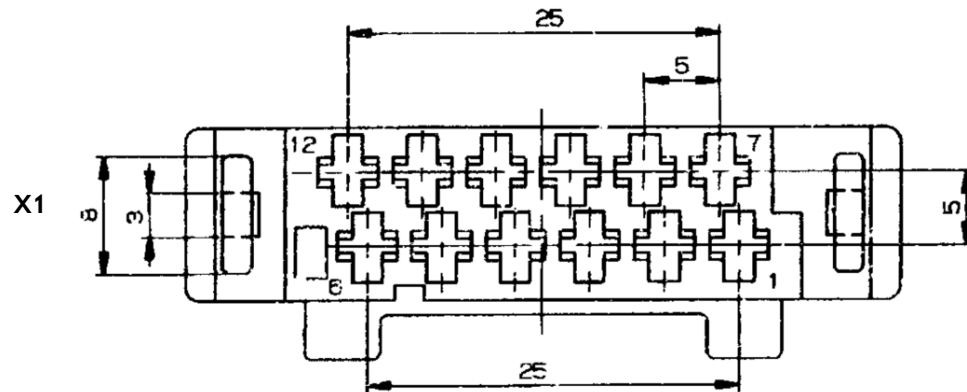
SUNROOF - LID

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	A40	BATT	2.5mm²				BRASS/TIN PLATING		
2	A50	GND	2.5mm²				BRASS/TIN PLATING		
3	128 / 3030	Sunroof Switch Low Reference	0.5mm²				BRASS/TIN PLATING		
4	6132	Linear Interconnect Network Bus 1	0.5mm²				BRASS/TIN PLATING		
5	5027	Sunroof Switch Data (1)	0.5mm²				BRASS/TIN PLATING		
6		N.c							
7		N.C							
8	A50	SEL2 - Connect to GND	0.5mm²				BRASS/TIN PLATING		
9		SEL2 (not connected)					BRASS/TIN PLATING		

SUNROOF - SUNSHADE

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	A40	BATT	2.5mm^2				BRASS/TIN PLATING		
2	A50	GND	2.5mm^2				BRASS/TIN PLATING		
3	5307	Front Sunshade Switch Low Reference	0.5mm^2				BRASS/TIN PLATING		
4	6132	Linear Interconnect Network Bus 1	0.5mm^2				BRASS/TIN PLATING		
5	3032	Front Sunshade Switch Signal - (SW1 - SUNROOF/SUNSHADE)	0.5mm^2				BRASS/TIN PLATING		
6		N.C							
7		N.C							
8		SEL1 (not connected)					BRASS/TIN PLATING		
9	A50	SEL2 - Connect to GND	0.5mm^2				BRASS/TIN PLATING		

TPMS (Tire Pressure Monitoring System) / ALM (Auto Learn Module)

The Tire Pressure Monitoring System consists of two modules (RFA and ALM), four tire pressure sensors and an application software which is located in the BCM. The system measures tire pressure and gives feedback to the driver.

Block diagram TPMS

TPM Sensors

TPM Sensor frame via RF

TPM Sensor frame via RF

IPC/ DIC

ALM (Auto Learn Module)

Sensor locations and ID´s via LIN2

BCM

TPMS Application SW

RFA

TPM Sensor frame (pressure, temperature, sensor ID´s)

Vehicle speed, transmission info via LIN2

Calibration Files
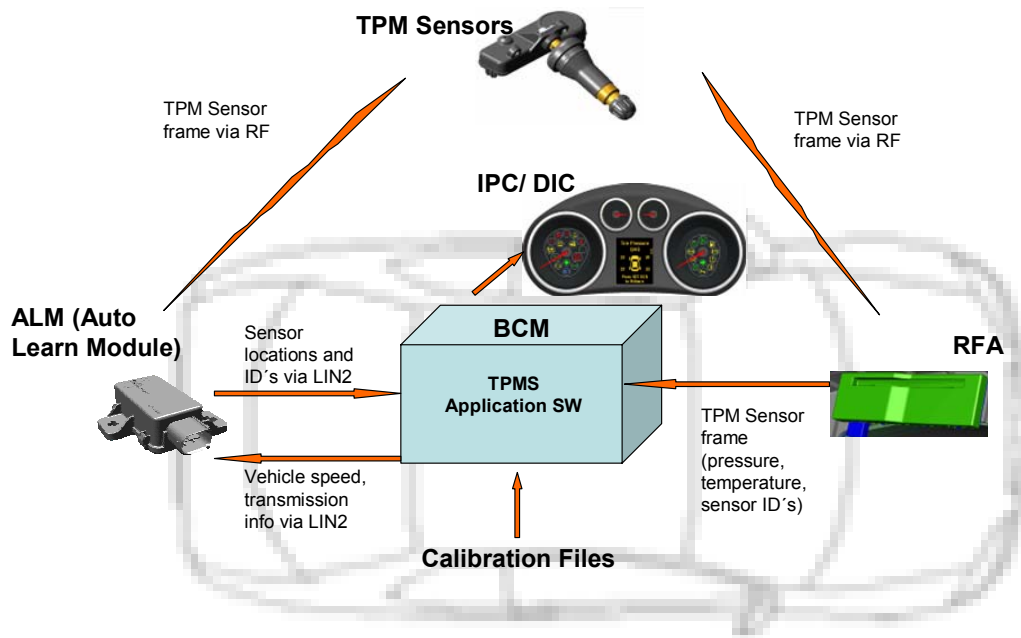
Functional description TPMS

Getting the tire pressure information

The sensors, which are located in the tires, send RF frames that contain an identifier, pressure and temperature.
RFA receives the sensor frame. It has no further intelligence, but simply transfers the sensor data to TPMS application software in the BCM. The application software processes the TPMS algorithm according to specification. The position of the sending tire is determined by the ALM. If the TPMS application software got every information needed it finally sends the information to the Instrument Panel Cluster IPC and (if equipped) to the Driver Information Center DIC.

Auto learn functionality

In addition to the sensors' RF signal, ALM also receives the left/right information sent by the sensors. This information is determined by the rotating direction of the tire.
The ALM decides if the tire which is sending information is located at the front or rear axle. It can determine that information by the sensor's signal strength. ALM is mounted in the rear of the vehicle in order to gain the difference in signal strength between front axle and rear axle sensors.
The combination of the front/rear and left/right information gives the ALM the opportunity to assign a sensor's identifier with its position. This information is sent to the BCM via LIN bus.
ALM is able to relearn the sensor location automatically on ignition on if the vehicle has been stationary for approx. 20 minutes. This process takes about 3-5 minutes of driving, 9 minutes worst case.

IPC / DIC display

The IPC shows a telltale. The possible states of the telltale are:
- Off – everything is ok
- On – one or more tires is/are significantly under-inflated
- Steady active after 60-90 seconds of blinking – System failure

DIC gives information about the actual pressure value of each tire. On any error it gives warnings in words. That may be:
- Check Left/Right Front/Rear Tire Pressure (small pressure loss)
- Left/Right Front/Rear Tire Pressure High / Low
- Pressure Imbalance Front/Rear (pressure delta between left and right tire on one axle reached a certain value)
- Service Tire Monitor System (system failure)

## Connectors and pin assignment ALM
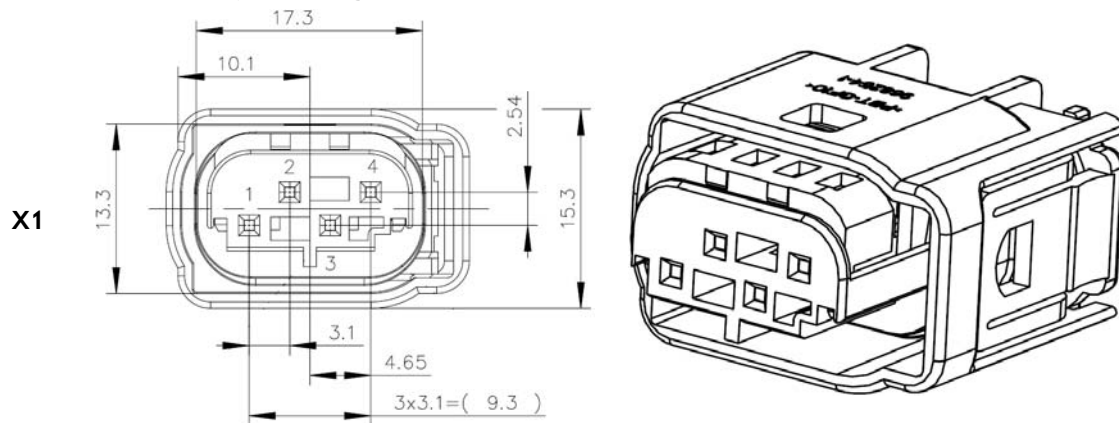
X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
			mm²	Ω				mm²	
1	A51	Signal Ground	0,64	10			Tin over Nickel		
2	A39	Run/Crank Ignition 1 Voltage	0,64	10			Tin over Nickel		
3	6133	Linear Interconnect Network Bus 2	0,64	10			Tin over Nickel		
4		SPARE	0,64	10			Tin over Nickel		

For further information concerning RFA see corresponding functional description in chapter 8.9.

Other Components

IEC (Instrument Panel Electrical Center)

The Instrument Panel Electrical Center is located beneath the I/P stack. It provides relays and fuses for the I/P. IEC is part of the wiring harness.

Relays:
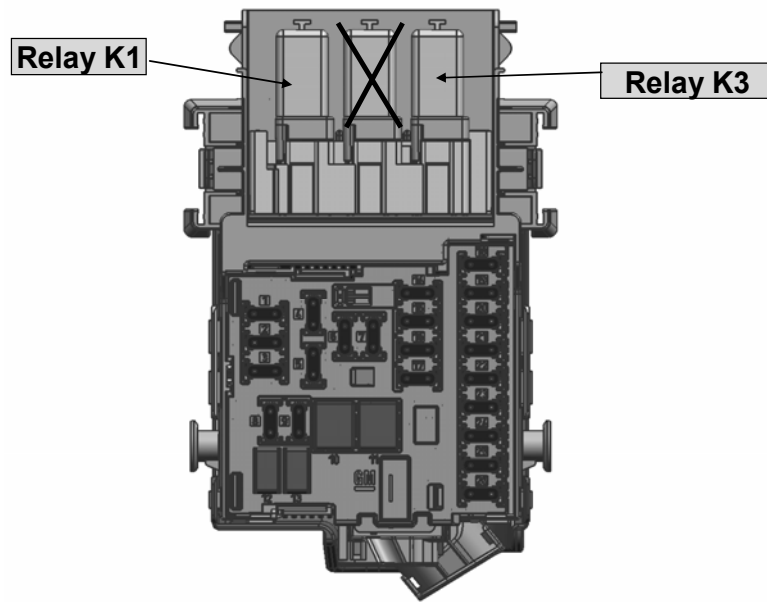
Fuses:
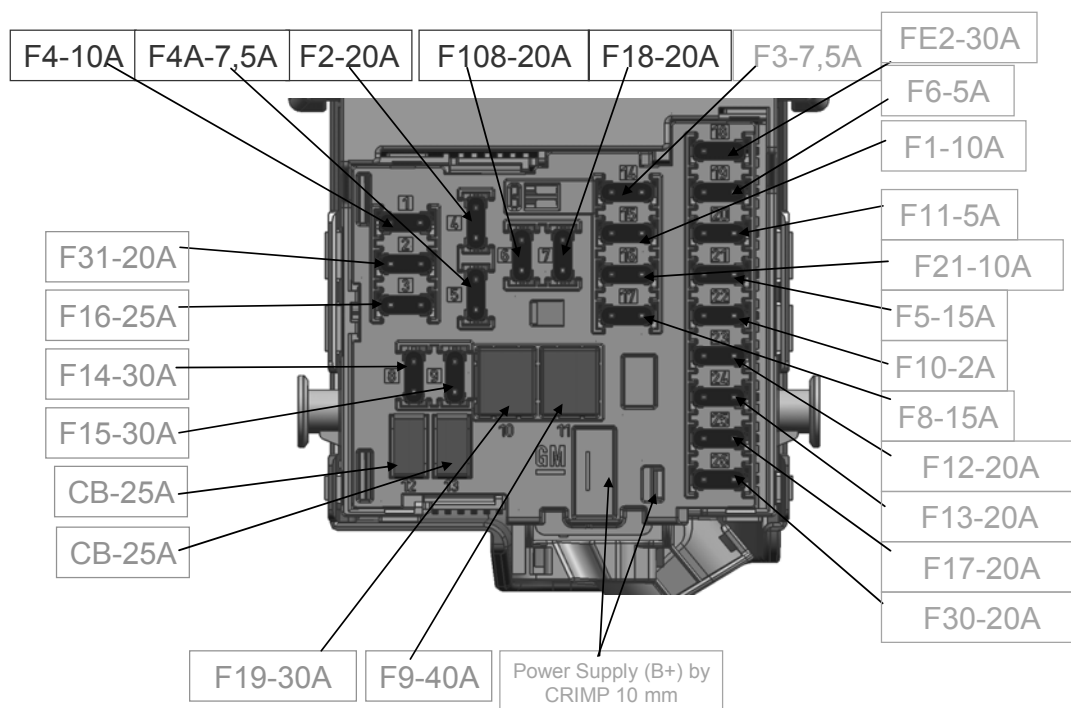
| F4-10A | F4A-7,5A | F2-20A | F108-20A | F18-20A | F3-7,5A |

FE2-30A
F6-5A
F1-10A
F11-5A
F21-10A
F5-15A
F10-2A
F8-15A
F12-20A
F13-20A
F17-20A
F30-20A

F31-20A
F16-25A
F14-30A
F15-30A
CB-25A
CB-25A

F19-30A | F9-40A | Power Supply (B+) by CRIMP 10 mm

Depending on the chosen options, only some of the devices may be installed.

Device Type	Device	Description	Value
J-Case Fuses	F9	Blower IP HVAC ACC	40A
	F19	BCM VBATT08	30A
Mini Fuses	F1	Airbag Unit	10A
	F3	Diagnostic Connector	7,5A
	F5	Cluster IPC	15A
	F6	Active Immobilizer, RF Receiver	5A
	F8	HVAC Electronic	15A
	F10	IGN PEPS Passive Start	2A
	F11	AOS System	5A
	F12	BCM VBATT01	20A
	F13	BCM VBATT02	20A
	F14	BCM VBATT03	30A
	F15	BCM VBATT04	30A
	F16	BCM VBATT05	25A
	F17	ESCL unlock	20A
	F30	Trunk Outlet	20A
	F31	BCM VBATT07	20A
Circuit Breaker	CB1	Power seat LH	25A
	CB2	Power seat RT	25A

Plugged Relays	K1	Trunk Relay CTRL Ground (K1_85)	X
		Trunk Ground (K1_87A)	
		Trunk Relay CTRL (K1_86)	
		Trunk Relay Connected to Fuse (K1_87)	
		Trunk (K1_30)	
	K3	Logistic Mode Relay CTRL (RESET)	X
		Logistic Mode Relay CTRL GND	
		Logisti Mode Relay CTRL (SET)	
		Logistic Mode in (K2_30)	
		Logistic Mode out Connected to Fuse	

12V Power Outlets

PO-1. All body styles have a power outlet beside the cup holders in the floor console. The power outlet is illuminated an equipped with a dummy plug.

PO-2. All body styles have a power outlet in the floor console storage compartment.

PO-3. All station wagons have a power outlet in the trunk. Sedan as an option, (&KC8).

Here's a plan view representing the power outlets and their mounting points:
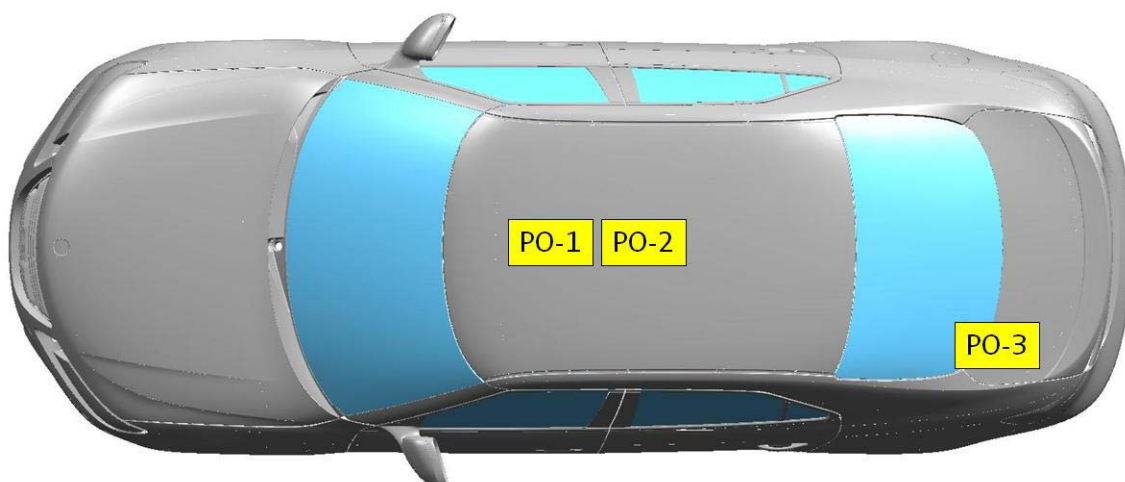
Pin-out of PO-1 (PN 13502522) Floor console:
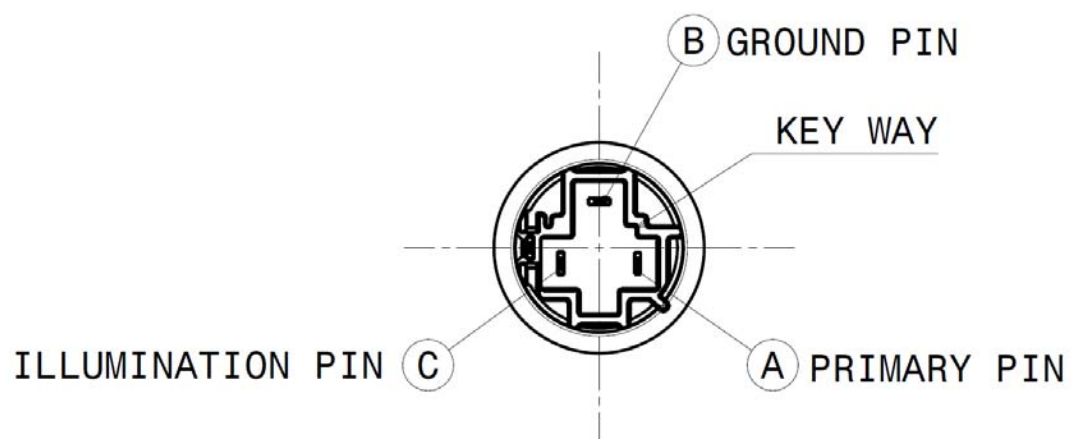
Pin-out of PO-2 & 3 (PN 13502523) Floor console storage compartment and trunk:
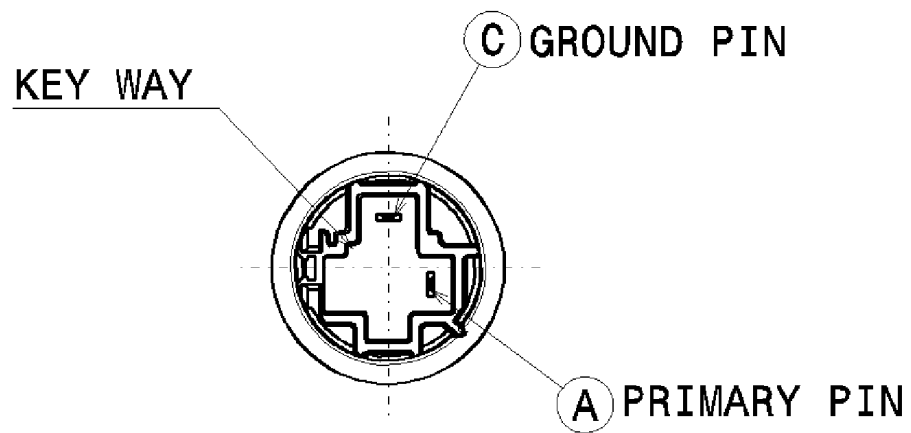
REC (Rear Electrical Center)

The Rear Electrical Center is located in the trunk compartment behind a cover on the left side. It provides relays and fuses for all body electrics.
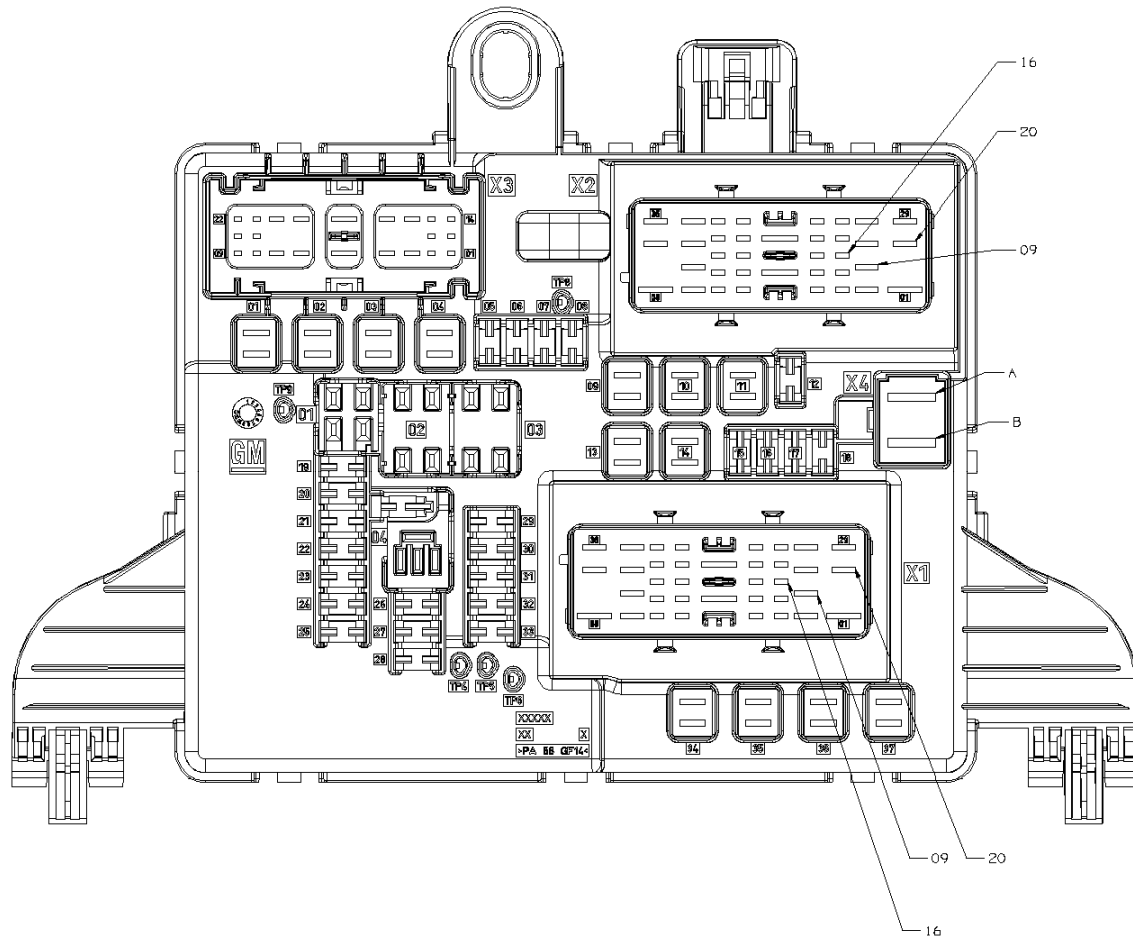
Depending on the chosen options, only some of the devices may be installed.

Device Type	Device	Description	Installed?
J-Case Fuses	F1	Lock Control RR Compartment, Tailgate, REM CONT ELEC Open/Close	30A
	F2	Spare	30A*
	F3	TIM (station wagon only)	40A*
	F4	Spare 30A	-
	F9	Spare 40A	-
	F10	Heater – Radiator, Coolant, Fuel Fired	20A*
	F11	Seat RR Adjustable, RH, Power	-
	F13	Chassis – Rear, Air, Increased Ride	-
	F14	Spare 40A	-
	F34	Cabrio Soft Top / Roof – Sun, Glass, Sliding, Elec, Transparent Glass Fixed	30A
	F35	Lock Control, Entry – Remote, Keyless Start, Passive Entry	30A*
	F36	Sear RR – Adjustable, LH, Power	-
	F37	Spare 30A	-
Mini Fuses	F5	Trailer Outlet	20A*
	F6	Switch – Steering Wheel, Heated	-
	F7	Liftglass, Rear Window	-
	F8	Terminal 30, Trailer Outlet	20A*
	F12	HVAC System- air conditioning, Front & rear electrical control	10A
	F15	Air Solenoid	-
	F16	Spare 20A	-
	F17	Heater – Seat RR LH/RH	-
	F18	Power Tailgate Lock	20A*
	F19	Sunshade Switch	5A*
	F20	Fan-Seat, Driver / Passenger	10A*
	F21	Ignition 15, TIM (station wagon only)	7,5A*
	F22	Sunshade RR Window, Electric	15A*
	F23	Theft Deterrent System – Glass Break Sensor / Tilt Sensor	5A*
	F24	Park – Taillamp, Sidemarker, LH	-
	F25	Park – Taillamp, Sidemarker, RH	-
	F26	Lamp – Cornering, LH	-
	F27	Lamp – Cornering, RH	-
	F28	Pedals – Adjustable, Power	-
	F29	Logistic Mode Relay Protective Fuse	30A*
	F30	used if K4 has a malfunction and is removed	30A*
	F31	ACC, LDW, TSM, SADS, HBSM, Garage Door Opener	10A
	F32	Side Obstacle Detector	-
	F33	RDCM (chassis all wheel drive)	10A
Plugg	K1	Air Solenoid	-
	K2	Ignition 15	X*

	K3	Ignition 15, Rear	X*
	K4	Logistic Mode Relay Set (only for oversea transport)	X*
PCB Relays **	K5	Park – Taillamp Sidemarker, LH & RH	-
	K6	Pedals – Adjustable, RWD	-
	K7	Pedals – Adjustable, FWD	-
	K8	Fuel Door Isolation RHD	X*
	K9	Liftglass, Rear Window	-
	K10	Lamp – Cornering LH	-
	K11	Lamp – Cornering RH	-
	K12	Park Enable	-

X   utilized
*   Non-standard, only in combination with optional features
**   Not replaceable

RFA (Remote Function Actuation Subsystem)

The Remote Function Actuation Subsystem converts button actuation information received via Radio Frequency which indicate customer actuations of a remote transmitter.

Block diagram RFA
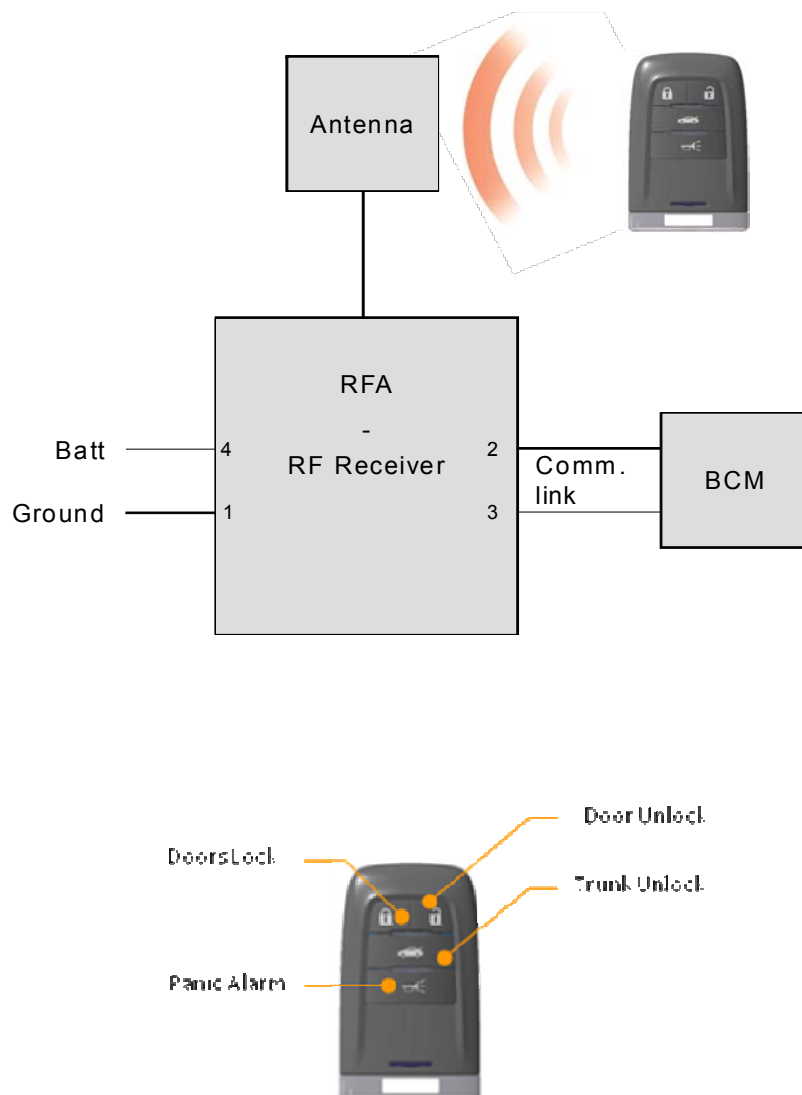
Functional description RFA

The RFA is a module installed to receive the messages transmitted by RF keys or TPMS valves using 433Mhz or 315Mhz depending on market. It is placed behind the instrument panel cluster.

With every button push, the 32-bit transmitter ID, a synchronization counter and the requested command is transmitted in an encrypted sequence.

There are several features which may be initiated by RF key, all explained below.

Lock / Unlock

The Remote Control Access feature enables the customer to lock, unlock, and theft-security lock their vehicle as well as request initiation or termination of motion of power closures such as liftgates.

The operator is able to initiate unlocking of one or more vehicle doors with one or more presses of the remote transmitter Unlock button. Based on personalization settings, either the driver door or all doors will unlock upon the first press of the remote unlock button. The second press of the remote unlock button within a calibratable time period (default of 5 seconds) will always result in unlocking of all doors.

The operator is able to initiate locking of vehicle doors or theft-security locking of all vehicle doors with one or more presses of the remote transmitter Lock button.

Comfort Open / Comfort Close

The Remote Comfort Open & Remote Comfort Close features allow the customer the convenience of opening or closing all of the vehicle's powered windows simultaneously based on a remote transmitter button press.

Comfort Open: A press & hold of the remote transmitter's Unlock button while in range of the vehicle, when the comfort open calibration is enabled, shall cause the vehicle's powered windows to travel toward their full open positions, for as long as the button remains pressed or until the full open positions are reached.

Comfort Close: same functionality as "Comfort Open"; the driver must use the transmitter's Lock button.

Vehicle Locate

The Remote Vehicle Locate feature enables the customer to activate the vehicle's horn, when enabled, and exterior lights by pressing the remote transmitter alarm button in range of their vehicle. The vehicle locate feature is intended to serve as an audible and visual aid in locating the vehicle.

The Remote Vehicle Locate feature shall be deactivated by new function activation from any known remote transmitter, Remote Panic Alarm activation, or timeout.

Power Liftgate Initiate / Stop Motion

The operator is able to request motion initiation of a vehicle's power liftgate with the press and hold of the remote transmitter Liftgate button.

The operator is able to request that motion of a vehicle's power liftgate stop with the press of the remote transmitter Liftgate button while the liftgate is in motion.

Rear Closure Release

The operator is able to request release of a vehicle's rear closure with the press of the remote transmitter Rear Closure button.

Connectors and pin assignment RFA
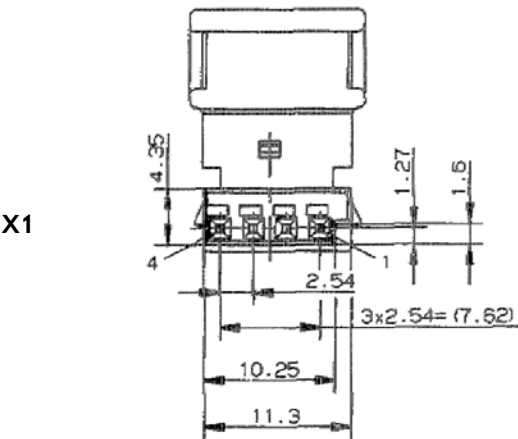
X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	x51	Signal Ground							
2	971	Comm Transmit (RF (slave) - Master IN Slave OUT - RF comm)							
3	970	Comm Receive (RF (slave) - Master OUT Slave IN - RF comm)							
4	x40	Battery Positive Voltage							

Stalks

Two stalks are available and will be explained below:
- WW – Wisher-Washer
- MFS – Multi-Function Switch

Functional description WW

The stalk in the picture shows all available functions. Depending on chosen options, some functions will not be available. They are marked by a *.

- Front wiper control with detent positions:
    1. High speed
    2. Low speed
    3. Intermittent
    4. OFF
- MIST
    o push stalk down to activate the wiper, non latching
- Adjustment for intermittent interval / Rain sensor sensitivity setting *
- Front wiper wash
    o pull stalk towards driver
- Hot Shot (explained in separate chapter) *
- Rear wiper end-cap button with detent positions: *
    o Upper position continuous operation
    o Middle position OFF
    o Lower position interval
- Rear wiper wash *
    o push stalk towards vehicle front

- Pin Out:

MATES WITH GM PART# 19167198
INTERFACE DESIGN PER JST DWG CN1-00181-100

DETAIL B
scale 2:1

PIN	DESCRIPTION
1	WINDSHIELD HIGH SIGNAL
2	WINDSHIELD LOW REFERENCE
3	WINDSHIELD LOW SIGNAL
4	BLANK
5	FRONT WASH
6	BLANK
7	BLANK
8	BLANK

- Circuit Schematic:

CIRCUIT SCHEMATIC - WASH WIPE

R1:442(Ω)
R2:536
R3:665
R4:825
R5:1070
R6:332
C1-C11:0.1(μF)
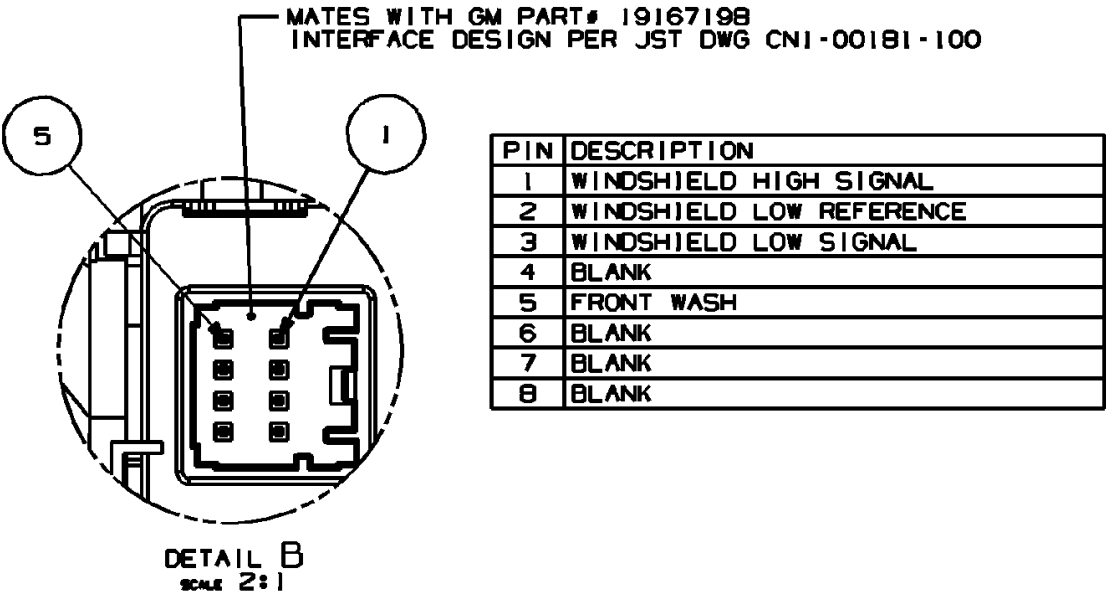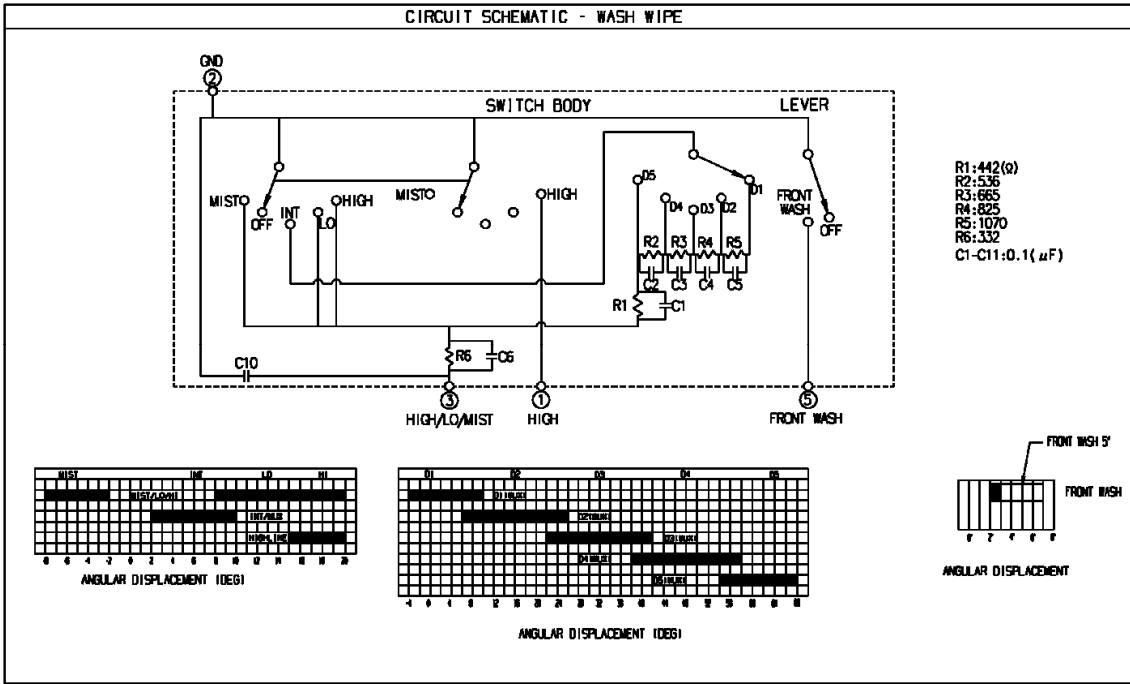
Functional description MFS

Again, the stalk in the picture shows all available functions. Depending on chosen options, some functions will not be available. They are marked by a *.

- Turn signal control with detent positions:
    - Right turn signal
    - Left turn signal
- High beam control:
    - High beam ON
        - push stalk to detent position towards vehicle front
    - High beam flash to pass
        - pull stalk towards driver
- Driver Information Center control:
    - Menu-Selection
        - push button
    - Set/Clear
        - end-cap push button
    - Non latching collar
        - up/down

- Pin Out:

MATES WITH GM PART# 19187197
INTERFACE DESIGN PER JST DWG CNI-00181-100

PIN	DESCRIPTION
1	LEFT
2	HI BEAM
3	GND
4	FTP
5	DIC MENU
6	GND
7	RIGHT
8	BLANK
9	BLANK
10	BLANK
11	BLANK
12	DIC SET

DETAIL B
SCALE 2:1

1   7

- Circuit Schematic:

TURN MFS CIRCUIT SCHEMATIC

HDLP DIMMER SW   TURN SW   DIC SET/MENU SW

FTP HI-BEAM   LEFT RIGHT

④ ②   ① ⑦

FTP GND HI   LEFT GND RIGHT

R1:5380(Ω)
R2:1910
R3:1020
R4:604
C1-C5:0.1(μF)

③ GND   ③ GND   ③ GND   ⑤ MENU   ⑥ GND   ⑫ SET

L T/S 11°   R T/S 11°   LEFT TURN SIGNAL   RIGHT TURN SIGNAL
ANGULAR DISPLACEMENT

BEAM CHANGE TOGGLE 6.5°   FTP 5°   BEAM CHANGE TOGGLE   FLASH TO PASS
ANGULAR DISPLACEMENT

INFO UP -20°   INFO DOWN 20°   INFO UP   DIC OFF   INFO DOWN
ANGULAR DISPLACEMENT

1.5 MM   DIC OFF   DIC SET
LINEAR DISPLACEMENT (MM)

1.5 MM   DIC OFF   DIC MENU
LINEAR DISPLACEMENT (MM)

213

SWC (Steering Wheel Control)

Based on chosen options, the steering wheel will be utilized with some switches. All available Steering Wheel Controls will be explained below. For Saab 9-5 MY2010, the SWC comes in two different colours, Jet Black and Cocoa. For MY2011 another variant including Adaptive cruise control will be implemented. The SWC's are connected to the Body Control Module, BCM.

SWC left side

- Cruise control:
    - on/off cruise
    - resume & accelerate
    - set & decelerate
    - cancel

- Adaptive cruise control

Introduced MY 11

SWC right side

- Audio/phone remote control:
    - volume +
    - volume -
    - seek +
    - seek -
    - source (SRC)
    - phone & push to talk (PTT)
    - hang up & audio mute

Cruise control

The cruise control can store and maintain speeds of approx. 30 to 200 km/h (20 to 120 mph). Deviations from the stored speeds may occur when driving uphill or downhill.

For safety reasons the cruise control cannot be activated until the foot brake has been operated once.

Do not use the cruise control if it is not advisable to maintain a constant speed.

With automatic transmission, only activate cruise control in automatic mode.

Control indicator ⟨⟩ ⇨ 88.

Activation

Press rocker switch ⟨⟩ down, control indicator ⟨⟩ illuminates. Accelerate to the desired speed and turn thumb wheel to RES/+ or SET/-, the current speed is stored and maintained. Accelerator pedal can be released.

Vehicle speed can be increased by depressing the accelerator pedal. When the accelerator pedal is released, the previously stored speed is resumed.

The speed cannot be accelerated by turning the thumb wheel to SET/- while first gear is selected.

Increase speed

With cruise control active, hold thumb wheel turned to RES/+ or briefly turn to RES/+ repeatedly: speed increases continuously or in small increments.

Alternatively accelerate to the desired speed and store by turning to RES/+.

Reduce speed

With cruise control active, hold thumb wheel turned to SET/- or briefly turn to SET/- repeatedly: speed decreases continuously or in small increments.

Deactivation

Press rocker switch ⟨⟩ up, control indicator ⟨⟩ goes out. Cruise control is deactivated.

Automatic deactivation:

- vehicle speed below approx. 30 km/h (20 mph),
- the brake pedal is depressed,
- the clutch pedal is depressed,
- selector lever in N,
- the Traction Control system or Electronic Stability Control is operating.

Resume stored speed

Turn thumb wheel to RES/+ at a speed above 30 km/h (20 mph). The stored speed will be obtained.

Deleting the stored speed

The stored speed will be deleted by pressing button ⊗ or switching off ignition.

Steering wheel audio controls
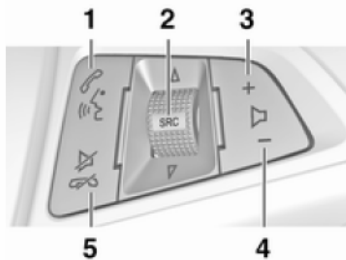
1   Short press: take call 87
    or dial number in call list 100
    or activate voice control 100
    Long press: show call list 100
2   SRC (Source) 4
    Press: select audio source 4
    Turn upward: next preset, next radio station, next entry or switch to next call 4
    Turn downward: previous preset, radio station, previous entry or switch to previous call 4
3   Increase volume 4
4   Reduce volume 4
5   Short press: end/decline call 100
    or close call list 100
    or deactivate voice control . . 100
    or activate/deactivate mute ... 13

CONNECTOR SERIES AIT-II 6PIN
JST #S06B-AIT2-1AK (MALE)

MATES WITH
JST #AIT2PB-06-1AK (FEMALE)
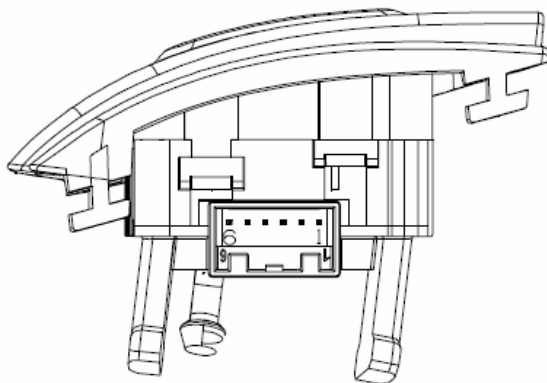
Audio switch connector

CONNECTOR SERIES AIT-II 7PIN
JST #S07B-AIT2-1FS (MALE)

MATES WITH
JST #AIT2PB-07-1FS (FEMALE)
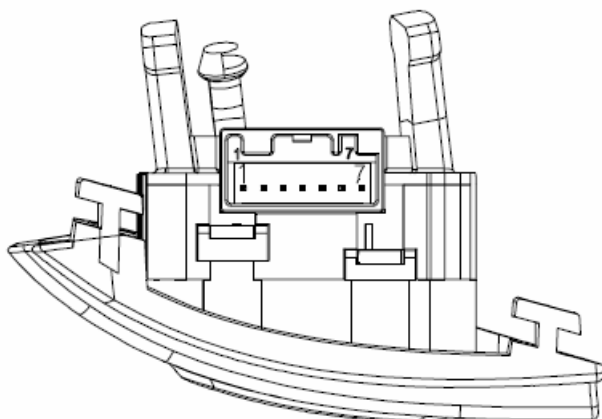
CONNECTOR LAYOUT

Cruise switch connector

UEC (Underhood Electrical Center)

The Underhood Electrical Center is located in the engine compartment and provides some relays and fuses.
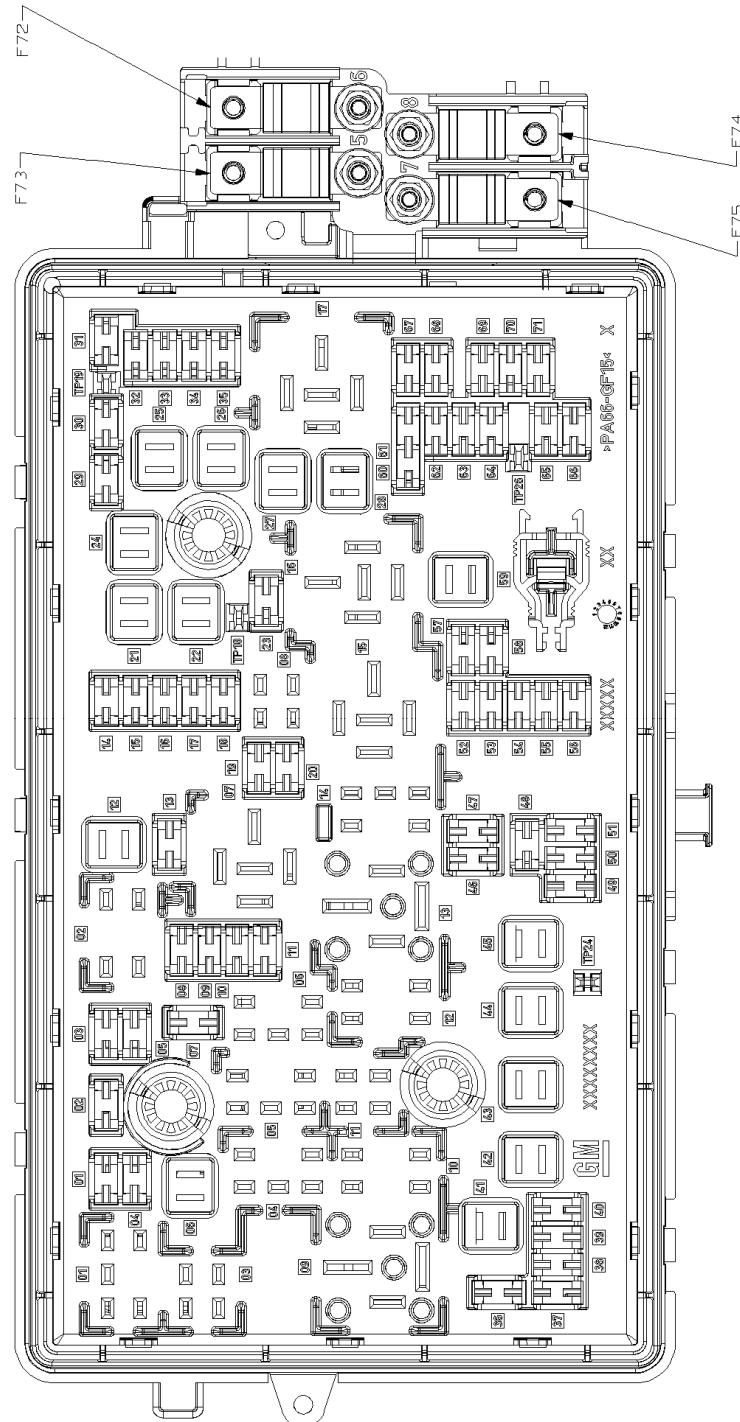
Depending on the engine, different devices will be installed.

Device Type	Device	Description	Size depending on engine
J-Case Fuses	F6	Front Wiper	30A
	F12	Starter Solenoid	30A
	F21	Power Window Rear	30A
	F22	ABS valve	30A
	F24	Power Window Front	30A
	F25	Receptacle – Electrical, Accessory 230V	-
	F26	ABS Pump	60A
	F27	Electrical Park Brake	30A
	F28	Rear Defog	40A
	F41	Vacuum Pump / Passive Start	30A
	F42	Cool Fan K2	30-60A
	F43	Hot Shot	-
	F44	Washer Headlamps	25A
	F45	Cool Fan K1 (size depending on engine)	30-60A
	F59	Diesel Fuel Heating Sec Air Pump	30-40A
Mini Fuses	F1	TCM Batt	15A
	F2	ECM Batt	15A
	F3	Spare	-
	F4	Spare	-
	F5	Ignition 15, ECM/TCM	15A
	F7	Spare	-
	F8	Fuel Inj Evn Bnk / Ign Coil Evn Bnk	15A
	F9	Fuel Inj Odd Bnk / Ign Coil Odd Bnk	15A
	F10	ECM	15A
	F11	Lambda Sens 2 / Non Walk Home	10A
	F13	Blow By Sensor / FSCM	7,5A
	F14	Air Solenoid / Low Beam DRL Term 30	15A
	F15	Rear Wiper	20A
	F16	Vacuum Pump / Air Flow Meter	7,5A
	F17	Ignition 15, SDM	5A
	F18	AFL AHL Power 1	15A
	F19	AFL AHL Power 2	10A
	F20	Fuel pump	20A
	F23	VES	10A
	F29	Control Seat, Power, Lumbar LH	15A
	F30	Control Seat, Power, Lumbar RH	15A
	F31	AC Clutch	10A
	F32	BCM VBatt	20A

	F33	Heated Seats, Front	25A
	F34	Roof – Sun, Glass, Sliding, Elec.	25A
	F35	Amplifier, Subwoofer	30A
	F36	Spare	-
	F37	High Beam RH	10A
	F38	High Beam LH	10A
	F39	Spare	-
	F40	After Boil Pump	5A
	F46	Terminal 87 / A	10A
	F47	Lambda Sens 1 / Not Walk Home	10A
	F48	Fog Lamp	15A
	F49	Low Beam HID RH	15A
	F50	Low Beam HID LH	15A
	F51	Horn / Dual Horn	15A
	F52	Ignition 15, MIL	5A
	F53	Ignition 15, MHL RH / LH / Ventilation RH / LH / ISRVM / ALM / Rear Vision Camera	10A
	F54	Ignition 15, MHL Light Center / EHS	5A
	F55	Power Window / Mirror Fold	7,5A
	F56	Washer Front	15A
	F57	Ignition 15, Not R/C Escl.	15A
	F60	MIR DEF	7,5A
	F61	MIR DEF	7,5A
	F62	Canister Vent Solenoid	10A
	F63	RR Window Sensor	7,5A
	F64	AFL AHL Elect	5A
	F65	ATWS Horn	7,5A
	F66	Washer Rear	15A
	F67	Terminal 30, FSCM	20A
	F69	Battery Voltage Sens	5A
	F70	RSM	5A
	F71	Body Elec Supply	5A
Others	F72	EHS	100A
	F73	Glow Plug	80A
	F74	Glow Plug	-
	F75	Spare	-
Plugged Relays	K1	AC Clutch	X
	K2	Starter Solenoid	X
	K3	Cooling Fan	X
	K4	Front Wiper Speed	X
	K5	Front Wiper On	X
	K6	Low Beam DRL / Air Solenoid	X
	K7	Main Relay	X
	K8	Fuel Pump	X
	K9	Cooling Fan	X
	K10	Cooling Fan	X

			X
	K11	Washer Headlamps	X
	K12	Cooling Fan	X
	K13	Cooling Fan	X
	K14	Low Beam HID / DRL	X
	K15	Ignition 15	X
	K16	Diesel Fuel Heat, Secondary Air Pump	X
	K17	Window / Mirror Defog	X
PCB Relays ***	K18	Trunk release	X
	K19	RR Wiper	X
	K20	High Beam LH / RH	X
	K21	Horn / Dual Horn	X
	K22	Fog Lamp	X
	K23	Washer Front	X
	K24	Washer Rear	X
	K25	ATWS Horn	X
	K26	ATSL	X

WSS (Wheel Speed Sensor)

The wheel speed sensors are used in conjunction with a magnetic encoder. They measure and transmit information pertaining to the angular position changes of the vehicle's wheel to the Electronic Brake Control Module (EBCM), which the sensors are directly connected to.

Block diagram WSS
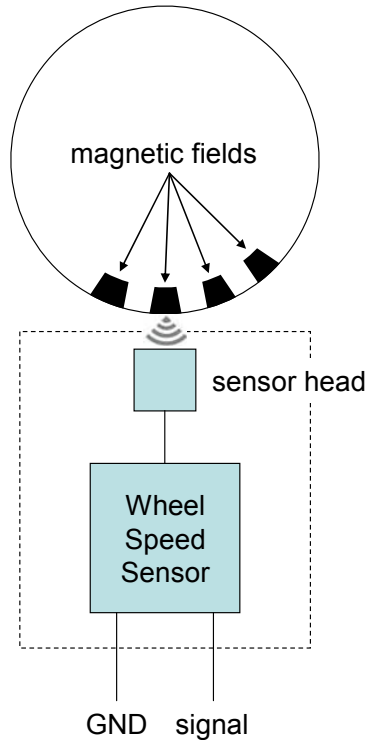
Functional description WSS

The sensor is based on MR technology. At the wheel, a disk with 48 magnetic fields on it is mounted. The sensor is installed on the chassis. If the wheel moves, the sensor head detects changes in the magnetic field in front of it and represents this signal as an electric pulse on the signal line.

Connectors and pin assignment WSS
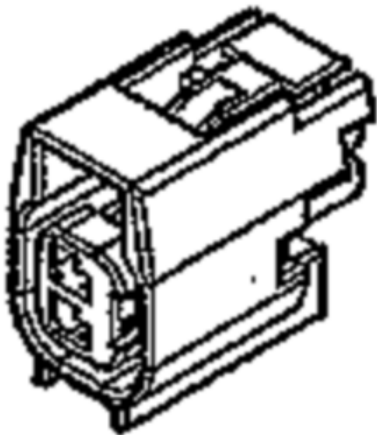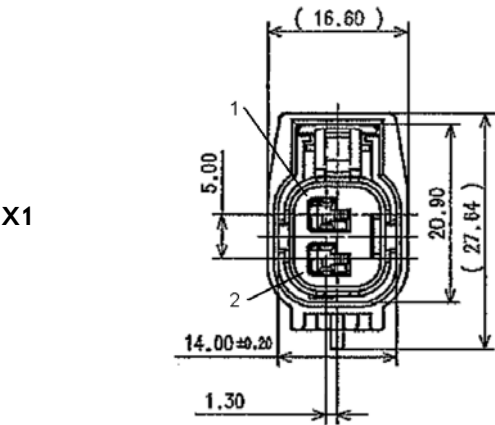
X1

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1/B	830	Wheel Speed Sensor Signal			A30				
2/A	873	Wheel Speed Sensor Low Reference			A30				

Main Functions

Customization

The driver is able to customize the car's behavior. Therefore a customization menu is available. All available options are explained below.

Vehicle Settings

Climate and Air Quality

Label	Option 1	Option 2	Option 3	STD / OPT
Auto Fan Speed	High	Medium	Low	STD
Air Conditioning Mode	On	Off	Last setting	STD
Air Quality Sensor	Off	Low sensitivity	High sensitivity	STD
Auto Cooled/Vented Seats	On	Off		OPT
Auto Heated Seats	On	Off		OPT
*Remote Start Auto Seat Cool**	*Off*	*On*		*OPT*
*Remote Start Auto Heat Seats**	*Off*	*On*		*OPT*
Rear Zone Temp	Rear Off	Rear Mimic Front	Rear Last Known	OPT
Auto Defog	On	Off		OPT
Auto Rear Defog	On	Off		OPT

*= Only in US

Comfort and Convenience

Label	Option 1	Option 2	STD / OPT
Easy Exit Driver Seat	Off	On	OPT
Chime Volume	Normal	High	STD
Auto Parking Mirror Tilt	Off	On	OPT
Auto Mirror Folding	Off	On	OPT

Collision / Detection Systems

Label	Option 1	Option 2	Option 3	STD / OPT
Park Assist with Towbar	Off	On	Tow Bar attached	OPT

Lighting

Label	Option 1	Option 2	Option 3	Option 4	STD / OPT
Vehicle Locator Lights	On	Off			STD
Exit Lighting	Off	30 Seconds	1 Minute	2 Minutes	STD

Power Door Locks

Label	Option 1	Option 2	Option 3	STD / OPT
*Unlocked Door Anti Lock Out**	*Off*	*On*		*STD*
Auto Door Lock	Off	On		STD
Auto Door Unlock	All doors	Driver door	Off	STD
*Delayed Door Lock**	*Off*	*On*		*STD*

*= Only in US

Remote Locking, Unlocking, Starting…

Label	Option 1	Option 2	Option 3	Option 4	STD / OPT
Remote Unlock Light Feedback	Flash Lights	Off			STD
Remote Lock Lights/Horn Feedback	Lights & Horn	Lights Only	Horn Only	Off	STD
Remote Door Unlock	Driver Door	All Doors			STD
Memory Remote Recall	Off	On			OPT
Passive Door Unlock	All Doors	Driver Door			OPT
Passive Door Lock	On with Horn chirp	On	Off		OPT
Remote Left in Vehicle Reminder	On	Off			OPT

Return to factory settings

Label	Option 1	Option 2	STD / OPT
Return to Factory Settings	No	Yes	STD

Driving mode selection

The driver has the ability to change the chassis systems' behavior within a certain range. Examples for labeling these modes are:

- Sport
- Intelligent
- Comfort

These driver selectable modes represent a pre determination. But they can't utilize the full benefit of using smart chassis systems for vehicle ride and handling and active safety since the performance of the different active chassis subsystems will depend on the driver selection and not on the actual driving situation. So the driver is supported by a application software called "Driving Mode Control (DMC II)".

Functional description Driving mode selection

The interface of this system to the driver is a button placed in the center console / stack. It is specified with the nomenclature of the possible, user selectable modes, i.e. "sport" and "Intelligent". When the driver pushes the button the first step of the whole process is performed – the push event is evaluated.
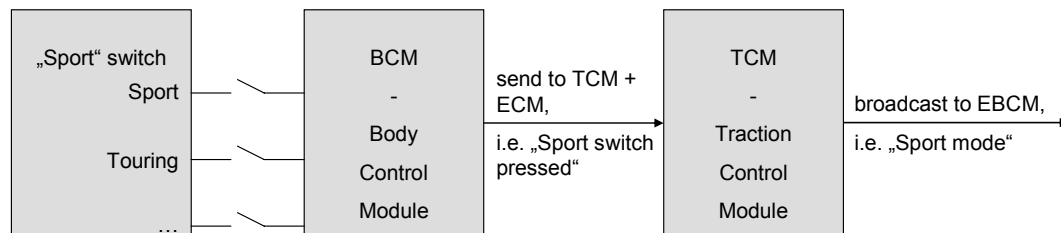
The BCM reads the button state and forwards its information to TCM or ECM if TCM is not available. TCM/BCM is responsible for creating a signal representing the user-selected mode. This is done by a state machine:
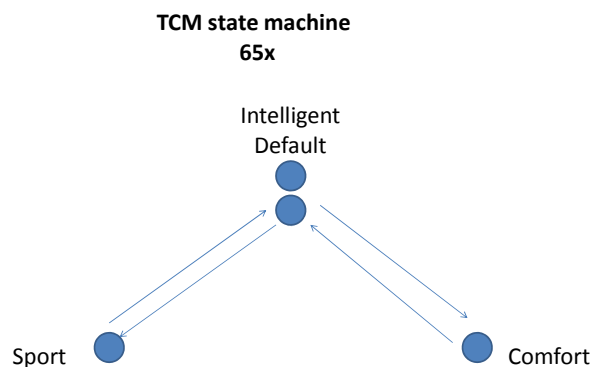
This state machine is necessary to allow multiple, configurable options in different cars. Within every Saab, the same scheme is used.

The driver is able to change modes in the direction of the arrows. As shown in the drawing changes are possible to any state, not depending on the actual state. There is one rotary switch to provide this opportunity: A "Sport" mode, "Intelligent" mode and a "Comfort" mode. The actual user-selected driving mode is represented by LEDs installed in the switch.

(By calibration, the behavior of the state machine is changeable. So for example, it could not be possible to go directly from "Sport mode" into "Comfort Mode". The state machine may force to pass via "Default mode".)

The most important input value for leading the chassis systems into a defined mode is the user switch. However, for every user selected mode various calibrations can be implemented. That means that the car can adjust the user selection within a certain range. But it will never lead the systems into a mode that completely differs from the driver's selection.

A detailed overview on how this works is shown within the next diagrams:
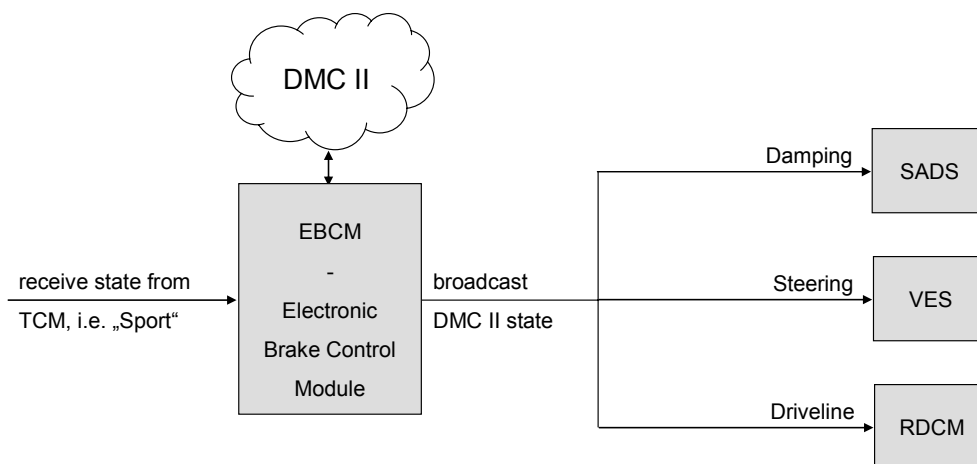
TCM sends the encoded, user-selected mode to the EBCM. In that module, an application software called DMC II is running. This is the core software responsible for the dynamic driving mode selection. Its task is to determine the driver's behavior. It can differentiate between several driving manners, such as soft driving or active driving. The outcome of that information – combined with the driver's selection – is the vehicle's behavior. This information is forwarded to the chassis systems.

The next scheme should give some more detailed information on how DMC II acts. Please note, that it is just an example. Real calibrations and labeling may differ.

driver's selection (by switch) | Comfort | Sport

adapted selection (by DMC II) | State 1 | State 2 | State 3 | State 4

„Sport mode"
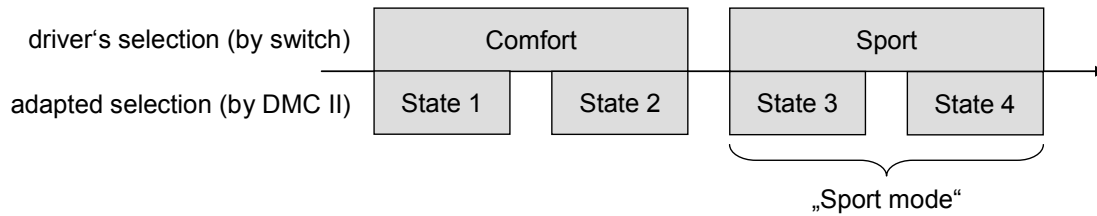
The picture shows possible chassis systems' behaviors – "State 1…4". This is the information sent to SADS, VES, RDCM, … which evaluate the information and react in a defined way:

- dampers react softer / harder
- steering gets easier / harder
- rear drive is switched on / off
- …

What should be clear also is that the driver's selection is the key input for the finally selected state. DMC II will never select a state out of the driver selected range. But it may adjust the selection. If the driver selected "Sport mode", DMC II has the ability to decide whether "State 3" or "State 4" is applied. This decision is based on driving facts. For example: The driver selects "Sport mode" but drives very conservatively. He would feel uncomfortable with i.e. extremely hard dampers. For that reason, DMC II decides to lead the systems into a more comfortable state which could be "State 3". But if the driver drives very racy, DMC II will recognize that and switch to a more sporty state, i.e. "State 4". Both is called "Sport mode".

EPM (Electric Power Management)

The Electric Power Management (EPM) guarantees highest battery life due to controlling the generator and intelligent power distribution.
Before concentrating on the functional description of EPM, some terms have to be explained.

EPM blockdiagram
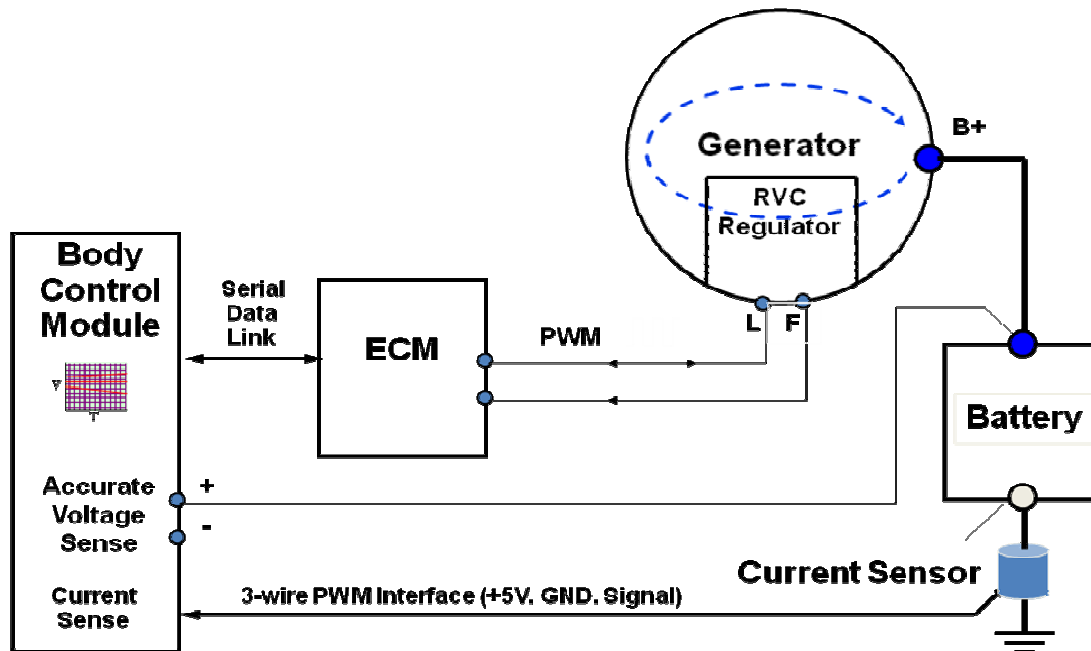
Body Contro Module (BCM)

The BCM is the master for EPM functionality.
It measure the current with a sensor mounted between the battery minus(-) pole and chassi ground. It also measure the minimum battery voltage during engine crank with a good accuracy at all temperatures.
By estimating the battery temperature the most valueble input data is know to be able to run the EPM System

RVC Generator

To vary the voltage from the generator, the conventional generator has been replaced by a "Regulated Voltage Control (RVC) Generator". By a PWM signal is possible to adjust the output voltage of the generator taken from the algorithm and calculations made in the BCM.

Regulated Voltage Control

The Regulator Voltage Control (RVC) will result in the battery being charged at its optimum voltage for each certain voltage mode. The optimum battery charge voltage will be converted to a percent duty cycle command that will be sent to the ECM via serial data link. The ECM will then place the 128 Hz PWM Duty Cycle on the L line. The regulator in the generator will then adjust the regulated voltage set point according to the commanded duty cycle (see figure). When the generator is at full field the RVC algorithm is unable to control the generator-regulated voltage.
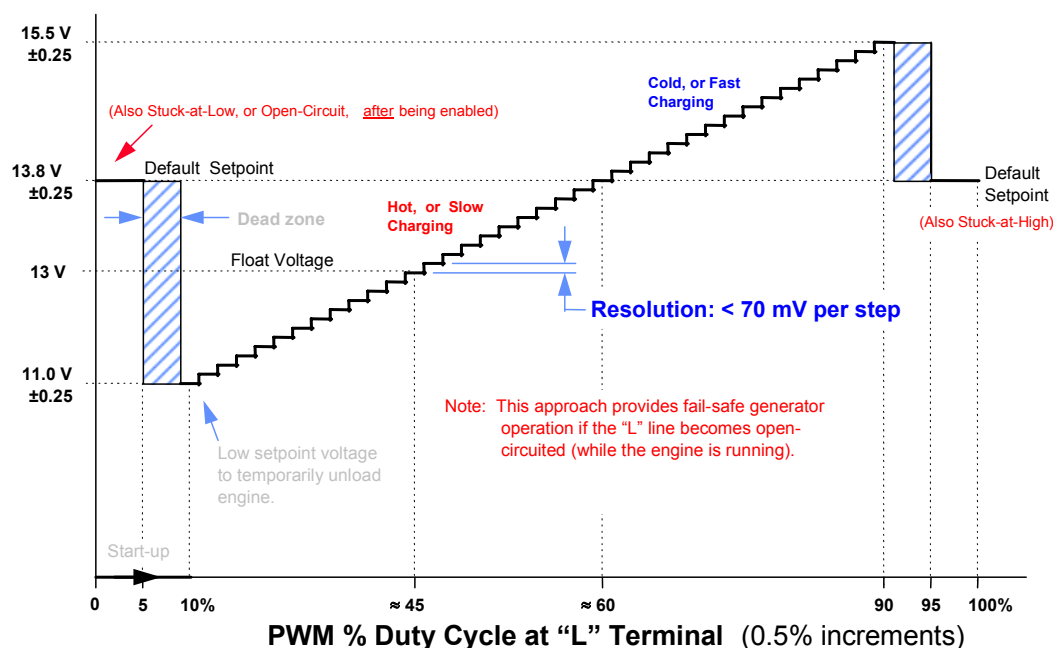
Battery SOC

SOC is defined as the remaining capacity (in amp-hours) in a battery when a fully charged battery is discharged with a constant current (C20-rate capacity) in 25Cdeg until the battery reach 10.5V. are referenced to C20-rate capacity. The SOC is expressed in a percentage value and ranges from 0% to 100%.

The SOC calculations in the EPM system can be determined in two ways.
1. If the cars have been switch if for more that 16h the battery voltage (Open Circuit Voltage OCV) is measured and the SOC calculated by using values stored in a programmed table.
2. During running and key ON position , the State Of Charge (SOC) is calculated by a current sensor mounted between the batter (-) pole and chassi ground.

Diagnostic

Diagnostics are used to ensure that the system is working properly and the proper Diagnostic Trouble Codes (DTCs) or Telltales are activated when an error occurs in the system. Subsystem and Generator faults will be tested to ensure that the system responds correctly to these types of errors concerning the RVC system.

Diagnostic Trouble Codes (DTCs) Table

GMLAN Signal	Parameter Name	DTC	Cluster with DIC	
			Battery Telltale	DIC Message Display
	Battery Voltage Sense Fault	B1517.5A	No	No
Service Battery Charging System Indication On	Low Battery Voltage	B1517.03	Yes	Service Battery Charging System
Service Battery Charging System Indication On	High Battery Voltage	B1517.07	Yes	Service Battery Charging System
	Battery Current Sensor Performance	B1516.08	No	No
Service Battery Charging System Indication On	Current Sensor Polarity Check	B1516.66	Yes	Service Battery Charging System
	High Parasitic Load	B1527.00	No	No
Battery Saver Indication On	Energy Management Load Shed No3	-	No	WBattery Saver Active
Battery Voltage Indication	Low Voltage	B151A.58	No	Low Battery

If any DTC is set and if all of the conditions required to set this particular DTC are cleared (problem corrects itself), after some seconds.

Functional description EPM

The purpose of the Electric Power Management feature is to maintain engine startability and prevent vehicle failures due to discharged batteries. When the battery State-of-Charge (SOC) is low, the vehicle's engine idle speed is increased slightly. When the battery SOC continues to drop, the rear defog, heated seats, and heated mirrors may be momentarily shut off. As an extreme measure, when the battery SOC is very low, the A/C compressor and engine cooling fan after-blow may also be turned off. Once the battery SOC reaches an appropriate level, these items will be turned back on. These measures should be rarely visible to the customer, except during the extreme measures.

Normal operation mode

In normal operation mode the system voltage is calculated based on the actual battery temperature and the SOC. Therefore an array of curves is used, representing optimal charging conditions.

Charging Voltage For Different Battery SOCs and Temperatures
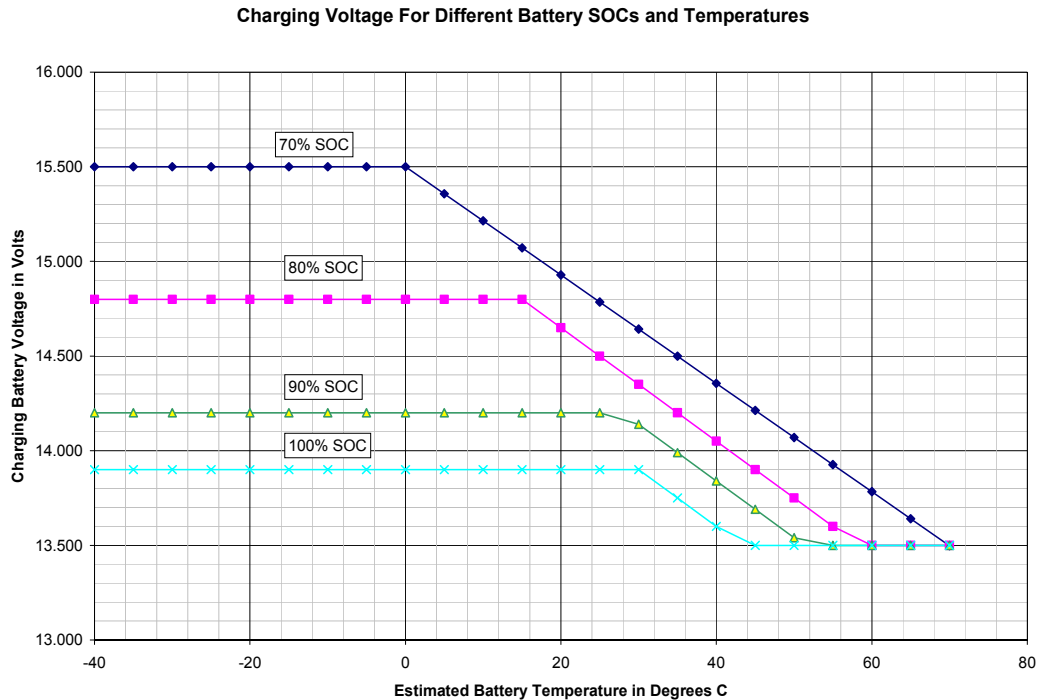
There are functionalities of the EPM System that cause different voltage behaviors like:

- **Start-Up voltage boost**
  Battery recovers charge lost during cranking it occurs after every ignition cycle and it lasts 30 seconds

- **Headlamp Mode**
  Purpose of this mode is to maintain optimum headlamp system performance anytime the EPM system is in any low voltage modes

- **Wiper Mode**
  Purpose of this mode is to maintain optimum wiper system performance anytime the EPM system is in any low voltage modes

- **Sulfation Mode**
  Battery voltage increase to optimum battery charging voltage for a short time (3-5 minutes) to avoid sulfation. Battery sulfation mode occurs any time the battery voltage has been at 13V or below for more than 45 minutes.

- **Plant Assembly Mode**
  Improve battery warranty during assembly and while the vehicle is located at the dealer for the first x miles.

- **Voltage Reduction Mode**
  Voltage reduction mode's purpose is to reduce the voltage under certain conditions, anytime the battery is fully charged.

- **Fuel Economy Mode**
  To save fuel, the RVC generator will only provide power to the system if the battery is fully charged and even drain the battery to a lower SOC in certain conditions

- **Climate Control Voltage Boost request**
  This request will be used if the RVC control algorithm is in Voltage Reduction mode or in Fuel Economy mode.

Idle Speed

During periods of high electrical loads and battery discharging, the engine idle speed is increased to increase the generator output.

The IB noticeability is with respect to Creep Torque, Audible Noise and Vibration. The maximum degree of noticeability may vary as a function of Resonances, Temperature or Gear.

- **Idle Boost 0** is defined as the normal or base operating mode (with respect to EPM) with no idle boost requested.
- **Idle Boost 1** is defined as the maximum rpm without being noticeable by 95% of all customers with the engine cooling fans at low speed, the radio off, and the HVAC blower at medium speed.
- **Idle Boost 2** is defined as the maximum rpm without being noticeable by 75% of all customers with the same loads as for level 1. Thus with the engine cooling fans at high speed, or the radio on at moderate volume, or the HVAC blower at high speed, Level 2 will be unnoticeable by more than 75% of all customers. If it is noticeable it should not be objectionable.
- **Idle Boost 3** is defined as the maximum rpm without excessive creep torque. It is expected to occur very rarely, and to be noticeable by 75% of all customers and it requires driver notification to prevent warranty claims.

Load Shed

If an increased idle speed doesn't result in suitable voltages, an additional feature will be enabled called Load Shedding which will reduced or entirely turned off some certain electrical loads. The loads that may be reduced or turned off are considered customer convenience rather than customer safety features.

Examples of loads are:

Heated seats, Heated rear window defogger, Heated exterior mirrors, HVAC blower

- **Load Shed 1**
  Reduces load: HVAC blower
- **Load Shed 2**
  Reduces load: HVAC blower
- **Load Shed 3**
  Turns off: heated seats, heated rear window defogger, heated exterior mirrors, HVAC blower

If EPM activates Load Shedding Level 3, a message will displayed in the IPC: "Battery Saver active!

Exterior Lighting

BCM controls all exterior lights. Beside the conventional switch, there are some additional features which will be explained below.

Light switch

The position of the switch responsible for exterior lighting is read out by the BCM. There are four possible states:
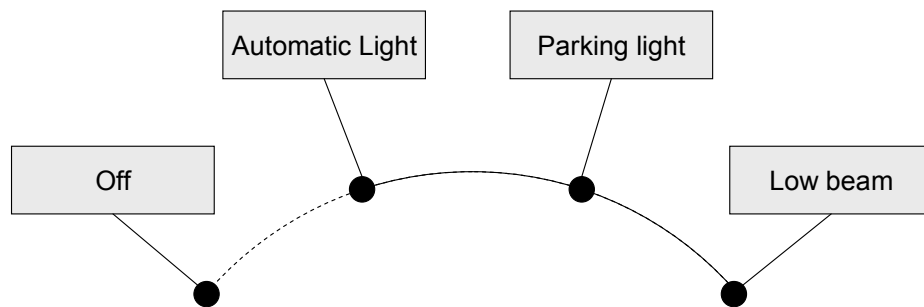
The connection between "Off" and "Automatic Light" is drawn dashed, because "Off" is a non latching switch state. The switch will not stay in "Off" position, but go back into "Automatic Light" position. See section "Automatic light" for details.

Automatic Light

Automatic Light is switched on as default. It can be switched off by turning the light switch to "Off" position. It will be switched on again by doing so again.

RSM or the ambient light sensor(dashboard mounted) will send the actual ambient light values to the BCM which then will determine day or night condition and by that adjust interior and exterior lights automatically to calibrated settings . If the car is equipped with RSM, a Tunnel Detect feature is also available which will react quicker if car enter a tunnel.

Lead me to the car

There are 2 version of this feature. The first one is for ROW and second one is for North America. Both version activates for 30 seconds
First one activates by pressing the "Panic" button (short press) on the UID and cancel by a second press or a non OFF power mode.

The second version will be automatically activated by pressing "Unlock"button on the UID. The second one will in addition only activate when BCM detects night condition as it's ambient light dependent and cancels by pressing lock button or a non OFF power mode.

The following lamps will be activated:
- Parking Light
- Rear Light
- Reverse Light
- Number plate light
- Low beam

Second version also activates interior light and can be configured off in customization menu.

Follow me home

If the Power Mode is OFF and the driver door is opened, the driver can activate the flash-to-pass switch to activate the "Follow me home" feature. BCM will activate the following lights:
- Parking Light
- Rear Light
- Reverse Light
- Number plate light
- Low beam

Immobilizer
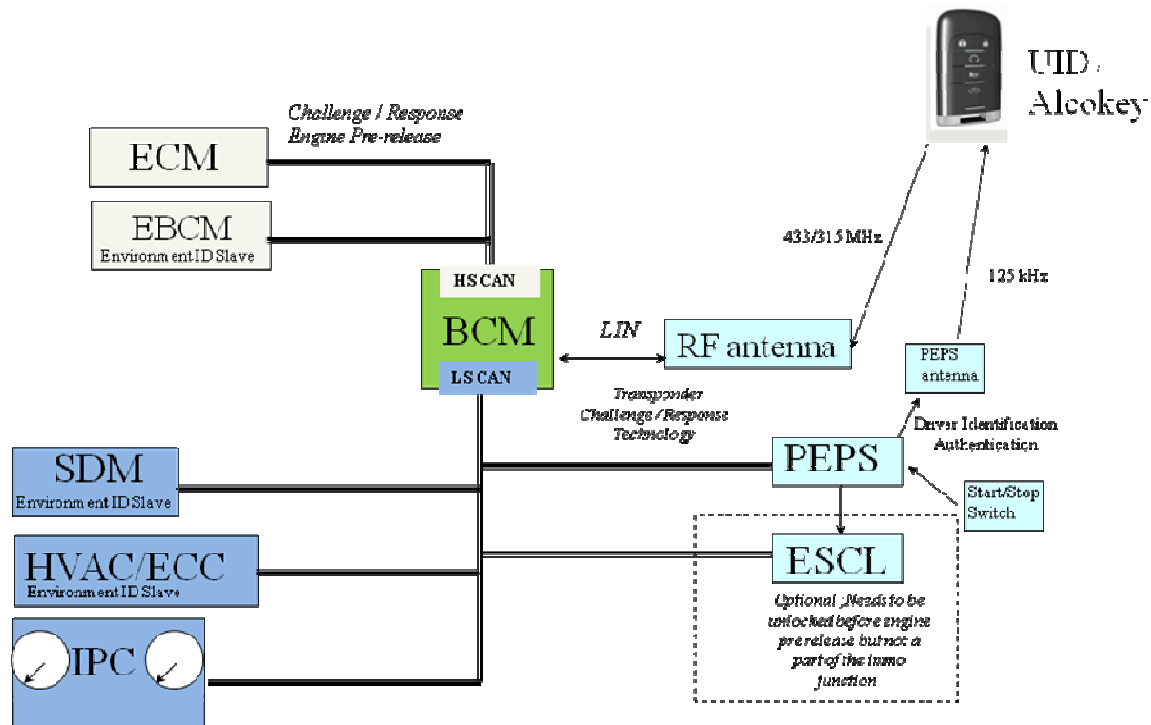
Functional description Immobilizer

The main immobilizer function is performed as an interaction between several modules. The process that determines whether the engine may be engaged or not consists of several steps:

1. Key Authentication:
   - Every key delivered with the car has been registered in the BCM.
   - On key authentication, the transponder code of the key will be read out by the PEPS system. It is sent to the BCM which compares it to the registered keys.

2. Vehicle Authentication:
   - At end-of-line, pass phrases have been programmed into several ECUs.
   - During the authentication process, BCM sends out a broadcast message to force some modules to send these keys back. Since BCM knows the pass phrases either, it is able to compare the received and stored keys.
   - Participating ECUs are EBCM, ECC, IPC and SDM.
   - At least three of these modules have to answer within a given time, an answer of IPC is always required.

3. ECM ⇔ BCM Challenge Response:
    - ECM sends out a 4 Byte random number (challenge) to the BCM.
    - BCM performs a calculation with the challenge (using end-of-line programmed variables) and sends the converted value back to ECM.
    - ECM performs the calculation itself.
    - Both results are compared in the ECM. If equal, engine start is permitted.

If any of these three steps fails, the engine will not start by disabling starter, fuel injection and spark. In addition, a telltale will indicate the error.

Backup Authentication

If the battery in the Remote Control is empty there is second way to Authenticate the driver and that is to use the Immobilizer Coil/module which is installed in the arm rest box in middle console. This coil is used to readout the transponder code of the key. The information is sent to the BCM.

Connectors and pin assignment Immobilizer Coil

X1
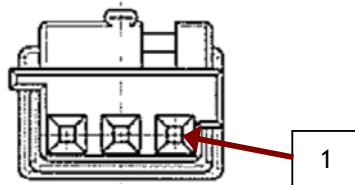
Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
1	3277	Return / Ground							
2	7533	Linear Interconnect Network Bus 11							
3	3276	Supply Voltage							

Interior Lighting

The interior lighting is controlled by the BCM. At first, all controllable lights will be explained. Subsequently, behavior in every possible state will be described. At the end of the chapter, a table provides an overview over Interior Lighting Features.

Controllable Interior Lights and Function

Dome lamps
- o illuminate the passenger compartment
- o activated by Welcome Light and on door open recognition

Spotlight
- o shall make it possible to read in dark surrounding of the passenger compartment
- o separate control of driver and co-driver spotlight

Rear Passenger Reading Lamp
- o shall make it possible to read in dark surrounding of the passenger compartment

Trunk lamp
- o illuminates the trunk if opened

Makeup lamp
- o shall illuminate the area in front of the makeup mirror

Glove Box light
- o illuminates the glove box if opened

Door Handle light
- o illuminates the pocket box in the door

PRNDL illumination

Cigarette Lighter
- o cigarette lighters provide an illuminated ring

IP switches
- o switches not mounted within a faceplate are controlled by the BCM according to backlight function

Radio switches
- o according backlight function

ECC switches
- o according backlight function

IPC Backlight
- o according backlight function

Main Display (TID, GID, CID)
- o activated by:
  - Radio
  - Ignition on/off

ECC Display
- o activated by Ignition on/off

IPC Display
- o activated by opened Driver Door (Odo-only)
- o activated by Ignition on/off

Welcome Light

If the driver unlocks the doors via RF key, welcome light is activated. This means switching on the dome lamp and puddle lights. Welcome light leads into Theater Dimming if a door is opened. If no door is opened within a timeout (0…255s, 1s steps, 0: disable), Welcome Light fades out.

Theater Dimming (IGN off)

In case of "Ignition off" Theater Dimming will be activated, if doors are opened.

Door Open behavior

If a door is opened, interior light will be switched on. BCM differentiates between driver door and others. On door open recognition, the following lights will be switched on:

driver door	other doors
• Dome lamps • Mirror puddle light option • Door cortesy light • Footweel light • Ambient light Door handle, door pocket, footwell, front dome light area. • Heart beat Start/Stop Switch (flashing)	• Dome lamps • Mirror puddle light (option) • Door cortesy light • Footweel light • Ambient light Door handle, door pocket, footwell, front dome light area.

Door Close behavior

If a door is closed, the lights will be switched off. There is a difference again between driver door and others.
When the driver door is closed, the lights will stay on for some time (approx. 20 seconds). After that time, they will fade out. Within every other door, the lights that have been switched on will be switched off by fading out immediately.

If the driver switch into > accessory state before the lights went out, they will be switched off faster

Door open/close light

If a door is opened in "Ignition on" state, dome lamps, Heart beat Start/Stop Switch (flashing) and puddle light will be switched on. If the doors are closed again, they fade out immediately.

Inadvertent Load

The following lights are controlled by an inadvertent load relay and will therefore switch off after some time:

- Glove Box Light
- Sunshade
- Dome lamps
- Reading lamps
- Trailer hook

Door open energy saving (IGN off)

To prevent the battery from running down in "Ignition off" state while the door stays open, the lights will be switched off after some time. This feature disabled all lamps, in addition to the Inadvertent Load controlled ones.

Dimming interior lights

Most interior lights are dimmable by the potentiometer mounted left to the IPC:
- IPC
- SWC
- radio display
- radio faceplate
- HVAC faceplate
- top console
- all LEDs installed in the switches

Locking

The car provides many ways of locking and unlocking opportunities. These are:

- remote key buttons
- open/close switch in the center stack
- manually lock/unlock the doors

For remote key functionality please refer to RFA description.

The switch in the center stack provides two buttons: one button unlocks, the other one locks all doors including tailgate and fuel door.

Even if a door is locked electrically it is always possible to unlock it by pulling the door handle. There is a mechanism that automatically unlocks the door in that case unless the Door is Theft Security Locked (TSL).

With TSL, the system locks all doors; the courtesy switches, interior and exterior trunk release switches are disabled. TSL function activates with 2 press of the Fob lock button or if car equipped with full PEPS by pressing 2 times on the door handle lock switch.

Logistic Mode

The logistic mode is included in all vehicles that will be shipped overseas. It is a function to ensure highest battery charge when the car arrives at the customer. Therefore, most electrical (comfort) features will be disabled.

Functional description Logistic Mode

Within Logistic Mode, many ECUs will be deactivated. Security functions will still be enabled, but all comfort functions are disabled.

The Logistic Mode can be activated by activating Hazard function and pressing the start button in CRANK position for more than 15 seconds. On "Ignition off" and "Ignition on", Logistic Mode will still be activated. The only way to leave Logistic Mode is to reverse/repeat the above mentioned procedure.

There are two relays that come with Logistic Mode: one in IEC, another one in REC. They simply switch off power distributed to the fuses that supply the ECUs.

The following ECUs will be switched off:

IEC	
Fuse	**ECU**
F1	DAB
F1	UHP
F1	RSE Display
F1	HUD
F4	Chime Module
F4	Radio
F5	UPA
F5	PSM
F5	Navi Display
F5	PDIM
F5	Infotainment Display
F5	Tunnel Control
F5	Center Stack
F5	Navi Faceplate
F5	Analog CLock
F5	TV Tuner

REC	
Fuse	**ECU**
F31	SADS
F31	LDW
F31	ACC
F31	ISRVM, HBSM
F31	UGDO
F31	IPB
F32	SAM
F23	AAS
F33	RDCM

Software Logistic Mode

Via diagnose tool, Software Logistic Mode may be activated. This causes a deactivation of the ECC. Every other module will still be working.

Power Window Lifter

The Power Window Lifter subsystem is an interaction of the PWL1..4 modules, DSP1, RFA and one part of the BCM. They are all connected via LIN bus.

Block diagram PWL
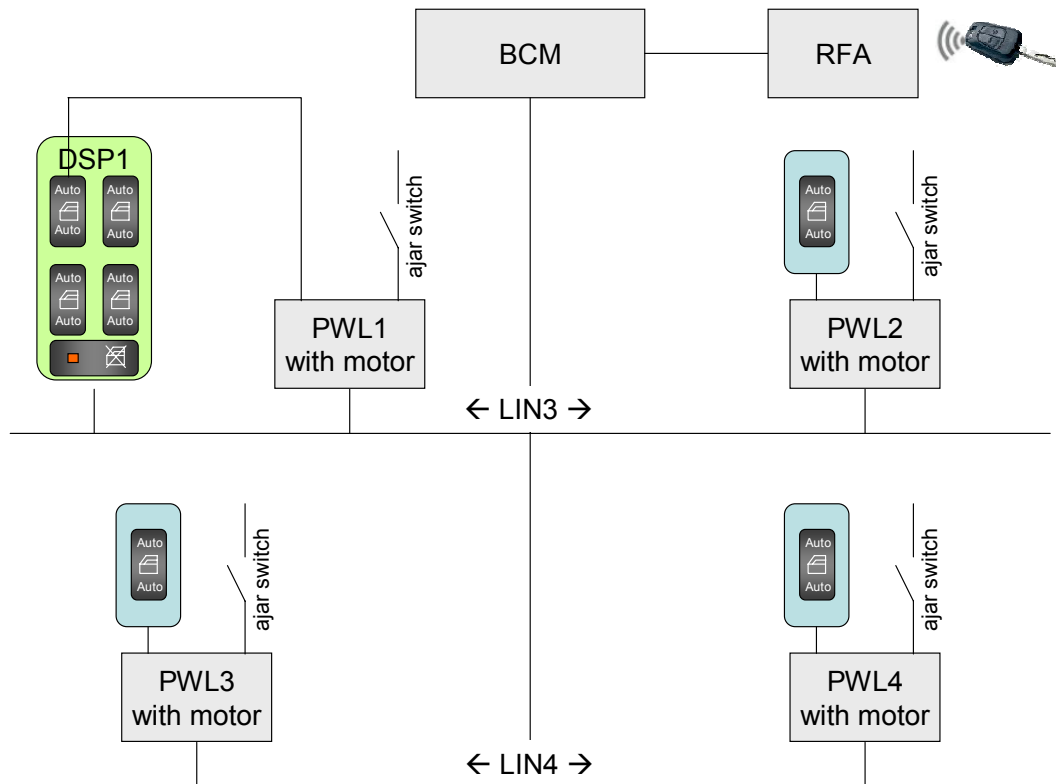
In Saab 650, one configurations are possible:
1. as shown in the block diagram above

Functional description PWL

LIN bus interaction

Every PWL movement must be requested to the BCM. The BCM handles these requests and sends orders to the PWL modules. Without an acceptance of the BCM no PWL movement is possible.

Switch design

The switches, which are located in every door, are multi-state switches. Their neutral position is the center position. There are two position detents in up and down direction.

```
            Up 2

            Up 1

          Neutral

           Down 1

           Down 2
```
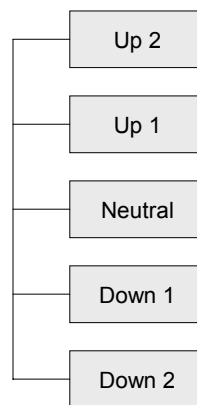
Opening and Closing

The first position detent of the PWL switch causes simple opening or closing movement. The window will move as long as the switch is activated, even if an obstacle is detected.

Opening and Closing is always applicable, even if the car is locked.

Express Opening and Express Closing

As long as the second detent of the switch is activated, the window is opening/closing like with the first detent. As soon as the switch is released (returns to neutral position), express open/close is active. In express mode, the window will completely open or close. It can be stopped by activating the switch again. Obstacle Detection is active during express window closing. That means that the PWL module will stop moving the window if a resistance higher than a calibratable value is recognized. The window will move on in reverse direction.

Remote Opening

All windows can be opened by pushing the Open button on the remote control for longer than 2 seconds. The windows will stop moving if the button is released.

Remote Closing

According to the remote Opening feature, all windows can be closed by pushing the Close button on the remote control for longer than 2 seconds. The windows will stop closing if the button is released. Obstacle Detection is active during Remote Movement.

Deactivaiting the rear window switch

The driwer switch panel content a button for deactivate the window switches in the rear doors. Same button can be used for temporary override of window pinch protection.

Door Open Recognition

The PWL modules are reading the "Door Ajar" switch signal. The corresponding switch located in the door is connected to the PWL module which sends this information to the BCM via LIN bus.

Connectors and pin assignment PWL1..4
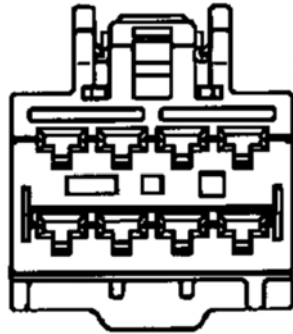
PWL1...4

Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
PWL1-1	A50	GND							
PWL1-2	A40	BAT							
PWL1-3	164	Power Window Motor Left Front Up Control							
PWL1-4	6134	Linear Interconnect Network Bus 3							
PWL1-5	9068	Power Window Switch Left Front Express Signal							
PWL1-6	745	Right Front Door Ajar Switch Signal							
PWL1-7	165	Power Window Motor Left Front Down Control							
PWL2-1	A50	GND							
PWL2-2	A40	BAT							
PWL2-3	166	Power Window Motor Right Front Up Control							
PWL2-4	6134	Linear Interconnect Network Bus 3							
PWL2-5	2765	Power Window Switch Right Front Express Signal							
PWL2-6	746	Right Front Door Ajar Switch Signal							
PWL2-7	167	Power Window Motor Right Front Down Control							
PWL3-1	A50	GND							
PWL3-2	A40	BAT							
PWL3-3	168	Power Window Motor Left Rear Up Control							
PWL3-4	6135	Linear Interconnect Network Bus 4							
PWL3-5	5048	Power Window Switch Left Rear Express Signal							
PWL3-6	747	Left Rear Door Ajar Switch Signal							
PWL3-7	169	Power Window Motor Left Rear Down Control							
PWL4-1	A50	GND							
PWL4-2	A40	BAT							
PWL4-3	170	Power Window Motor Right Rear Up Control							
PWL4-4	6135	Linear Interconnect Network Bus 4							
PWL4-5	5049	Power Window Switch Right Rear Express Signal							
PWL4-6	748	Right Rear Door Ajar Switch Signal							
PWL4-7	171	Power Window Motor Right Rear Down Control							

Connectors and pin assignment DSP1

X5 (DSP1)
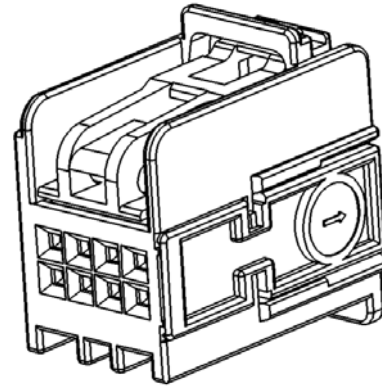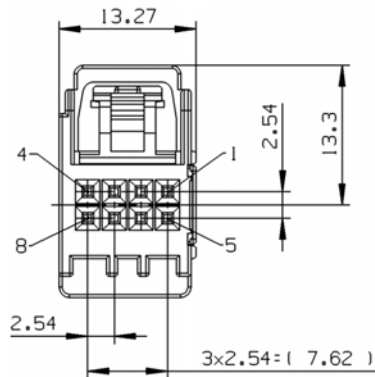
Cavity	Circuit #	Circuit Description	Minimum Wire Gauge	Max. Wire Resistance	Twist Group & Rate	Shield Group	Terminal Plating	Pigtail Wire Gauge	Pigtail Wire Color
DSP1-1	A50	GND							
DSP1-2	3381	Power Window Switch Driver Express Signal							
DSP1-3	3380	Power Window Switch Driver Down Signal							
DSP1-4	A40	BATT							
DSP1-5	6134	Linear Interconnect Network Bus 3							
DSP1-6	3379	Power Window Switch Driver Up Signal							
DSP1-7	3270	Driver Door Lock Motor Status Control							
DSP1-8	1124	Door Lock Key Switch Unlock Signal							

RSE (Rear Seat Entertainment)

The Vehicle may have a DVD rear seat Entertainment (RSE) system. The RSE system works with the vehicles infotainment system. The DVD player is part of the navigation system. The RSE system includes a navigation unit with a DVD player, two rear seat video display screens, audio/video jacks, two wireless headphones, and a remote control.

Block Diagram
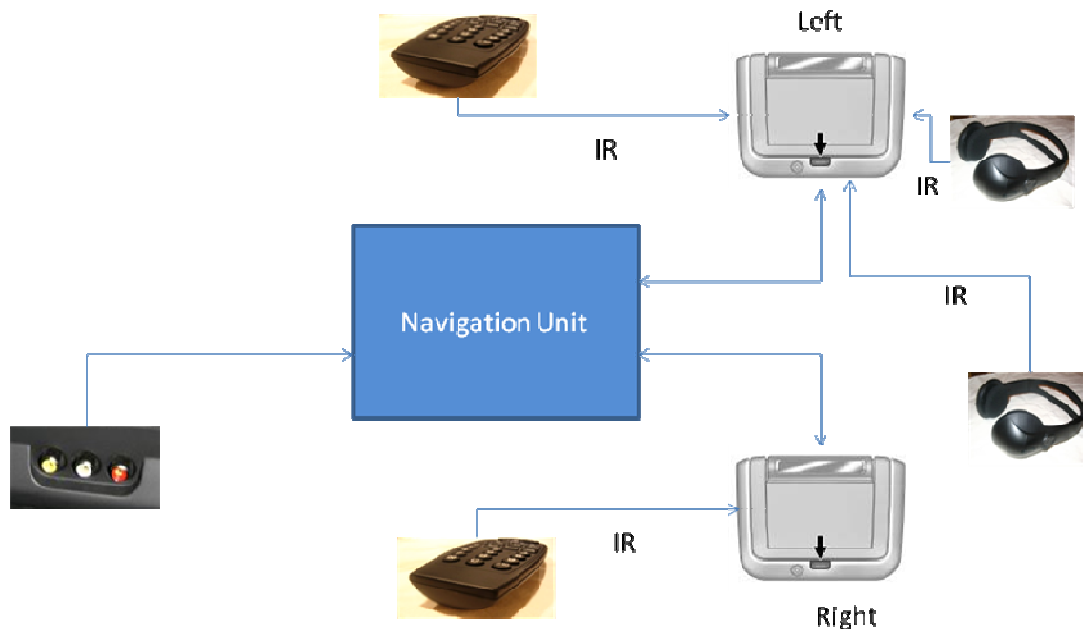
Functional description

A DVD can play in the navigation radio, or from an auxiliary video source.

To use the rear seat displays the Radio display or remote control may be used.

Operation over Radio display
1. Insert a DVD into the navigation radio or an attached auxiliary video source.
2. Press the CD/AUX/HDD hard key until the AV source screen displays.
3. Press Rear Display 1 for left video screen or Rear Display 2 for right video.
4. Select the video source to be used (AUX A/V or DVD).

Operation over Remote control
To use the remote control, aim it at the transmitter window at either seatback console and press the button. Direct sunlight or very bright light could affect the ability of the RSE transmitter to receive signals from the remote control.

Connectors and pin assignment RSE

Cavity	Circuit #	Circuit Description	*1 Minimum Wire Gauge	*2 Maximum Wire Resistance	*3 Twist Group &	*4 Shield Group	*5 Terminal Plating	*6 Pigtail Wire Gauge	*7 Pigtail Wire Color
LEFT Seat (Including RHD Applications) Harness Mating Connector Information									
1	4240	Battery Positive Voltage	20						
2	7066	Entertainment Remote Enable Signal	22						
3	5329	RSA Left Audio Signal (+)	22		D30	G			
4	5330	RSA Right Audio Signal (+)	22		D30	G			
5	6979	DVD Audio Signal Common	22		B30	F			
6	5826	DVD Left Audio Signal (+)	22		B30	F			
7	5828	DVD Right Audio Signal (+)	22		B30	F			
8	450	Ground	20						
9	6975	DVD Video Signal (+)	22		A33	E			
10	5335	DVD Video Signal (-)	22		A33	E			
11	3360	RSA Audio Signal Common	22		D30	G			
12	5831	Remote Infra Red Signal (+)	22		C30				
13	5830	Remote Infra Red Signal (-)	22		C30				
14	450	Dual Display Enable - MUST BE GROUNDED FOR DUAL VSM	22						
15	5845	Video Mode Signal	22						
16	5844	Video Bright Control	22						

HARNESS MATING CONNECTOR — LEFT Seat

p/n 15136073

Cavity	Circuit #	Circuit Description	*1 Minimum Wire Gauge	*2 Maximum Wire Resistance	*3 Twist Group &	*4 Shield Group	*5 Terminal Plating	*6 Pigtail Wire Gauge	*7 Pigtail Wire Color
RIGHT Seat (Including RHD Applications) Harness Mating Connector Information									
1	4240	Battery Positive Voltage	20						
2	7066	Entertainment Remote Enable Signal	22						
3	NC								
4	NC								
5	NC								
6	NC								
7	NC								
8	450	Ground	20						
9	7396	DVD Video Signal (+)	22		H33	K			
10	7394	DVD Video Signal (-)	22		H33	K			
11	NC								
12	5831	Remote Infra Red Signal (+)	22		J30				
13	5830	Remote Infra Red Signal (-)	22		J30				
14	450	Dual Display Enable - MUST BE GROUNDED FOR DUAL VSM	22						
15	7395	Video Mode Signal	22						
16	5844	Video Bright Control	22						

HARNESS MATING CONNECTOR — RIGHT Seat

p/n 89047357

AUX jacket.

Cavity	Ckt #	Circuit Description	Twist Group	Shield Group	Pigtail Wire Gauge
3	2056	Auxiliary Video High Signal - Input (+)		1	22
1	2057	Auxiliary Video Low Signal - Common (-)		1	22
5	2058	Right Auxiliary Audio Signal - Input (+)	1	2	22
6	2059	Left Auxiliary Audio Signal - Input (+)	1	2	22
2		N/C			
7	5843	Auxiliary Audio Common Signal	1	2	22
4		N/C			
8		N/C			

Diagnostic Trouble Codes

If a module recognizes a failure, a trouble code will be saved. These codes can be read out via diagnostic tool. The following tables explain the codes by assigning a description.

AFL

Code	DTC	Type	Error text
0x8000	B0000	0x71	Vehicle Speed, Invalid signal
0x8984	B0984	0x00	Left Headlamp Light Distribution Stepper Motor Control Circuit
0x8985	B0985	0x00	Right Headlamp Light Distribution Stepper Motor Control Circuit
0x901D	B101D	0x00	Body ECU Hardware Performance
0x901E	B101E	0x47	Body ECU VIN not programmed
0x901E	B101E	0x4A	Body ECU Checksum error
0x901E	B101E	0x4B	Sensor calibration not learned
0x9325	B1325	0x03	Supply voltage below 9V
0x9325	B1325	0x07	Supply voltage above 16V
0x9461	B1461	0x00	DBL LH stepper motor driver circuit malfunction
0x9462	B1462	0x00	DBL RH stepper motor driver circuit malfunction
0xA575	B2575	0x00	LH High Intensy Discharge (ECU) malfunction
0xA575	B2575	0x04	LH High Intensy Discharge (lamp), Open load
0xA590	B2590	0x02	Left Cornering Lamp Circuit, Short to ground
0xA590	B2590	0x04	Left Cornering Lamp Circuit, Open load
0xA595	B2595	0x02	Right Cornering Lamp Circuit, Short to ground
0xA595	B2595	0x04	Right Cornering Lamp Circuit, Open load
0xA699	B2699	0x00	RH High Intensity Discharge (ECU) malfunction
0xA699	B2699	0x04	RH High Intensity Discharge (lamp), Open load
0xB410	B3410	0x02	Front axle sensor signal circuit, Short to ground
0xB410	B3410	0x05	Front axle sensor signal circuit, Short to battery or open load
0xB410	B3410	0x08	Front axle sensor; Invalid signal
0xB415	B3415	0x01	Axle sensor supply circuit, Short to battery
0xB415	B3415	0x02	Axle sensor supply circuit, Short to ground
0xB420	B3420	0x02	Rear axle sensor signal circuit, Short to ground
0xB420	B3420	0x05	Rear axle sensor signal circuit, Short to battery or open load
0xB420	B3420	0x08	Rear axle sensor, Invalid signal
0xB435	B3435	0x00	AHL LH stepper motor driver circuit malfunction
0xB440	B3440	0x00	AHL RH stepper motor driver circuit malfunction
0x4460	C0460	0x71	Steering Angle Sensor, Invalid signal
0xC073	U0073	0x00	Control Module Communication Bus Off
0xC100	U0100	0x00	Lost Communication With ECM
0xC121	U0121	0x00	Lost Communication With EBCM
0xC140	U0140	0x00	Lost Communication With BCM
0xD501	U1501	0x00	Inter Device Dedicated Bus (LH_LIN Bus)
0xD502	U1502	0x00	Inter Device Dedicated Bus (RH_LIN Bus)
0xD511	U1511	0x00	Inter-Device Deticated Bus (LH_LIN) Lost Communication

Code	DTC	Type	Error text
			With HID ECU
0xD512	U1512	0x00	Inter-Device Deticated Bus (LH_LIN) Lost Communication With Variox Stepper Motor
0xD513	U1513	0x00	Inter-Device Deticated Bus (LH_LIN) Lost Communication With DBL Stepper Motor
0xD514	U1514	0x00	Inter-Device Deticated Bus (LH_LIN) Lost Communication With AHL Stepper Motor
0xD521	U1521	0x00	Inter-Device Deticated Bus (RH_LIN) Lost Communication With HID ECU
0xD522	U1522	0x00	Inter-Device Deticated Bus (RH_LIN) Lost Communication With Variox Stepper Motor
0xD523	U1523	0x00	Inter-Device Deticated Bus (RH_LIN) Lost Communication With DBL Stepper Motor
0xD524	U1524	0x00	Inter-Device Deticated Bus (RH_LIN) Lost Communication With AHL Stepper Motor

AOS

Code	DTC	Type	Error text
0x8071	B0071	0x00	Passenger Seat Belt Tension Sensor Circuit, no additional information
0x8071	B0071	0x03	Passenger Seat Belt Tension Sensor Circuit Voltage Below Threshold
0x8071	B0071	0x04	Passenger Seat Belt Tension Sensor Open Circuit
0x8071	B0071	0x07	Passenger Seat Belt Tension Sensor Circuit Voltage Above Threshold
0x8074	B0074	0x00	Passenger Occupant Classification Sensor Circuit
0x8074	B0074	0x03	Passenger Occupant Classification Sensor Circuit, voltage below threshold
0x8074	B0074	0x04	Passenger Occupant Classification Sensor Circuit, open circuit
0x8074	B0074	0x07	Passenger Occupant Classification Sensor Circuit, voltage above threshold
0x8081	B0081	0x00	Passenger Presence System, no additional information
0x901D	B101D	0x00	Electronic Control Unit (ECU) Hardware Performance
0x901D	B101D	0x31	Electronic Control Unit (ECU) General Checksum Failure
0x901D	B101D	0x32	Electronic Control Unit (ECU) General Memory Failure
0x901D	B101D	0x33	Electronic Control Unit (ECU) Special Memory Failure
0x901D	B101D	0x34	Electronic Control Unit (ECU) RAM Failure
0x901D	B101D	0x35	Electronic Control Unit (ECU) ROM Failure
0x901D	B101D	0x36	Electronic Control Unit (ECU) EEPROM Failure
0x901D	B101D	0x39	Electronic Control Unit (ECU) Internal Electronic Failure
0x901D	B101D	0x3A	Electronic Control Unit (ECU), incorrect component installed
0x901D	B101D	0x3B	Electronic Control Unit (ECU) Internal Self Test Failed
0x901D	B101D	0x3C	Electronic Control Unit (ECU) Internal Communications Failure
0x901E	B101E	0x00	Electronic Control Unit (ECU) Software Performance
0x901E	B101E	0x41	Electronic Control Unit (ECU) Operational Software / Calibration Set not programmed
0x901E	B101E	0x42	Electronic Control Unit (ECU) Calibration Data Set not programmed
0x901E	B101E	0x43	Electronic Control Unit (ECU) EEPROM error
0x901E	B101E	0x44	Electronic Control Unit (ECU) Security Access not activated
0x901E	B101E	0x46	Electronic Control Unit (ECU) Vehicle Configuration not programmed
0x901E	B101E	0x4A	Electronic Control Unit (ECU) Checksum error
0x901E	B101E	0x4B	Electronic Control Unit (ECU) Calibration not learned
0x9325	B1325	0x03	Device Power Circuit Voltage below threshold
0x9325	B1325	0x07	Device Power Circuit Voltage above threshold
0xC020	U0020	0x00	Low Speed CAN Communication Bus Performance
0xC073	U0073	0x00	Control Module Communication Bus Off
0xC140	U0140	0x00	Lost Communication With BCM
0xC151	U0151	0x00	Lost Communication With SDM
0xC155	U0155	0x00	Lost Communication With IPC

BCM

Code	DTC	Type	Error text
0x4277	C0277	0x06	Brake Pedal Position Sensor Circuit, short to ground or open
0x4277	C0277	0x07	Brake Pedal Position Sensor Circuit, voltage above threshold
0x4277	C0277	0x09	Brake Pedal Position Sensor Circuit, rate of change above threshold
0x4277	C0277	0x4B	Brake Pedal Position Sensor Circuit, calibration not learned
0x4297	C0297	0x01	Brake Applied Output Circuit, short to battery
0x4297	C0297	0x02	Brake Applied Output Circuit, short to ground
0x4297	C0297	0x04	Brake Applied Output Circuit, open circuit
0x4569	C0569	0x00	System Configuration Error, no additional information
0x4750	C0750	0x03	Left Front Low Tire Pressure Sensor, voltage below threshold
0x4750	C0750	0x29	Left Front Low Tire Pressure Sensor, too few pulses
0x4750	C0750	0x39	Left Front Low Tire Pressure Sensor, internal electronic failure
0x4755	C0755	0x03	Right Front Low Tire Pressure Sensor, voltage below threshold
0x4755	C0755	0x29	Right Front Low Tire Pressure Sensor, too few pulses
0x4755	C0755	0x39	Right Front Low Tire Pressure Sensor, internal electronic failure
0x4760	C0760	0x03	Left Rear Low Tire Pressure Sensor, voltage below threshold
0x4760	C0760	0x29	Left Rear Low Tire Pressure Sensor, too few pulses
0x4760	C0760	0x39	Left Rear Low Tire Pressure Sensor, internal electronic failure
0x4765	C0765	0x03	Right Rear Low Tire Pressure Sensor, voltage below threshold
0x4765	C0765	0x29	Right Rear Low Tire Pressure Sensor, too few pulses
0x4765	C0765	0x39	Right Rear Low Tire Pressure Sensor, internal electronic failure
0x4775	C0775	0x00	Low Tire Pressure System Sensors Not Programmed/Learned, no additional information
0x478A	C078A	0x39	Low Tire Pressure Indicator Module - internal electronic failure
0x4890	C0890	0x03	Device Voltage Reference Output 3 Circuit - voltage below threshold
0x4890	C0890	0x07	Device Voltage Reference Output 3 Circuit - voltage above threshold
0x8000	B0000	0x01	Reporting diagnostic trouble code for SeatHCV_LR_ModeInd1Output short to battery circuit
0x8000	B0000	0x02	Reporting diagnostic trouble code for SeatHCV_LR_ModeInd1Output short to ground circuit
0x8000	B0000	0x04	Reporting diagnostic trouble code for SeatHCV_LR_ModeInd1Output open circuit
0x8550	B0550	0x32	Season Odometer Circuit, general memory failure
0x858A	B058A	0x01	Fuel Economy Mode Switch Indicator Circuit - short to battery
0x858A	B058A	0x02	Fuel Economy Mode Switch Indicator Circuit - short to ground
0x858A	B058A	0x04	Fuel Economy Mode Switch Indicator Circuit - open
0x8685	B0685	0x01	Security System Indicator Circuit - short to battery
0x8685	B0685	0x02	Security System Indicator Circuit - short to ground
0x8685	B0685	0x04	Security System Indicator Circuit - open
0x871F	B071F	0x39	Remote PRNDL Indicator - internal electronic failure
0x8931	B0931	0x39	Compass Sensor - internal electronic failure
0x896A	B096A	0x01	Hazard Lamps Switch Backlighting Circuit, short to battery
0x896A	B096A	0x02	Hazard Lamps Switch Backlighting Circuit, short to ground
0x896A	B096A	0x04	Hazard Lamps Switch Backlighting Circuit, open circuit

Code	DTC	Type	Error text
0x896F	B096F	0x01	Power Mode Switch Assembly Backlighting Circuit, short to battery
0x896F	B096F	0x02	Power Mode Switch Assembly Backlighting Circuit, short to ground
0x896F	B096F	0x04	Power Mode Switch Assembly Backlighting Circuit, open circuit
0x8978	B0978	0x01	Power Mode ACCESSORY Indicator Circuit, short to battery
0x8978	B0978	0x02	Power Mode ACCESSORY Indicator Circuit, short to ground
0x8978	B0978	0x04	Power Mode ACCESSORY Indicator Circuit, open circuit
0x897B	B097B	0x00	Power Mode START Switch Circuit, no additional information
0x897B	B097B	0x02	Power Mode START Switch Circuit, short to ground
0x897B	B097B	0x04	Power Mode START Switch Circuit, open circuit
0x897B	B097B	0x08	Power Mode START Switch Circuit, signal invalid
0x897C	B097C	0x01	Power Mode RUN CRANK Indicator Circuit, short to battery
0x897C	B097C	0x02	Power Mode RUN CRANK Indicator Circuit, short to ground
0x897C	B097C	0x04	Power Mode RUN CRANK Indicator Circuit, open circuit
0x897D	B097D	0x01	Transmission Sport Mode Indicator Circuit, short to battery
0x897D	B097D	0x02	Transmission Sport Mode Indicator Circuit, short to ground
0x897D	B097D	0x04	Transmission Sport Mode Indicator Circuit, open circuit
0x897E	B097E	0x01	Transmission Winter Mode Indicator Circuit, short to battery
0x897E	B097E	0x02	Transmission Winter Mode Indicator Circuit, short to ground
0x897E	B097E	0x04	Transmission Winter Mode Indicator Circuit, open circuit
0x897F	B097F	0x01	Transmission Tow Mode Indicator Circuit, short to battery
0x897F	B097F	0x02	Transmission Tow Mode Indicator Circuit, short to ground
0x897F	B097F	0x04	Transmission Tow Mode Indicator Circuit, open circuit
0x9000	B1000	0x39	Electronic Control Unit (ECU) Performance, internal electronic failure
0x9001	B1001	0x33	Option Configuration Error, special memory failure
0x9001	B1001	0x45	Option Configuration Error, variant not programmed
0x9001	B1001	0x4B	Option Configuration Error, calibration not learned
0x9011	B1011	0x00	System Disabled Information Stored - no additional information
0x901D	B101D	0x00	ECU Hardware Performance - no additional information (IReportProccessorFault_dtc)
0x901D	B101D	0x34	ECU Hardware Performance, RAM failure (IReportVerifyRAM_Failed_dtc)
0x901D	B101D	0x35	ECU Hardware Performance, ROM failure (IReportVerifyROM_Failed_dtc)
0x901D	B101D	0x36	ECU Hardware Performance, EEPROM failure (IReportVerifyBINVDM_Failed_dtc)
0x901E	B101E	0x43	ECU Software Performance, EEPROM error (IReportUpdateBINVDM_Failed_dtc)
0x901E	B101E	0x47	ECU Software Performance - VIN not programmed
0x901E	B101E	0x48	ECU Software Performance, theft / security data not programmed
0x901E	B101E	0x4D	ECU Software Performance - stack overflow (IReportStackOverflow_dtc)
0x9020	B1020	0x39	Auxiliary Electronic Control Unit Performance - internal electronic failure
0x9295	B1295	0x07	Steering Wheel Controls Group 2 Signal Circuit, voltage above threshold
0x9370	B1370	0x01	Device Ignition 1 Circuit, short to battery
0x9370	B1370	0x02	Device Ignition 1 Circuit, short to ground

Code	DTC	Type	Error text
0x9370	B1370	0x04	Device Ignition 1 Circuit, open circuit
0x9380	B1380	0x01	Device Ignition ACCESSORY Circuit, short to battery
0x9380	B1380	0x04	Device Ignition ACCESSORY Circuit, open circuit
0x9395	B1395	0x03	Device Voltage Reference Output 1 Circuit, voltage below threshold
0x9395	B1395	0x07	Device Voltage Reference Output 1 Circuit, voltage above threshold
0x9405	B1405	0x03	Device Voltage Reference Output 2 Circuit, voltage below threshold
0x9405	B1405	0x07	Device Voltage Reference Output 2 Circuit, voltage above threshold
0x9441	B1441	0x01	Device Ignition OFF, RUN, and CRANK Circuit, short to battery
0x9441	B1441	0x04	Device Ignition OFF, RUN, and CRANK Circuit, open circuit
0x9445	B1445	0x01	Device Voltage Output 1 Circuit, short to battery
0x9445	B1445	0x02	Device Voltage Output 1 Circuit, short to ground
0x9445	B1445	0x04	Device Voltage Output 1 Circuit, open circuit
0x9448	B1448	0x01	ACCESSORY Power Relay Circuit - short to battery
0x9448	B1448	0x02	ACCESSORY Power Relay Circuit - short to ground
0x9448	B1448	0x04	ACCESSORY Power Relay Circuit - open circuit
0x944A	B144A	0x01	Run Power Relay Circuit - short to battery
0x944A	B144A	0x02	Run Power Relay Circuit - short to ground
0x944A	B144A	0x04	Run Power Relay Circuit - open circuit
0x944B	B144B	0x01	Run Crank Relay Circuit - short to battery
0x944B	B144B	0x02	Run Crank Relay Circuit - short to ground
0x944B	B144B	0x04	Run Crank Relay Circuit - open circuit
0x947E	B147E	0x01	Logistics Mode Relay Set Coil Circuit, short to battery
0x947E	B147E	0x02	Logistics Mode Relay Set Coil Circuit, short to ground
0x947E	B147E	0x04	Logistics Mode Relay Set Coil Circuit, open circuit
0x947F	B147F	0x01	Logistics Mode Relay Reset Coil Circuit, short to battery
0x947F	B147F	0x02	Logistics Mode Relay Reset Coil Circuit, short to ground
0x947F	B147F	0x04	Logistics Mode Relay Reset Coil Circuit, open circuit
0x9480	B1480	0x01	Battery Rundown Protection Circuit, short to battery
0x9480	B1480	0x02	Battery Rundown Protection Circuit, short to ground
0x9480	B1480	0x04	Battery Rundown Protection Circuit, open circuit
0x9516	B1516	0x08	Battery Current Sensor Performance, signal invalid
0x9516	B1516	0x66	Battery Current Sensor Performance, wrong mounting position
0x9517	B1517	0x03	Battery Voltage, voltage below threshold
0x9517	B1517	0x07	Battery Voltage, voltage above threshold
0x9517	B1517	0x5A	Battery Voltage, plausibility failure
0x951A	B151A	0x58	Battery Capacity, incorrect reaction after event
0x9527	B1527	0x00	High Parasitic Load Detected - no additional information
0x9529	B1529	0x03	Device Voltage Reference Circuit, voltage below threshold
0x9529	B1529	0x07	Device Voltage Reference Circuit, voltage above threshold
0x9543	B1543	0x00	Cargo Door/Endgate/Liftgate/Midgate Exterior Lock Switch Circuit - no additional information
0xA42C	B242C	0x01	Driver Seat Temperature Request Circuit, short to battery
0xA42C	B242C	0x02	Driver Seat Temperature Request Circuit, short to ground
0xA42C	B242C	0x04	Driver Seat Temperature Request Circuit, open circuit
0xA42D	B242D	0x01	Passenger Seat Temperature Request Circuit, short to battery
0xA42D	B242D	0x02	Passenger Seat Temperature Request Circuit, short to ground

Code	DTC	Type	Error text
0xA42D	B242D	0x04	Passenger Seat Temperature Request Circuit, open circuit
0xA48C	B248C	0x01	Left Rear Seat Temperature Request Circuit, short to battery
0xA48C	B248C	0x02	Left Rear Seat Temperature Request Circuit, short to ground
0xA48C	B248C	0x04	Left Rear Seat Temperature Request Circuit, open circuit
0xA48D	B248D	0x01	Right Rear Seat Temperature Request Circuit, short to battery
0xA48D	B248D	0x02	Right Rear Seat Temperature Request Circuit, short to ground
0xA48D	B248D	0x04	Right Rear Seat Temperature Request Circuit, open circuit
0xA494	B2494	0x00	Liftgate/Endgate Handle Switch Circuit - no additional information
0xA49A	B249A	0x01	All Windows Express Down Circuit - short to battery
0xA500	B2500	0x00	Driver Exterior Unlock Switch Circuit - no additional information
0xA503	B2503	0x00	Trunk/Liftglass/Hatch Key Switch Circuit - no additional information
0xA515	B2515	0x5A	Steering Column Lock Solenoid Feedback Circuit, plausibility failure
0xA516	B2516	0x00	Driver Exterior Lock Switch Circuit - no additional information
0xA51A	B251A	0x01	All Door Unlatch Circuit, short to battery
0xA51A	B251A	0x02	All Door Unlatch Circuit, short to ground circuit
0xA51A	B251A	0x04	All Door Unlatch Circuit, open circuit
0xA51B	B251B	0x01	Driver Door Unlatch High Control Circuit, short to battery
0xA51B	B251B	0x02	Driver Door Unlatch High Control Circuit, short to ground
0xA51B	B251B	0x04	Driver Door Unlatch High Control Circuit, open circuit
0xA52C	B252C	0x00	Child Security Lock Switch Circuit - no additional information
0xA52D	B252D	0x00	Child Security Unlock Switch Circuit - no additional information
0xA52E	B252E	0x01	Child Security Lock Switch Indicator Circuit, short to battery
0xA52E	B252E	0x02	Child Security Lock Switch Indicator Circuit, short to ground
0xA52E	B252E	0x04	Child Security Lock Switch Indicator Circuit, open circuit
0xA530	B2530	0x01	Front Foglamps Control Circuit, short to battery
0xA530	B2530	0x02	Front Foglamps Control Circuit, short to ground
0xA530	B2530	0x04	Front Foglamps Control Circuit, open circuit
0xA540	B2540	0x01	Rear Foglamps Control Circuit, short to battery
0xA540	B2540	0x02	Rear Foglamps Control Circuit, short to ground
0xA540	B2540	0x04	Rear Foglamps Control Circuit, open circuit
0xA545	B2545	0x01	Backup Lamps Circuit, short to battery
0xA545	B2545	0x02	Backup Lamps Circuit, short to ground
0xA545	B2545	0x04	Backup Lamps Circuit, open circuit
0xA555	B2555	0x01	Passenger Compartment Lamp Control 1 Circuit, short to battery
0xA555	B2555	0x02	Passenger Compartment Lamp Control 1 Circuit, short to ground
0xA555	B2555	0x04	Passenger Compartment Lamp Control 1 Circuit, open circuit
0xA55D	B255D	0x01	Passenger Compartment Lamp Control 2 Circuit, short to battery
0xA55D	B255D	0x02	Passenger Compartment Lamp Control 2 Circuit, short to ground
0xA55D	B255D	0x04	Passenger Compartment Lamp Control 2 Circuit, open circuit
0xA55F	B255F	0x01	Interior Door Handle Illumination Circuit, short to battery
0xA55F	B255F	0x02	Interior Door Handle Illumination Circuit, short to ground
0xA55F	B255F	0x04	Interior Door Handle Illumination Circuit, open circuit
0xA560	B2560	0x01	Cargo Lamp Control Circuit, short to battery
0xA560	B2560	0x02	Cargo Lamp Control Circuit, short to ground
0xA560	B2560	0x04	Cargo Lamp Control Circuit, open circuit
0xA56A	B256A	0x01	Liftgate Lamp Control Circuit - short to battery

Code	DTC	Type	Error text
0xA56A	B256A	0x02	Liftgate Lamp Control Circuit - short to ground
0xA56A	B256A	0x04	Liftgate Lamp Control Circuit - open
0xA570	B2570	0x01	Trunk Lamp Control Circuit - short to battery
0xA570	B2570	0x02	Trunk Lamp Control Circuit - short to ground
0xA570	B2570	0x04	Trunk Lamp Control Circuit - open
0xA575	B2575	0x01	Left Headlamp Control Circuit, short to battery
0xA575	B2575	0x02	Left Headlamp Control Circuit, short to ground
0xA575	B2575	0x04	Left Headlamp Control Circuit, open circuit
0xA57A	B257A	0x00	Headlamp Switch Input Signals Mismatch - no additional information
0xA57B	B257B	0x03	Lighting Control Switch Signal, voltage below threshold
0xA57B	B257B	0x07	Lighting Control Switch Signal, voltage above threshold
0xA580	B2580	0x01	Left Headlamp High Beam Control Circuit, short to battery
0xA580	B2580	0x02	Left Headlamp High Beam Control Circuit, short to ground
0xA580	B2580	0x04	Left Headlamp High Beam Control Circuit, open circuit
0xA585	B2585	0x01	Left Parklamp Control Circuit, short to battery
0xA585	B2585	0x02	Left Parklamp Control Circuit, short to ground
0xA585	B2585	0x04	Left Parklamp Control Circuit, open circuit
0xA58A	B258A	0x01	Headlamp Low Beam Control Circuit, short to battery
0xA58A	B258A	0x02	Headlamp Low Beam Control Circuit, short to ground
0xA58A	B258A	0x04	Headlamp Low Beam Control Circuit, open circuit
0xA590	B2590	0x01	Left Cornering Lamp Circuit, short to battery
0xA590	B2590	0x02	Left Cornering Lamp Circuit, short to ground
0xA590	B2590	0x04	Left Cornering Lamp Circuit, open circuit
0xA595	B2595	0x01	Right Cornering Lamp Circuit, short to battery
0xA595	B2595	0x02	Right Cornering Lamp Circuit, short to ground
0xA595	B2595	0x04	Right Cornering Lamp Circuit, open circuit
0xA59A	B259A	0x01	Left Cornering Lamp Relay Control Circuit, short to battery
0xA59A	B259A	0x02	Left Cornering Lamp Relay Control Circuit, short to ground
0xA59A	B259A	0x04	Left Cornering Lamp Relay Control Circuit, open circuit
0xA59B	B259B	0x01	Right Cornering Lamp Relay Control Circuit, short to battery
0xA59B	B259B	0x02	Right Cornering Lamp Relay Control Circuit, short to ground
0xA59B	B259B	0x04	Right Cornering Lamp Relay Control Circuit, open circuit
0xA600	B2600	0x01	Daytime Running Lamp Control 1 Circuit, short to battery
0xA600	B2600	0x02	Daytime Running Lamp Control 1 Circuit, short to ground
0xA600	B2600	0x04	Daytime Running Lamp Control 1 Circuit, open circuit
0xA605	B2605	0x01	Daytime Running Lamp Control 2 Circuit, short to battery
0xA605	B2605	0x02	Daytime Running Lamp Control 2 Circuit, short to ground
0xA605	B2605	0x04	Daytime Running Lamp Control 2 Circuit, open circuit
0xA60A	B260A	0x00	Nighttime Backlighting and Display Dimming Request Circuit - no additional information
0xA60B	B260B	0x01	Left Daytime Running Lamp Relay Control Circuit, short to battery
0xA60B	B260B	0x02	Left Daytime Running Lamp Relay Control Circuit, short to ground
0xA60B	B260B	0x04	Left Daytime Running Lamp Relay Control Circuit, open circuit
0xA60C	B260C	0x01	Right Daytime Running Lamp Relay Control Circuit, short to battery
0xA60C	B260C	0x02	Right Daytime Running Lamp Relay Control Circuit, short to ground

Code	DTC	Type	Error text
0xA60C	B260C	0x04	Right Daytime Running Lamp Relay Control Circuit, open circuit
0xA60D	B260D	0x01	Daytime Running Lamp and Front Park Lamp Control 1 Circuit, short to battery
0xA60D	B260D	0x02	Daytime Running Lamp and Front Park Lamp Control 1 Circuit, short to ground
0xA60D	B260D	0x04	Daytime Running Lamp and Front Park Lamp Control 1 Circuit, open circuit
0xA60E	B260E	0x01	Daytime Running Lamp and Front Park Lamp Control 2 Circuit, short to battery
0xA60E	B260E	0x02	Daytime Running Lamp and Front Park Lamp Control 2 Circuit, short to ground
0xA60E	B260E	0x04	Daytime Running Lamp and Front Park Lamp Control 2 Circuit, open circuit
0xA610	B2610	0x01	Passenger Compartment Dimming 1 Circuit, short to battery
0xA610	B2610	0x02	Passenger Compartment Dimming 1 Circuit, short to ground
0xA610	B2610	0x04	Passenger Compartment Dimming 1 Circuit, open circuit
0xA615	B2615	0x01	Passenger Compartment Dimming 2 Circuit, short to battery
0xA615	B2615	0x02	Passenger Compartment Dimming 2 Circuit, short to ground
0xA615	B2615	0x04	Passenger Compartment Dimming 2 Circuit, open circuit
0xA625	B2625	0x01	Display Dimming Pulse Width Modulation Output Circuit, short to battery
0xA625	B2625	0x02	Display Dimming Pulse Width Modulation Output Circuit, short to ground
0xA625	B2625	0x04	Display Dimming Pulse Width Modulation Output Circuit, open circuit
0xA63A	B263A	0x01	Exterior Illumination Lamp Circuit, short to battery
0xA63A	B263A	0x02	Exterior Illumination Lamp Circuit, short to ground
0xA63A	B263A	0x04	Exterior Illumination Lamp Circuit, open circuit
0xA645	B2645	0x03	Ambient Light Sensor Circuit, voltage below threshold
0xA645	B2645	0x07	Ambient Light Sensor Circuit, voltage above threshold
0xA652	B2652	0x01	Passenger Compartment Dimming 3 Circuit, short to battery
0xA652	B2652	0x02	Passenger Compartment Dimming 3 Circuit,, short to ground
0xA652	B2652	0x04	Passenger Compartment Dimming 3 Circuit, open circuit
0xA657	B2657	0x01	Ignition Halo Lamp Output Circuit, short to battery
0xA657	B2657	0x02	Ignition Halo Lamp Output Circuit, short to ground
0xA657	B2657	0x04	Ignition Halo Lamp Output Circuit, open circuit
0xA699	B2699	0x01	Right Headlamp Control Circuit, short to battery
0xA699	B2699	0x02	Right Headlamp Control Circuit, short to ground
0xA699	B2699	0x04	Right Headlamp Control Circuit, open circuit
0xA705	B2705	0x01	Gearshift Unlock Circuit, short to battery
0xA705	B2705	0x02	Gearshift Unlock Circuit, short to ground
0xA705	B2705	0x04	Gearshift Unlock Circuit, open circuit
0xA70A	B270A	0x01	Park Lock Solenoid Control Circuit, short to battery
0xA70A	B270A	0x02	Park Lock Solenoid Control Circuit, short to ground
0xA70A	B270A	0x04	Park Lock Solenoid Control Circuit, open circuit

Code	DTC	Type	Error text
0xA70B	B270B	0x01	Park Lock Solenoid Shift Control Circuit, short to battery
0xA70B	B270B	0x02	Park Lock Solenoid Shift Control Circuit, short to ground
0xA70B	B270B	0x04	Park Lock Solenoid Shift Control Circuit, open circuit
0xA730	B2730	0x00	Interior Trunk/Liftglass/Hatch Release Switch Circuit - no additional information
0xA73A	B273A	0x02	Hill Descent Control Switch, short to ground
0xA740	B2740	0x00	Front Foglamp Switch Circuit - no additional information
0xA745	B2745	0x02	Traction Control Switch Circuit, short to ground
0xA750	B2750	0x01	Horn Relay Coil Circuit, short to battery
0xA750	B2750	0x02	Horn Relay Coil Circuit, short to ground
0xA750	B2750	0x04	Horn Relay Coil Circuit, open circuit
0xA910	B2910	0x71	Steering Column Lock Password Incorrect, invalid serial data received
0xA91A	B291A	0x39	Theft Deterrent Alarm Assembly - internal electronic failure
0xA91B	B291B	0x00	Theft Deterrent Alarm Sensor - no additional information
0xA91B	B291B	0x39	Theft Deterrent Alarm Sensor - internal electronic failure
0xA91B	B291B	0x42	Theft Deterrent Alarm Sensor, calibration data set not programmed
0xA955	B2955	0x00	Security System Sensor Passkey Data Circuit - no additional information
0xB006	B3006	0x01	Hood Ajar Circuit, short to battery
0xB006	B3006	0x02	Hood Ajar Circuit, short to ground
0xB006	B3006	0x04	Hood Ajar Circuit, open circuit
0xB02A	B302A	0x00	Telematic Requested Immobilization - no additional information
0xB031	B3031	0x00	Security System Controller In Learn Mode - no additional information
0xB055	B3055	0x00	No Transponder Modulation or No Transponder - no additional information
0xB05A	B305A	0x00	No Response From Steering Column Lock Received - no additional information
0xB060	B3060	0x00	Unprogrammed Transponder Identification Code Received - no additional information
0xB062	B3062	0x00	Right Front Door Key Lock Switch Circuit - no additional information
0xB067	B3067	0x00	Right Front Door Key Unlock Switch Circuit - no additional information
0xB101	B3101	0x00	Keyless Entry Data Link Circuit Range/Performance - no additional information
0xB105	B3105	0x00	Keyless Entry System Key Fobs Not Programmed - no additional information
0xB106	B3106	0x00	Keyless Entry Data Link Parity Error - no additional information
0xB109	B3109	0x00	Keyless Entry Transmitter 1 Low Battery - no additional information
0xB10D	B310D	0x00	Keyless Entry Transmitter 6 Low Battery - no additional information
0xB10E	B310E	0x00	Keyless Entry Transmitter 7 Low Battery - no additional information
0xB10F	B310F	0x00	Keyless Entry Transmitter 8 Low Battery - no additional information
0xB110	B3110	0x00	Keyless Entry Transmitter 2 Low Battery - no additional information
0xB111	B3111	0x00	Keyless Entry Transmitter 3 Low Battery - no additional information

Code	DTC	Type	Error text
0xB112	B3112	0x00	Keyless Entry Transmitter 4 Low Battery - no additional information
0xB113	B3113	0x00	Keyless Entry Transmitter 5 Low Battery - no additional information
0xB125	B3125	0x01	Driver Door Only Unlock Circuit, short to battery
0xB125	B3125	0x02	Driver Door Only Unlock Circuit, short to ground
0xB125	B3125	0x04	Driver Door Only Unlock Circuit, open circuit
0xB130	B3130	0x01	All Door Unlock Circuit, short to battery
0xB130	B3130	0x02	All Door Unlock Circuit, short to ground
0xB130	B3130	0x04	All Door Unlock Circuit, open circuit
0xB135	B3135	0x01	All Door Lock Circuit, short to battery
0xB135	B3135	0x02	All Door Lock Circuit, short to ground
0xB135	B3135	0x04	All Door Lock Circuit, open circuit
0xB140	B3140	0x00	Left Front Unlock Switch Circuit - no additional information
0xB145	B3145	0x00	Right Front Unlock Switch Circuit - no additional information
0xB150	B3150	0x00	Left Front Lock Switch Circuit - no additional information
0xB155	B3155	0x00	Right Front Lock Switch Circuit - no additional information
0xB16B	B316B	0x00	Driver Window Switch - no additional information (DRVPAD)
0xB16B	B316B	0x02	Driver Window Switch, short to ground
0xB16B	B316B	0x39	Driver Window Switch - internal electronic failure (DSP1APinfo4)
0xB16B	B316B	0x42	Driver Window Switch, calibration data set not programmed
0xB17A	B317A	0x02	Passenger Window Switch, short to ground
0xB17A	B317A	0x39	Passenger Window Switch - internal electronic failure (DSP2APinfo4)
0xB17A	B317A	0x42	Passenger Window Switch, calibration data set not programmed
0xB18A	B318A	0x02	Left Rear Window Switch, short to ground
0xB18A	B318A	0x39	Left Rear Window Switch - internal electronic failure (DSP3APinfo4)
0xB18A	B318A	0x42	Left Rear Window Switch, calibration data set not programmed
0xB19A	B319A	0x02	Right Rear Window Switch, short to ground
0xB19A	B319A	0x39	Right Rear Window Switch - internal electronic failure (DSP4APinfo4)
0xB19A	B319A	0x42	Right Rear Window Switch, calibration data set not programmed
0xB205	B3205	0x00	Left Front Window Motor - no additional information
0xB205	B3205	0x39	Left Front Window Motor - internal electronic failure (PWL1APinfo4)
0xB205	B3205	0x42	Left Front Window Motor - calibration data set not programmed (PWL1APINFO3)
0xB205	B3205	0x4B	Left Front/Driver Window Motor LIN, calibration not learned
0xB210	B3210	0x00	Right Front Window Motor - no additional information
0xB210	B3210	0x39	Right Front Window Motor - internal electronic failure (PWL2APinfo4)
0xB210	B3210	0x42	Right Front Window Motor - calibration data set not programmed (PWL2APINFO3)
0xB210	B3210	0x4B	Right Front/Passenger Window Motor LIN, calibration not learned
0xB215	B3215	0x00	Left Rear Window Motor - no additional information

Code	DTC	Type	Error text
0xB215	B3215	0x39	Left Rear Window Motor - internal electronic failure (PWL3APinfo4)
0xB215	B3215	0x42	Left Rear Window Motor - calibration data set not programmed (PWL3APinfo3)
0xB215	B3215	0x4B	Left Rear Window Motor - calibration not learned (WNDNOTNORM)
0xB220	B3220	0x00	Right Rear Window Motor - no additional information
0xB220	B3220	0x39	Right Rear Window Motor - internal electronic failure (PWL4APinfo4)
0xB220	B3220	0x42	Right Rear Window Motor - calibration data set not programmed (PWL4APinfo3)
0xB220	B3220	0x4B	Right Rear Window Motor - calibration not learned (WNDNOTNORM)
0xB245	B3245	0x01	Cargo Door/Endgate/Liftgate/Midgate Lock Motor Circuit, short to battery
0xB245	B3245	0x02	Cargo Door/Endgate/Liftgate/Midgate Lock Motor Circuit, short to ground
0xB245	B3245	0x04	Cargo Door/Endgate/Liftgate/Midgate Lock Motor Circuit, open circuit
0xB24A	B324A	0x01	Cargo Door/Endgate/Liftgate/Midgate Unlock Motor Circuit, short to battery
0xB24A	B324A	0x02	Cargo Door/Endgate/Liftgate/Midgate Unlock Motor Circuit, short to ground
0xB24A	B324A	0x04	Cargo Door/Endgate/Liftgate/Midgate Unlock Motor Circuit, open circuit
0xB265	B3265	0x00	Trunk/Liftglass/Hatch Release Output Circuit - no additional information
0xB265	B3265	0x01	Trunk/Liftglass/Hatch Release Output Circuit, short to battery
0xB265	B3265	0x02	Trunk/Liftglass/Hatch Release Output Circuit, short to ground
0xB265	B3265	0x04	Trunk/Liftglass/Hatch Release Output Circuit, open circuit
0xB445	B3445	0x01	Left Stop Lamp Circuit, short to battery
0xB445	B3445	0x02	Left Stop Lamp Circuit, short to ground
0xB445	B3445	0x04	Left Stop Lamp Circuit, open circuit
0xB44A	B344A	0x01	Stop Lamp Control Circuit, short to battery
0xB44A	B344A	0x02	Stop Lamp Control Circuit, short to ground
0xB44A	B344A	0x04	Stop Lamp Control Circuit, open circuit
0xB588	B3588	0x00	Rear Foglamp Switch Circuit - no additional information
0xB596	B3596	0x00	Hazard Lamps Request Circuit - no additional information
0xB600	B3600	0x03	Passenger Compartment Dimming Request Signal Circuit, voltage below threshold
0xB600	B3600	0x07	Passenger Compartment Dimming Request Signal Circuit, voltage above threshold
0xB618	B3618	0x00	Exterior Trunk/Liftglass/Hatch Release Switch Circuit - no additional information
0xB622	B3622	0x07	Steering Wheel Controls Group 1 Signal Circuit, voltage above threshold
0xB623	B3623	0x08	Steering Wheel Controls ACC Gap Up / Down Signal Circuit, signal

Code	DTC	Type	Error text
			invalid
0xB623	B3623	0x61	Steering Wheel Controls ACC Gap Up / Down Signal Circuit, actuator stuck
0xB631	B3631	0x01	Adjustable Foot Pedal Inhibit Circuit, short to battery
0xB631	B3631	0x02	Adjustable Foot Pedal Inhibit Circuit, short to ground
0xB631	B3631	0x04	Adjustable Foot Pedal Inhibit Circuit, open circuit
0xB64A	B364A	0x00	Surveillance Mode Switch Circuit - no additional information
0xB650	B3650	0x08	Headlamp High Beam Request Signal Circuit, signal invalid
0xB658	B3658	0x00	Interior Tonneau Release Switch Circuit - no additional information
0xB65A	B365A	0x00	Exterior Tonneau Release Switch Circuit - no additional information
0xB664	B3664	0x02	Sunroof Position Select Switch High Signal Circuit, short to ground
0xB664	B3664	0x05	Sunroof Position Select Switch High Signal Circuit, short to battery or open
0xB664	B3664	0x59	Sunroof Position Select Switch High Signal Circuit - component protection time-out
0xB667	B3667	0x01	Tonneau Release Circuit, short to battery
0xB667	B3667	0x02	Tonneau Release Circuit, short to ground
0xB667	B3667	0x04	Tonneau Release Circuit, open circuit
0xB697	B3697	0x00	Sunroof Actuator Performance - no additional information
0xB697	B3697	0x39	Sunroof Actuator Performance, internal electronic failure
0xB697	B3697	0x42	Sunroof Actuator Performance, calibration data set not programmed
0xB697	B3697	0x4B	Sunroof Actuator Performance, calibration not learned
0xB69B	B369B	0x02	Sunroof Sunshade Position Select Switch Circuit, internal electronic failure
0xB69B	B369B	0x05	Sunroof Sunshade Position Select Switch Circuit, short to battery or open
0xB69B	B369B	0x59	Sunroof Sunshade Position Select Switch Circuit, Circuit / component protection time-out
0xB69C	B369C	0x02	Sunroof Vent Position Select Switch Circuit, internal electronic failure
0xB69C	B369C	0x05	Sunroof Vent Position Select Switch Circuit, short to battery or open
0xB69C	B369C	0x59	Sunroof Vent Position Select Switch Circuit, Circuit / component protection time-out
0xB69D	B369D	0x00	Sunroof Sunshade Actuator Performance - no additional information
0xB69D	B369D	0x39	Sunroof Sunshade Actuator Performance, internal electronic failure
0xB69D	B369D	0x42	Sunroof Sunshade Actuator Performance, calibration data set not programmed
0xB69D	B369D	0x4B	Sunroof Sunshade Actuator Performance, calibration not learned
0xB70A	B370A	0x39	Rain Sensor - internal electronic failure
0xB70B	B370B	0x01	Rear Wiper Function Control Circuit, short to battery
0xB70B	B370B	0x02	Rear Wiper Function Control Circuit, short to ground
0xB70B	B370B	0x04	Rear Wiper Function Control Circuit, open circuit
0xB715	B3715	0x01	Front Wiper Relay Drive Circuit, short to battery
0xB715	B3715	0x02	Front Wiper Relay Drive Circuit, short to ground
0xB715	B3715	0x04	Front Wiper Relay Drive Circuit, open circuit
0xB71A	B371A	0x39	Front Wiper Motor - internal electronic failure

Code	DTC	Type	Error text
0xB71B	B371B	0x01	Washer Fluid Heater Enable Circuit, short to battery
0xB71B	B371B	0x02	Washer Fluid Heater Enable Circuit, short to ground
0xB71B	B371B	0x04	Washer Fluid Heater Enable Circuit, open circuit
0xB794	B3794	0x08	Cruise Control Function Request Circuit, signal invalid
0xB794	B3794	0x61	Cruise Control Function Request Circuit, actuator stuck
0xB797	B3797	0x01	All Door Dead Lock Circuit, short to battery
0xB797	B3797	0x02	All Door Dead Lock Circuit, short to ground
0xB797	B3797	0x04	All Door Dead Lock Circuit, open circuit
0xB803	B3803	0x01	All Windows Up Circuit - short to battery
0xB806	B3806	0x00	Headlamps High Beam and Flash to Pass Select Circuit - no additional information
0xB810	B3810	0x01	Headlamp Washer Relay Circuit, short to battery
0xB810	B3810	0x02	Headlamp Washer Relay Circuit, short to ground
0xB810	B3810	0x04	Headlamp Washer Relay Circuit, open circuit
0xB811	B3811	0x01	Rear Washer Relay Circuit, short to battery
0xB811	B3811	0x02	Rear Washer Relay Circuit, short to ground
0xB811	B3811	0x04	Rear Washer Relay Circuit, open circuit
0xB815	B3815	0x01	Reporting diagnostic trouble code for WiperFrontActiveOutput short to battery circuit
0xB815	B3815	0x02	Reporting diagnostic trouble code for WiperFrontActiveOutput short to ground circuit
0xB815	B3815	0x04	Reporting diagnostic trouble code for WiperFrontActiveOutput open circuit
0xB867	B3867	0x01	Right Parklamp Control Circuit, short to battery
0xB867	B3867	0x02	Right Parklamp Control Circuit, short to ground
0xB867	B3867	0x04	Right Parklamp Control Circuit, open circuit
0xB873	B3873	0x01	Front Washer Relay Circuit, short to battery
0xB873	B3873	0x02	Front Washer Relay Circuit, short to ground
0xB873	B3873	0x04	Front Washer Relay Circuit, open circuit
0xB875	B3875	0x01	Wiper High Speed Relay Circuit, short to battery
0xB875	B3875	0x02	Wiper High Speed Relay Circuit, short to ground
0xB875	B3875	0x04	Wiper High Speed Relay Circuit, open circuit
0xB878	B3878	0x01	Right Stoplamp Circuit, short to battery
0xB878	B3878	0x02	Right Stoplamp Circuit, short to ground
0xB878	B3878	0x04	Right Stoplamp Circuit, open circuit
0xB881	B3881	0x01	Left Tail Lamp Circuit, short to battery
0xB881	B3881	0x02	Left Tail Lamp Circuit, short to ground
0xB881	B3881	0x04	Left Tail Lamp Circuit, open circuit
0xB882	B3882	0x01	Right Tail Lamp Circuit, short to battery
0xB882	B3882	0x02	Right Tail Lamp Circuit, short to ground
0xB882	B3882	0x04	Right Tail Lamp Circuit, open circuit
0xB883	B3883	0x01	License Plate Lamp Circuit, short to battery
0xB883	B3883	0x02	License Plate Lamp Circuit, short to ground
0xB883	B3883	0x04	License Plate Lamp Circuit, open circuit
0xB884	B3884	0x01	Center High Mounted Stop Lamp Circuit, short to battery
0xB884	B3884	0x02	Center High Mounted Stop Lamp Circuit, short to ground

Code	DTC	Type	Error text
0xB884	B3884	0x04	Center High Mounted Stop Lamp Circuit, open circuit
0xB887	B3887	0x01	Trailer Left Turn Signal Circuit, short to battery
0xB887	B3887	0x02	Trailer Left Turn Signal Circuit, short to ground
0xB887	B3887	0x04	Trailer Left Turn Signal Circuit, open circuit
0xB888	B3888	0x01	Trailer Right Turn Signal Circuit, short to battery
0xB888	B3888	0x02	Trailer Right Turn Signal Circuit, short to ground
0xB888	B3888	0x04	Trailer Right Turn Signal Circuit, open circuit
0xB88A	B388A	0x01	Trailer Park Lamps Circuit, short to battery
0xB88A	B388A	0x02	Trailer Park Lamps Circuit, short to ground
0xB88A	B388A	0x04	Trailer Park Lamps Circuit, open circuit
0xB890	B3890	0x01	Trailer Backup Lamps Circuit, short to battery
0xB890	B3890	0x02	Trailer Backup Lamps Circuit, short to ground
0xB890	B3890	0x04	Trailer Backup Lamps Circuit, open circuit
0xB89A	B389A	0x00	Environment Identification Failed - no additional information
0xB916	B3916	0x01	Security System Siren Data Circuit, short to battery
0xB916	B3916	0x02	Security System Siren Data Circuit, short to ground
0xB916	B3916	0x04	Security System Siren Data Circuit, open circuit
0xB930	B3930	0x01	Child Security Motor Lock Circuit, short to battery
0xB930	B3930	0x02	Child Security Motor Lock Circuit, short to ground
0xB930	B3930	0x04	Child Security Motor Lock Circuit, open circuit
0xB935	B3935	0x00	Transponder Authentication Error - no additional information
0xB938	B3938	0x01	Fuel Door Actuator Lock Circuit, short to battery
0xB938	B3938	0x02	Fuel Door Actuator Lock Circuit, short to ground
0xB938	B3938	0x04	Fuel Door Actuator Lock Circuit, open circuit
0xB948	B3948	0x01	Left Front Turn Signal Circuit, short to battery
0xB948	B3948	0x02	Left Front Turn Signal Circuit, short to ground
0xB948	B3948	0x04	Left Front Turn Signal Circuit, open circuit
0xB949	B3949	0x01	Right Front Turn Signal Circuit, short to battery
0xB949	B3949	0x02	Right Front Turn Signal Circuit, short to ground
0xB949	B3949	0x04	Right Front Turn Signal Circuit, open circuit
0xB950	B3950	0x01	Left Rear Turn Signal Circuit, short to battery
0xB950	B3950	0x02	Left Rear Turn Signal Circuit, short to ground
0xB950	B3950	0x04	Left Rear Turn Signal Circuit, open circuit
0xB951	B3951	0x01	Right Rear Turn Signal Circuit, short to battery
0xB951	B3951	0x02	Right Rear Turn Signal Circuit, short to ground
0xB951	B3951	0x04	Right Rear Turn Signal Circuit, open circuit
0xB976	B3976	0x00	Unconfigured Transponder - no additional information
0xC020	U0020	0x00	Low Speed CAN Communication Bus Performance - no additional information
0xC073	U0073	0x00	Control Module Communication Bus Off - no additional information
0xC100	U0100	0x00	Lost Communication With ECM/PCM - no additional information
0xC101	U0101	0x00	Lost Communication with TCM - no additional information
0xC102	U0102	0x00	Lost Communication with Transfer Case Control Module - no additional information
0xC104	U0104	0x00	Lost Communication With Cruise Control Module - no additional information

Code	DTC	Type	Error text
0xC109	U0109	0x00	Lost Communication With Fuel Pump Control Module - no additional information
0xC117	U0117	0x00	Lost Communication With PTO Control Module - no additional information
0xC121	U0121	0x00	Lost Communication With Anti-Lock Brake System (ABS) Control Module - no additional information
0xC128	U0128	0x00	Lost Communication With Park Brake Control Module - no additional information
0xC130	U0130	0x00	Lost Communication With Steering Effort Control Module - no additional information
0xC131	U0131	0x00	Lost Communication With Power Steering Control Module - no additional information
0xC132	U0132	0x00	Lost Communication With Suspension Control Module 'A" - no additional information
0xC136	U0136	0x00	Lost Communication With Differential Control Module - Rear - no additional information
0xC139	U0139	0x00	Lost Communication With Suspension Control Module "B" - no additional information
0xC140	U0140	0x00	Lost Communication With Body Control Module - no additional information
0xC151	U0151	0x00	Lost Communication With Restraints Control Module - no additional information
0xC155	U0155	0x00	Lost Communication With Instrument Panel Cluster Control Module - no additional information
0xC158	U0158	0x00	Lost Communication With Head Up Display - no additional information
0xC159	U0159	0x00	Lost Communication With Parking Assist Control Module "A" - no additional information
0xC160	U0160	0x00	Lost Communication With Audible Alert Control Module - no additional information
0xC164	U0164	0x00	Lost Communication With HVAC Control Module - no additional information
0xC166	U0166	0x00	Lost Communication With Auxiliary Heater Control Module - no additional information
0xC170	U0170	0x00	Lost Communication With "Restraints System Sensor A" - no additional information
0xC181	U0181	0x00	Lost Communication With Headlamp Leveling Control Module - no additional information
0xC182	U0182	0x00	Lost Communication With Front Lighting Control Module - no additional information
0xC184	U0184	0x00	Lost Communication With Radio - no additional information
0xC186	U0186	0x00	Lost Communication With Audio Amplifier - no additional information
0xC191	U0191	0x00	Lost Communication With Television - no additional information
0xC197	U0197	0x00	Lost Communication With Telephone Control Module - no additional information
0xC198	U0198	0x00	Lost Communication With Telematic Control Module - no additional

Code	DTC	Type	Error text
			information
0xC203	U0203	0x00	Lost Communication With "Door Control Module E" - no additional information
0xC204	U0204	0x00	Lost Communication With "Door Control Module F" - no additional information
0xC207	U0207	0x00	Lost Communication With Moveable Roof Control Module - no additional information
0xC208	U0208	0x00	Lost Communication With "Seat Control Module A" - no additional information
0xC209	U0209	0x00	Lost Communication With "Seat Control Module B" - no additional information
0xC210	U0210	0x00	Lost Communication With "Seat Control Module C" - no additional information
0xC230	U0230	0x00	Lost Communication With Rear Gate Module - no additional information
0xC232	U0232	0x00	Lost Communication With Left Side Obstacle Detection Control Module - no additional information
0xC233	U0233	0x00	Lost Communication With Right Side Obstacle Detection Control Module - no additional information
0xC236	U0236	0x00	Lost Communication With Column Lock Module - no additional information
0xC237	U0237	0x00	Lost Communication With "Digital Audio Control Module C" - no additional information
0xC23A	U023A	0x00	Lost Communication With Image Processing Module "A" - no additional information
0xC249	U0249	0x00	Lost Communication With Rear Entertainment Control Module "B" - no additional information
0xC252	U0252	0x00	Lost Communication With Rear Lighting Control Module "B" - no additional information
0xC254	U0254	0x00	Lost Communication With Remote Start Module - no additional information
0xD510	U1510	0x00	Inter-device Dedicated Bus 1 Lost Communication With Device 0 - no additional information (AAS = Auxiliary Alarm Sensor)
0xD515	U1515	0x00	Inter-device Dedicated Bus 1 Lost Communication With Device 5 - no additional information (MWM_S = Master Wiper Module - Single Motor) (MWM_D = Master Wiper Module - Dual Motor)
0xD517	U1517	0x00	Inter-device Dedicated Bus 1 Lost Communication With Device 7 - no additional information (SRC1 = Sunshade Controller)
0xD51A	U151A	0x00	Inter-device Dedicated Bus 1 Lost Communication With Device 10 - no additional information (RSM = Rain Sense Module, RLM = Rain/Light Sense Module)
0xD51B	U151B	0x00	Inter-device Dedicated Bus 1 Lost Communication With Device 11 - no additional information (SRC2 = Sunroof Controller)

Code	DTC	Type	Error text
0xD520	U1520	0x00	Inter-device Dedicated Bus 2 Lost Communication With Device 0 - no additional information (PSM = Power Sounder Module)
0xD522	U1522	0x00	Inter-device Dedicated Bus 2 Lost Communication With Device 2 - no additional information (ALM = Auto Learn Module)
0xD52C	U152C	0x00	Inter-device Dedicated Bus 2 Lost Communication With Device 12 - no additional information (RCM = Remote Compass Module)
0xD52D	U152D	0x00	Inter-device Dedicated Bus 2 Lost Communication With Device 13 - no additional information (RPD = Remote PRNDL Display)
0xD530	U1530	0x00	Inter-device Dedicated Bus 3 Lost Communication With Device 0 - no additional information (PWL2 = Power Window Lifter - Right Front Door)
0xD534	U1534	0x00	Inter-device Dedicated Bus 3 Lost Communication With Device 4 - no additional information (PWL1 = Power Window Lifter - Left Front Door)
0xD538	U1538	0x00	Inter-device Dedicated Bus 3 Lost Communication With Device 8 - no additional information (DSP2 = Door Switch Plate - Right Front Door)
0xD53A	U153A	0x00	Inter-device Dedicated Bus 3 Lost Communication With Device 10 - no additional information (DSP1 = Door Switch Plate - Left Front Door)
0xD540	U1540	0x00	Inter-device Dedicated Bus 4 Lost Communication With Device 0 - no additional information (PWL4 = Power Window Lifter - Right Rear Door)
0xD544	U1544	0x00	Inter-device Dedicated Bus 4 Lost Communication With Device 4 - no additional information (PWL3 = Power Window Lifter - Left Rear Door)
0xD548	U1548	0x00	Inter-device Dedicated Bus 4 Lost Communication With Device 8 - no additional information (DSP4 = Door Switch Plate - Right Rear Door)
0xD54A	U154A	0x00	Inter-device Dedicated Bus 4 Lost Communication With Device 10 - no additional information (DSP3 = Door Switch Plate - Left Rear Door)
0xD54C	U154C	0x00	Inter-device Dedicated Bus 4 Lost Communication With Device 12 - no additional information (SSM = Slouch Seat Module)
0xD814	U1814	0x01	"Bus B" High Speed Communication Enable Circuit - short to battery
0xD814	U1814	0x02	"Bus B" High Speed Communication Enable Circuit - short to ground
0xD814	U1814	0x04	"Bus B" High Speed Communication Enable Circuit - open
0xD900	U1900	0x00	Lost Communication With Speech to Text Interface Module - no additional information
0xE099	U2099	0x01	High Speed Communication Enable Circuit - short to battery
0xE099	U2099	0x02	High Speed Communication Enable Circuit - short to ground
0xE099	U2099	0x04	High Speed Communication Enable Circuit - open

DAB

Code	DTC	Type	Error text
0x901D	B101D	0x34	ECU Hardware Performance, RAM failure
0x901D	B101D	0x35	ECU Hardware Performance, ROM failure
0x901D	B101D	0x39	ECU Hardware Performance, internal electronic failure
0x901D	B101D	0x3C	ECU Hardware Performance, internal communication failure
0x901E	B101E	0x43	ECU Software Performance, EEPROM error
0x901E	B101E	0x47	ECU Software Performance, VIN not programmed
0x901E	B101E	0x4C	ECU Software Performance, DTC memory full
0x9265	B1265	0x04	Switched Antenna Power Supply Circuit, Open circuit
0x9265	B1265	0x0B	Switched Antenna Power Supply Circuit, Current above threshold
0x9325	B1325	0x03	Device Power, Voltage below 9V
0x9325	B1325	0x07	Device Power, Voltage above 16V
0xC020	U0020	0x00	Low Speed CAN Communication Bus Performance
0xC073	U0073	0x00	Control Module Communication Bus 'A' Off
0xC184	U0184	0x00	Lost Communication With Radio
0xC197	U0197	0x00	Lost Communication With UHP

EBCM

Code	DTC	Type	Error text
0x0704	P0704	0x5A	Clutch Switch Plausability Failure
0x4010	C0010	0x5A	Reverse Gear Switch Plausability Failure
0x4035	C0035	0x06	Left Front Wheel Speed Sensor Circuit, short to ground or open
0x4035	C0035	0x0F	Left Front Wheel Speed Sensor Circuit, Erratic
0x4035	C0035	0x18	Left Front Wheel Speed Sensor Circuit, signal amplitude < minimum
0x4035	C0035	0x5A	Left Front Wheel Speed Sensor Circuit, plausibility failure
0x4040	C0040	0x06	Right Front Wheel Speed Sensor Circuit, short to ground or open
0x4040	C0040	0x0F	Right Front Wheel Speed Sensor Circuit, Erratic
0x4040	C0040	0x18	Right Front Wheel Speed Sensor Circuit, signal amplitude < minimum
0x4040	C0040	0x5A	Right Front Wheel Speed Sensor Circuit, plausibility amlitude < minimum
0x4045	C0045	0x06	Left Rear Wheel Speed Sensor Circuit, short to ground or open
0x4045	C0045	0x0F	Left Rear Wheel Speed Sensor Circuit, Erratic
0x4045	C0045	0x18	Left Rear Wheel Speed Sensor Circuit, signal amplitude < minimum
0x4045	C0045	0x5A	Left Rear Wheel Speed Sensor Circuit, plausibility failure
0x4050	C0050	0x06	Right Rear Wheel Speed Sensor Circuit, short to ground or open
0x4050	C0050	0x0F	Right Rear Wheel Speed Sensor Circuit, Erratic
0x4050	C0050	0x18	Right Rear Wheel Speed Sensor Circuit, signal amplitude < minimum
0x4050	C0050	0x5A	Right Rear Wheel Speed Sensor Circuit, plausibility failure
0x4110	C0110	0x06	Pump Motor Ciruit, open circuit
0x4110	C0110	0x61	Pump Motor Ciruit, actuator stuck
0x4131	C0131	0x00	Antilock Brake System(ABS)/Traction Control System(TCS) Pressure Cicuit, Internal failure
0x4131	C0131	0x4B	Antilock Brake System(ABS)/Traction Control System(TCS) Pressure Cicuit, calibration not learned
0x4131	C0131	0x5A	Antilock Brake System(ABS)/Traction Control System(TCS) Pressure Cicuit, plausibility failure
0x4161	C0161	0x5A	Brake Switch Plausability Failure
0x4166	C0166	0x00	Antilock Brake System (ABS)/Traction Control System (TCS) Brake Switch Circuit
0x4186	C0186	0x00	Lateral Accelerometer Circuit
0x4186	C0186	0x4B	Lateral Accelerometer Circuit, calibration not learned
0x4186	C0186	0x5A	Lateral Accelerometer Circuit, plausability failure
0x4186	C0186	0x71	Lateral Accelerometer Circuit. Invalid serial data received.
0x4187	C0187	0x5A	Lateral Accelerometer Circuit Range/Performance, Plausibility failure
0x4196	C0196	0x00	Yaw Rate Circuit
0x4196	C0196	0x5A	Yaw Rate Circuit, plausibility failure
0x4196	C0196	0x71	Yaw Rate Circuit. Invalid serial data received.
0x4242	C0242	0x00	Powertrain Control Module(PCM) indicated TCS Malfunction
0x4245	C0245	0x00	Wheel Speed Sensor Frequency
0x4252	C0252	0x00	Vehicle Stability Enhancement System(VSES) Sensors Uncorrelated
0x4253	C0253	0x00	Centering Error, has to be discussed eith supplier
0x4267	C0267	0x00	Low Brake Fluid Indicated

Code	DTC	Type	Error text
0x4274	C0274	0x54	Isolation Valve Performance, Temperature High
0x4275	C0275	0x54	Dump Valve Performance, Temperature High
0x4280	C0280	0x54	Stability System Active To Long, Temperature High
0x4281	C0281	0x01	Dynamic Rear Proportioning (DRP) Performance
0x4287	C0287	0x00	Longitudinal Accelerometer Circuit
0x4287	C0287	0x4B	Longitudinal Accelerometer Circuit, calibration not learned
0x4287	C0287	0x5A	Longitudinal Accelerometer Circuit, plausibility failure
0x4287	C0287	0x71	Longitudinal Accelerometer Circuit. Invalid serial data received.
0x4297	C0297	0x4A	Lost communication with IMU, Invalid serial data received
0x4299	C0299	0x56	Large Vacuum Leak
0x4558	C0558	0x4B	Calibration Data. Calibration not learned
0x4569	C0569	0x00	System Configuration Error
0x456D	C056D	0x00	ECU Internal Error, General failure
0x456E	C056E	0x38	DMC-II related failures - memory allocation fault
0x456E	C056E	0x45	Option Configuration Error, Variant not programmed
0x456E	C056E	0x47	Option Configuration Error, VIN not programmed
0x456E	C056E	0x48	ECU Software Performance, theft/ security data not programmed
0x456E	C056E	0x4A	DMC-II related failures - Interface version fault
0x456E	C056E	0x5A	Option Configuration Error, Plausibility failure
0x4710	C0710	0x42	Steering Position Signal, Calibration data set not programmed
0x4710	C0710	0x5A	Steering Position Signal, Plausibility failure
0x4710	C0710	0x71	Steering Position Signal. Invalid serial data received.
0x4800	C0800	0x03	Device Power, under voltage
0x4800	C0800	0x07	Device Power, over voltage
0x4800	C0800	0x0D	Loss Of Solonoid Ground (Pin 38 in connector)
0x5100	C1100	0x00	Vacuum Sensor Failure, Malfunction
0x5100	C1100	0x02	Vacuum Sensor Failure, Short to Battery
0x5100	C1100	0x04	Vacuum Sensor Failure, Open Circuit
0x5100	C1100	0x09	Vacuum Sensor Failure, rate of data change above threshold
0x5100	C1100	0x5A	Vacuum Sensor Failure, plausibility failure
0xB902	B3902	0x00	Wrong Immobilizer Identifier Received
0xB984	B3984	0x00	Device 1 Environment Identifier Not Programmed
0xC073	U0073	0x00	Control Module Communication Bus 'A' Off
0xC074	U0074	0x00	Control Module Communication Bus 'B' Off
0xC100	U0100	0x00	Lost communication with ECM
0xC100	U0100	0x71	Lost communication with ECM, Invalid serial data received
0xC100	U0100	0x72	Lost communication with ECM. Alive counter incorrect/not updated.
0xC100	U0100	0x74	Lost communication with ECM. Value of signal correction value incorrect.
0xC101	U0101	0x00	Lost communication with TCM
0xC101	U0101	0x71	Lost communication with TCM, Invalid serial data received
0xC102	U0102	0x71	Lost communication with TCCM, Invalid serial data received
0xC104	U0104	0x00	Lost communication with ACC
0xC104	U0104	0x71	Lost communication with ACC, Invalid serial data received
0xC104	U0104	0x72	Lost communication with ACC. Alive counter incorrect/not updated.
0xC104	U0104	0x74	Lost communication with ACC.Value of signal correction value

Code	DTC	Type	Error text
			incorrect.
0xC125	U0125	0x00	Lost communication with IMU
0xC125	U0125	0x71	Lost communication with IMU, Invalid serial data received
0xC125	U0125	0x72	Lost communication with IMU. Alive counter incorrect/not updated.
0xC125	U0125	0x74	Lost communication with IMU.Value of signal correction value incorrect.
0xC126	U0126	0x00	Lost communication with SAS
0xC126	U0126	0x71	Lost communication with SAS, Invalid serial data received
0xC126	U0126	0x72	Lost communication with SAS. Alive counter incorrect/not updated.
0xC126	U0126	0x74	Lost communication with SAS.Value of signal correction value incorrect.
0xC128	U0128	0x00	Lost communication with EPB
0xC128	U0128	0x71	Lost communication with EPB, Invalid serial data received
0xC128	U0128	0x72	Lost communication with EPB. Alive counter incorrect/not updated.
0xC128	U0128	0x74	Lost communication with EPB. Value of signal correction value incorrect.
0xC130	U0130	0x00	Lost communication with AFS
0xC130	U0130	0x71	Lost communication with AFS, Invalid serial data received
0xC133	U0133	0x00	Lost communication with ALC
0xC133	U0133	0x71	Lost communication with ALC, Invalid serial data received
0xC136	U0136	0x00	Lost communication with RDCM
0xC136	U0136	0x71	Lost communication with RDCM, Invalid serial data received
0xC139	U0139	0x00	Lost communication with SADS
0xC139	U0139	0x71	Lost communication with SADS, Invalid serial data received
0xC140	U0140	0x00	Lost communication with BCM
0xC140	U0140	0x71	Lost communication with BCM, Invalid serial data received
0xC140	U0140	0x72	Lost Communication with BCM. Alive counter incorrect/not updated.
0xC140	U0140	0x74	Lost Communication with BCM. Value of signal correction value incorrect.
0xD048	U1048	0x00	Lost Communication With Electric Power Steering
0xD048	U1048	0x71	Lost Communication With Electric Power Steering, Invalid serial data received
0xD8B9	U18B9	0x00	Subnet Config List Not Programmed(Primary HS)
0xD8BF	U18BF	0x00	Subnet Config List Not Programmed(Chassis Expansion Bus)

ECC

Code	DTC	Type	650CJ4	Error text
0x8155	B0155	0x00	NO	AC Refrigerant underpressure
0x8157	B0157	0x00	NO	AC Refrigerant small leaks detected
0x8163	B0163	0x02	YES	Passenger Compartment Temp Sensor Circuit , Short to ground
0x8163	B0163	0x05	YES	Passenger Compartment Temp Sensor Circuit , Short to battery or open
0x8173	B0173	0x02	YES	Upper Left Outlet Air Temperature Sensor Circuit , Short to ground
0x8173	B0173	0x05	YES	Upper Left Outlet Air Temperature Sensor Circuit , Short to battery or open
0x8178	B0178	0x02	YES	Lower Left Outlet Air Temperature Sensor Circuit , Short to ground
0x8178	B0178	0x05	YES	Lower Left Outlet Air Temperature Sensor Circuit , Short to battery or open
0x8183	B0183	0x02	YES	Solar Load Sensor Circuit , Short to ground
0x8183	B0183	0x05	YES	Solar Load Sensor Circuit , Short to battery or open
0x818A	B018A	0x02	YES	Windshield Temperature Sensor Circuit, Short to ground
0x818A	B018A	0x05	YES	Windshield Temperature Sensor Circuit, Short to battery or open
0x818B	B018B	0x02	NO	HVAC Condensor Air Deflector Circuit, Short to ground
0x818B	B018B	0x05	NO	HVAC Condensor Air Deflector Circuit, Short to battery or open
0x8193	B0193	0x01	YES	Front Blower Motor Speed Circuit , Short to battery
0x8193	B0193	0x06	YES	Front Blower Motor Speed Circuit , Short to ground or open
0x8208	B0208	0x01	YES	Rear Blower Motor Speed Circuit , Short to battery
0x8208	B0208	0x06	YES	Rear Blower Motor Speed Circuit , Short to ground or open
0x8223	B0223	0x01	YES	Recirculate Position Command 1 Circuit , Short to battery
0x8223	B0223	0x02	YES	Recirculate Position Command 1 Circuit , Short to ground
0x8223	B0223	0x04	YES	Recirculate Position Command 1 Circuit , Open circuit
0x8223	B0223	0x06	YES	Recirculate Position Command 1 Circuit , Short to ground or open
0x8228	B0228	0x02	NO	Recirculate Position Feedback 1 Circuit , Short to ground
0x8228	B0228	0x05	NO	Recirculate Position Feedback 1 Circuit , Short to battery or open
0x822A	B022A	0x01	YES	Recirculate Position Command 2 Circuit , Short to battery
0x822A	B022A	0x02	YES	Recirculate Position Command 2 Circuit , Short to ground
0x822A	B022A	0x04	YES	Recirculate Position Command 2 Circuit , Open circuit
0x822A	B022A	0x06	YES	Recirculate Position Command 2 Circuit , Short to ground or open
0x822B	B022B	0x02	NO	Recirculate Position Feedback 2 Circuit , Short to ground
0x822B	B022B	0x05	NO	Recirculate Position Feedback 2 Circuit , Short to battery or open
0x8233	B0233	0x01	YES	Air Flow Control Circuit, Short to battery
0x8233	B0233	0x02	YES	Air Flow Control Circuit, Short to ground
0x8233	B0233	0x04	YES	Air Flow Control Circuit, Open circuit
0x8233	B0233	0x06	YES	Air Flow Control Circuit, Short to ground or open
0x823A	B023A	0x02	YES	HVAC Actuators Supply Voltage, Short to ground
0x8283	B0283	0x02	YES	Rear Defrost Circuit , Short to ground
0x8283	B0283	0x05	YES	Rear Defrost Circuit , Short to battery or open
0x8373	B0373	0x02	NO	Rear Climate Control Off or Mode Selection Switch Circuit, Short to ground
0x8373	B0373	0x05	NO	Rear Climate Control Off or Mode Selection Switch Circuit, Short to battery or open

Code	DTC	Type	650CJ4	Error text
0x8408	B0408	0x01	YES	Main Temperature Control Circuit, Short to battery
0x8408	B0408	0x02	YES	Main Temperature Control Circuit, Short to ground
0x8408	B0408	0x04	YES	Main Temperature Control Circuit, Open circuit
0x8408	B0408	0x06	YES	Main Temperature Control Circuit, Short to ground or open
0x8413	B0413	0x02	NO	Main Temperature Control Feedback Circuit, Short to ground
0x8413	B0413	0x05	NO	Main Temperature Control Feedback Circuit, Short to battery or open
0x8418	B0418	0x01	YES	Right Temperature Control Circuit, Short to battery
0x8418	B0418	0x02	YES	Right Temperature Control Circuit, Short to ground
0x8418	B0418	0x04	YES	Right Temperature Control Circuit, Open circuit
0x8418	B0418	0x06	YES	Right Temperature Control Circuit, Short to ground or open
0x8423	B0423	0x02	NO	Right Temperature Control Feedback Circuit, Short to ground
0x8423	B0423	0x05	NO	Right Temperature Control Feedback Circuit, Short to battery or open
0x8428	B0428	0x01	YES	Rear Temperature Control Circuit, Short to battery
0x8428	B0428	0x02	YES	Rear Temperature Control Circuit, Short to ground
0x8428	B0428	0x04	YES	Rear Temperature Control Circuit, Open circuit
0x8428	B0428	0x06	YES	Rear Temperature Control Circuit, Short to ground or open
0x8433	B0433	0x02	NO	Rear Temperature Control Feedback Circuit, Short to ground
0x8433	B0433	0x05	NO	Rear Temperature Control Feedback Circuit, Short to battery or open
0x848B	B048B	0x02	NO	Rear Climate Control Blower Switch Circuit, Short to ground
0x848B	B048B	0x05	NO	Rear Climate Control Blower Switch Circuit, Short to battery or open
0x848C	B048C	0x02	YES	Humidity Sensor Humidity Circuit, Short to ground
0x848C	B048C	0x05	YES	Humidity Sensor Humidity Circuit, Short to battery or open
0x848D	B048D	0x01	YES	Auxilliary Heater Temperature Command Circuit, Short to battery
0x848D	B048D	0x06	YES	Auxilliary Heater Temperature Command Circuit, Short to ground or open
0x848E	B048E	0x00	YES	Auxilliary Heater System, Malfunction
0x848F	B048F	0x02	YES	Humidity Sensor Temperature Circuit, Short to ground
0x848F	B048F	0x05	YES	Humidity Sensor Temperature Circuit, Short to battery or open
0x849C	B049C	0x02	NO	Rear Temperature Control Switch Circuit, Short to ground
0x849C	B049C	0x05	NO	Rear Temperature Control Switch Circuit, Short to battery or open
0x8509	B0509	0x02	YES	Upper Right Outlet Air Temperature Sensor Circuit , Short to ground
0x8509	B0509	0x05	YES	Upper Right Outlet Air Temperature Sensor Circuit , Short to battery or open
0x8514	B0514	0x02	YES	Lower Right Outlet Air Temperature Sensor Circuit , Short to ground
0x8514	B0514	0x05	YES	Lower Right Outlet Air Temperature Sensor Circuit , Short to battery or open
0x8519	B0519	0x02	YES	Rear Upper Outlet Air Temperature Sensor Circuit, Short to ground
0x8519	B0519	0x05	YES	Rear Upper Outlet Air Temperature Sensor Circuit, Short to battery or open
0x901D	B101D	0x00	YES	ECU Hardware Performance, Malfunction
0x901E	B101E	0x47	YES	ECU Software Performance, VIN not programmed
0x901E	B101E	0x48	YES	ECU Software Performance, Security code not programmed
0x901E	B101E	0x4B	YES	Body ECU Software Performance, Calibration not learned

Code	DTC	Type	650CJ4	Error text
0x9020	B1020	0x39	YES	Auxiliary Electronic Control Unit, Internal electronic failure
0x9395	B1395	0x03	NO	Device Voltage Reference Output Circuit, Voltage below threshold
0x9395	B1395	0x07	NO	Device Voltage Reference Output Circuit, Voltage above threshold
0x9405	B1405	0x02	YES	Device Voltage Reference Output 2 Circuit, Short to ground
0x9405	B1405	0x05	YES	Device Voltage Reference Output 2 Circuit, Short to battery or open
0xB531	B3531	0x01	YES	Rear Air Flow Control Circuit, Short to battery
0xB531	B3531	0x02	YES	Rear Air Flow Control Circuit, Short to ground
0xB531	B3531	0x04	YES	Rear Air Flow Control Circuit, Open circuit
0xB531	B3531	0x06	YES	Rear Air Flow Control Circuit, Short to ground or open
0xB583	B3583	0x02	YES	Rear Lower Outlet Air Temperature Sensor Circuit, Short to ground
0xB583	B3583	0x05	YES	Rear Lower Outlet Air Temperature Sensor Circuit, Short to battery or open
0xB74A	B374A	0x02	NO	Air Flow Control Feedback Circuit, Short to ground
0xB74A	B374A	0x05	NO	Air Flow Control Feedback Circuit, Short to battery or open
0xB782	B3782	0x02	NO	Rear Air Flow Control Feedback Circuit, Short to ground
0xB782	B3782	0x05	NO	Rear Air Flow Control Feedback Circuit, Short to battery or open
0xB843	B3843	0x02	YES	Outside Air Quality Sensor Circuit , Short to ground
0xB843	B3843	0x05	YES	Outside Air Quality Sensor Circuit , Short to battery or open
0xB843	B3843	0x08	YES	Outside Air Quality Sensor Circuit , Invalid signal
0xB844	B3844	0x01	NO	Engine Coolant Circulation Pump Circuit, Short to battery
0xB844	B3844	0x06	NO	Engine Coolant Circulation Pump Circuit, Short to ground or open
0xB902	B3902	0x00	YES	Incorrect Immobilizer Identifier Received
0xB933	B3933	0x02	YES	Air Conditioning Evaporator Temperature Sensor Circuit, Short to ground
0xB933	B3933	0x05	YES	Air Conditioning Evaporator Temperature Sensor Circuit, Short to battery or open
0xB93A	B393A	0x02	NO	Air Conditioning Low Side Pressure Sensor Circuit, Short to ground
0xB93A	B393A	0x05	NO	Air Conditioning Low Side Pressure Sensor Circuit, Short to battery or open
0xB93B	B393B	0x04	YES	Air Conditioning Compressor Valve Control Circuit, Open circuit
0xB93B	B393B	0x0B	YES	Air Conditioning Compressor Valve Control Circuit, Current above threshold
0xB984	B3984	0x00	YES	Device 1 Environment Identifier not programmed
0xC020	U0020	0x00	YES	Low Speed CAN Communication Bus Performance
0xC073	U0073	0x00	YES	Control Module Communication Bus Off
0xC140	U0140	0x00	YES	Lost Communication With BCM
0xC151	U0151	0x00	YES	Lost Communication With SDM
0xC155	U0155	0x00	YES	Lost Communication With IPC
0xC158	U0158	0x00	YES	Lost Communication With HUD
0xC184	U0184	0x00	YES	Lost Communication With Radio
0xC197	U0197	0x00	YES	Lost Communication With UHP
0xC198	U0198	0x00	NO	Lost Communication With ONSTAR
0xC208	U0208	0x00	YES	Lost Communication With DSM/ HVSM
0xC230	U0230	0x00	NO	Lost Communication With PTM
0xC254	U0254	0x00	NO	Lost Communication With PEPS
0xD501	U1501	0x00	? TBC YES	Inter Device Dedicated Bus (LIN)

Code	DTC	Type	650CJ4	Error text
0xD510	U1510	0x00	? TBC YES	Inter-Device Deticated Bus, Lost communication with HVAC Faceplate

EPM (Electric Power Management)

GMLAN Signal	Parameter Name	DTC	Cluster w/o DIC	Cluster with DIC	
			Battery Telltale	Battery Telltale	DIC Message Display
	Battery Voltage Sense Fault	B1517.5A	No	No	No
Service Battery Charging System Indication On	Low Battery Voltage	B1517.03	Yes (Run with engine running)	Yes	W142 - Service Battery Charging System
Service Battery Charging System Indication On	High Battery Voltage	B1517.07	Yes (Run with engine running)	Yes	W142 - Service Battery Charging System
	Battery Current Sensor Performance	B1516.08	No	No	No
Service Battery Charging System Indication On	Current Sensor Polarity Check	B1516.66	Yes	Yes	W142 - Service Battery Charging System
	High Parasitic Load	B1527.00	No	No	No
Battery Saver Indication On	Energy Management Load Shedding Request (data=$3)	-	No	No	W138 - Battery Saver Active
Battery Voltage Indication Request (BattVltIR)	Low Voltage	B151A.58	Yes	No	W192 - Low Battery

EPB

Code	DTC	Type	Error text
0x428A	C028A	0x01	Relay short (short to battery)
0x428A	C028A	0x02	MOSFET short (short to ground)
0x428A	C028A	0x04	Open Motor Circuit (open circuit)
0x428A	C028A	0x08	SCS line implausible (signal invalid)
0x428A	C028A	0x28	PWM (incorrect frequency)
0x428B	C028B	0x08	Park Brake Motor Position Sensor Circuit/invalid signal
0x428B	C028B	0x26	Park Brake Motor Position Sensor Circuit/Signal, frequency too low (stuck)
0x428B	C028B	0x29	Park Brake Motor Position Sensor Circuit/Signal, too few pulses
0x428B	C028B	0x2A	Park Brake Motor Position Sensor Circuit/Signal, too many pulses
0x428D	C028D	0x00	Replace Park Brake Lining (max. Backup Dynamic Braking reached)
0x428F	C028F	0x01	Park Brake Solenoid (Force Sensor) Circuit, short to battery
0x428F	C028F	0x02	Park Brake Solenoid (Force Sensor) Circuit, short to ground
0x428F	C028F	0x08	Park Brake Solenoid (Force Sensor) Circuit, invalid signal
0x4293	C0293	0x01	Park Brake Switch Control, short to battery
0x4293	C0293	0x06	Park Brake Switch Control, short to ground or open
0x4293	C0293	0x08	Park Brake Switch Control, signal invalid
0x4298	C0298	0x00	Park Brake Release Switch Circuit, (Stuck Button)
0x4558	C0558	0x55	Calibration Data Not Learned, expected number of transitions not reached (Actuator Force Position Calibration Missing)
0x4558	C0558	0x5A	Calibration Data Not Learned, Plausibility Failure (Actuator Zero Position Calibration Requested)
0x4561	C0561	0x71	System Disabled Information Stored, invalid serial data received
0x456D	C056D	0x34	ECU Hardware Performance, RAM failure
0x456D	C056D	0x35	ECU Hardware Performance, ROM failure
0x456D	C056D	0x36	ECU Hardware Performance, EEPROM
0x456D	C056D	0x37	ECU Hardware Performance, watchdog / safety uC failure
0x456D	C056D	0x39	ECU Hardware Performance, internal electronic failure
0x456D	C056D	0x3C	ECU Hardware Performance, internal communication failure
0x456E	C056E	0x41	ECU Software Performance, operational software / calibration set not programmed
0x456E	C056E	0x42	ECU Software Performance, Calibration Data set not programmed
0x456E	C056E	0x5A	ECU Software Performance, plausibility failure (Master - Slave, Actuator Movement, only Development)
0x4574	C0574	0x01	Circuit Board Temperature Sensor, short to battery
0x4574	C0574	0x02	Circuit Board Temperature Sensor, short to ground
0x4574	C0574	0x54	Circuit Board Temperature Sensor, temperature high
0x4800	C0800	0x03	Device Power Circuit, voltage below threshold
0x4800	C0800	0x07	Device Power Circuit, voltage above threshold
0xC073	U0073	0x00	Control Module Communication Bus Off
0xC100	U0100	0x00	Lost Communication With ECM/PCM "A"
0xC101	U0101	0x00	Lost Communication with TCM
0xC121	U0121	0x00	Lost Communication With Anti-Lock Brake System (ABS) Control Module

Code	DTC	Type	Error text
0xC140	U0140	0x00	Lost Communication With Body Control Module
0xE099	U2099	0x02	High Speed Communication Enable Circuit, short to GND (CommEnable)
0xE099	U2099	0x5A	High Speed Communication Enable Circuit, plausibility Failure (CommEnable with SystemPowerMode)

FSCM

Code	DTC	Type	Error text
0x018B	P018B	0x00	Fuel Pressure Sensor Performance - no additional information
0x018C	P018C	0x00	Fuel Pressure Sensor Low Voltage - no additional information
0x018D	P018D	0x00	Fuel Pressure Sensor High Voltage - no additional information
0x0231	P0231	0x00	Fuel Pump Control Circuit Low Voltage(15A /100A fault)
0x0232	P0232	0x00	Fuel Pump Control Circuit High Voltage
0x023F	P023F	0x00	Fuel Pump Control Circuit (Open)
0x025A	P025A	0x00	Fuel Pump Control Module Enable Control Circuit
0x0562	P0562	0x00	System Voltage Low
0x0563	P0563	0x00	System Voltage High
0x0601	P0601	0x00	Control Module Read Only Memory (ROM)
0x0602	P0602	0x00	Control Module Not Programmed
0x0603	P0603	0x00	Control Module Long Term Memory Reset
0x0604	P0604	0x00	Control Module Random Access Memory (RAM)
0x0606	P0606	0x00	Control Module Internal Performance
0x062F	P062F	0x00	Control Module Long Term Memory Performance
0x0641	P0641	0x00	5 Volt Reference Circuit
0x064A	P064A	0x00	Fuel Pump Control Module Performance - no additional information
0x06A6	P06A6	0x00	5 Volt Reference 1 Performance
0x1255	P1255	0x00	Fuel Pump Control Module Driver, Overtemperature - no additional information
0x2534	P2534	0x00	Ignition 1 Switch Circuit Low Voltage - no additional information
0x2635	P2635	0x00	Fuel Pump Flow Performance
0xC073	U0073	0x00	Control Module Communication Bus 'A' Off
0xC100	U0100	0x00	Lost Communication With ECM
0xC140	U0140	0x00	Lost Communication With Body Control Module
0xE099	U2099	0x00	High Speed Communication Enable Circuit Low - no additional information

HBSM

Code	DTC	Type	Error text
0x8000	B0000	0x71	Vehicle Speed Information Circuit, Invalid signal
0x8988	B0988	0x66	Vehicle Direction Camera Control Module, Wrong mounting position
0x901D	B101D	0x39	ECU Hardware Performance, Internal electronic failure
0x901E	B101E	0x43	ECU Software Performance, EEPROM error
0x9325	B1325	0x03	Device Power, under voltage
0x9325	B1325	0x07	Device Power, over voltage
0x954D	B154D	0x01	Mirror Dimming Circuit, Short to battery
0x954D	B154D	0x02	Mirror Dimming Circuit, Short to ground
0xC020	U0020	0x00	Low Speed CAN Communication Bus Performance
0xC073	U0073	0x00	Control Module Communication Bus 'A' Off
0xC140	U0140	0x00	Lost Communication With BCM
0xC155	U0155	0x00	Lost Communication With IPC

HVSM

Code	DTC	Type	Error text
0x901D	B101D	0x39	ECU Hardware Performance - Internal Electronic Failure
0x901E	B101E	0x42	ECU Software Performance - Calibration Data Set Not Programmed
0x9925	B1925	0x02	Left Seat Cushion Heater Sensor Circuit - Short to Ground
0x9925	B1925	0x05	Left Seat Cushion Heater Sensor Circuit - Short to Battery or Open
0x9935	B1935	0x0B	Left Seat Back Heater Circuit - Current AboveThreshold
0x9935	B1935	0x0D	Left Seat Back Heater Circuit - Resistance Above Threshold
0x9935	B1935	0x0E	Left Seat Back Heater Circuit - Resistance Below Threshold
0xA170	B2170	0x02	Right Seat Cushion Heater Sensor Circuit - Short to Ground
0xA170	B2170	0x05	Right Seat Cushion Heater Sensor Circuit - Short to Battery or Open
0xA180	B2180	0x0B	Right Seat Back Heater Circuit - Current Above Threshold
0xA180	B2180	0x0D	Right Seat Back Heater Circuit - Resistance Above Threshold
0xA180	B2180	0x0E	Right Seat Back Heater Circuit - Resistance Below Threshold
0xA345	B2345	0x13	Seat Heater Disable Circuit - Above Temperature Threshold
0xA425	B2425	0x0B	Left Seat Cushion Heater Circuit - Current Above Threshold
0xA425	B2425	0x0D	Left Seat Cushion Heater Circuit - Resistance Above Threshold
0xA425	B2425	0x0E	Left Seat Cushion Heater Circuit - Resistance Below Threshold
0xA42A	B242A	0x01	Seat Heaters Common Circuit - Short to Battery
0xA42A	B242A	0x02	Seat Heaters Common Circuit - Short to Ground
0xA430	B2430	0x0B	Right Seat Cushion Heater Circuit - Current Above Threshold
0xA430	B2430	0x0D	Right Seat Cushion Heater Circuit - Resistance Above Threshold
0xA430	B2430	0x0E	Right Seat Cushion Heater Circuit - Resistance Below Threshold
0xA435	B2435	0x02	Left Seat Back Heater Sensor Circuit - Short to Ground
0xA435	B2435	0x05	Left Seat Back Heater Sensor Circuit - Short to Battery or Open
0xA440	B2440	0x02	Right Seat Back Heater Sensor Circuit - Short to Ground
0xA440	B2440	0x05	Right Seat Back Heater Sensor Circuit - Short to Battery or Open
0xC020	U0020	0x00	Low Speed CAN Communication Bus Performance - No Additional Information
0xC073	U0073	0x00	Control Module Communication Bus Off - No Additional Information
0xC140	U0140	0x00	Lost Communication with Body Control Module - No Additional Information
0xC155	U0155	0x00	Lost Communication With Instrument Panel Cluster Control Module - No Additional Information
0xC164	U0164	0x00	Lost Communication with HVAC Control Module - No Additional Information
0xC249	U0249	0x00	Lost Communication with Entertainment Control Module Rear B - No Additional Information

IMU

Code	DTC	Type	Error text
0x418B	C018B	0x5A	Lateral Accelerometers 1 & 2 Correlation, plausibility failure
0x419B	C019B	0x5A	Yaw Rates 1 & 2 Correlation, plausibility failure
0x456D	C056D	0x39	ECU Hardware Performance, internal electronic failure
0x456D	C056D	0x3B	ECU Hardware Performance, internal self test failed
0x456E	C056E	0x46	ECU Software Performance, vehicle configuration not programmed
0x456E	C056E	0x47	ECU Software Performance, VIN not programmed
0x456E	C056E	0x4A	ECU Software Performance, checksum error
0x4800	C0800	0x03	Device Power, under voltage
0x4800	C0800	0x07	Device Power, over voltage
0xC073	U0073	0x00	Control Module Communication Bus 'A' Off
0xC121	U0121	0x00	Lost communication with EBCM

IPB

Code	DTC	Type	Error text
0x8987	B0987	0x05	Vehicle Direction Alert Alarm Warning Indicator Circuit, Short to Battery/Open Load
0x8988	B0988	0x00	Vehicle Direction Camera Calibration Not Learned
0x9015	B1015	0x00	Vehicle Identification Number (VIN) Information Error
0x9016	B1016	0x47	Vehicle Identification Number (VIN) Information Not Programmed
0x901D	B101D	0x00	ECU Hardware Performance, FPGA failure
0x901D	B101D	0x04	ECU Hardware Performance, Image Sensor, No Response
0x901D	B101D	0x34	ECU Hardware Performance, RAM failure
0x901D	B101D	0x35	ECU Hardware Performance, ROM failure
0x901D	B101D	0x36	ECU Hardware Performance, EEPROM failure
0x901D	B101D	0x39	ECU Hardware Performance, internal electronic failure
0x901D	B101D	0x3C	ECU Hardware Performance, internal communication failure
0x901D	B101D	0x54	ECU Hardware Performance, temperature high
0x901D	B101D	0x55	ECU Hardware Performance, Image Sensor, No Image
0x901D	B101D	0x5A	ECU Hardware Performance, Image Sensor, Verify Error
0x901E	B101E	0x43	ECU Software Performance, EEPROM error
0x901E	B101E	0x4B	ECU Software Performance, calibration not learned
0x9325	B1325	0x03	Device Power, under voltage
0x9325	B1325	0x07	Device Power, over voltage
0xB56A	B356A	0x02	Vehicle Direction Alert Alarm Warning Switch Circuit, Short to Ground
0xB56A	B356A	0x05	Vehicle Direction Alert Alarm Warning Switch Circuit, Short to Battery/Open Load
0xC020	U0020	0x00	Low Speed CAN Communication Bus Performance
0xC073	U0073	0x00	Control Module Communication Bus 'A' Off
0xC140	U0140	0x00	Lost communication with Body Control Module
0xC155	U0155	0x00	Lost communication with Instrument Panel Cluster (IPC) Control Module
0xC158	U0158	0x00	Lost communication with Head Up Display
0xC184	U0184	0x00	Lost communication with Radio

IPC

Code	DTC	Type	Error text
0x8158	B0158	0x02	Outside Air Temperature Sensor Circuit, Short To Ground
0x8158	B0158	0x05	Outside Air Temperature Sensor Circuit, Short To Battery or Open Circuit
0x901E	B101E	0x46	Body ECU Vehicle Configuration not programmed
0x901E	B101E	0x47	Body ECU VIN not programmed
0x901E	B101E	0x48	Body ECU Theft / Security Data not programmed; Immobilizer Security Code Not Programmed
0x9325	B1325	0x03	Body System Device Power Voltage below threshold
0x9325	B1325	0x07	Body System Device Power Voltage above threshold
0x9370	B1370	0x01	Device Ignition 1 Circuit (short to battery)
0x9370	B1370	0x06	Device Ignition 1 Circuit, Short To Ground or Open
0xB567	B3567	0x01	Driver Information Center (DIC) Select Switch Circuit Short To Battery
0xB567	B3567	0x02	Driver Information Center (DIC) Select Switch Circuit Short To Ground
0xB567	B3567	0x04	Driver Information Center (DIC) Select Switch Circuit Open Circuit
0xB567	B3567	0x59	Driver Information Center (DIC) Select Switch Circuit Component Protection Time-Out
0xB902	B3902	0x00	Wrong Immobilizer Identifier Received
0xB984	B3984	0x00	Device 1 Environment Identifier Not Programmed
0xC020	U0020	0x00	Low Speed CAN Communication Bus Performance
0xC073	U0073	0x00	Control Module Communication Bus Off
0xC140	U0140	0x00	Lost Communication With Body Control Module
0xC151	U0151	0x00	Lost Communication With SDM
0xC158	U0158	0x00	Lost Comminication With HUD
0xC159	U0159	0x00	Lost Communication With Parking Assist Control Module
0xC164	U0164	0x00	Lost Communication With ECC
0xC166	U0166	0x00	Lost Communication With PHS
0xC184	U0184	0x00	Lost Communication With Radio
0xC198	U0198	0x00	Lost Communication With OnStar
0xC230	U0230	0x00	Lost Communication With PTM
0xC236	U0236	0x00	Lost Communication with Column Lock
0xC23A	U023A	0x00	Lost Communication With LDW
0xC254	U0254	0x00	Lost Communication With PEPS

MSM

Code	DTC	Type	Error text
0x901D	B101D	0x39	ECU Hardware Performance - Internal Electronic Failure
0x901E	B101E	0x42	ECU Software Performance - Calibration Data Set Not Programmed
0x9325	B1325	0x03	Device Power - Voltage Below Threshold
0x9325	B1325	0x07	Device Power - Voltage Above Threshold
0x9395	B1395	0x03	Device Voltage Reference Output 1 Circuit - Voltage Below Threshold
0x9395	B1395	0x07	Device Voltage Reference Output 1 Circuit - Voltage Above Threshold
0x9405	B1405	0x02	Device Voltage Reference Output 2 Circuit - Short to Ground
0x954A	B154A	0x39	Driver Mirror - Internal Electronic Failure
0x954B	B154B	0x39	Passenger Mirror - Internal Electronic Failure
0x9735	B1735	0x02	Driver Seat Front Up Switch Circuit - Short to Ground
0x9740	B1740	0x02	Driver Seat Front Down Switch Circuit - Short to Ground
0x9745	B1745	0x02	Driver Seat Rear Up Switch Circuit - Short to Ground
0x9750	B1750	0x02	Driver Seat Rear Down Switch Circuit - Short to Ground
0x9755	B1755	0x02	Driver Seat Assembly Forward Switch Circuit - Short to Ground
0x9760	B1760	0x02	Driver Seat Assembly Rearward Switch Circuit - Short to Ground
0x9815	B1815	0x02	Driver Seat Recline Forward Switch Circuit - Short to Ground
0x9820	B1820	0x02	Driver Seat Recline Rearward Switch Circuit - Short to Ground
0x9825	B1825	0x01	Driver Seat Recline Position Sensor Circuit - Short to Battery
0x9825	B1825	0x06	Driver Seat Recline Position Sensor Circuit - Short to Ground or Open
0x9830	B1830	0x02	Driver Seat Lumbar Forward Switch Circuit - Short to Ground
0x9835	B1835	0x02	Driver Seat Lumbar Rearward Switch Circuit - Short to Ground
0x9840	B1840	0x02	Driver Seat Lumbar Up Switch Circuit - Short to Ground
0x9845	B1845	0x02	Driver Seat Lumbar Down Switch Circuit - Short to Ground
0x9850	B1850	0x01	Driver Seat Lumbar Horizontal Position Sensor Circuit - Short to Battery
0x9850	B1850	0x06	Driver Seat Lumbar Horizontal Position Sensor Circuit - Short to Ground or Open
0x9850	B1850	0x5A	Driver Seat Lumbar Horizontal Position Sensor Circuit - Plausibility Failure
0x9860	B1860	0x01	Driver Seat Lumbar Vertical Position Sensor Circuit - Short to Battery
0x9860	B1860	0x06	Driver Seat Lumbar Vertical Position Sensor Circuit - Short to Ground or Open
0x9860	B1860	0x5A	Driver Seat Lumbar Vertical Position Sensor Circuit - Plausibility Failure
0x9925	B1925	0x02	Left Seat Cushion Heater Sensor Circuit - Short to Ground
0x9925	B1925	0x05	Left Seat Cushion Heater Sensor Circuit - Short to Battery or Open
0x9935	B1935	0x0B	Left Seat Back Heater Circuit - Current AboveThreshold
0x9935	B1935	0x0D	Left Seat Back Heater Circuit - Resistance Above Threshold
0x9935	B1935	0x0E	Left Seat Back Heater Circuit - Resistance Below Threshold
0xA085	B2085	0x01	Passenger Seat Lumbar Up Switch Circuit - Short to Battery
0xA090	B2090	0x01	Passenger Seat Lumbar Down Switch Circuit - Short to Battery
0xA105	B2105	0x01	Passenger Seat Lumbar Vertical Position Sensor Circuit - Short to

Code	DTC	Type	Error text
			Battery
0xA105	B2105	0x06	Passenger Seat Lumbar Vertical Position Sensor Circuit - Short to Ground or Open
0xA170	B2170	0x02	Right Seat Cushion Heater Sensor Circuit - Short to Ground
0xA170	B2170	0x05	Right Seat Cushion Heater Sensor Circuit - Short to Battery or Open
0xA180	B2180	0x0B	Right Seat Back Heater Circuit - Current Above Threshold
0xA180	B2180	0x0D	Right Seat Back Heater Circuit - Resistance Above Threshold
0xA180	B2180	0x0E	Right Seat Back Heater Circuit - Resistance Below Threshold
0xA345	B2345	0x13	Seat Heater Disable Circuit - Above Temperature Threshold
0xA355	B2355	0x01	Driver Seat Front Vertical Position Sensor Circuit - Short to Battery
0xA355	B2355	0x06	Driver Seat Front Vertical Position Sensor Circuit - Short to Ground or Open
0xA365	B2365	0x01	Driver Seat Rear Vertical Position Sensor Circuit - Short to Battery
0xA365	B2365	0x06	Driver Seat Rear Vertical Position Sensor Circuit - Short to Ground or Open
0xA375	B2375	0x01	Driver Seat Assembly Horizontal Position Sensor Circuit - Short to Battery
0xA375	B2375	0x06	Driver Seat Assembly Horizontal Position Sensor Circuit - Short to Ground or Open
0xA425	B2425	0x0B	Left Seat Cushion Heater Circuit - Current Above Threshold
0xA425	B2425	0x0D	Left Seat Cushion Heater Circuit - Resistance Above Threshold
0xA425	B2425	0x0E	Left Seat Cushion Heater Circuit - Resistance Below Threshold
0xA42A	B242A	0x01	Seat Heaters Common Circuit - Short to Battery
0xA42A	B242A	0x02	Seat Heaters Common Circuit - Short to Ground
0xA430	B2430	0x0B	Right Seat Cushion Heater Circuit - Current Above Threshold
0xA430	B2430	0x0D	Right Seat Cushion Heater Circuit - Resistance Above Threshold
0xA430	B2430	0x0E	Right Seat Cushion Heater Circuit - Resistance Below Threshold
0xA435	B2435	0x02	Left Seat Back Heater Sensor Circuit - Short to Ground
0xA435	B2435	0x05	Left Seat Back Heater Sensor Circuit - Short to Battery or Open
0xA440	B2440	0x02	Right Seat Back Heater Sensor Circuit - Short to Ground
0xA440	B2440	0x05	Right Seat Back Heater Sensor Circuit - Short to Battery or Open
0xA755	B2755	0x00	Driver Memory Select Switch Circuit - No Additional Information
0xA755	B2755	0x01	Driver Memory Select Switch Circuit - Short to Battery
0xA755	B2755	0x02	Driver Memory Select Switch Circuit - Short to Ground
0xA765	B2765	0x02	Driver Memory Set Switch Circuit - Short to Ground
0xA85A	B285A	0x39	Column Position Module - Internal Electronic Failure
0xA85A	B285A	0x4B	Column Position Module - Calibration Not Learned
0xB604	B3604	0x02	Adjustable Foot Pedal Forward Switch Circuit - Short to Ground
0xB605	B3605	0x02	Adjustable Foot Pedal Rearward Switch Circuit - Short to Ground
0xB606	B3606	0x01	Adjustable Foot Pedal Position Sensor 1 Circuit - Short to Battery
0xB606	B3606	0x06	Adjustable Foot Pedal Position Sensor 1 Circuit - Short to Ground or Open
0xB606	B3606	0x5A	Adjustable Foot Pedal Position Sensor 1 Circuit - Plausibility Failure
0xB606	B3606	0x61	Adjustable Foot Pedal Position Sensor 1 Circuit - Actuator Stuck
0xB607	B3607	0x4B	Adjustable Foot Pedal Motor Circuit - Calibration Not Learned
0xB60B	B360B	0x01	Adjustable Foot Pedal Position Sensor 2 Circuit - Short to Battery
0xB60B	B360B	0x06	Adjustable Foot Pedal Position Sensor 2 Circuit - Short to Ground or

Code	DTC	Type	Error text
			Open
0xB60B	B360B	0x5A	Adjustable Foot Pedal Position Sensor 2 Circuit - Plausibility Failure
0xB920	B3920	0x00	Driver Group 1 Seat Motors Common Circuit - No Additional Information
0xB920	B3920	0x01	Driver Group 1 Seat Motors Common Circuit - Short to Battery
0xB920	B3920	0x02	Driver Group 1 Seat Motors Common Circuit - Short to Ground
0xB920	B3920	0x0B	Driver Group 1 Seat Motors Common Circuit - Current Above Threshold
0xB920	B3920	0x42	Driver Group 1 Seat Motors Common Circuit - Calibration Data Set Not Programmed
0xB921	B3921	0x01	Driver Group 2 Seat Motors Common Circuit - Short to Battery
0xB921	B3921	0x02	Driver Group 2 Seat Motors Common Circuit - Short to Ground
0xC020	U0020	0x00	Low Speed CAN Communication Bus Performance - No Additional Information
0xC073	U0073	0x00	Control Module Communication Bus Off - No Additional Information
0xC140	U0140	0x00	Lost Communication with Body Control Module - No Additional Information
0xC155	U0155	0x00	Lost Communication With Instrument Panel Cluster Control Module - No Additional Information
0xC164	U0164	0x00	Lost Communication with HVAC Control Module - No Additional Information
0xD501	U1501	0x00	Inter- device Dedicated Bus 1 - No Additional Information
0xD511	U1511	0x00	Inter- device Dedicated Bus 1 Lost Communication With Device 1 - No Additional Information
0xD519	U1519	0x00	Inter- device Dedicated Bus 1 Lost Communication With Device 9 - No Additional Information
0xD51B	U151B	0x00	Inter- device Dedicated Bus 1 Lost Communication With Device 11 - No Additional Information

PDIM

Code	DTC	Type	Error text
0x901D	B101D	0x35	ECU Hardware Performance, ROM failure
0x901D	B101D	0x36	ECU Hardware Performance, EEPROM failure
0x901D	B101D	0x39	ECU Hardware Performance, Internal Electronic Failure
0x9278	B1278	0x01	Auxiliary Input 1 Signal Circuit, Short to battery
0x9278	B1278	0x02	Auxiliary Input 1 Signal Circuit, Short to ground
0x9279	B1279	0x01	Auxiliary Input 2 Signal Circuit, Short to battery
0x9279	B1279	0x02	Auxiliary Input 2 Signal Circuit, Short to ground
0x9325	B1325	0x03	Device Power, under voltage
0x9325	B1325	0x07	Device Power, over voltage
0xC020	U0020	0x00	ICB CAN Communication Bus Performance
0xC073	U0073	0x00	Control Module Communication Bus 'A' Off
0xC184	U0184	0x00	Lost Communication with Radio

PEPS

Code	DTC	Type	Error text
0x897B	B097B	0x02	Power Mode START Switch Circuit, Short to ground
0x897B	B097B	0x05	Power Mode START Switch Circuit, Short to battery or open circuit
0x897B	B097B	0x08	Power Mode START Switch Circuit, Invalid Signal
0x897B	B097B	0x61	Power Mode START Switch Circuit, Stuck Switch
0x901D	B101D	0x34	ECU Hardware Performance, RAM failure
0x901D	B101D	0x35	ECU Hardware Performance, ROM failure
0x901D	B101D	0x39	ECU Hardware Performance, internal electronic failure
0x901E	B101E	0x43	ECU Software Performance, EEPROM error
0x901E	B101E	0x47	ECU Software Performance, VIN not programmed
0x9325	B1325	0x03	Device Power, under voltage
0x9325	B1325	0x07	Device Power, over voltage
0x9330	B1330	0x03	Device Power 2 Circuit Voltage below treshhold
0x944B	B144B	0x01	Run and Crank Circuit, Short to battery
0x944B	B144B	0x02	Run and Crank Circuit, Short to ground
0x944B	B144B	0x04	Run and Crank Circuit, open load
0x9451	B1451	0x01	Accessory Power Circuit, Short to battery
0x9451	B1451	0x02	Accessory Power Circuit, Short to ground
0x9451	B1451	0x04	Accessory Power Circuit, open load
0x9474	B1474	0x02	Right Front Exterior Door Handle Switch Circuit, Short to ground
0x9534	B1534	0x02	Left Rear Door Handle Switch Circuit, Short to ground
0x9535	B1535	0x02	Right Rear Door Handle Switch Circuit, Short to ground
0x9543	B1543	0x00	Cargo Door/Endgate/Liftgate/Midgate Exterior Lock Sensor, Circuit Failure
0xA494	B2494	0x02	Endgate/Liftgate Handle Switch Circuit, Short to ground
0xA50B	B250B	0x01	LF/ Driver Door Unlatch Low Control Circuit, Short to battery
0xA50B	B250B	0x02	LF/ Driver Door Unlatch Low Control Circuit, Short to ground
0xA516	B2516	0x00	Left Front Exterior Lock Sensor, Circuit Failure
0xA51A	B251A	0x01	All Door Unlatch Low Control Circuit, Short to battery
0xA51A	B251A	0x02	All Door Unlatch Low Control Circuit, Short to ground
0xA51B	B251B	0x04	Driver Door Unlatch High Control Circuit, Open Load
0xA51C	B251C	0x04	Passenger Door Unlatch High Control Circuit, Open Load
0xA51D	B251D	0x04	LR Door Unlatch High Control Circuit, Open Load
0xA51E	B251E	0x04	RR Door Unlatch High Control Circuit, Open Load
0xA51F	B251F	0x04	Endgate/ Liftgate/ Midgate Door Unlatch High Control Circuit, Open Load
0xA52A	B252A	0x01	Driver Door Unlatch Enable Circuit
0xA52B	B252B	0x01	Passenger Door Unlatch Enable Circuit
0xA897	B2897	0x01	Steering Column Lock Solenoid/Motor Unlock Circuit, Short to battery
0xA97B	B297B	0x5A	Driver Door open switch circuit, Plausibility failure
0xA97C	B297C	0x5A	CoDriver Door open switch circuit, Plausibility failure
0xB10A	B310A	0x02	Keyless Entry Antenna 8 Performance , Short to ground
0xB10A	B310A	0x05	Keyless Entry Antenna 8 Performance , Short to battery or open
0xB119	B3119	0x02	Keyless Entry Antenna 1 (Driver) Performance, Short to ground

Code	DTC	Type	Error text
0xB119	B3119	0x05	Keyless Entry Antenna 1 (Driver) Performance, Short to battery or open
0xB120	B3120	0x02	Keyless Entry Antenna 2 (Co-Driver) Performance, Short to ground
0xB120	B3120	0x05	Keyless Entry Antenna 2 (Co-Driver) Performance, Short to battery or open
0xB121	B3121	0x02	Keyless Entry Antenna 3 (Bumper) Performance, Short to ground
0xB121	B3121	0x05	Keyless Entry Antenna 3 (Bumper) Performance, Short to battery or open
0xB122	B3122	0x02	Keyless Entry Antenna 4 (Interior 1)Performance, Short to ground
0xB122	B3122	0x05	Keyless Entry Antenna 4 (Interior 1) Performance, Short to battery or open
0xB123	B3123	0x02	Keyless Entry Antenna 5 (Interior 2) Performance, Short to ground
0xB123	B3123	0x05	Keyless Entry Antenna 5 (Interior 2) Performance, Short to battery or open
0xB124	B3124	0x02	Keyless Entry Antenna 6 (Trunk) Performance, Short to ground
0xB124	B3124	0x05	Keyless Entry Antenna 6 (Trunk) Performance, Short to battery or open
0xB155	B3155	0x00	Right Front Exterior Lock Sensor, Circuit Failure
0xB625	B3625	0x02	Keyless Entry Antenna 7 Performance , Short to ground
0xB625	B3625	0x05	Keyless Entry Antenna 7 Performance , Short to battery or open
0xB849	B3849	0x02	Left Front Exterior Door Handle Switch Circuit, Short to ground
0xC020	U0020	0x00	Low Speed CAN Communication Bus Performance
0xC073	U0073	0x00	Control Module Communication Bus 'A' Off
0xC140	U0140	0x00	Lost Communication With BCM
0xC155	U0155	0x00	Lost Communication With IPC

Radio UpLevel + Radio High Nav

DTC hex	DTC# SAE	FTB hex	DTC Description
C073	U0073	00	(Low Speed) Control Module Communication Bus A Off
C020	U0020	00	Low Speed CAN Comm. Bus Performance
C140	U0140	00	LCW Body Control Module
C151	U0151	00	LCW Restraints Control Module
C155	U0155	00	LCW Instrument Panel Cluster (IPC) Control Module
C164	U0164	00	LCW HVAC Control Module
C170	U0170	00	LCW Restraints System Sensor A (AOS)
C208	U0208	00	LCW Seat Control Module "A"
C184	U0184	00	LCW Radio
C186	U0186	00	LCW Audio Amplifier A
C191	U0191	00	LCW Television
C193	U0193	00	LCW Digital Audio Control Module A (DAB)
C196	U0196	00	LCW Entertainment Control Module (RSA)
C198	U0198	00	LCW Telematic Control Module (ONS/UHP)
C257	U0257	00	LCW Front Controls/Display Interface Module (ICS)
C264	U0264	00	LCW Camera Module
C168	U0168	00	LCW Easy Key 2 Module (EK2)
C160	U0160	00	LCW Audible Alert Control Module (CHM)
C249	U0249	00	LCW Entertainment Control Module - Rear "B" (RSA)
C159	U0159	00	LCW Parking Assist Control Module "A" (UPA)
C168	U0168	00	LCW Vehicle Security Control Module (VTD)
C255	U0255	00	LCW Front Display Interface Module
C256	U0256	00	LCW Front Controls Interface Module
D901	U1901	00	LCW Front Controls Interface Module "B"
C073	U0074	00	(Mid-Speed) Control Module Communication Bus B Off
C237	U0237	00	LCW Digital Audio Control Module – "C" (PDIM)
		00	Reserved
		00	Reserved
		00	Reserved
		00	Reserved
		00	Reserved
		00	Reserved
901D	B101D	31	ECU Hardware Performance general checksum failure
910D	B101D	39	ECU Hardware Performance internal electronic failure
901D	B101D	3C	ECU Hardware Performance Internal Communications Failure
901D	B101D	36	ECU Hardware Performance EEPROM failure
901E	B101E	41	ECU Software Performance Operational Software/calibration set not programmed
901E	B101E	42	ECU Software Performance calibration data set not pgm'd
901E	B101E	46	ECU Software Performance vehicle configuration not pgmd
901E	B101E	47	ECU Software Performance VIN not programmed
9020	B1020	00	(Display/Faceplate) Auxiliary ECU 1 Performance

DTC hex	DTC# SAE	FTB hex	DTC Description
8997	B0997	00	(NAV Display) Auxiliary ECU 2 Performance
9449	B1449	01	Remote Device Voltage (IR Transmit) Short to Battery
9449	B1449	02	Remote Device Voltage (IR Transmit) Short to Ground
9265	B1265	01	Switched 14 Volt Performance Short to Battery
9265	B1265	02	Switched 14 Volt Performance Short to Ground
9325	B1325	03	Device Power Voltage Below Threshold
9325	B1325	07	Device Power Voltage Above Threshold
9025	B1025	01	Audio Output #1 (LF) Short to Battery
9025	B1025	02	Audio Output #1 (LF) Short to Ground
9025	B1025	04	Audio Output #1 (LF) Open Circuit
9035	B1035	01	Audio Output #2 (RF) Short to Battery
9035	B1035	02	Audio Output #2 (RF) Short to Ground
9035	B1035	04	Audio Output #2 (RF) Open Circuit
9045	B1045	01	Audio Output #3 (LR) Short to Battery
9045	B1045	02	Audio Output #3 (LR) Short to Ground
9045	B1045	04	Audio Output #3 (LR) Open Circuit
9055	B1055	01	Audio Output #4 (RR) Short to Battery
9055	B1055	02	Audio Output #4 (RR) Short to Ground
9055	B1055	04	Audio Output #4 (RR) Open Circuit
9065	B1065	01	Audio Output #5 (Center) Short to Battery
9065	B1065	02	Audio Output #5 (Center) Short to Ground
9065	B1065	04	Audio Output #5 (Center) Open Circuit
9075	B1075	01	Audio Output #6 (Subwoofer) Short to Battery
9075	B1075	02	Audio Output #6 (Subwoofer) Short to Ground
9075	B1075	04	Audio Output #6 (Subwoofer) Open Circuit
9287	B1287	01	External Amp Control Short to Battery
9287	B1287	02	External Amp Control Short to Ground
9287	B1287	04	External Amp Control Open Circuit
928D	B128D	62	Video Display Position Signal Actuator Stuck Open
928D	B128D	63	Pop Up Display Position Sense Video Display Position Signal Actuator Stuck Closed
928D	B128D	04	Pop Up Display Position Sense Video Display Position Signal Open Circuit
9288	B1288	01	Video Display Mode 1 (Video Mode) Circuit Short to Battery
9288	B1288	02	Video Display Mode 1 (Video Mode) Circuit Short to Ground
9288	B1288	04	Video Display Mode 1 (Video Mode) Circuit Open Circuit
9289	B1289	01	Video Display Mode 2 (Bright) Circuit Short to Battery
9289	B1289	02	Video Display Mode 2 (Bright) Circuit Short to Ground
9289	B1289	04	Video Display Mode 2 (Bright) Circuit Open Circuit
928E	B128E	01	Pop Up Display Video Display Position Control Signal Short to Battery
928E	B128E	02	Pop Up Display Video Display Position Control Signal Short to Ground
9278	B1278	01	Auxiliary Input 1 (LT channel) Signal Circuit Short to Battery
9278	B1278	02	Auxiliary Input 1 (LT channel) Signal Circuit Short to Ground

DTC hex	DTC# SAE	FTB hex	DTC Description
9279	B1279	01	Auxiliary Input 2 (RT channel) Signal Circuit Short to Battery
9279	B1279	02	Auxiliary Input 2 (RT channel) Signal Circuit Short to Ground
927A	B127A	02	Auxiliary Input Video Signal Circuit Short to Ground
927A	B127A	04	Auxiliary Input Video Signal Circuit Open
8000	B0000	00	Vehicle Speed Information Circuit
8000	B0000	5A	Vehicle Speed Information Circuit Plausibility Failure
A455	B2455	01	(Cellular Phone) Microphone Circuit Short to Battery
A455	B2455	02	(Cellular Phone) Microphone Circuit Short to Ground
A455	B2455	04	(Cellular Phone) Microphone Circuit Open Circuit
9271	B1271	00	Theft Locked
A462	B2462	01	Global Positioning System (GPS) Signal Short to Battery
A462	B2462	02	Global Positioning System (GPS) Signal Short to Ground
A462	B2462	04	Global Positioning System (GPS) Signal Open Circuit
		00	Reserved
9259	B1259	02	Antenna Ground Circuit Short to Ground
9259	B1259	05	Antenna Ground Circuit Short to Battery or Open
925A	B125A	01	Antenna 1 Circuit Short to Battery
925A	B125A	02	Antenna 1 Circuit Short to Ground
925A	B125A	0B	Antenna 1 Circuit Current Above Threshold
925A	B125A	04	Antenna 1 Circuit Open Circuit
		00	Reserved
		00	Reserved
925C	B125C	01	Satellite Antenna 1 Circuit Short to Battery
925C	B125C	02	Satellite Antenna 1 Circuit Short to Ground
925C	B125C	04	Satellite Antenna 1 Circuit Open Circuit
925C	B125C	05	Satellite Antenna 1 Circuit Short to Battery or Open
925D	B125D	01	Satellite Antenna 2 Circuit Short to Battery
925D	B125D	02	Satellite Antenna 2 Circuit Short to Ground
925D	B125D	04	Satellite Antenna 2 Circuit Open Circuit
A625	B2625	01	Display Dimming (PWM) Output Circuit Short To Battery
A625	B2625	02	Display Dimming (PWM) Output Circuit Short To Ground
A625	B2625	04	Display Dimming (PWM) Output Circuit Open
928B	B128B	01	Video Display 1 ~~Video Out~~ Output Signal Short to Battery
928B	B128B	02	Video Display 1 ~~Video Out~~ Output Signal Short to Ground
928C	B128C	01	Video Display 2 ~~Video Out~~ Output Signal Short to Battery
928C	B128C	02	Video Display 2 ~~Video Out~~ Output Signal Short to Ground
928A	B128A	01	~~Audio Prompts Out~~ Mono Audio Signal Circuit Short to Battery
928A	B128A	02	~~Audio Prompts Out~~ Mono Audio Signal Circuit Short to Ground

RDCM

Code	DTC	Type	Error text
0x4393	C0393	0x0B	Rear Axle Coupling Solenoid Control Circuit - Current above threshold
0x439F	C039F	0x00	AWD Torque Transfer Device
0x4402	C0402	0x02	Torque Transfer Device Valve Solenoid/Motor/Actuator short-circuit
0x4402	C0402	0x04	Torque Transfer Device Valve Solenoid/Motor/Actuator broken or missing
0x4402	C0402	0x42	Torque Transfer Device Valve Solenoid/Motor/Calibration data set not programmed
0x4402	C0402	0x43	Torque Transfer Device Valve Solenoid/Motor/Actuator calibration EEPROM error
0x4402	C0402	0x4B	Torque Transfer Device Valve Solenoid/Motor/Actuator calibration not learned
0x4402	C0402	0x61	Torque Transfer Device Valve Solenoid/Motor/Actuator valve stuck
0x4403	C0403	0x62	AWD/Differential Oil Filter Reverse Valve. Actuator stuck open
0x4406	C0406	0x0B	Torque Transfer Device Solenoid Control Circuit. Current above threshold
0x4407	C0407	0x02	AWD/Differential Oil Pump Motor. Short circuit
0x4407	C0407	0x04	AWD/Differential Oil Pump Motor. Open circuit
0x4407	C0407	0x0B	AWD/Differential Oil Pump Motor. Pump current too high
0x4407	C0407	0x64	AWD/Differential Oil Pump Motor. Pump motor deviation
0x4408	C0408	0x02	Rear Axle Coupling Valve Solenoid/Motor/Actuator, short-circuit
0x4408	C0408	0x04	Rear Axle Coupling Valve Solenoid/Motor/Actuator, broken or missing
0x4408	C0408	0x42	Rear Axle Coupling Valve Solenoid/Motor/Calibration data set not programmed
0x4408	C0408	0x43	Rear Axle Coupling Valve Solenoid/Motor/EEPROM error
0x4408	C0408	0x4B	Rear Axle Coupling Valve Solenoid/Motor/Calibration not learned
0x4408	C0408	0x61	Rear Axle Coupling Valve Solenoid/Motor/Actuator, stuck
0x456D	C056D	0x0F	ECU Hardware Performance. Erratic (faulty ADC)
0x456D	C056D	0x3A	ECU Hardware Performance
0x456D	C056D	0x43	ECU Hardware Performance, EEPROM error
0x456E	C056E	0x42	ECU Software Performance, calibration data set not programmed
0x456E	C056E	0x46	ECU Software Performance, vehicle configuration not programmed
0x4574	C0574	0x02	Circuit Board Temperature Sensor.Temperature Sensor Broken. Short to ground
0x4574	C0574	0x04	Circuit Board Temperature Sensor. Temperature Sensor Broken. Open circuit
0x4574	C0574	0x13	Circuit Board Temperature Sensor. ECU temperature above threshold. Incorrect Temperature
0x4574	C0574	0x14	Circuit Board Temperature Sensor. ECU temperature below threshold
0x4800	C0800	0x03	Device Power, under voltage
0x4800	C0800	0x07	Device Power, over voltage

Code	DTC	Type	Error text
0xC073	U0073	0x00	Control Module Communication Bus 'A' Off
0xC074	U0074	0x00	Control Module Communication Bus 'B' Off
0xC100	U0100	0x00	Lost communication with ECM
0xC100	U0100	0x71	Invalid serial data received from ECM
0xC101	U0101	0x00	Lost communication with TCM
0xC101	U0101	0x71	Invalid serial data received from TCM
0xC121	U0121	0x00	Lost communication with EBCM
0xC121	U0121	0x71	Invalid serial data received from EBCM
0xC121	U0121	0x72	alive counter incorrect / not updated from EBCM
0xC121	U0121	0x74	value of signal protection calculation incorrect from EBCM
0xC125	U0125	0x00	Lost communication with IMU
0xC125	U0125	0x71	Invalid serial data received from IMU
0xC125	U0125	0x72	alive counter incorrect / not updated from IMU
0xC125	U0125	0x74	value of signal protection calculation incorrect from IMU
0xC126	U0126	0x00	Lost communication with SAS
0xC126	U0126	0x71	Invalid serial data received from SAS
0xC126	U0126	0x72	alive counter incorrect / not updated from SAS
0xC126	U0126	0x74	value of signal protection calculation incorrect from SAS
0xC128	U0128	0x00	Lost communication with EPB
0xC130	U0130	0x00	Lost communication with AFS
0xC130	U0130	0x71	Invalid serial data received from AFS
0xC140	U0140	0x00	Lost communication with BCM
0xC140	U0140	0x71	Invalid serial data received from BCM
0xC140	U0140	0x72	alive counter incorrect / not updated from BCM
0xC140	U0140	0x74	value of signal protection calculation incorrect from BCM

RSA / RSE

Code	DTC	Type	Error text
0x901D	B101D	0x36	ECU Hardware Performance, EEPROM failure
0x901E	B101E	0x42	ECU Software Performance Calibaration Data Set Not Programmed
0x9325	B1325	0x03	Device Power, under voltage
0x9325	B1325	0x07	Device Power, over voltage
0xC020	U0020	0x00	Low Speed CAN Communication Bus Performance
0xC073	U0073	0x00	Control Module Communication Bus 'A' Off
0xC140	U0140	0x00	Lost Communication with BCM
0xC155	U0155	0x00	Lost Communication with IPC
0xC164	U0164	0x00	Lost Communication with HVAC
0xC184	U0184	0x00	Lost Communication with Radio
0xC208	U0208	0x00	Lost Communication wtih Heated Seat Module

SADS

Code	DTC	Type	Error text
0x4000	C0000	0x71	Vehicle Speed Information, Invalid signal
0x4161	C0161	0x71	Brake Pedal Driver Applied Pressure Status, Invalid signal
0x4460	C0460	0x71	Steering Angle Information, Invalid signal
0x456D	C056D	0x34	ECU Hardware Performance, RAM failure
0x456D	C056D	0x35	ECU Hardware Performance, ROM failure
0x456D	C056D	0x36	ECU Hardware Performance, EEPROM failure
0x4575	C0575	0x02	Front Left Solenoid/Motor/Actuator Circuit, short to ground
0x4575	C0575	0x04	Front Left Solenoid/Motor/Actuator Circuit, open circuit
0x4575	C0575	0x0F	Front Left Solenoid/Motor/Actuator Circuit, erratic
0x4580	C0580	0x02	Front Right Solenoid/Motor/Actuator Circuit, short to ground
0x4580	C0580	0x04	Front Right Solenoid/Motor/Actuator Circuit, open circuit
0x4580	C0580	0x0F	Front Right Solenoid/Motor/Actuator Circuit, erratic
0x4585	C0585	0x02	Rear Left Solenoid/Motor/Actuator Circuit, short to ground
0x4585	C0585	0x04	Rear Left Solenoid/Motor/Actuator Circuit, open circuit
0x4585	C0585	0x0F	Rear Left Solenoid/Motor/Actuator Circuit, erratic
0x4590	C0590	0x02	Rear Right Solenoid/Motor/Actuator Circuit, short to ground
0x4590	C0590	0x04	Rear Right Solenoid/Motor/Actuator Circuit, open circuit
0x4590	C0590	0x0F	Rear Right Solenoid/Motor/Actuator Circuit, erratic
0x4595	C0595	0x02	Front Left Body Accelerometer Circuit, Shorted to ground
0x4595	C0595	0x05	Front Left Body Accelerometer Circuit, Shorted to battery or open
0x4595	C0595	0x0A	Front Left Body Accelerometer Circuit, rate of change below threshold
0x4600	C0600	0x02	Front Right Body Accelerometer Circuit, Shorted to ground
0x4600	C0600	0x05	Front Right Body Accelerometer Circuit, Shorted to battery or open
0x4600	C0600	0x0A	Front Right Body Accelerometer Circuit, rate of change below threshold
0x4605	C0605	0x02	Rear Body Accelerometer Circuit, Shorted to ground
0x4605	C0605	0x05	Rear Body Accelerometer Circuit, Shorted to battery or open
0x4605	C0605	0x0A	Rear Body Accelerometer Circuit, rate of change below threshold
0x4670	C0670	0x02	Front Left Wheel Accelerometer Circuit, Shorted to ground
0x4670	C0670	0x05	Front Left Wheel Accelerometer Circuit, Shorted to battery or open
0x4670	C0670	0x0A	Front Left Wheel Accelerometer Circuit, rate of change below threshold
0x4675	C0675	0x02	Front Right Wheel Accelerometer Circuit, Shorted to ground
0x4675	C0675	0x05	Front Right Wheel Accelerometer Circuit, Shorted to battery or open
0x4675	C0675	0x0A	Front Right Wheel Accelerometer Circuit, rate of change below threshold
0x4720	C0720	0x71	Engine Torque Information, Invalid signal
0x4800	C0800	0x03	Device Power, under voltage
0x4800	C0800	0x07	Device Power, over voltage
0x4870	C0870	0x03	Device Voltage Reference Output {single or 1} Circuit, Voltage below threshold
0x4870	C0870	0x07	Device Voltage Reference Output {single or 1} Circuit, Voltage

Code	DTC	Type	Error text
			above threshold
0xC073	U0073	0x00	Control Module Communication Bus 'A' Off
0xC074	U0074	0x00	Control Module Communication Bus 'B' Off
0xC100	U0100	0x00	Lost communication with ECM
0xC122	U0122	0x00	Lost communication with EBCM
0xC125	U0125	0x00	Lost communication with IMU
0xC126	U0126	0x00	Lost communication with SAS
0xC140	U0140	0x00	Lost communication with BCM

SAS

Code	DTC	Type	Error text
0x456D	C056D	0x00	ECU Hardware Performance
0x4710	C0710	0x00	Steering Position Signal, general failure
0x4800	C0800	0x03	Device Power, under voltage
0x4800	C0800	0x07	Device Power, over voltage
0xC073	U0073	0x00	Control Module Communication Bus 'A' Off
0xC121	U0121	0x00	Lost communication with EBCM

SCL

Code	DTC	Type	Error text
0x901D	B101D	0x39	ECU Hardware Performance, Internal Electronic Failure
0x901E	B101E	0x45	ECU Software Performance, variant not programmed
0x901E	B101E	0x46	ECU Software Performance, Vehicle configuration not programmed
0x901E	B101E	0x47	ECU Software Performance, VIN not programmed
0x901E	B101E	0x48	ECU Software Performance, theft/ security data not programmed
0x9023	B1023	0x00	Integral Switch Performance
0x9325	B1325	0x03	Device Power, under voltage
0x9325	B1325	0x07	Device Power, over voltage
0x944C	B144C	0x01	Inverted RUN CRANK Power Relay Circuit - Short to battery
0x944C	B144C	0x06	Inverted RUN CRANK Power Relay Circuit - Short to ground or open circuit
0xA897	B2897	0x02	Steering Column Motor Lock Circuit, Shorted to ground
0xA897	B2897	0x05	Steering Column Motor Lock Circuit, Shorted to battery or open
0xA910	B2910	0x00	Steering Column Lock Password Incorrect
0xC020	U0020	0x00	Low Speed CAN Communication Bus Performance
0xC073	U0073	0x00	Control Module Communication Bus 'A' Off
0xC140	U0140	0x00	Lost communication with BCM
0xC155	U0155	0x00	Lost communication with IPC
0xC254	U0254	0x00	Lost communication with PEPS

SDM

Code	DTC	Type	Error text
0x8012	B0012	0x01	Driver Frontal Deployment Loop Stage 1, short to battery
0x8012	B0012	0x02	Driver Frontal Deployment Loop Stage 1, short to ground
0x8012	B0012	0x04	Driver Frontal Deployment Loop Stage 1, open circuit
0x8012	B0012	0x0D	Driver Frontal Deployment Loop Stage 1, resistance above threshold
0x8012	B0012	0x0E	Driver Frontal Deployment Loop Stage 1, resistance below threshold
0x8013	B0013	0x01	Driver Frontal Deployment Loop Stage 2, short to battery
0x8013	B0013	0x02	Driver Frontal Deployment Loop Stage 2, short to ground
0x8013	B0013	0x04	Driver Frontal Deployment Loop Stage 2, open circuit
0x8013	B0013	0x0D	Driver Frontal Deployment Loop Stage 2, resistance above threshold
0x8013	B0013	0x0E	Driver Frontal Deployment Loop Stage 2, resistance below threshold
0x8014	B0014	0x01	Driver Side Deployment Loop, short to battery
0x8014	B0014	0x02	Driver Side Deployment Loop, short to ground
0x8014	B0014	0x04	Driver Side Deployment Loop, open circuit
0x8014	B0014	0x0D	Driver Side Deployment Loop, resistance above threshold
0x8014	B0014	0x0E	Driver Side Deployment Loop, resistance below threshold
0x8015	B0015	0x01	Driver Pretensioner Deployment Loop, short to battery
0x8015	B0015	0x02	Driver Pretensioner Deployment Loop, short to ground
0x8015	B0015	0x04	Driver Pretensioner Deployment Loop, open circuit
0x8015	B0015	0x0D	Driver Pretensioner Deployment Loop, resistance above threshold
0x8015	B0015	0x0E	Driver Pretensioner Deployment Loop, resistance below threshold
0x8016	B0016	0x01	Left Roof Rail Initiator 1 Deployment Loop, short to battery
0x8016	B0016	0x02	Left Roof Rail Initiator 1 Deployment Loop, short to ground
0x8016	B0016	0x04	Left Roof Rail Initiator 1 Deployment Loop, open circuit
0x8016	B0016	0x0D	Left Roof Rail Initiator 1 Deployment Loop, resistance above threshold
0x8016	B0016	0x0E	Left Roof Rail Initiator 1 Deployment Loop, resistance below threshold
0x8017	B0017	0x01	Driver Knee Deployment Loop, short to battery
0x8017	B0017	0x02	Driver Knee Deployment Loop, short to ground
0x8017	B0017	0x04	Driver Knee Deployment Loop, open circuit
0x8017	B0017	0x0D	Driver Knee Deployment Loop, resistance above threshold
0x8017	B0017	0x0E	Driver Knee Deployment Loop, resistance below threshold
0x8018	B0018	0x01	Left Roof Rail Initiator 2 Deployment Loop, short to battery
0x8018	B0018	0x02	Left Roof Rail Initiator 2 Deployment Loop, short to ground
0x8018	B0018	0x04	Left Roof Rail Initiator 2 Deployment Loop, open circuit
0x8018	B0018	0x0D	Left Roof Rail Initiator 2 Deployment Loop, resistance above threshold
0x8018	B0018	0x0E	Left Roof Rail Initiator 2 Deployment Loop, resistance below threshold
0x8019	B0019	0x01	Passenger Frontal Deployment Loop Stage 1, short to battery
0x8019	B0019	0x02	Passenger Frontal Deployment Loop Stage 1, short to ground
0x8019	B0019	0x04	Passenger Frontal Deployment Loop Stage 1, open circuit
0x8019	B0019	0x0D	Passenger Frontal Deployment Loop Stage 1, resistance above threshold

Code	DTC	Type	Error text
0x8019	B0019	0x0E	Passenger Frontal Deployment Loop Stage 1, resistance below threshold
0x801A	B001A	0x01	Driver Pretensioner Deployment Loop 2, short to battery
0x801A	B001A	0x02	Driver Pretensioner Deployment Loop 2, short to ground
0x801A	B001A	0x04	Driver Pretensioner Deployment Loop 2, open circuit
0x801A	B001A	0x0D	Driver Pretensioner Deployment Loop 2, resistance above threshold
0x801A	B001A	0x0E	Driver Pretensioner Deployment Loop 2, resistance below threshold
0x801B	B001B	0x01	Passenger Pretensioner Deployment Loop 2, short to battery
0x801B	B001B	0x02	Passenger Pretensioner Deployment Loop 2, short to ground
0x801B	B001B	0x04	Passenger Pretensioner Deployment Loop 2, open circuit
0x801B	B001B	0x0D	Passenger Pretensioner Deployment Loop 2, resistance above threshold
0x801B	B001B	0x0E	Passenger Pretensioner Deployment Loop 2, resistance below threshold
0x801C	B001C	0x01	Left Front/Driver Rollover Bar Deployment Loop, short to battery
0x801C	B001C	0x02	Left Front/Driver Rollover Bar Deployment Loop, short to ground
0x801C	B001C	0x04	Left Front/Driver Rollover Bar Deployment Loop, open circuit
0x801C	B001C	0x0D	Left Front/Driver Rollover Bar Deployment Loop, resistance above threshold
0x801C	B001C	0x0E	Left Front/Driver Rollover Bar Deployment Loop, resistance below threshold
0x801D	B001D	0x01	Right Front/Passenger Rollover Bar Deployment Loop, short to battery
0x801D	B001D	0x02	Right Front/Passenger Rollover Bar Deployment Loop, short to ground
0x801D	B001D	0x04	Right Front/Passenger Rollover Bar Deployment Loop, open circuit
0x801D	B001D	0x0D	Right Front/Passenger Rollover Bar Deployment Loop, resistance above threshold
0x801D	B001D	0x0E	Right Front/Passenger Rollover Bar Deployment Loop, resistance below threshold
0x8020	B0020	0x01	Passenger Frontal Deployment Loop Stage 2, short to battery
0x8020	B0020	0x02	Passenger Frontal Deployment Loop Stage 2, short to ground
0x8020	B0020	0x04	Passenger Frontal Deployment Loop Stage 2, open circuit
0x8020	B0020	0x0D	Passenger Frontal Deployment Loop Stage 2, resistance above threshold
0x8020	B0020	0x0E	Passenger Frontal Deployment Loop Stage 2, resistance below threshold
0x8021	B0021	0x01	Passenger Side Deployment Loop, short to battery
0x8021	B0021	0x02	Passenger Side Deployment Loop, short to ground
0x8021	B0021	0x04	Passenger Side Deployment Loop, open circuit
0x8021	B0021	0x0D	Passenger Side Deployment Loop, resistance above threshold
0x8021	B0021	0x0E	Passenger Side Deployment Loop, resistance below threshold
0x8022	B0022	0x01	Passenger Pretensioner Deployment Loop, short to battery
0x8022	B0022	0x02	Passenger Pretensioner Deployment Loop, short to ground
0x8022	B0022	0x04	Passenger Pretensioner Deployment Loop, open circuit
0x8022	B0022	0x0D	Passenger Pretensioner Deployment Loop, resistance above threshold

Code	DTC	Type	Error text
0x8022	B0022	0x0E	Passenger Pretensioner Deployment Loop, resistance below threshold
0x8023	B0023	0x01	Right Roof Rail Initiator 1 Deployment Loop, short to battery
0x8023	B0023	0x02	Right Roof Rail Initiator 1 Deployment Loop, short to ground
0x8023	B0023	0x04	Right Roof Rail Initiator 1 Deployment Loop, open circuit
0x8023	B0023	0x0D	Right Roof Rail Initiator 1 Deployment Loop, resistance above threshold
0x8023	B0023	0x0E	Right Roof Rail Initiator 1 Deployment Loop, resistance below threshold
0x8024	B0024	0x01	Passenger Knee Deployment Loop, short to battery
0x8024	B0024	0x02	Passenger Knee Deployment Loop, short to ground
0x8024	B0024	0x04	Passenger Knee Deployment Loop, open circuit
0x8024	B0024	0x0D	Passenger Knee Deployment Loop, resistance above threshold
0x8024	B0024	0x0E	Passenger Knee Deployment Loop, resistance below threshold
0x8025	B0025	0x01	Right Roof Rail Initiator 2 Deployment Loop, short to battery
0x8025	B0025	0x02	Right Roof Rail Initiator 2 Deployment Loop, short to ground
0x8025	B0025	0x04	Right Roof Rail Initiator 2 Deployment Loop, open circuit
0x8025	B0025	0x0D	Right Roof Rail Initiator 2 Deployment Loop, resistance above threshold
0x8025	B0025	0x0E	Right Roof Rail Initiator 2 Deployment Loop, resistance below threshold
0x802A	B002A	0x01	Driver Head Rest Deployment Loop, short to battery
0x802A	B002A	0x02	Driver Head Rest Deployment Loop, short to ground
0x802A	B002A	0x04	Driver Head Rest Deployment Loop, open circuit
0x802A	B002A	0x0D	Driver Head Rest Deployment Loop, resistance above threshold
0x802A	B002A	0x0E	Driver Head Rest Deployment Loop, resistance below threshold
0x802B	B002B	0x01	Passenger Head Rest Deployment Loop, short to battery
0x802B	B002B	0x02	Passenger Head Rest Deployment Loop, short to ground
0x802B	B002B	0x04	Passenger Head Rest Deployment Loop, open circuit
0x802B	B002B	0x0D	Passenger Head Rest Deployment Loop, resistance above threshold
0x802B	B002B	0x0E	Passenger Head Rest Deployment Loop, resistance below threshold
0x802C	B002C	0x01	Steering Column Deployment Loop, short to battery
0x802C	B002C	0x02	Steering Column Deployment Loop, short to ground
0x802C	B002C	0x04	Steering Column Deployment Loop, open circuit
0x802C	B002C	0x0D	Steering Column Deployment Loop, resistance above threshold
0x802C	B002C	0x0E	Steering Column Deployment Loop, resistance below threshold
0x802D	B002D	0x01	Second Row Left Headrest Deployment Loop, short to battery
0x802D	B002D	0x02	Second Row Left Headrest Deployment Loop, short to ground
0x802D	B002D	0x04	Second Row Left Headrest Deployment Loop, open circuit
0x802D	B002D	0x0D	Second Row Left Headrest Deployment Loop, resistance above threshold
0x802D	B002D	0x0E	Second Row Left Headrest Deployment Loop, resistance below threshold
0x802E	B002E	0x01	Second Row Right Headrest Deployment Loop, short to battery
0x802E	B002E	0x02	Second Row Right Headrest Deployment Loop, short to ground
0x802E	B002E	0x04	Second Row Right Headrest Deployment Loop, open circuit
0x802E	B002E	0x0D	Second Row Right Headrest Deployment Loop, resistance above

Code	DTC	Type	Error text
			threshold
0x802E	B002E	0x0E	Second Row Right Headrest Deployment Loop, resistance below threshold
0x802F	B002F	0x01	Second Row Center Headrest Deployment Loop, short to battery
0x802F	B002F	0x02	Second Row Center Headrest Deployment Loop, short to ground
0x802F	B002F	0x04	Second Row Center Headrest Deployment Loop, open circuit
0x802F	B002F	0x0D	Second Row Center Headrest Deployment Loop, resistance above threshold
0x802F	B002F	0x0E	Second Row Center Headrest Deployment Loop, resistance below threshold
0x8031	B0031	0x01	Left Rear Side Deployment Loop, short to battery
0x8031	B0031	0x02	Left Rear Side Deployment Loop, short to ground
0x8031	B0031	0x04	Left Rear Side Deployment Loop, open circuit
0x8031	B0031	0x0D	Left Rear Side Deployment Loop, resistance above threshold
0x8031	B0031	0x0E	Left Rear Side Deployment Loop, resistance below threshold
0x8032	B0032	0x01	Left Rear Pretensioner Deployment Loop, short to battery
0x8032	B0032	0x02	Left Rear Pretensioner Deployment Loop, short to ground
0x8032	B0032	0x04	Left Rear Pretensioner Deployment Loop, open circuit
0x8032	B0032	0x0D	Left Rear Pretensioner Deployment Loop, resistance above threshold
0x8032	B0032	0x0E	Left Rear Pretensioner Deployment Loop, resistance below threshold
0x8033	B0033	0x01	Third Row Left Roof Rail Deployment Loop, short to battery
0x8033	B0033	0x02	Third Row Left Roof Rail Deployment Loop, short to ground
0x8033	B0033	0x04	Third Row Left Roof Rail Deployment Loop, open circuit
0x8033	B0033	0x0D	Third Row Left Roof Rail Deployment Loop, resistance above threshold
0x8033	B0033	0x0E	Third Row Left Roof Rail Deployment Loop, resistance below threshold
0x8038	B0038	0x01	Right Rear Side Deployment Loop, short to battery
0x8038	B0038	0x02	Right Rear Side Deployment Loop, short to ground
0x8038	B0038	0x04	Right Rear Side Deployment Loop, open circuit
0x8038	B0038	0x0D	Right Rear Side Deployment Loop, resistance above threshold
0x8038	B0038	0x0E	Right Rear Side Deployment Loop, resistance below threshold
0x8039	B0039	0x01	Right Rear Pretensioner Deployment Loop, short to battery
0x8039	B0039	0x02	Right Rear Pretensioner Deployment Loop, short to ground
0x8039	B0039	0x04	Right Rear Pretensioner Deployment Loop, open circuit
0x8039	B0039	0x0D	Right Rear Pretensioner Deployment Loop, resistance above threshold
0x8039	B0039	0x0E	Right Rear Pretensioner Deployment Loop, resistance below threshold
0x8040	B0040	0x01	Third Row Right Roof Rail Deployment Loop, short to battery
0x8040	B0040	0x02	Third Row Right Roof Rail Deployment Loop, short to ground
0x8040	B0040	0x04	Third Row Right Roof Rail Deployment Loop, open circuit
0x8040	B0040	0x0D	Third Row Right Roof Rail Deployment Loop, resistance above threshold
0x8040	B0040	0x0E	Third Row Right Roof Rail Deployment Loop, resistance below threshold

Code	DTC	Type	Error text
0x8045	B0045	0x01	Center Rear Pretensioner Deployment Loop, short to battery
0x8045	B0045	0x02	Center Rear Pretensioner Deployment Loop, short to ground
0x8045	B0045	0x04	Center Rear Pretensioner Deployment Loop, open circuit
0x8045	B0045	0x0D	Center Rear Pretensioner Deployment Loop, resistance above threshold
0x8045	B0045	0x0E	Center Rear Pretensioner Deployment Loop, resistance below threshold
0x8051	B0051	0x01	Battery Cut Off Deployment Loop, short to battery
0x8051	B0051	0x02	Battery Cut Off Deployment Loop, short to ground
0x8051	B0051	0x04	Battery Cut Off Deployment Loop, open circuit
0x8051	B0051	0x0D	Battery Cut Off Deployment Loop, resistance above threshold
0x8051	B0051	0x0E	Battery Cut Off Deployment Loop, resistance below threshold
0x8052	B0052	0x00	Deployment Commanded, no additional information
0x8072	B0072	0x01	Left Front Seat Belt Sensor Circuit, short to battery
0x8072	B0072	0x02	Left Front Seat Belt Sensor Circuit, short to ground
0x8072	B0072	0x04	Left Front Seat Belt Sensor Circuit, open circuit
0x8072	B0072	0x06	Left Front Seat Belt Sensor Circuit, short to ground or open
0x8072	B0072	0x08	Left Front Seat Belt Sensor Circuit, signal invalid
0x8072	B0072	0x0B	Left Front Seat Belt Sensor Circuit, current above threshold
0x8072	B0072	0x0C	Left Front Seat Belt Sensor Circuit, current below threshold
0x8073	B0073	0x01	Right Front Seat Belt Sensor Circuit, short to battery
0x8073	B0073	0x02	Right Front Seat Belt Sensor Circuit, short to ground
0x8073	B0073	0x04	Right Front Seat Belt Sensor Circuit, open circuit
0x8073	B0073	0x06	Right Front Seat Belt Sensor Circuit, short to ground or open
0x8073	B0073	0x08	Right Front Seat Belt Sensor Circuit, signal invalid
0x8073	B0073	0x0B	Right Front Seat Belt Sensor Circuit, current above threshold
0x8073	B0073	0x0C	Right Front Seat Belt Sensor Circuit, current below threshold
0x8075	B0075	0x01	Left Rear Seat Belt Sensor Circuit, short to battery
0x8075	B0075	0x02	Left Rear Seat Belt Sensor Circuit, Short To Ground
0x8075	B0075	0x04	Left Rear Seat Belt Sensor Circuit, open circuit
0x8075	B0075	0x06	Left Rear Seat Belt Sensor Circuit, short to ground or open
0x8075	B0075	0x08	Left Rear Seat Belt Sensor Circuit, signal invalid
0x8075	B0075	0x0B	Left Rear Seat Belt Sensor Circuit, current above threshold
0x8076	B0076	0x01	Right Rear Seat Belt Sensor Circuit, short to battery
0x8076	B0076	0x02	Right Rear Seat Belt Sensor Circuit, short to ground
0x8076	B0076	0x04	Right Rear Seat Belt Sensor Circuit, open circuit
0x8076	B0076	0x06	Right Rear Seat Belt Sensor Circuit, short to ground or open
0x8076	B0076	0x08	Right Rear Seat Belt Sensor Circuit, signal invalid
0x8076	B0076	0x0B	Right Rear Seat Belt Sensor Circuit, current above threshold
0x8077	B0077	0x01	Center Rear Seat Belt Sensor Circuit, short to battery
0x8077	B0077	0x02	Center Rear Seat Belt Sensor Circuit, short to ground
0x8077	B0077	0x04	Center Rear Seat Belt Sensor Circuit, open circuit
0x8077	B0077	0x06	Center Rear Seat Belt Sensor Circuit, short to ground or open
0x8077	B0077	0x08	Center Rear Seat Belt Sensor Circuit, signal invalid
0x8077	B0077	0x0B	Center Rear Seat Belt Sensor Circuit, current above threshold
0x8079	B0079	0x01	Driver Seat Position Sensor Circuit, short to battery

Code	DTC	Type	Error text
0x8079	B0079	0x02	Driver Seat Position Sensor Circuit, short to ground
0x8079	B0079	0x04	Driver Seat Position Sensor Circuit, open circuit
0x8079	B0079	0x06	Driver Seat Position Sensor Circuit, short to ground or open
0x8079	B0079	0x08	Driver Seat Position Sensor Circuit, signal invalid
0x8079	B0079	0x0C	Driver Seat Position Sensor Circuit, current below threshold
0x8080	B0080	0x01	Passenger Seat Position Sensor Circuit, short to battery
0x8080	B0080	0x02	Passenger Seat Position Sensor Circuit, short to ground
0x8080	B0080	0x04	Passenger Seat Position Sensor Circuit, open circuit
0x8080	B0080	0x06	Passenger Seat Position Sensor Circuit, short to ground or open
0x8080	B0080	0x08	Passenger Seat Position Sensor Circuit, signal invalid
0x8080	B0080	0x0C	Passenger Seat Position Sensor Circuit, current below threshold
0x8081	B0081	0x00	Passenger Presence System, no additional information
0x8081	B0081	0x3A	Passenger Presence System, incorrect component installed
0x8081	B0081	0x71	Passenger Presence System, invalid serial data received
0x8082	B0082	0x01	Passenger Presence System 2, short to battery
0x8082	B0082	0x02	Passenger Presence System 2, short to ground
0x8082	B0082	0x04	Passenger Presence System 2, open circuit
0x8083	B0083	0x01	Front End Sensor 1, short to battery
0x8083	B0083	0x02	Front End Sensor 1, short to ground
0x8083	B0083	0x04	Front End Sensor 1, open circuit
0x8083	B0083	0x39	Front End Sensor 1, internal electronic failure
0x8083	B0083	0x3A	Front End Sensor 1, incorrect component installed
0x8083	B0083	0x71	Front End Sensor 1, invalid serial data received
0x8084	B0084	0x01	Front End Sensor 2, short to battery
0x8084	B0084	0x02	Front End Sensor 2, short to ground
0x8084	B0084	0x04	Front End Sensor 2, open circuit
0x8084	B0084	0x39	Front End Sensor 2, internal electronic failure
0x8084	B0084	0x3A	Front End Sensor 2, incorrect component installed
0x8084	B0084	0x71	Front End Sensor 2, invalid serial data received
0x8085	B0085	0x01	Left Front Side Impact Sensor (SIS), short to battery
0x8085	B0085	0x02	Left Front Side Impact Sensor (SIS), short to ground
0x8085	B0085	0x04	Left Front Side Impact Sensor (SIS), open circuit
0x8085	B0085	0x39	Left Front Side Impact Sensor (SIS), internal electronic failure
0x8085	B0085	0x3A	Left Front Side Impact Sensor (SIS), incorrect component installed
0x8085	B0085	0x71	Left Front Side Impact Sensor (SIS), invalid serial data received
0x8086	B0086	0x01	Right Front Side Impact Sensor (SIS), short to battery
0x8086	B0086	0x02	Right Front Side Impact Sensor (SIS), short to ground
0x8086	B0086	0x04	Right Front Side Impact Sensor (SIS), open circuit
0x8086	B0086	0x39	Right Front Side Impact Sensor (SIS), internal electronic failure
0x8086	B0086	0x3A	Right Front Side Impact Sensor (SIS), incorrect component installed
0x8086	B0086	0x71	Right Front Side Impact Sensor (SIS), invalid serial data received
0x8087	B0087	0x01	Left Rear Side Impact Sensor (SIS), short to battery
0x8087	B0087	0x02	Left Rear Side Impact Sensor (SIS), short to ground
0x8087	B0087	0x04	Left Rear Side Impact Sensor (SIS), open circuit
0x8087	B0087	0x39	Left Rear Side Impact Sensor (SIS), internal electronic failure
0x8087	B0087	0x3A	Left Rear Side Impact Sensor (SIS), incorrect component installed

Code	DTC	Type	Error text
0x8087	B0087	0x71	Left Rear Side Impact Sensor (SIS), invalid serial data received
0x8088	B0088	0x01	Right Rear Side Impact Sensor (SIS), short to battery
0x8088	B0088	0x02	Right Rear Side Impact Sensor (SIS), short to ground
0x8088	B0088	0x04	Right Rear Side Impact Sensor (SIS), open circuit
0x8088	B0088	0x39	Right Rear Side Impact Sensor (SIS), internal electronic failure
0x8088	B0088	0x3A	Right Rear Side Impact Sensor (SIS), incorrect component installed
0x8088	B0088	0x71	Right Rear Side Impact Sensor (SIS), invalid serial data received
0x808C	B008C	0x01	High Voltage Battery Cut Off Deployment Loop, short to battery
0x808C	B008C	0x02	High Voltage Battery Cut Off Deployment Loop, short to ground
0x808C	B008C	0x04	High Voltage Battery Cut Off Deployment Loop, open circuit
0x808C	B008C	0x0D	High Voltage Battery Cut Off Deployment Loop, resistance above treshold
0x808C	B008C	0x0E	High Voltage Battery Cut Off Deployment Loop, resistance below treshold
0x8091	B0091	0x01	Front End Sensor 3, short to battery
0x8091	B0091	0x02	Front End Sensor 3, short to ground
0x8091	B0091	0x04	Front End Sensor 3, open circuit
0x8091	B0091	0x39	Front End Sensor 3, internal electronic failure
0x8091	B0091	0x3A	Front End Sensor 3, incorrect component installed
0x8091	B0091	0x71	Front End Sensor 3, invalid serial data received
0x8092	B0092	0x01	Third Row Left Side Impact Sensor (SIS), short to battery
0x8092	B0092	0x02	Third Row Left Side Impact Sensor (SIS), short to ground
0x8092	B0092	0x04	Third Row Left Side Impact Sensor (SIS), open circuit
0x8092	B0092	0x39	Third Row Left Side Impact Sensor (SIS), internal electronic failure
0x8092	B0092	0x3A	Third Row Left Side Impact Sensor (SIS), incorrect component installed
0x8092	B0092	0x71	Third Row Left Side Impact Sensor (SIS), invalid serial data received
0x8093	B0093	0x01	Third Row Right Side Impact Sensor (SIS), short to battery
0x8093	B0093	0x02	Third Row Right Side Impact Sensor (SIS), short to ground
0x8093	B0093	0x04	Third Row Right Side Impact Sensor (SIS), open circuit
0x8093	B0093	0x39	Third Row Right Side Impact Sensor (SIS), internal electronic failure
0x8093	B0093	0x3A	Third Row Right Side Impact Sensor (SIS), incorrect component installed
0x8093	B0093	0x71	Third Row Right Side Impact Sensor (SIS), invalid serial data received
0x8098	B0098	0x01	Active Switch Circuit, short to battery
0x8098	B0098	0x02	Active Switch Circuit, short to ground
0x8098	B0098	0x04	Active Switch Circuit, open circuit
0x809E	B009E	0x01	Side Impact Safing Sensor, short to battery
0x809E	B009E	0x02	Side Impact Safing Sensor, short to ground
0x809E	B009E	0x04	Side Impact Safing Sensor, open circuit
0x809E	B009E	0x39	Side Impact Safing Sensor, internal electronic failure
0x809E	B009E	0x3A	Side Impact Safing Sensor, incorrect component installed
0x809E	B009E	0x71	Side Impact Safing Sensor, invalid serial data received
0x9001	B1001	0x00	Option Configuration Error, no additional information
0x9019	B1019	0x00	System Configuration Error, no additional information

Code	DTC	Type	Error text
0x9019	B1019	0x3A	System Configuration Error, incorrect component installed (only SDM-11)
0x901D	B101D	0x00	ECU Hardware Performance, no additional information
0x901D	B101D	0x31	ECU Hardware Performance, general checksum failure
0x901D	B101D	0x32	ECU Hardware Performance, general memory failure
0x901D	B101D	0x33	ECU Hardware Performance, special memory failure
0x901D	B101D	0x34	ECU Hardware Performance, RAM failure
0x901D	B101D	0x35	ECU Hardware Performance, ROM failure
0x901D	B101D	0x36	ECU Hardware Performance, EEPROM failure
0x901D	B101D	0x39	ECU Hardware Performance, internal electronic failure
0x901D	B101D	0x3B	ECU Hardware Performance, internal self test failed
0x901D	B101D	0x3C	ECU Hardware Performance, internal communications failure
0x901E	B101E	0x00	Body ECU Software Performance
0x901E	B101E	0x41	ECU Software Performance, operational software / calibration set not programmed
0x901E	B101E	0x42	ECU Software Performance, calibration data set not programmed
0x901E	B101E	0x43	ECU Software Performance, EEPROM error
0x901E	B101E	0x44	ECU Software Performance, security access not activated
0x901E	B101E	0x45	ECU Software Performance, variant not programmed
0x901E	B101E	0x46	ECU Software Performance, vehicle configuration not programmed
0x901E	B101E	0x47	ECU Software Performance, VIN not programmed
0x901E	B101E	0x48	ECU Software Performance, theft / security data not programmed
0x901E	B101E	0x4A	ECU Software Performance, checksum error
0x901E	B101E	0x4B	ECU Software Performance, calibration not learned
0x901E	B101E	0x4C	ECU Software Performance, DTC memory full
0x9325	B1325	0x03	Device Power under/over voltage detected, voltage below threshold
0x9325	B1325	0x07	Device Power under/over voltage detected, voltage above threshold
0xB902	B3902	0x00	Wrong Environment Identifier Received
0xB984	B3984	0x00	Device 1 Environment Identifier Not Programmed
0xC020	U0020	0x00	Low Speed CAN communication Bus Performance, No Additional Information
0xC073	U0073	0x00	Control Module Communication Bus Off
0xC140	U0140	0x00	Lost Communication With BCM
0xC154	U0154	0x00	Lost Communication With AOS
0xC155	U0155	0x00	Lost Communication With IPC
0xC160	U0160	0x00	Lost Communication With CHM
0xC170	U0170	0x00	Lost Communication With Restraints Sensor A
0xC184	U0184	0x00	Lost Communication With RadioHead
0xC186	U0186	0x00	Lost Communication With AMP

TCM

Code	DTC	Type	Error text
0x0218	P0218	0x00	HIGH ATF TEMPERATURE WARNING
0x0562	P0562	0x00	System Voltage - Low Supply Voltage
0x0563	P0563	0x00	System Voltage - High Supply Voltage
0x0601	P0601	0x00	Internal control module ROM error
0x0602	P0602	0x00	Control Modul Programming Error
0x0603	P0603	0x00	Non volatile memory - Read/Write error
0x0604	P0604	0x00	Random access memory - Read/Write error
0x0706	P0706	0x00	Transmission Range Sensor Circuit Malfunction (PRNDL Input) - Signal stuck
0x0707	P0707	0x00	Transmission Range Sensor Circuit Malfunction (PRNDL Input) - No signal
0x0708	P0708	0x00	Transmission Range Sensor Circuit Malfunction (PRNDL Input) - Out of service
0x0711	P0711	0x00	Transmission Fluid Temperature Sensor Circuit - Stuck
0x0712	P0712	0x00	Transmission Fluid Temperature Sensor Circuit - GND short
0x0713	P0713	0x00	Transmission Fluid Temperature Sensor Circuit - B short/OPEN
0x0716	P0716		Input Speed Sensor Circuit - Wrong pulse
0x0717	P0717	0x00	Input Speed Sensor Circuit - No pulse
0x0721	P0721		Output Speed Sensor Circuit - Wrong pulse
0x0722	P0722	0x00	Output Speed Sensor Circuit - No pulse
0x0725	P0725		Engine Speed Circuit
0x0729	P0729	0x00	Incorrect Gear 6 Ratio
0x0731	P0731	0x00	Incorrect Gear 1 Ratio
0x0732	P0732	0x00	Incorrect Gear 2 Ratio
0x0733	P0733	0x00	Incorrect Gear 3 Ratio
0x0734	P0734	0x00	Incorrect Gear 4 Ratio
0x0735	P0735	0x00	Incorrect Gear 5 Ratio
0x0736	P0736	0x00	Reverse Incorrect Gear Ratio
0x0741	P0741	0x00	Lock up control - off stuck
0x0742	P0742	0x00	Lock up control - on stuck
0x0748	P0748	0x00	Pressure Control Solenoid Circuit - Feedback current stuck
0x0778	P0778	0x00	Shift/ Timing Solenoid C1 - Feedback current stuck
0x0780	P0780	0x00	Shift Malfunction
0x0798	P0798	0x00	Shift/ Timing Solenoid C2 - Feedback current stuck
0x0817	P0817	0x00	Start lock (High-side) - GND short
0x0961	P0961	0x00	Pressure Control Solenoid Circuit - Terminal short
0x0962	P0962	0x00	Pressure Control Solenoid Circuit - GND short/OPEN
0x0963	P0963	0x00	Pressure Control Solenoid Circuit - B short
0x0965	P0965	0x00	Shift/ Timing Solenoid C1 - Terminal short
0x0966	P0966	0x00	Shift/ Timing Solenoid C1 - GND short/OPEN
0x0967	P0967	0x00	Shift/ Timing Solenoid C1 - B short
0x0969	P0969	0x00	Shift/ Timing Solenoid C2 - Terminal short
0x0970	P0970	0x00	Shift/ Timing Solenoid C2 - GND short/OPEN

Code	DTC	Type	Error text
0x0971	P0971	0x00	Shift/ Timing Solenoid C2 - B short
0x0973	P0973	0x00	Shift Solenoid "A", S2 - GND short
0x0974	P0974	0x00	Shift Solenoid "A", S2 - B short/OPEN
0x0985	P0985	0x00	Shift Solenoid "E", S1 - GND short
0x0986	P0986	0x00	Shift Solenoid "E", S1 - B short/OPEN
0x1701	P1701	0x00	Neutral Condition at D, R Range
0x1702	P1702	0x00	Clutch "C1" Malfunction - Engagement
0x1703	P1703	0x00	Clutch "C1" Malfunction - No control
0x1704	P1704	0x00	Clutch "C1" Malfunction - Engine flare
0x1731	P1731	0x00	Incorrect Gear 1 Ratio with Engine Brake
0x1820	P1820		Pedal Position Sensor 1
0x1895	P1895		Engine Torque
0x2534	P2534	0x00	Ignition Voltage - Low Supply Voltage
0x2537	P2537	0x00	Accesssory Voltage - Low Supply Voltage
0x2716	P2716	0x00	Shift/ Timing Solenoid C3 - Feedback current stuck
0x2719	P2719	0x00	Shift/ Timing Solenoid C3 - Terminal short
0x2720	P2720	0x00	Shift/ Timing Solenoid C3 - GND short/OPEN
0x2721	P2721	0x00	Shift/ Timing Solenoid C3 - B short
0x2725	P2725	0x00	Shift/ Timing Solenoid B1 - Feedback current stuck
0x2728	P2728	0x00	Shift/ Timing Solenoid B1 - Terminal short
0x2729	P2729	0x00	Shift/ Timing Solenoid B1 - GND short/OPEN
0x2730	P2730	0x00	Shift/ Timing Solenoid B1 - B short
0x2759	P2759	0x00	Torque Converter Clutch Circuit - Feedback current stuck
0x2762	P2762	0x00	Torque Converter Clutch Circuit - Terminal short
0x2763	P2763	0x00	Torque Converter Clutch Circuit - B short
0x2764	P2764	0x00	Torque Converter Clutch Circuit - GND short/OPEN
0xC001	U0001	0x00	CAN Bus Reset Counter Overrun
0xC073	U0073	0x00	CAN Node error
0xC100	U0100	0x00	Lost Communication with ECM
0xC121	U0121	0x00	Lost Communication with ABS
0xC140	U0140	0x00	Lost Communication with BCM
0xE101	U2101	0x00	Subnet Configuration List not programmed

TIM

Code	DTC	Type	Error text
0x8655	B0655	0x5A	Brake light switch circuit not plausible
0x901D	B101D	0x00	ECU Hardware Performance
0x901D	B101D	0x36	ECU Hardware Performance, EEPROM failure
0x901E	B101E	0x46	ECU Software Performance, vehicle configuration not programmed
0x901E	B101E	0x47	ECU Software Performance, VIN not programmed
0x9325	B1325	0x03	Device Power, under voltage
0x9325	B1325	0x07	Device Power, over voltage
0xB881	B3881	0x02	Left Tail Lamp Circuit, Short to ground
0xB881	B3881	0x04	Left Tail Lamp Circuit, Open circuit
0xB882	B3882	0x02	Right Tail Lamp Circuit, Short to ground
0xB882	B3882	0x04	Right Tail Lamp Circuit, Open circuit
0xB885	B3885	0x02	Trailer left rear/park lamp, shorted to ground
0xB885	B3885	0x04	Trailer left rear/park lamp, open circuit
0xB886	B3886	0x02	Trailer right rear/park lamp, shorted to ground
0xB886	B3886	0x04	Trailer right rear/park lamp, open circuit
0xB887	B3887	0x02	Trailer left turn lamp, shorted to ground
0xB887	B3887	0x04	Trailer left turn lamp open circuit, open circuit
0xB888	B3888	0x02	Trailer right turn lamp, shorted to ground
0xB888	B3888	0x04	Trailer right turn lamp open circuit, open circuit
0xB889	B3889	0x02	Trailer brake lamp/CHMSL, shorted to ground
0xB889	B3889	0x04	Trailer brake lamp/CHMSL, open circuit
0xB88B	B388B	0x02	Secondary Left Tail and Brake Lamp Circuit; Short to ground
0xB88B	B388B	0x04	Secondary Left Tail and Brake Lamp Circuit; Open circuit
0xB88C	B388C	0x02	Secondary Right Tail and Brake Lamp Circuit; Short to ground
0xB88C	B388C	0x04	Secondary Right Tail and Brake Lamp Circuit; Open circuit
0xB890	B3890	0x02	Trailer backup lamp, shorted to ground
0xB890	B3890	0x04	Trailer backup lamp, open circuit
0xB891	B3891	0x02	Trailer rear fog lamps, shorted to ground
0xB891	B3891	0x04	Trailer rear fog lamps, open circuit
0xB950	B3950	0x02	Secondary Left Rear Turn Signal Circuit; Short to ground
0xB950	B3950	0x04	Secondary Left Rear Turn Signal Circuit; Open circuit
0xB951	B3951	0x02	Secondary Right Rear Turn Signal Circuit; Short to ground
0xB951	B3951	0x04	Secondary Right Rear Turn Signal Circuit; Open circuit
0xC020	U0020	0x00	Low Speed CAN Communication Bus Performance
0xC073	U0073	0x00	Control Module Communication Bus 'A' Off
0xC140	U0140	0x00	Lost communication with Body Control Module (BCM)
0xC155	U0155	0x00	Lost Communication With IPC
0xC254	U0254	0x00	Lost Communication With PEPS

TPMS

DTC#	DTC Desc	FTB	Failure Mode	
C0569	System Configuration Error	00	Tire typeor placard values not loaded	
C0775	Low Tire Pressure System Sensors Not Learned	00	No sensors learned or learning incomplete	
C0750	Left Front Low Tire Pressure Sensor	39	Internal electronic failure (sensor indicates internal sensor fault = true)	
		29	Too few pulses (no valid transmission from sensor for a period of time equal to TPM DIAGNOSTIC TIMER)	
		03	Voltage Below Threshold (sensor indicates low battery = true)	
C0755	Right Front Low Tire Pressure Sensor	39	Internal electronic failure	
		29	Too few pulses	
		03	Voltage Below Threshold	
C0760	Left Rear Low Tire Pressure Sensor	39	Internal electronic failure	
		29	Too few pulses	
		03	Voltage Below Threshold	
C0765	Right Rear Low Tire Pressure Sensor	39	Internal electronic failure	
		29	Too few pulses	
		03	Voltage Below Threshold	
C078A	Service Autolocate Module	39	Internal Electronic Failure	

UHP

Code	DTC	Type	Error text
0x901D	B101D	0x3B	Body ECU Internal Self Test Failed
0x901D	B101D	0x3C	Body ECU Internal Communication Failure
0x901E	B101E	0x41	Body ECU Operational Software / Calibration Set not programmed
0x901E	B101E	0x46	Body ECU Vehicle Configuration not Programmed
0x9325	B1325	0x03	Body System Device Power Voltage below threshold
0x9325	B1325	0x07	Body System Device Power Voltage above threshold
0x9445	B1445	0x0B	Body ECU Cradle Power Circuit Over Current
0xA455	B2455	0x01	Microphone Circuit Malfunction Short to Plus
0xA455	B2455	0x02	Microphone Circuit Malfunction Short to Ground
0xA455	B2455	0x04	Microphone Circuit Malfunction Open Circuit
0xA485	B2485	0x02	Wireless Communication (BT) Antenna Circuit Short Circuit
0xA485	B2485	0x04	Wireless Communication (BT) Antenna Circuit Open Circuit
0xC020	U0020	0x00	CAN Communication Bus Performance
0xC073	U0073	0x00	Control Module Communication Bus Off
0xC140	U0140	0x00	Lost Communication With Body Control Module
0xC155	U0155	0x00	Lost Communication With Instrument Panel Cluster
0xC184	U0184	0x00	Lost Communication With Radio Head

UPA / APA

Code	DTC	Type	Error text
0x8953	B0953	0x01	Parking Aid Rear Audio Output 1 Circuit, Short to battery
0x8953	B0953	0x02	Parking Aid Rear Audio Output 1 Circuit, Short to ground
0x8953	B0953	0x03	Parking Aid Rear Audio Output 1 Circuit, Open circuit
0x8954	B0954	0x01	Parking Aid Front Sensor 1 Circuit, Short to Battery
0x8954	B0954	0x06	Parking Aid Front Sensor 1 Circuit, Short To Ground or Open
0x8954	B0954	0x08	Parking Aid Front Sensor 1 Circuit, Signal Invalid
0x8954	B0954	0x21	Parking Aid Front Sensor 1 Circuit, Incorrect Period
0x8954	B0954	0x3A	Parking Aid Front Sensor 1 Circuit, Incorrect Component Installed
0x8955	B0955	0x01	Parking Aid Front Sensor 2 Circuit, Short to Battery
0x8955	B0955	0x06	Parking Aid Front Sensor 2 Circuit, Short To Ground or Open
0x8955	B0955	0x08	Parking Aid Front Sensor 2 Circuit, Signal Invalid
0x8955	B0955	0x21	Parking Aid Front Sensor 2 Circuit, Incorrect Period
0x8955	B0955	0x3A	Parking Aid Front Sensor 2 Circuit, Incorrect Component Installed
0x8956	B0956	0x01	Parking Aid Front Sensor 3 Circuit, Short to Battery
0x8956	B0956	0x06	Parking Aid Front Sensor 3 Circuit, Short To Ground or Open
0x8956	B0956	0x08	Parking Aid Front Sensor 3 Circuit, Signal Invalid
0x8956	B0956	0x21	Parking Aid Front Sensor 3 Circuit, Incorrect Period
0x8956	B0956	0x3A	Parking Aid Front Sensor 3 Circuit, Incorrect Component Installed
0x8957	B0957	0x01	Parking Aid Front Sensor 4 Circuit, Short to Battery
0x8957	B0957	0x06	Parking Aid Front Sensor 4 Circuit, Short To Ground or Open
0x8957	B0957	0x08	Parking Aid Front Sensor 4 Circuit, Signal Invalid
0x8957	B0957	0x21	Parking Aid Front Sensor 4 Circuit, Incorrect Period
0x8957	B0957	0x3A	Parking Aid Front Sensor 4 Circuit, Incorrect Component Installed
0x8958	B0958	0x01	Parking Aid Rear Sensor 1 Circuit, Short to Battery
0x8958	B0958	0x06	Parking Aid Rear Sensor 1 Circuit, Short To Ground or Open
0x8958	B0958	0x08	Parking Aid Rear Sensor 1 Circuit, Signal Invalid
0x8958	B0958	0x21	Parking Aid Rear Sensor 1 Circuit, Incorrect Period
0x8958	B0958	0x3A	Parking Aid Rear Sensor 1 Circuit, Incorrect Component Installed
0x8959	B0959	0x01	Parking Aid Rear Sensor 2 Circuit, Short to Battery
0x8959	B0959	0x06	Parking Aid Rear Sensor 2 Circuit, Short To Ground or Open
0x8959	B0959	0x08	Parking Aid Rear Sensor 2 Circuit, Signal Invalid
0x8959	B0959	0x21	Parking Aid Rear Sensor 2 Circuit, Incorrect Period
0x8959	B0959	0x3A	Parking Aid Rear Sensor 2 Circuit, Incorrect Component Installed
0x895A	B095A	0x01	Parking Aid Audio Output 2 Circuit, Short Battery
0x895A	B095A	0x02	Parking Aid Audio Output 2 Circuit, Short to ground
0x895A	B095A	0x03	Parking Aid Audio Output 2 Circuit, Open Circuit
0x895B	B095B	0x01	Parking Aid Front Sensor 5 Circuit, Short to Battery
0x895B	B095B	0x06	Parking Aid Front Sensor 5 Circuit, Short To Ground or Open
0x895B	B095B	0x08	Parking Aid Front Sensor 5 Circuit, Signal Invalid
0x895B	B095B	0x21	Parking Aid Front Sensor 5 Circuit, Incorrect Period
0x895B	B095B	0x3A	Parking Aid Front Sensor 5 Circuit, Incorrect Component Installed
0x895C	B095C	0x01	Parking Aid Front Sensor 6 Circuit, Short to Battery
0x895C	B095C	0x06	Parking Aid Front Sensor 6 Circuit, Short To Ground or Open
0x895C	B095C	0x08	Parking Aid Front Sensor 6 Circuit, Signal Invalid

Code	DTC	Type	Error text
0x895C	B095C	0x21	Parking Aid Front Sensor 6 Circuit, Incorrect Period
0x895C	B095C	0x3A	Parking Aid Front Sensor 6 Circuit, Incorrect Component Installed
0x895D	B095D	0x01	Parking Aid Rear Sensor 5 Circuit, Short to Battery
0x895D	B095D	0x06	Parking Aid Rear Sensor 5 Circuit, Short To Ground or Open
0x895D	B095D	0x08	Parking Aid Rear Sensor 5 Circuit, Signal Invalid
0x895D	B095D	0x21	Parking Aid Rear Sensor 5 Circuit, Incorrect Period
0x895D	B095D	0x3A	Parking Aid Rear Sensor 5 Circuit, Incorrect Component Installed
0x895E	B095E	0x01	Parking Aid Rear Sensor 6 Circuit, Short to Battery
0x895E	B095E	0x06	Parking Aid Rear Sensor 6 Circuit, Short To Ground or Open
0x895E	B095E	0x08	Parking Aid Rear Sensor 6 Circuit, Signal Invalid
0x895E	B095E	0x21	Parking Aid Rear Sensor 6 Circuit, Incorrect Period
0x895E	B095E	0x3A	Parking Aid Rear Sensor 6 Circuit, Incorrect Component Installed
0x8960	B0960	0x01	Parking Aid Rear Sensor 3 Circuit, Short to Battery
0x8960	B0960	0x06	Parking Aid Rear Sensor 3 Circuit, Short To Ground or Open
0x8960	B0960	0x08	Parking Aid Rear Sensor 3 Circuit, Signal Invalid
0x8960	B0960	0x21	Parking Aid Rear Sensor 3 Circuit, Incorrect Period
0x8960	B0960	0x3A	Parking Aid Rear Sensor 3 Circuit, Incorrect Component Installed
0x8961	B0961	0x01	Parking Aid Rear Sensor 4 Circuit, Short to Battery
0x8961	B0961	0x06	Parking Aid Rear Sensor 4 Circuit, Short To Ground or Open
0x8961	B0961	0x08	Parking Aid Rear Sensor 4 Circuit, Signal Invalid
0x8961	B0961	0x21	Parking Aid Rear Sensor 4 Circuit, Incorrect Period
0x8961	B0961	0x3A	Parking Aid Rear Sensor 4 Circuit, Incorrect Component Installed
0x8967	B0967	0x02	Parking Aid Switch 1 (on/off) Circuit, Short to Ground
0x8968	B0968	0x01	Parking Aid Swicth 1 (on/off) Indicator Circuit Short to Battery
0x8968	B0968	0x06	Parking Aid Swicth 1 (on/off) Indicator Circuit , Short To Ground or Open
0x896B	B096B	0x02	Parking Aid Switch 2 Circuit - Short to Ground
0x896C	B096C	0x01	Parking Aid Side Sensor 1 (left front) Circuit Short to Battery (Parallel parking support)
0x896C	B096C	0x06	Parking Aid Side Sensor 1 (left front) Short to Ground or Open (Parallel parking support)
0x896C	B096C	0x08	Parking Aid Side Sensor 1 (left front) Circuit Signal Invalid (Parallel parking support)
0x896C	B096C	0x21	Parking Aid Side Sensor 1 (left front) Circuit Incorrect Period (Parallel Parking Support)
0x896C	B096C	0x3A	Parking Aid Rear Sensor 1 Circuit, Incorrect Component Installed
0x896D	B096D	0x01	Parking Aid Side Sensor 2 Circuit Short to Battery (Parallel Parking Support)
0x896D	B096D	0x06	Parking Aid Side Sensor 2 Circuit Short to Battery (Parallel Parking Support)
0x896D	B096D	0x08	Parking Aid Side Sensor 2 Circuit Signal Invalid (Parallel parking support)
0x896D	B096D	0x21	Parking Aid Side Sensor 2 Circuit Incorrect Period (Parallel Parking Support)
0x896D	B096D	0x3A	Parking Aid Side Sensor 2 Circuit Incorrect Component Installed (Parallel Parking Support)
0x896E	B096E	0x02	Parking Aid Switch 2 (parallel parking) Indicator Circuit, Short to

Code	DTC	Type	Error text
			Ground
0x898A	B098A	0x01	Parking Aid Front Display Indicator 1, yellow
0x898A	B098A	0x06	Parking Aid Front Display Indicator 1, yellow
0x898B	B098B	0x01	Parking Aid Front Display Indicator 2, yellow
0x898B	B098B	0x06	Parking Aid Front Display Indicator 2, yellow
0x898C	B098C	0x01	Parking Aid Front Display Indicator 3, red
0x898C	B098C	0x06	Parking Aid Front Display Indicator 3, red
0x898D	B098D	0x01	Parking Aid Rear Display Indicator 1, yellow
0x898D	B098D	0x06	Parking Aid Rear Display Indicator 1, yellow
0x898E	B098E	0x01	Parking Aid Rear Display Indicator 2, yellow
0x898E	B098E	0x06	Parking Aid Rear Display Indicator 2, yellow
0x898F	B098F	0x01	Parking Aid Rear Display Indicator 3, red
0x898F	B098F	0x06	Parking Aid Rear Display Indicator 3, red
0x9015	B1015	0x00	VIN Information Error
0x901D	B101D	0x2C	ADC failure
0x901D	B101D	0x34	Body ECU RAM Failure
0x901D	B101D	0x35	Body ECU ROM Failure
0x901D	B101D	0x36	Body ECU EEPROM Failure
0x901D	B101D	0x43	EEPROM error
0x901E	B101E	0x42	Body ECU Calibration Data Set not programmed
0x901E	B101E	0x43	ECU Software Performance, EEPROM error* * currently not supported by Bosch
0x901E	B101E	0x46	Body ECU Vehicle Configuration not programmed, XML-configuration
0x9325	B1325	0x03	Body System Device Power Voltage below threshold
0x9325	B1325	0x07	Body System Device Power Voltage above threshold
0x938A	B138A	0x03	Device Voltage Reference Group 1 Outputs (PA Sensor Feed) Voltage Below Threshold
0x938A	B138A	0x07	Device Voltage Reference Group 1 Outputs, Voltage Above Threshold
0x9395	B1395	0x02	Device Voltage Reference Output 1 Circuit for PA Speaker/Display Feed Faulty, Voltage Below Threshold
0x9395	B1395	0x03	Device Voltage Reference Output 1 Circuit for PA Speaker/Display Feed Faulty, Voltage Below Threshold
0x9395	B1395	0x07	Device Voltage Reference Output 1 Circuit for PA Speaker/Display Feed Faulty, Voltage Above Threshold
0x9405	B1405	0x02	Device Voltage Reference Output 2 Circuit for Sensor Feed Faulty, Short to Ground
0x9405	B1405	0x03	Device Voltage Reference Output 2 Circuit for Sensor Feed Faulty, Voltage Below Threshold
0x9405	B1405	0x07	Device Voltage Reference Output 2 Circuit for Sensor Feed Faulty, Voltage Above Threshold
0xC020	U0020	0x00	Low Speed CAN Communication Bus Performance
0xC073	U0073	0x00	Control Module Communication Bus Off
0xC140	U0140	0x00	Lost Communication With Body Control Module
0xC155	U0155	0x00	Lost Communication With Instrument Panel Cluster
0xC160	U0160	0x00	Lost Communication With Chime Module

Code	DTC	Type	Error text
0xC184	U0184	0x00	Lost Communication With Radio (Silverbox)
0xC186	U0186	0x00	Lost Communication With Audio Amplifier
0xC252	U0252	0x00	Lost Communication With Trailer Interface Module

VES

Code	DTC	Type	Error text
0x4450	C0450	0x01	Actuator (Coil) Short to Battery
0x4450	C0450	0x02	Actuator (Coil) Short to Ground
0x4450	C0450	0x04	Actuator (Coil) Open
0x456D	C056D	0x00	ECU Hardware Performance
0x456E	C056E	0x41	ECU Software Performance, calibration data set not programmed
0x4800	C0800	0x03	Device Power, Under voltage
0x4800	C0800	0x07	Device Power, Over voltage
0x4800	C0800	0x11	Device Power, High voltage
0xC073	U0073	0x00	CAN Bus Off Fault
0xC121	U0121	0x00	Lost communication with EBCM
0xC121	U0121	0x71	Non Driven Wheel Ground Velocity Validity Bits
0xD8B9	U18B9	0x00	Subnet Config List Not Programmed
0xD8B9	U18B9	0x01	
0xD8B9	U18B9	0x02	
0xD8B9	U18B9	0x03	