

# SAAB - XWD

T 04 09 15



# *Description*

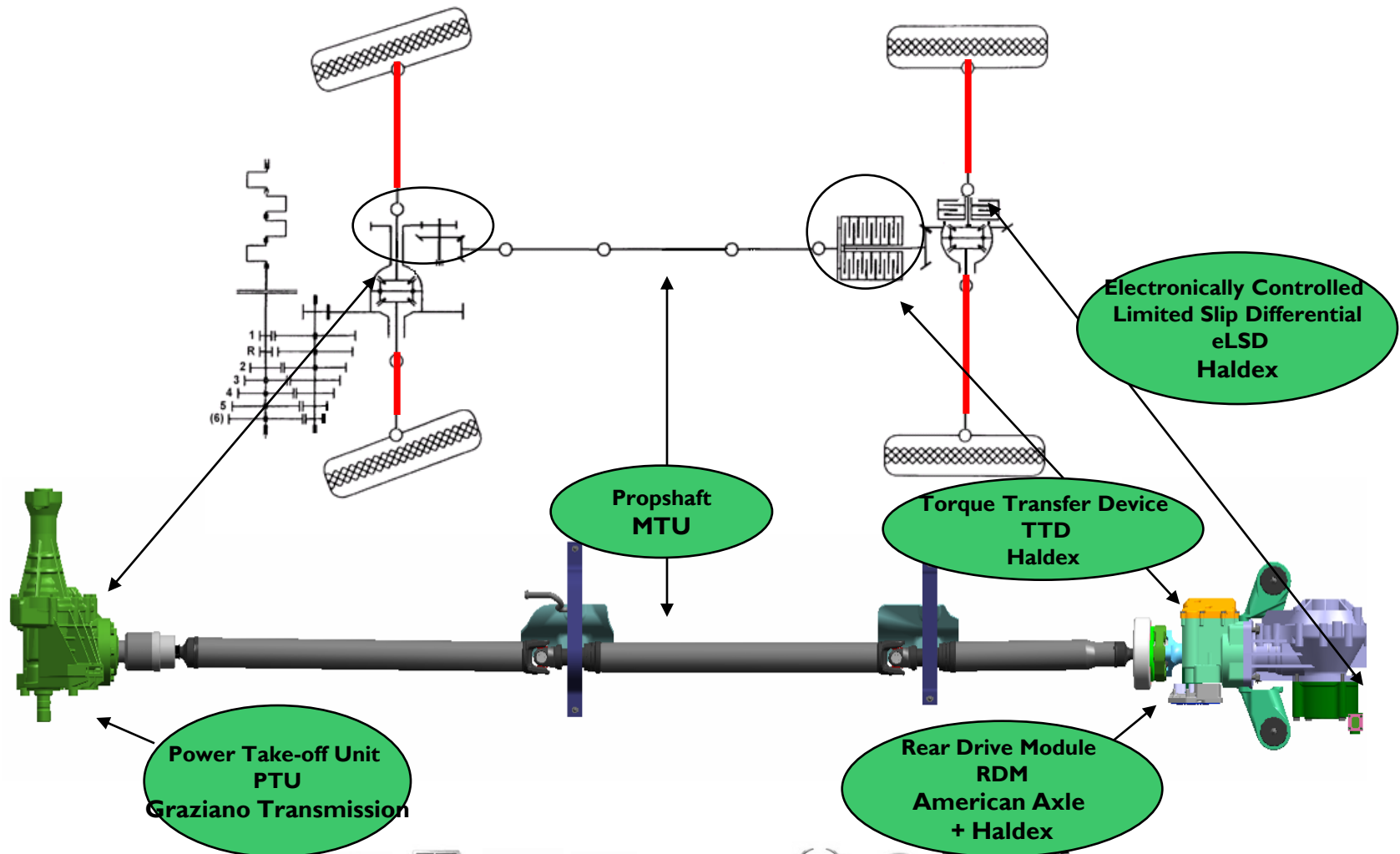
- XWD is an active system for all-wheel drive which has been developed to optimize the vehicle's responsiveness and stability in all driving conditions. It optimizes the transfer of drive torque between front and rear wheels according to the requirements of the circumstances

# *Active on Demand*

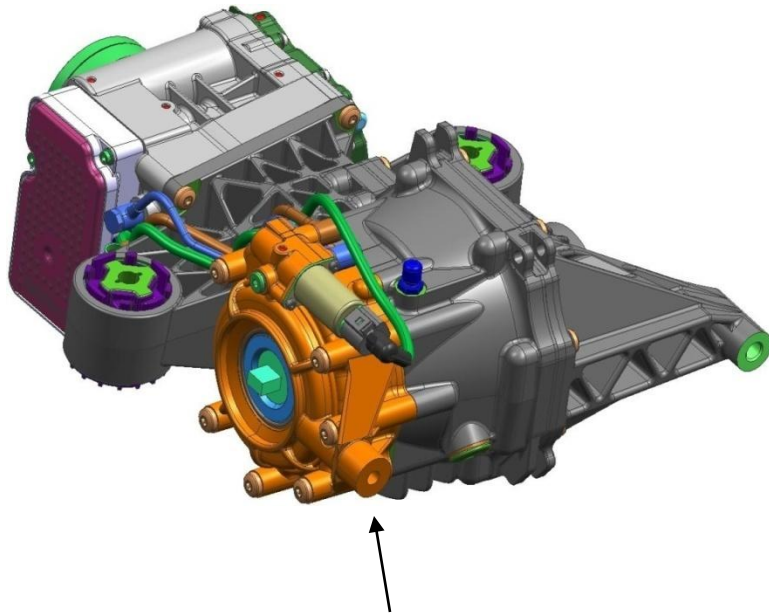
- Electronically engages the clutch before take off to avoid wheel spin and achieve maximum traction immediately.
- No front wheel slip is required before the rear wheels are engaged.
- XWD only activated when required (5-10% on rear wheel when cruising for stability). Which improves fuel efficiency.

# 9-3 XWD architecture

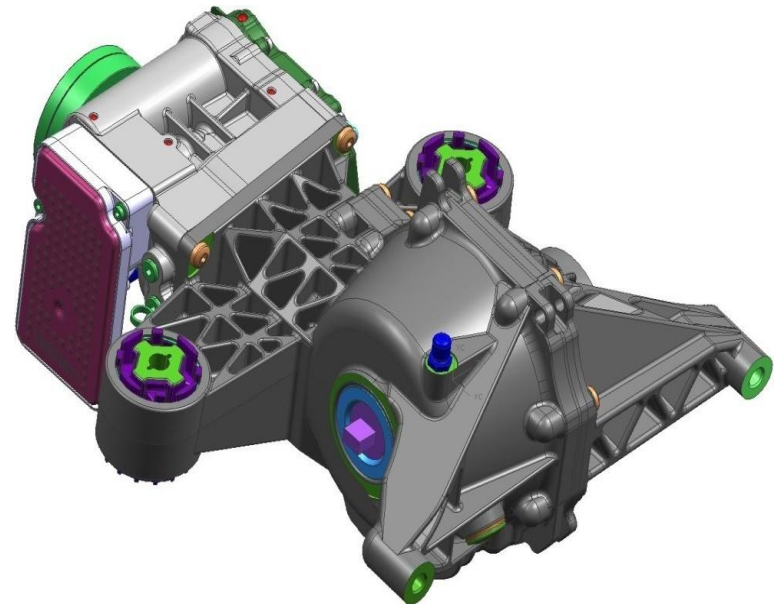
## XWD driveline layout



There are two variants: with and without limited slip differential clutch for the rear wheels.



ELS Device



Non-ELS

It is controlled by its own electronic control module which works together with the ECM, TCM and ABS/ESP control modules.





The XWD control module, abbreviated to RDCM, is connected to the vehicle's P-bus. Its bus messages are used to determine the operating/driving conditions for the vehicle.

**The software in the control module can be updated with SPS.**





# *Bus communication*

The XWD control module, uses information from these systems:

**ECM:** Requested (accelerator pedal position), current and maximum drive torque, engine speed, activated brake pedal

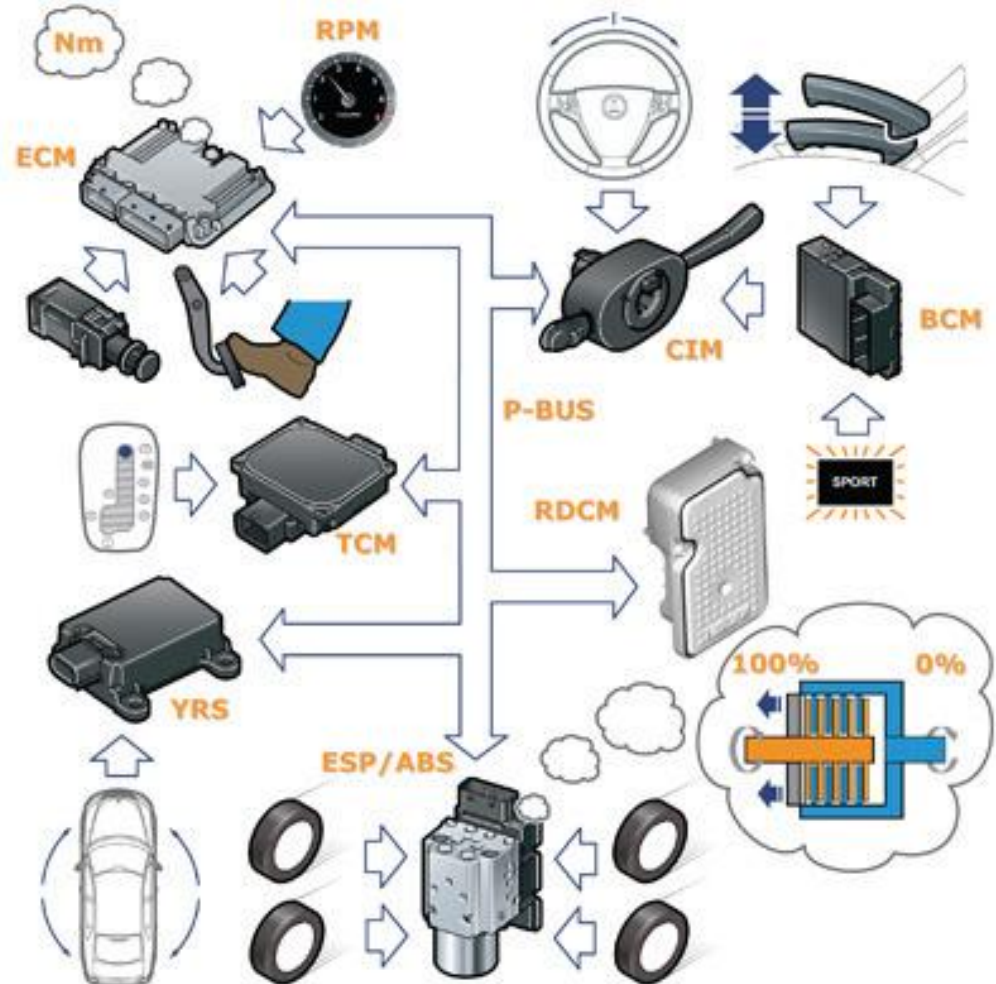
**YRS:** Yaw rate, lateral and longitudinal acceleration

**ESP:** Wheel speed of the four wheels

**CIM:** Steering wheel angle

**TCM:** Current gear

**BCM:** Handbrake activated, SPORT mode activated.

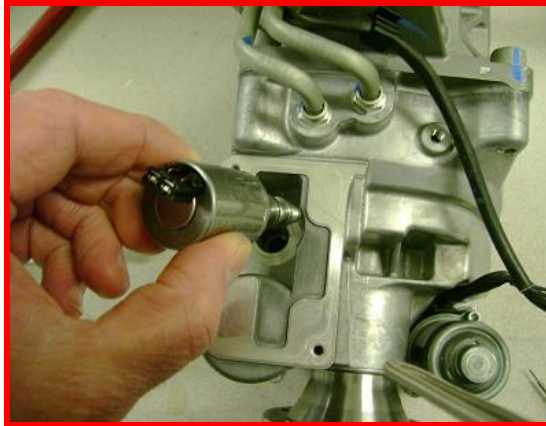


# *Main function*



- The function of the control module is to regulate the engagement of the differential clutch, and on cars with limited slip differential clutch its engagement too.
- **The control module and control valve are calibrated together, and they must be replaced together without exception.**

# Solenoid valve, differential clutch



- The pressure control valve is electrically controlled and its function is to regulate the hydraulic pressure (0-30 bar) to the operating piston. The valve is directly connected to the XWD control module which supplies it with a PWM voltage.

**The valve is precisely calibrated together with the XWD control module, they must be replaced together without exception.**

# ***Solenoid valve, limited slip differential clutch***

- To control the hydraulic pressure to the limited slip differential clutch.

- The pressure control valve is electrically controlled and its function is to regulate the limited slip differential clutch's hydraulic pressure (0-30 bar) to the operating piston. It is controlled by the XWD control module and is supplied with a PWM voltage. **This valve can be replaced separately.**



Pin no.	Signal type	Description
1	PWM	Supply voltage
2	Ground	Grounding

**ON VEHICLES WITH ELSD**

- The primary function of the differential clutch is to control the degree of drive (torque) to the rear wheels. It can be varied between 0-100% drive, which takes place by means of a hydraulically controlled multi-disc clutch. The hydraulic pressure is built up by an electrically driven pump, and is controlled by the XWD control module via a solenoid valve.





# ***PUMP OPERATION***

- The control module activates the output to the hydraulic pump as soon as the following conditions are fulfilled: "ignition ON" and "engine started". The output is active until the calculated pressure is approx. 32 bar. The pressure is calculated by means of the control module measuring electric motor power consumption. The higher the pressure, the greater the resistance there is for the electric motor to drive the pump itself, and the higher the current becomes. When the pressure in the system amounts to approx. 32 bar (fully charged accumulator) the accumulator piston exposes the unloading holes and the pressure does not increase further.

The current to the motor does not increase any further but remains constant, the control module now knows that full system pressure has been reached and shuts down the pump. Restart takes place when the calculated pressure is below approx. 27 bar.

# *Differential pump*

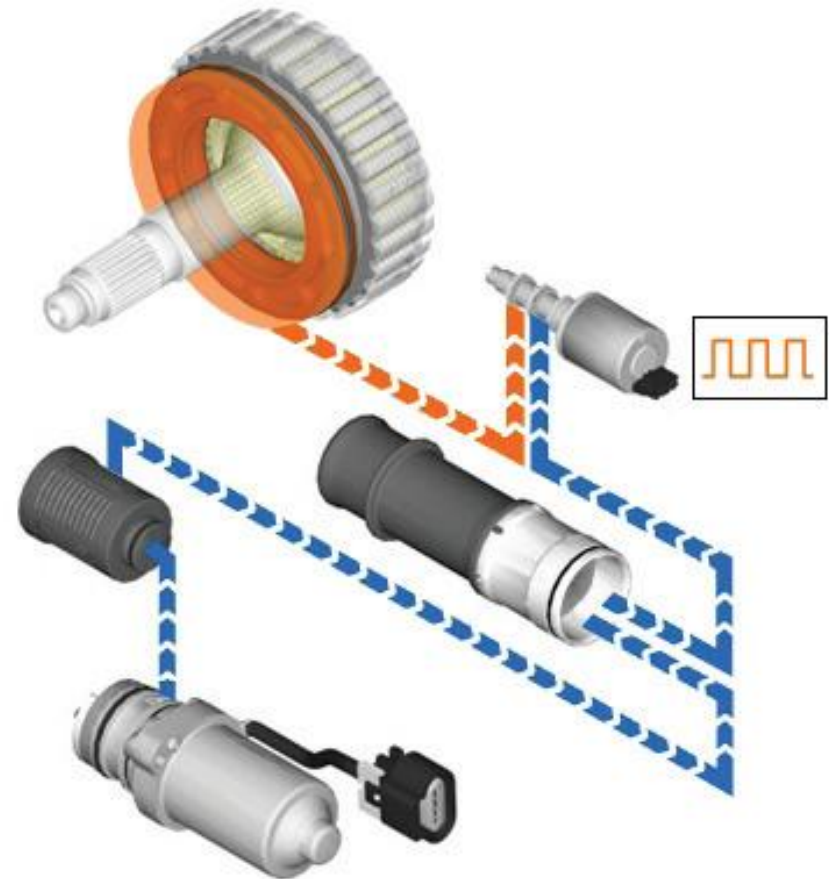
- Integrated in the differential clutch
- Electric motor of permanent magnet type.
- The motor drives a five cylinder axial piston pump in the pump housing which produces a working pressure of 27-32 bar.





# Hydraulics

- The hydraulic pump draws oil from the reservoir and pumps the pressurized oil onward to the oil filter.
- The oil is fed into the filter via an integrated check valve. The oil flows from the oil filter to the accumulator, the function of which is to store a volume of oil under pressure (27-32 bar). The oil is then fed to the pressure control valve for the differential clutch and, if so equipped, also to the pressure control valve for the limited slip differential clutch.

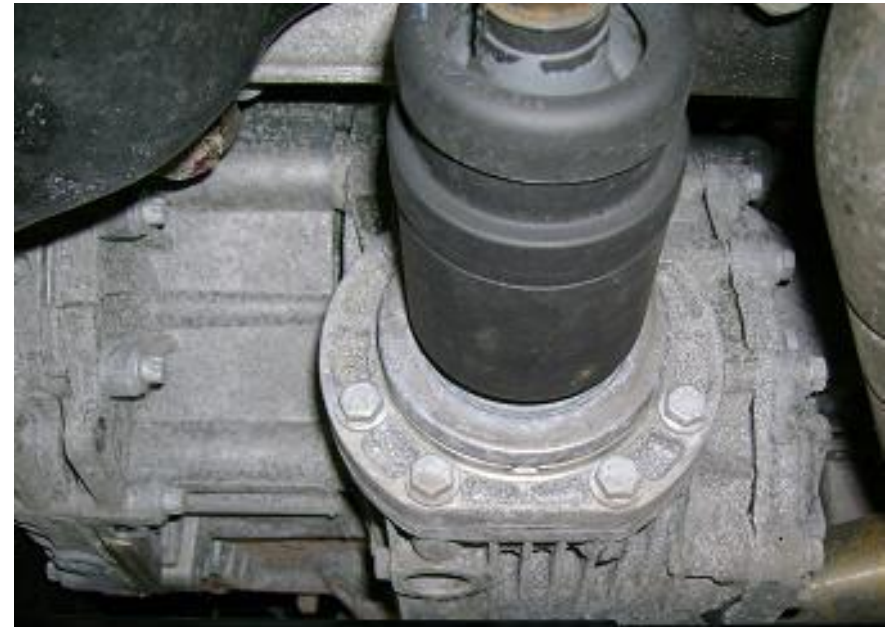


# ***Failsafe mode***

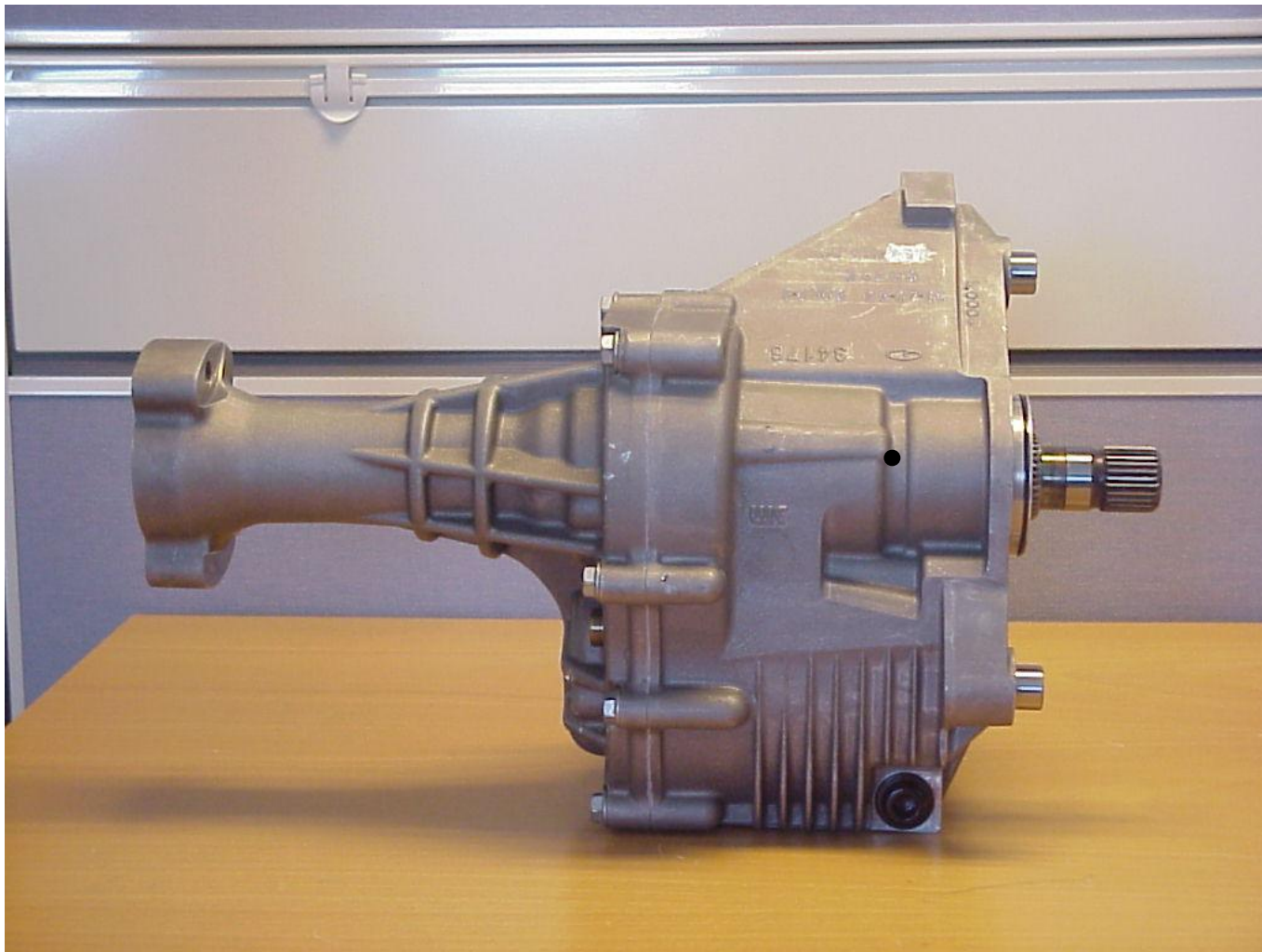
- Most diagnostic trouble codes are generated as a result of the control module switching off all-wheel drive or the limited slip differential clutch (if fitted) in order to protect the system from damage or aggravated damage. A message is shown in the SID display.

# ***PTU***

- The transfer case, also named PTU, is located to the right of the gearbox, to which it is bolted. Its primary function is to take power from the gearbox and transfer it via a hypoid gear to the differential clutch via the propeller shaft.



# ***Graziano PTU***



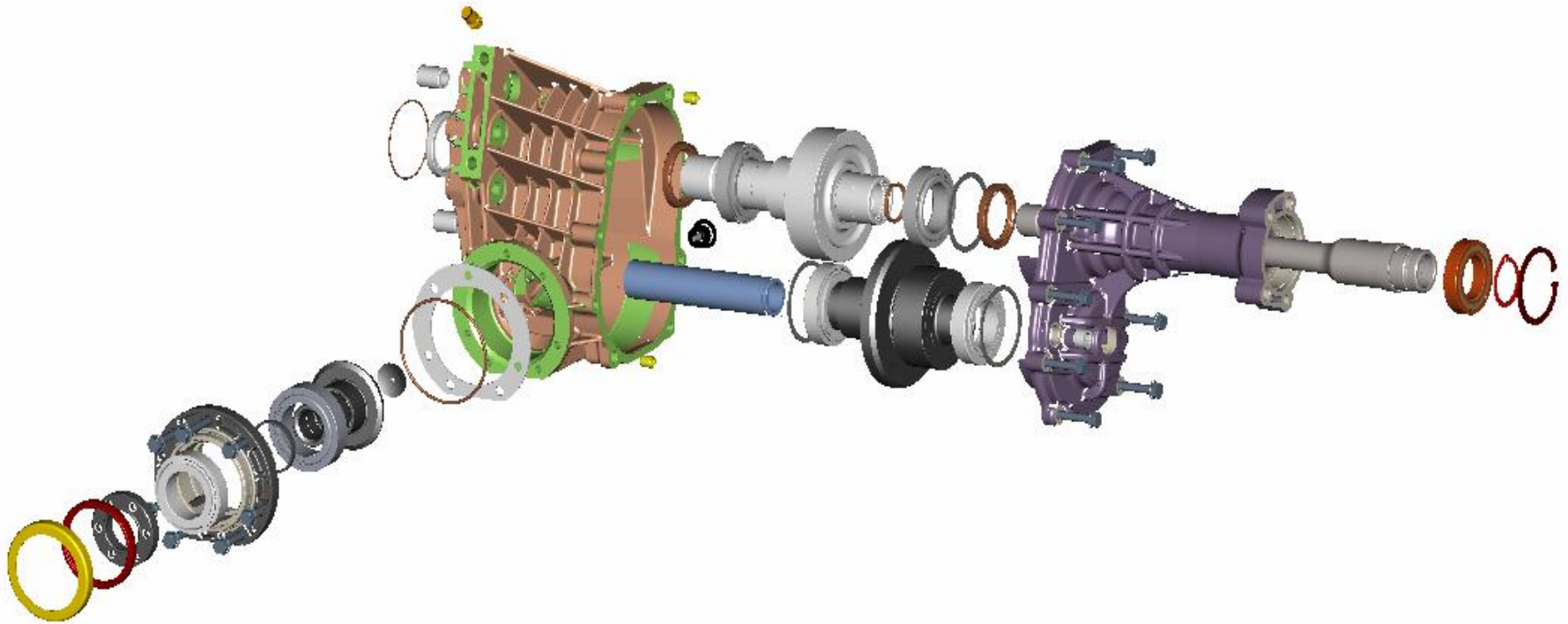
# ***PTU***

- The transfer case is fully mechanical.

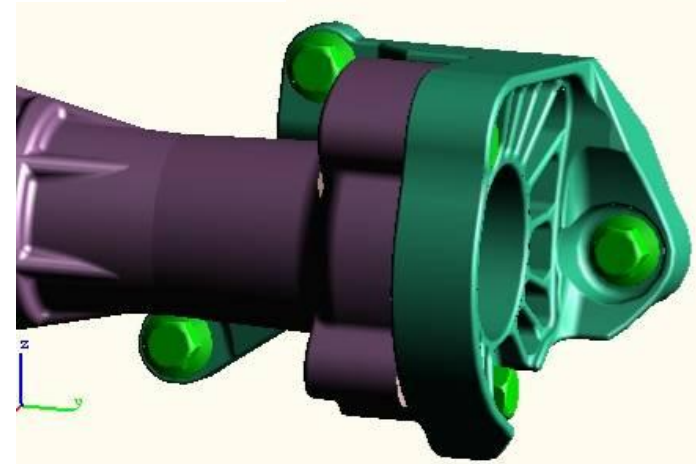
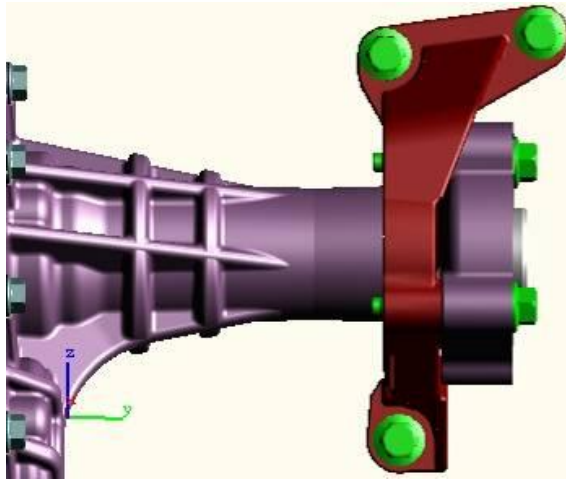
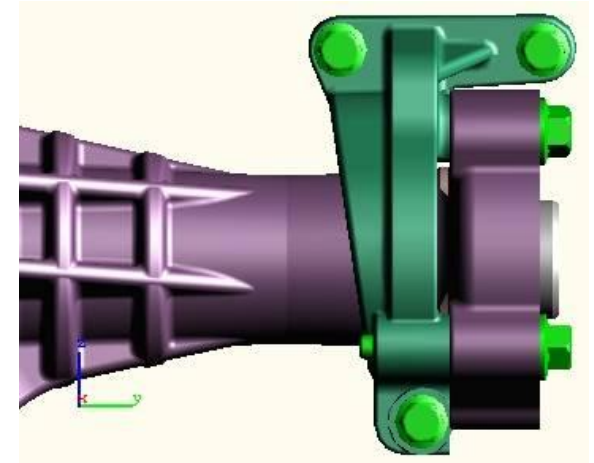
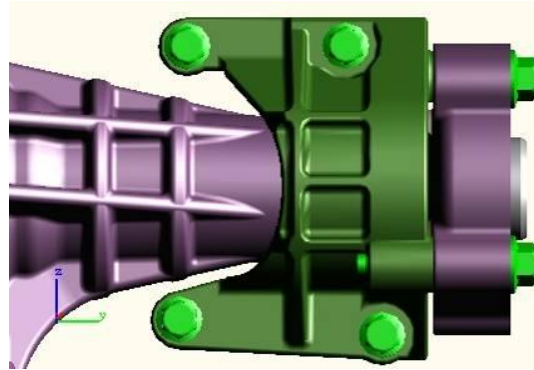
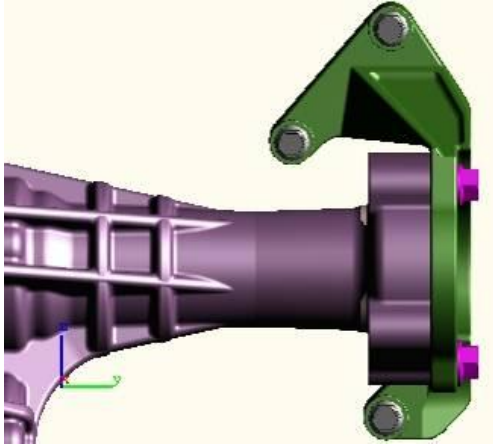




# ***PTU Exploded view***



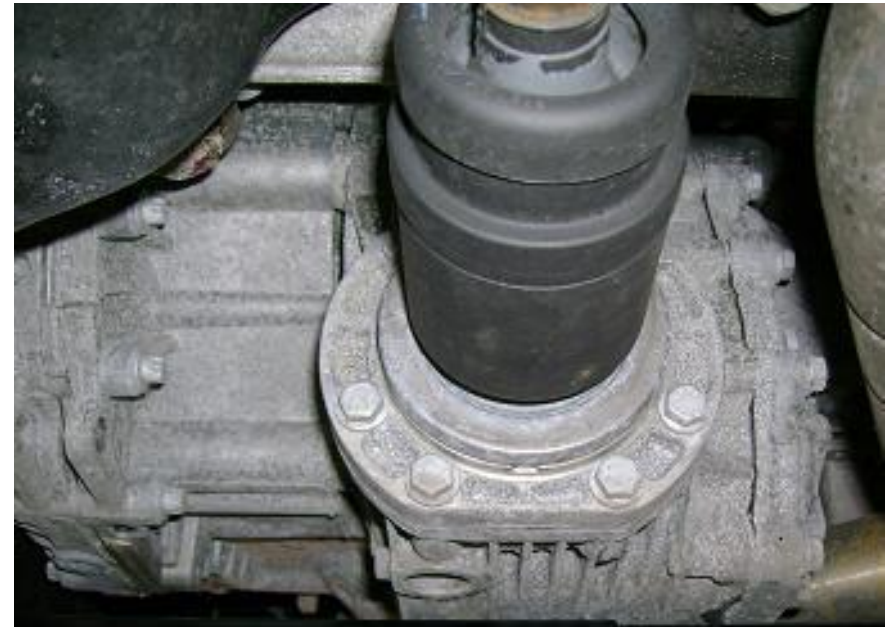
# ***Brackets between PTU and Engine***





# ***PTU***

- During manufacture the transfer case is filled with oil, which then does not require changing. The correct type of oil must be used without, exception when filling. The incorrect type of oil may destroy the transfer case.



# Fluid type



93 165 383



93 165 387



93 165 388

# ***Fluid capacity***

## **Differential clutch**

Capacity, dry differential clutch: 0.52 l (without limited slip differential clutch)  
0.56 l (with limited slip differential clutch)

Part no. [93 165 387](#) (1-litre package)

## **Limited slip differential**

Capacity: 0.6 l (without limited slip differential clutch) 0.7 l (with limited slip differential clutch)

Part no. [93 165 388](#) (1-litre package)

## **Transfer case**

Capacity: 0.66 l

Part no. [93 165 383](#) (1-litre package)

# *Propeller shaft*

The propeller shaft does not run in a straight line between the transfer case and the differential clutch but is instead slightly curved to prevent vibration.

The position of the brackets must be marked very precisely before replacing the propeller shaft

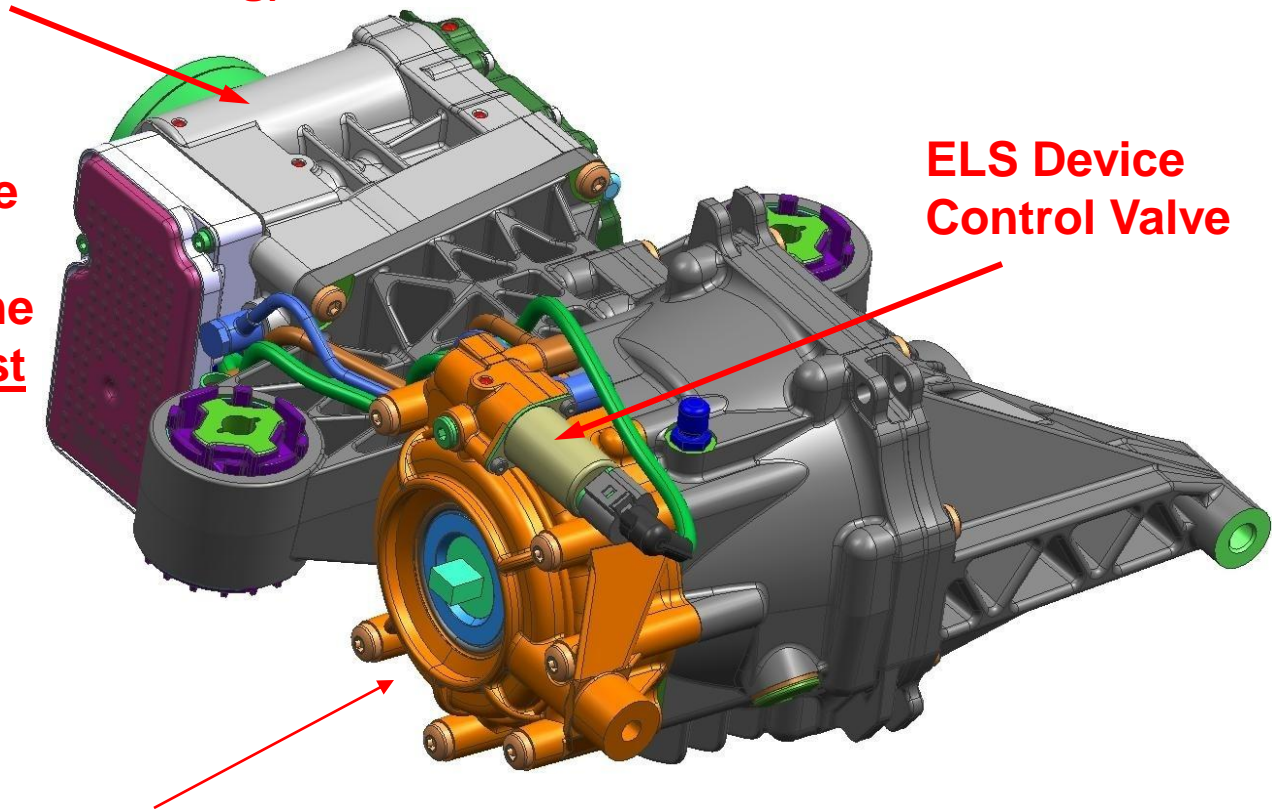


# RDM ELS Device

## ELSD Control Valve

( Behind ECU Inside TTD Housing)

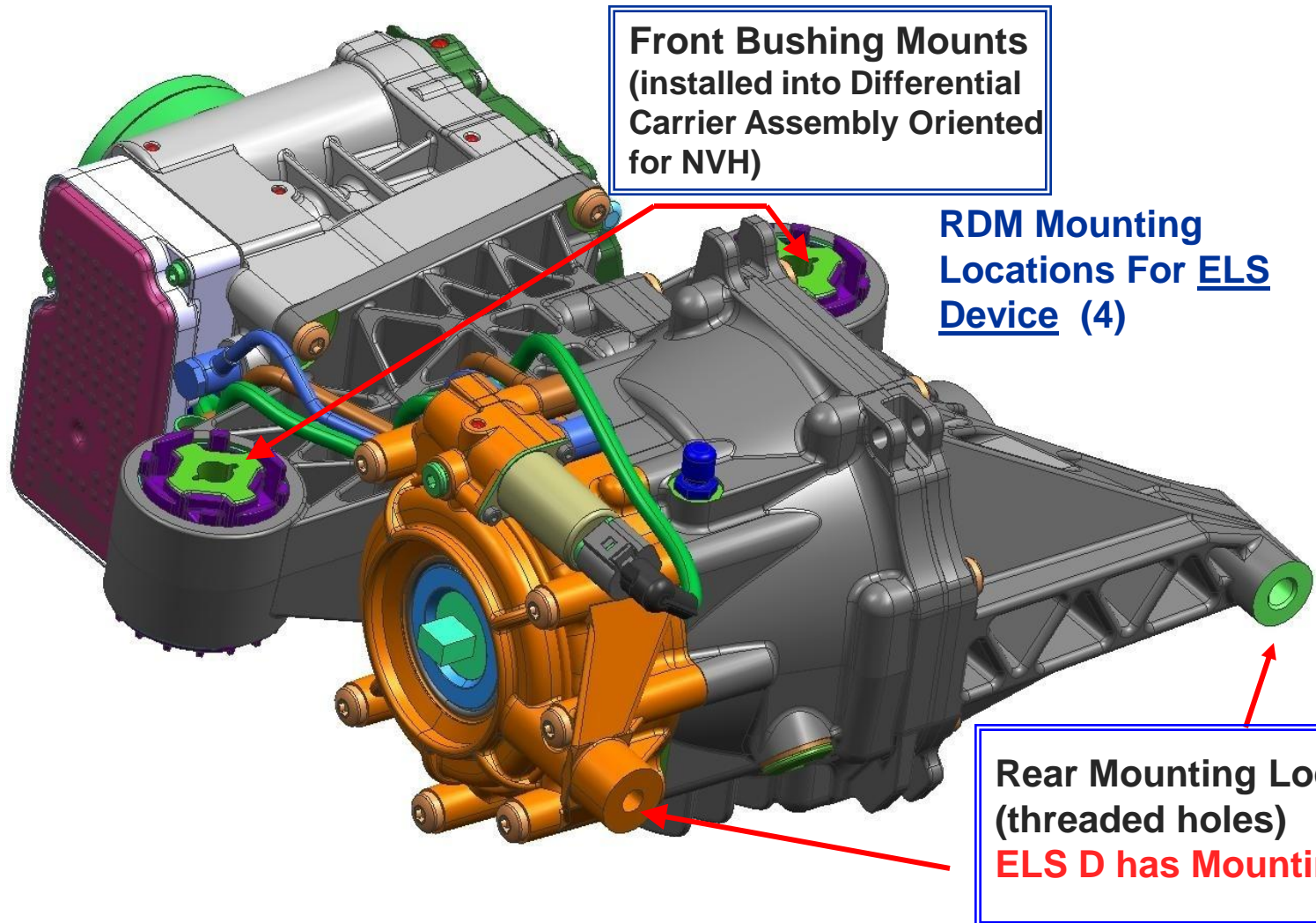
TTD & ELS Device utilize unique control valves that are calibrated at time of manufacture and must be serviced as a “matched” set.



## ELS Device



# Mounting locations



# TTD

- The TTD transfers power from the prop shaft to the pinion in the RDM through a disc package. The unit is hydraulic and the power comes from a axial piston pump. The pump feeds oil through a filter to a high pressure accumulator which stores the pressurised oil at 27.5 bar. This pressure is used to apply a force to a piston which acts on the disc package. The pressure going to the piston is controlled by a pressure reducing valve situated between the accumulator and the piston. The pressure reducing valve and the feeder pump is connected to the ECU which in turn is connected to the vehicle.



# TTD

- The locking level of the TTD is fully controllable between 0 and 100% Of available torque.
- The unit is stand alone and does not share oil with the RDM.
- Unit is sealed for life and no oil change is necessary during its life length.

# Differential Carrier Assembly

- Input power is transmitted 90 degrees through the Ring and Pinion Gearset.
- Output power is split by the differential to the rear halfshafts.
- The Differential Carrier Assembly provides support for the RDM by interfacing with the vehicle subframe at 4 mounting locations. Two front mount bushings are vertical in orientation and retained by the Differential Carrier Assembly. Rear mounting is horizontal in orientation. Isolation bushings for the RDM rear mounts are located in the subframe of the vehicle.

- - **Differential Carrier Assembly Features:**

- Ring gear diameter 160mm
- Laser welded ring gear
- Hypoid offset – 24mm
- Overall ratio –  $13:36 = 2.769:1$
- Pinion rotation – CCW
- Tapered roller bearings for pinion gear & differential assembly
- Shims for pinion height setting & preload
- Selective shims for backlash & differential bearing preload

# ***Electronic limited slip***

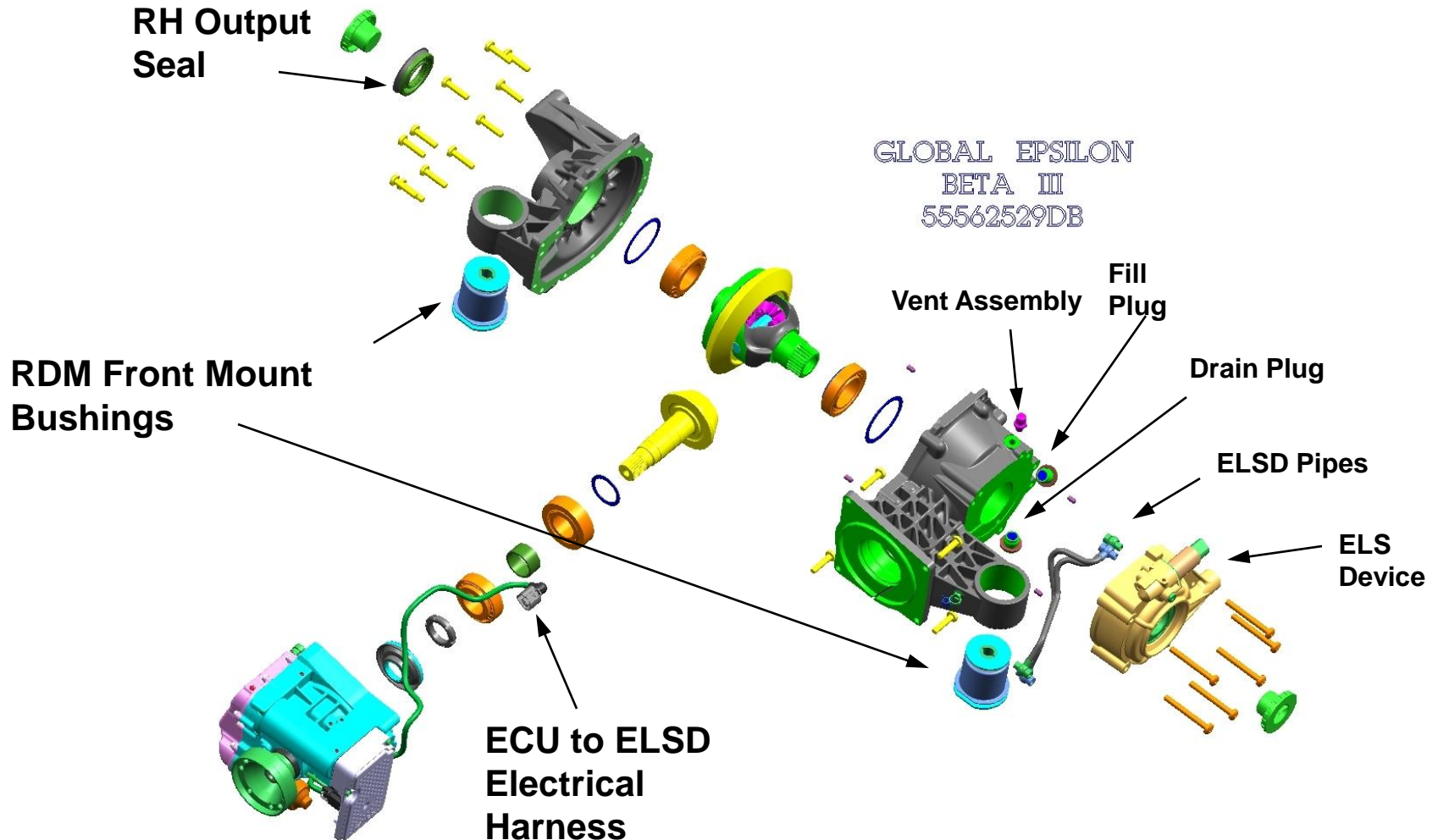
- The ELSD connects the differential carrier with the right half shaft via a disc package making it possible to have up to 1200Nm difference in torque level between the two half shafts.
- ELSD acts as a hang on to the TTD and uses the ECU and power pack (feeder pump, filter and accumulator) on the TTD. The unit has its own pressure reducing valve which is used to control the pressure to the piston. Two pipes connect the ELSD with the TTD; one is feeding the unit with pressurised oil and the other is the return pipe.
- The locking level of the ELSD is fully controllable between 0 and 100% during any driving situation.

# ***Electronic limited slip***

- The unit is integrated in the RDM and uses the RDM oil for lubrication and cooling of the disc package. The oil is fed into the center of the ELSD from the pinion gear and passes through the disc package and the disc drum before it is lead back to the RDM.
- The axial forces from the piston is distributed through the disc package to the RDM.
- One of the rear RDM mounting location is integrated into the ELSD housing for a more compact design of the complete RDM system.



# RDM ELS Device



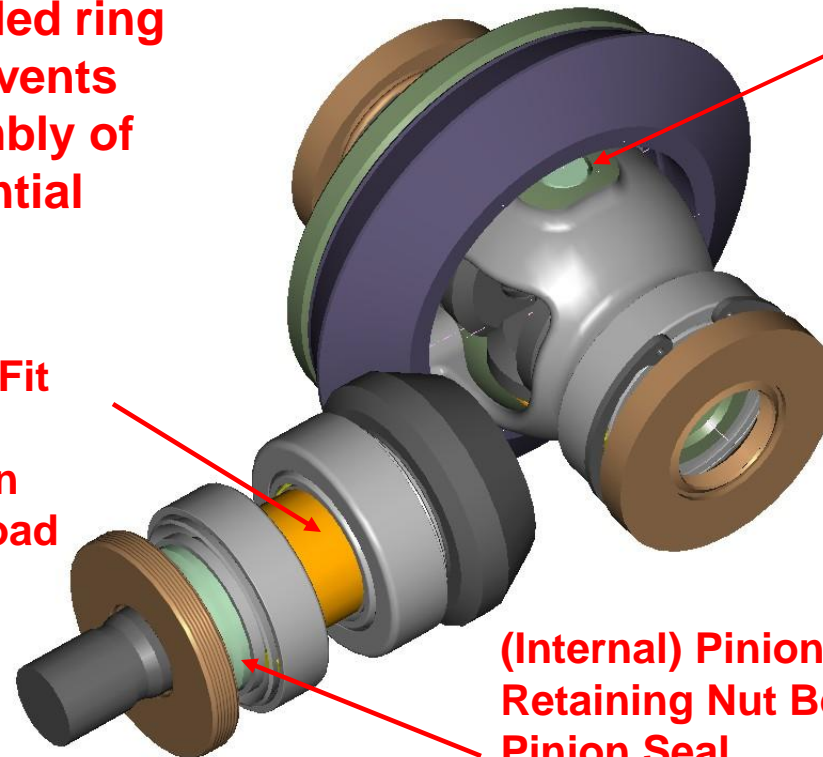
# Key Design Features

**Note –**

**Laser welded ring  
gear prevents  
disassembly of  
differential**

**Ring gear retains  
diff cross-pin  
(Cannot Remove  
Differential  
Components)**

**Dimensional Fit  
Spacer for  
Setting Pinion  
Bearing Preload**



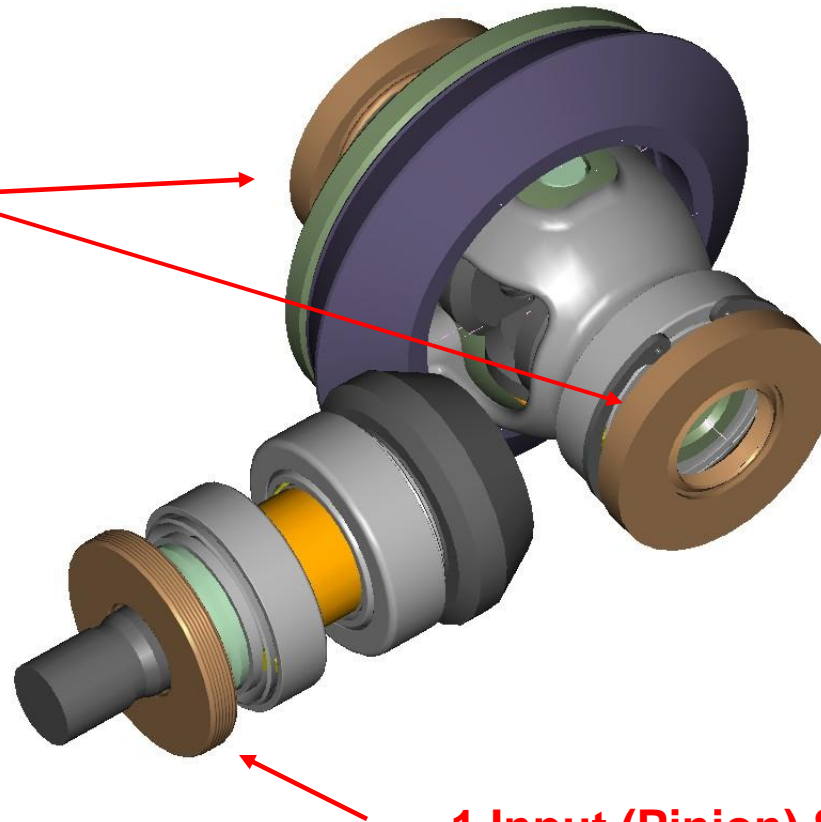
**(Internal) Pinion Bearing  
Retaining Nut Below  
Pinion Seal  
(Special Socket Needed)**



# Seal Locations

**2 Output Seals**

**Output Seals can be  
Accessed After  
Halfshafts are  
Removed from RDM**



**TTD Must be  
Separated from  
RDM to Access  
Pinion Seal**

**1 Input (Pinion) Seal**

# *Service*

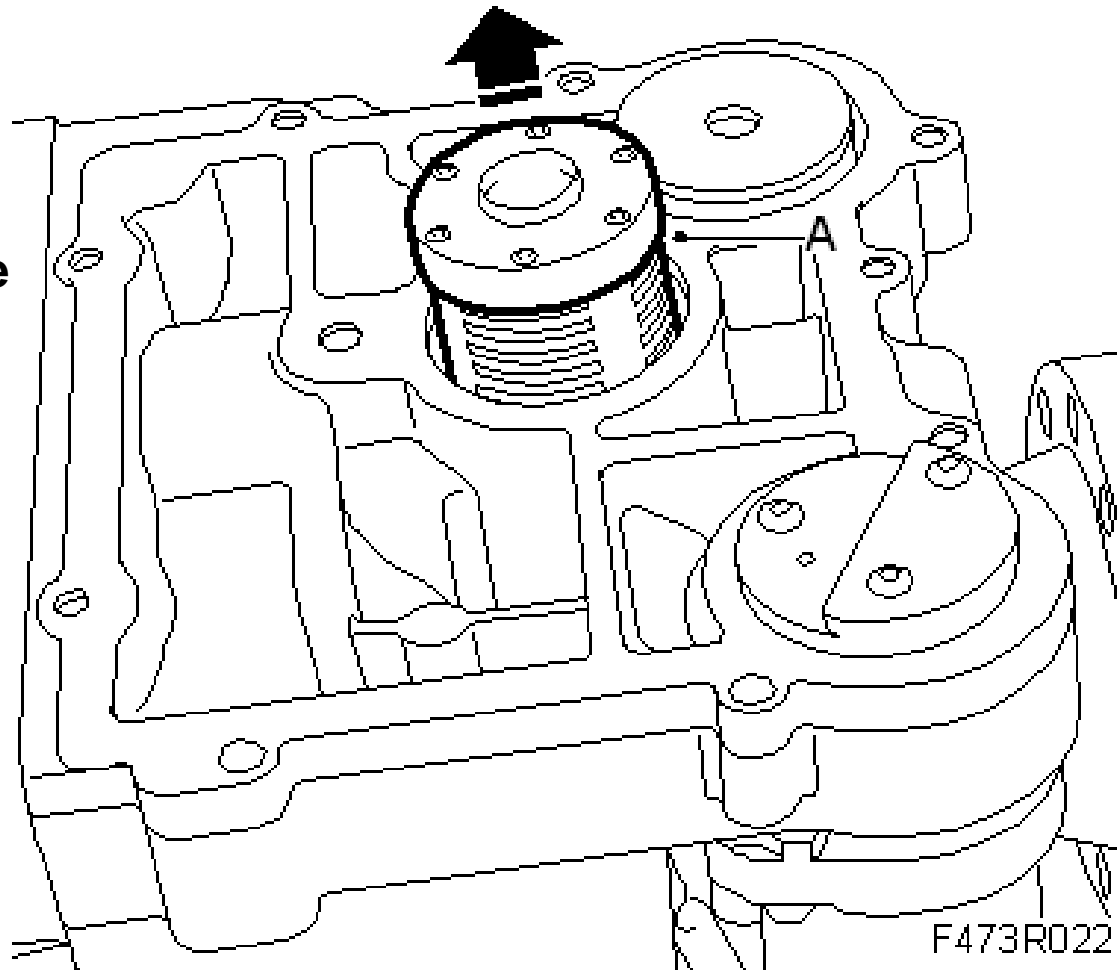
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- Key design features “limit” serviceable components.

- RDM Differential Carrier Assembly Internal Components Are NOT Serviceable Due to the Unique Design Features of the System.
- Lash and Gear Pattern Cannot Be Verified. (no site window or NVH field equipment)
- RDM Sub-component Replacement is Best Option to Ensure End User Performance Satisfaction. Sub-components include: TTD, Differential Carrier Assembly, ELS Device.
- Differential Carrier Assembly Should Be Replaced as an Assembly if any Internal Repair is Required. Service Diff Carrier Assembly will ship without lubricant..
- TTD, ELS Device, and ECU Can Be Replaced IF NEW Calibrated Control Valves Are Replaced With Kit Provided By Haldex.

# *Filter change*

**Serviceable  
filter**



# *Oil Filter*

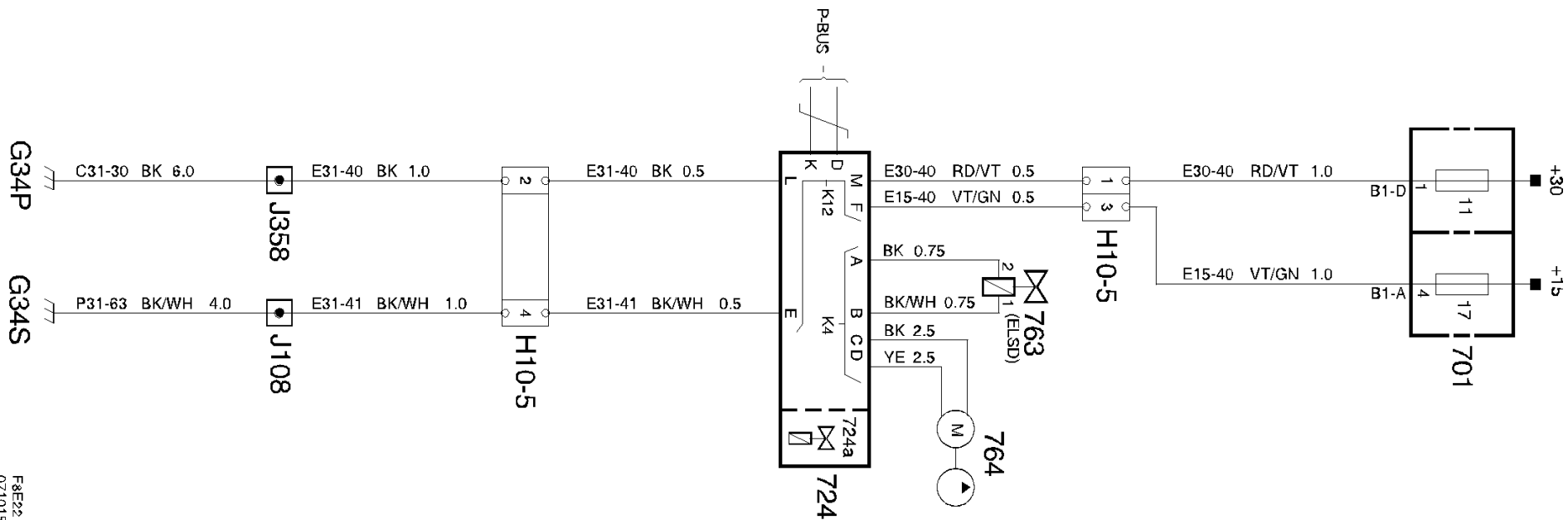
- The function of the oil filter is to separate fixed impurities in the hydraulic circuit's oil after it has passed through the hydraulic pump.
- The oil is fed into the center of the filter via a check valve. This prevents the pressurized oil in the accumulator from leaking out via the pump when it is not operating.



# ***Power & Grounds***



# Schematic



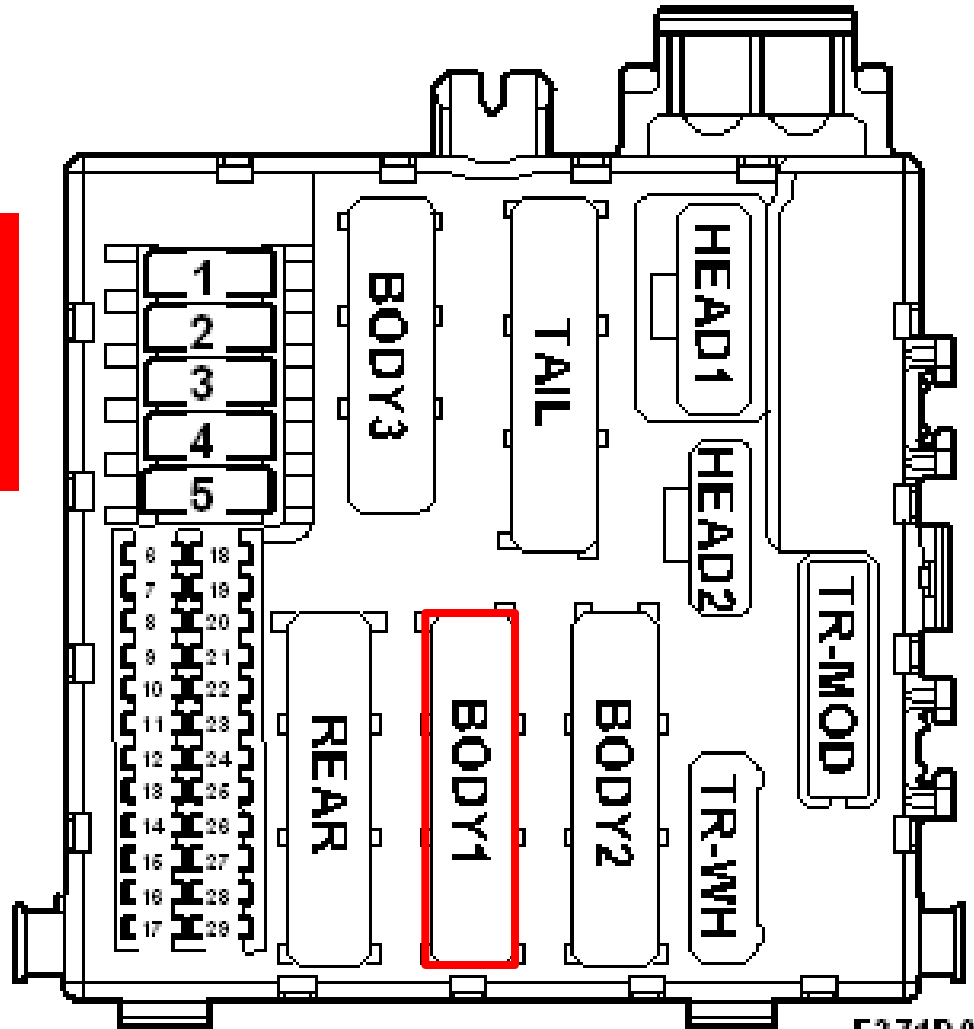
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# ***Power location***



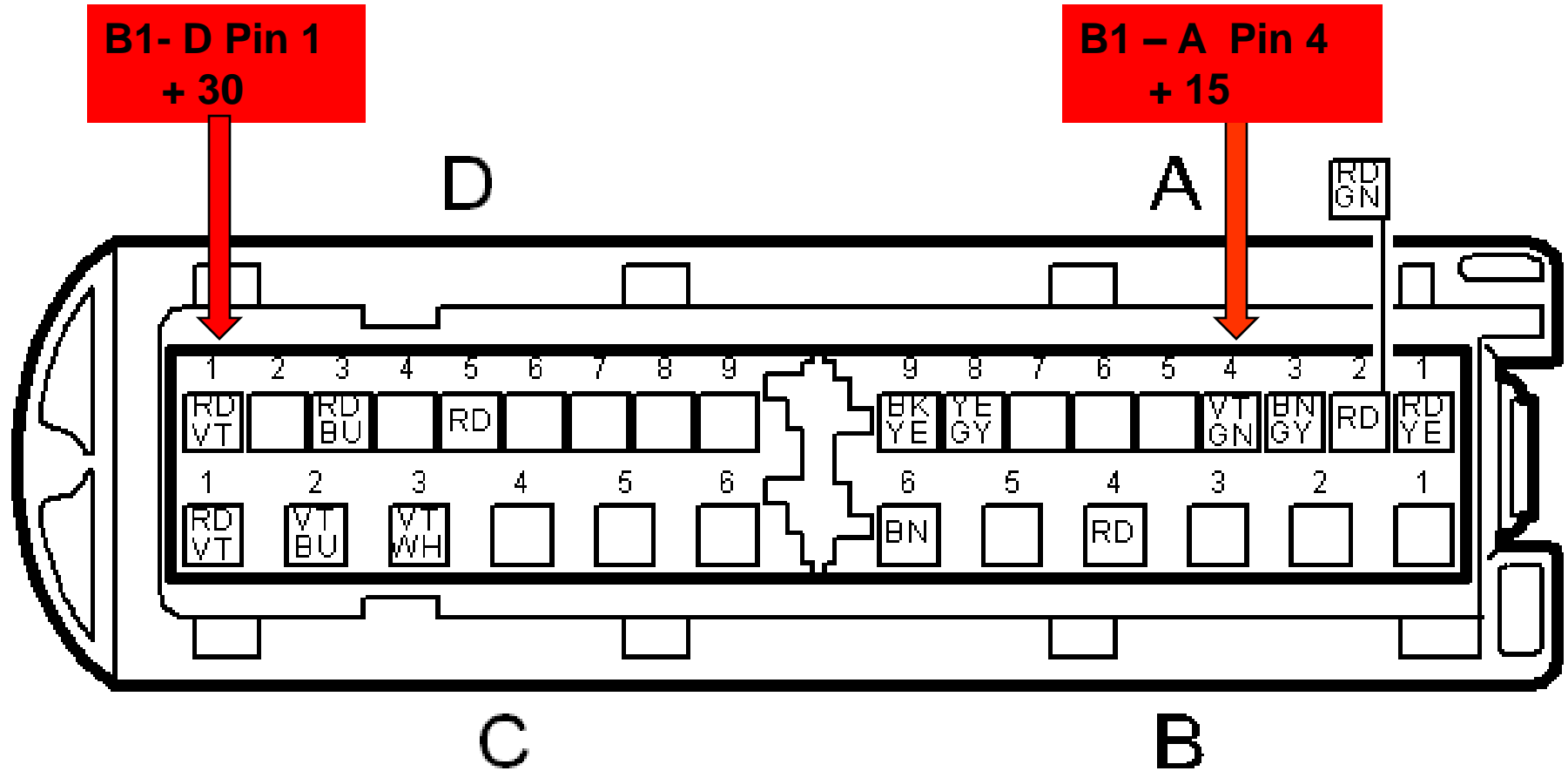
# ***B1 Location***

**Panel in rear  
passenger  
compartment  
- left side -**



F371D0

# Power supply

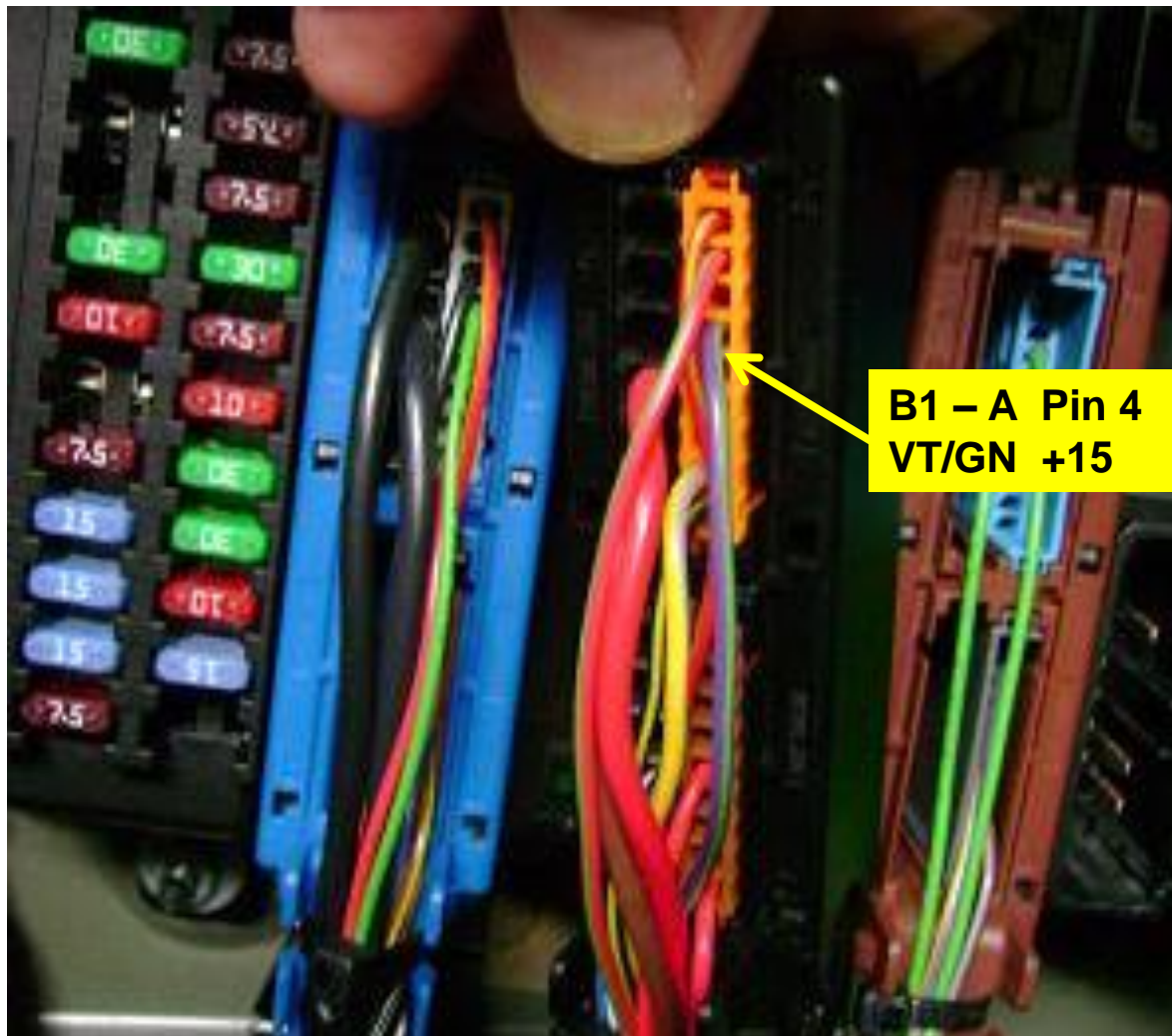


# *Power supply*



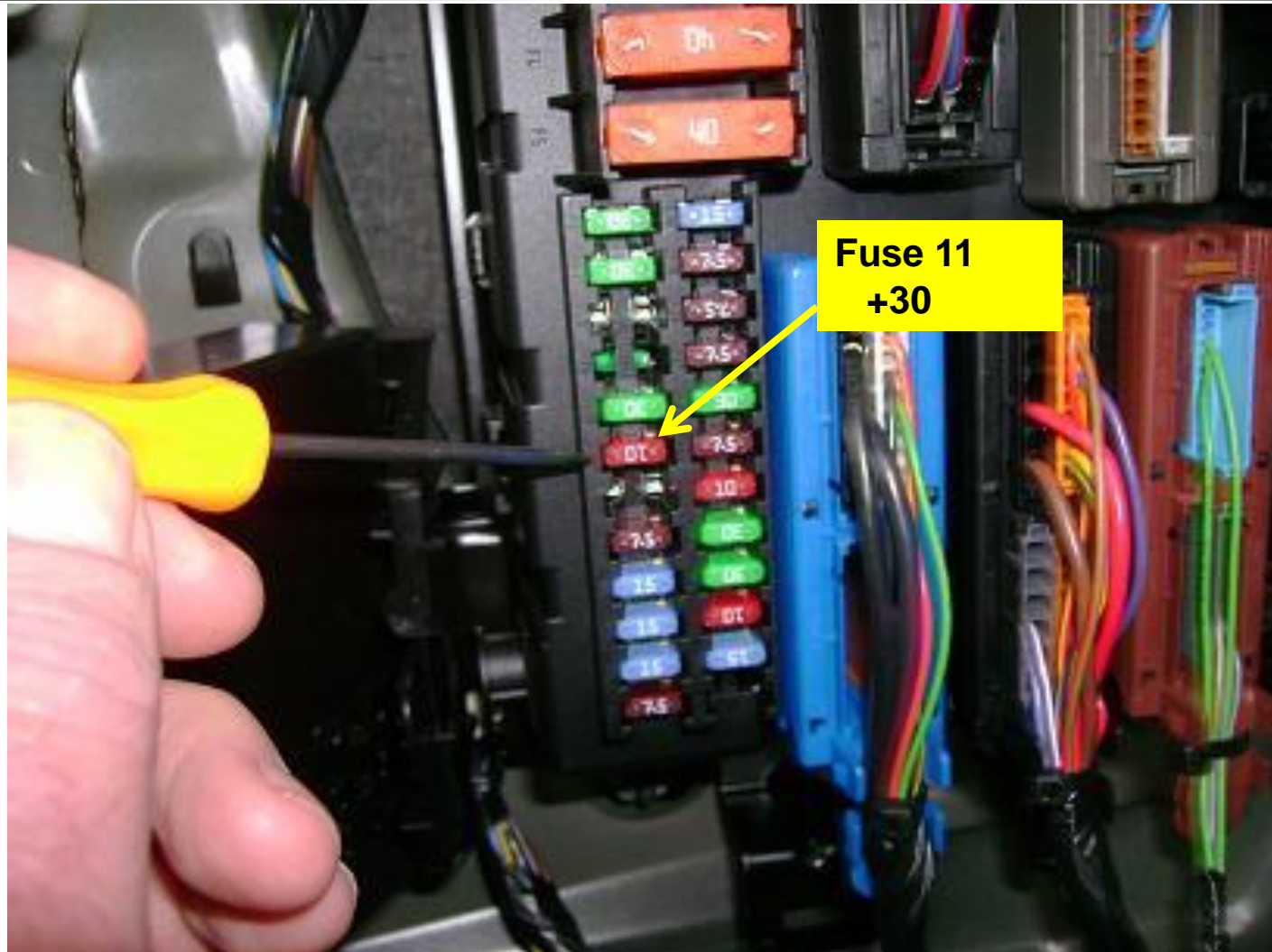


# *Power supply*

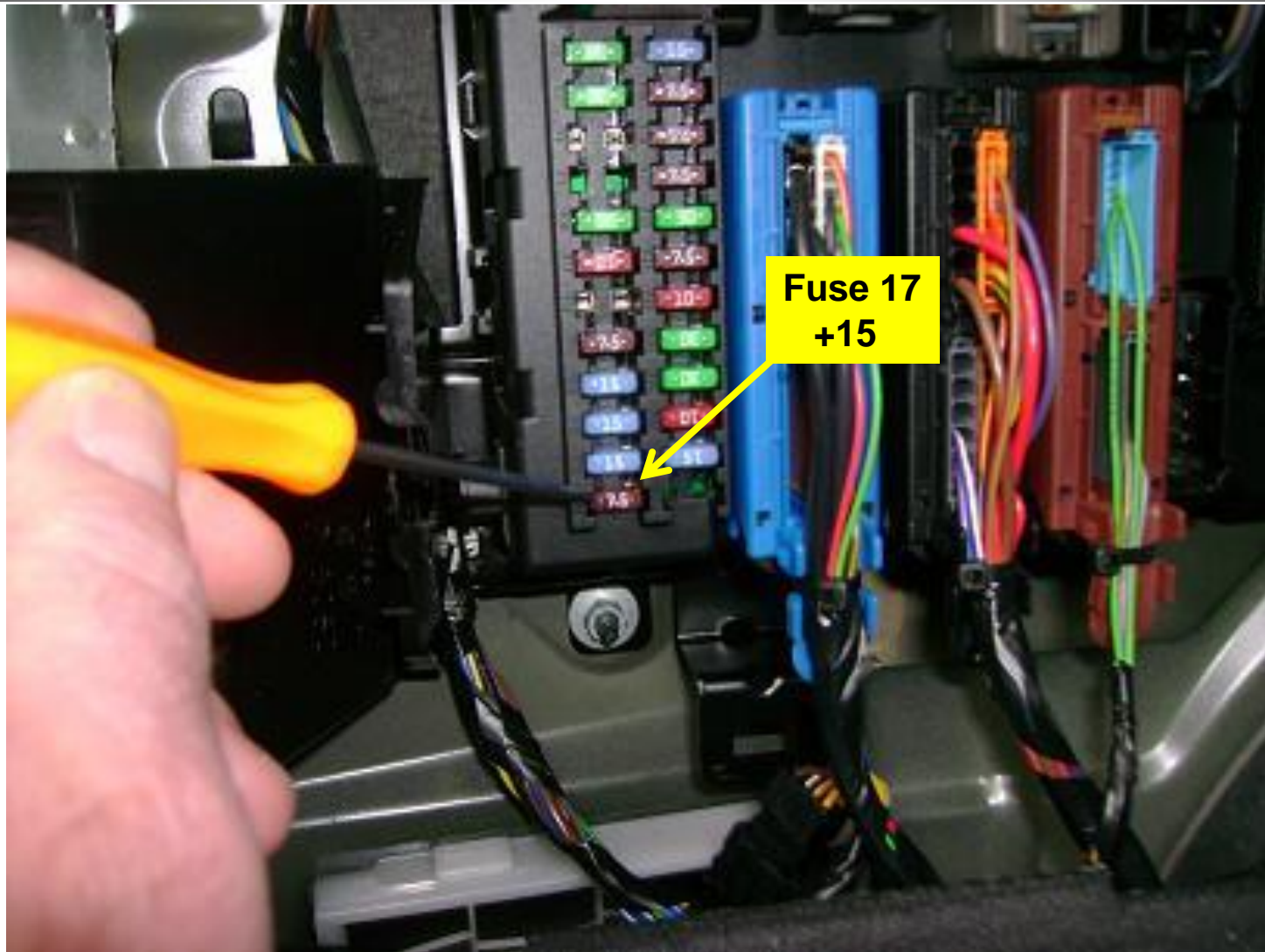


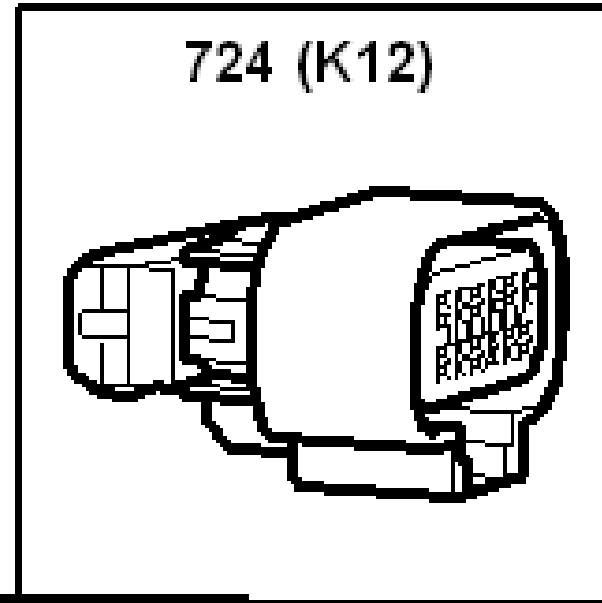
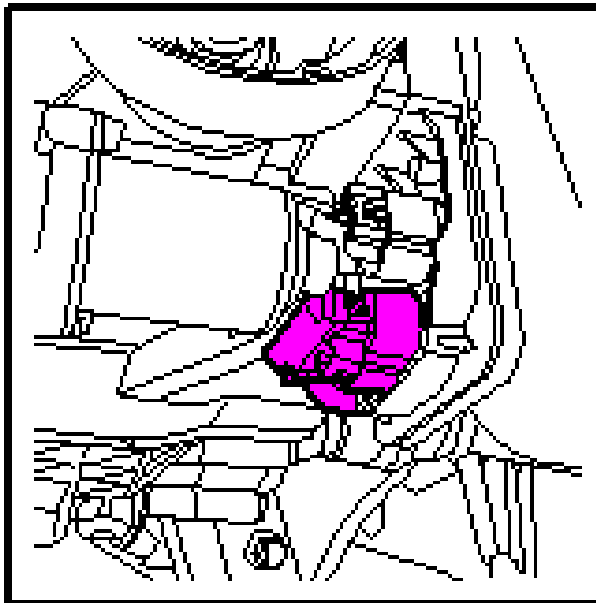


## ***Fuse location***



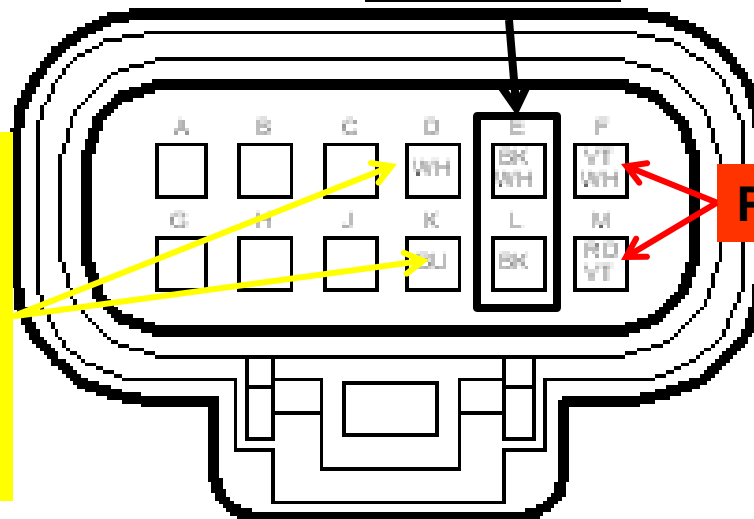
# ***Fuse location***





**Grounds**

**P- Data  
Should  
be 2.5v  
on each  
Leg to  
Ground**



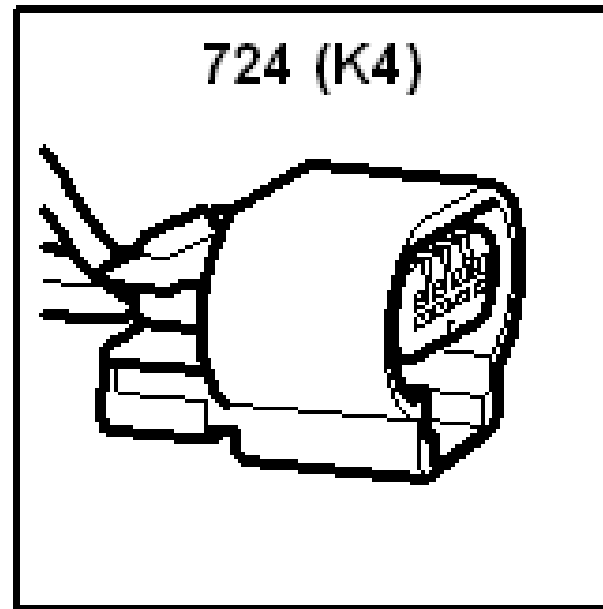
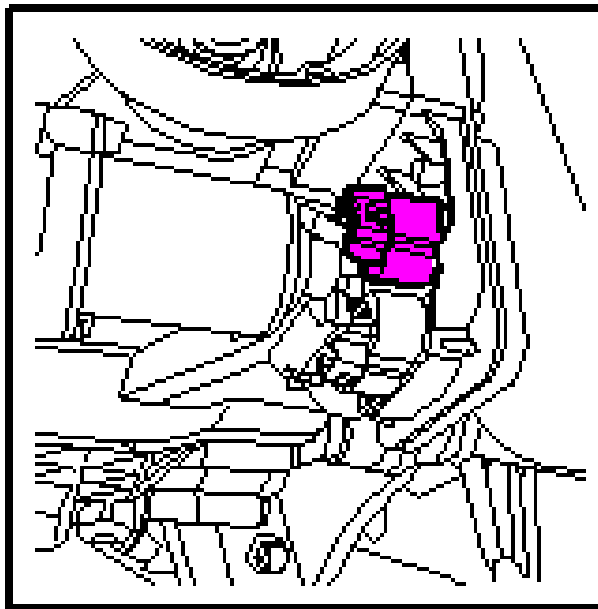
**Power**

F8A2K12

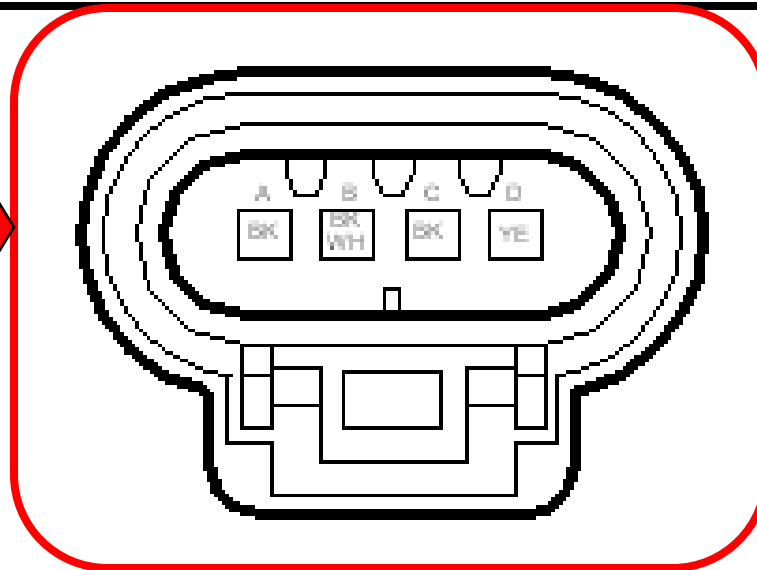
# Connector 12

## K12

Pin no.	Signal type	Description
D	P-BUS	Bus-
E	Signal ground	Connected to grounding point G34S
F	+ 15	Supplied from fuse 17 in REC
K	P-BUS	Bus+
L	Power ground	Connected to grounding point G34P
M	+30	Supplied from fuse 11 in REC



Will only have 2  
Wires without ELSD



F8A2K4

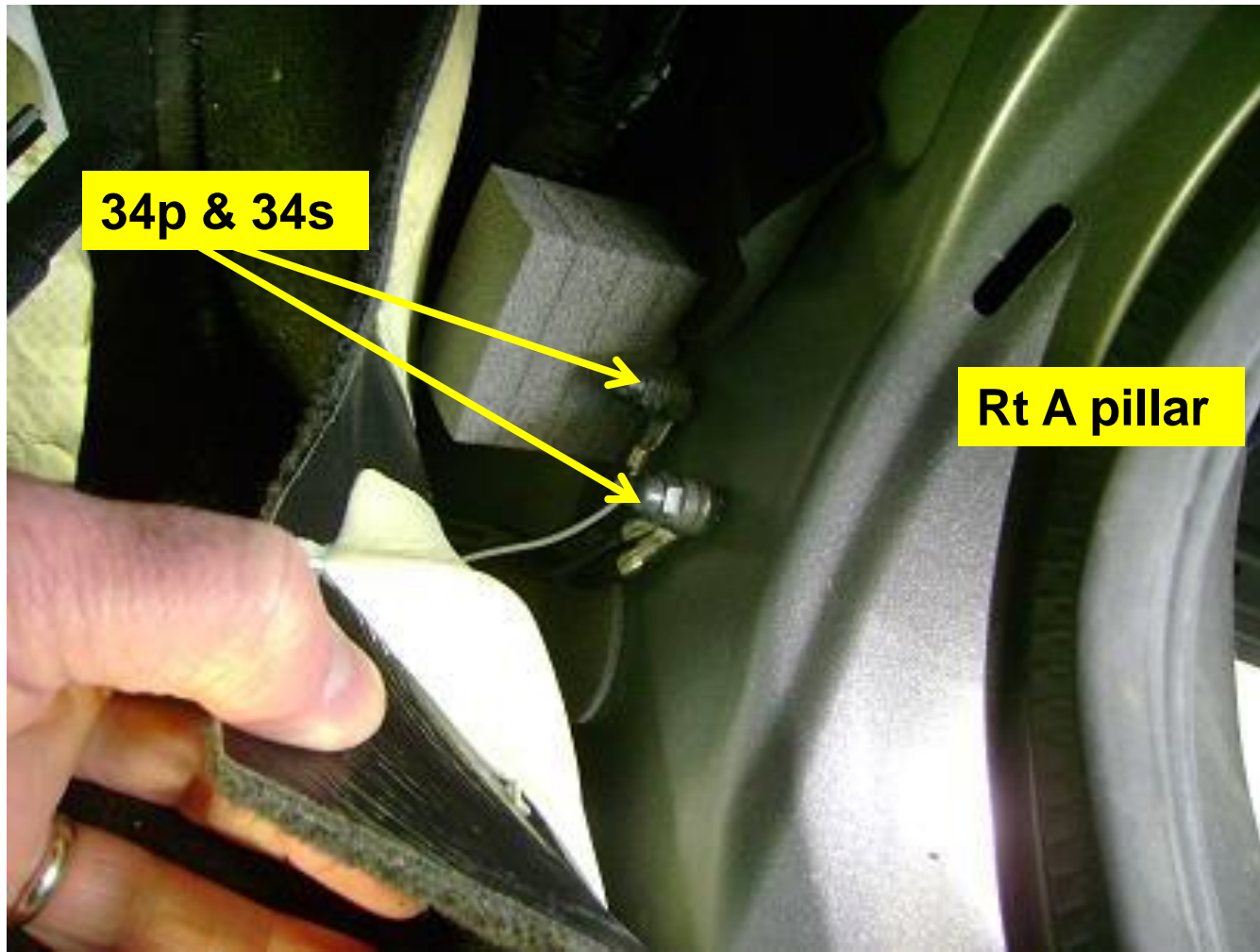
# Connector 4

K4

Pin no.	Signal type	Description
A	Ground	Ground for solenoid valve, limited slip differential clutch
B	PWM	Power supply to solenoid valve, limited slip differential clutch
C	Ground	Ground for pump motor
D	PWM	Power supply to pump motor



# *Grounds*



# ***Special Notes:***

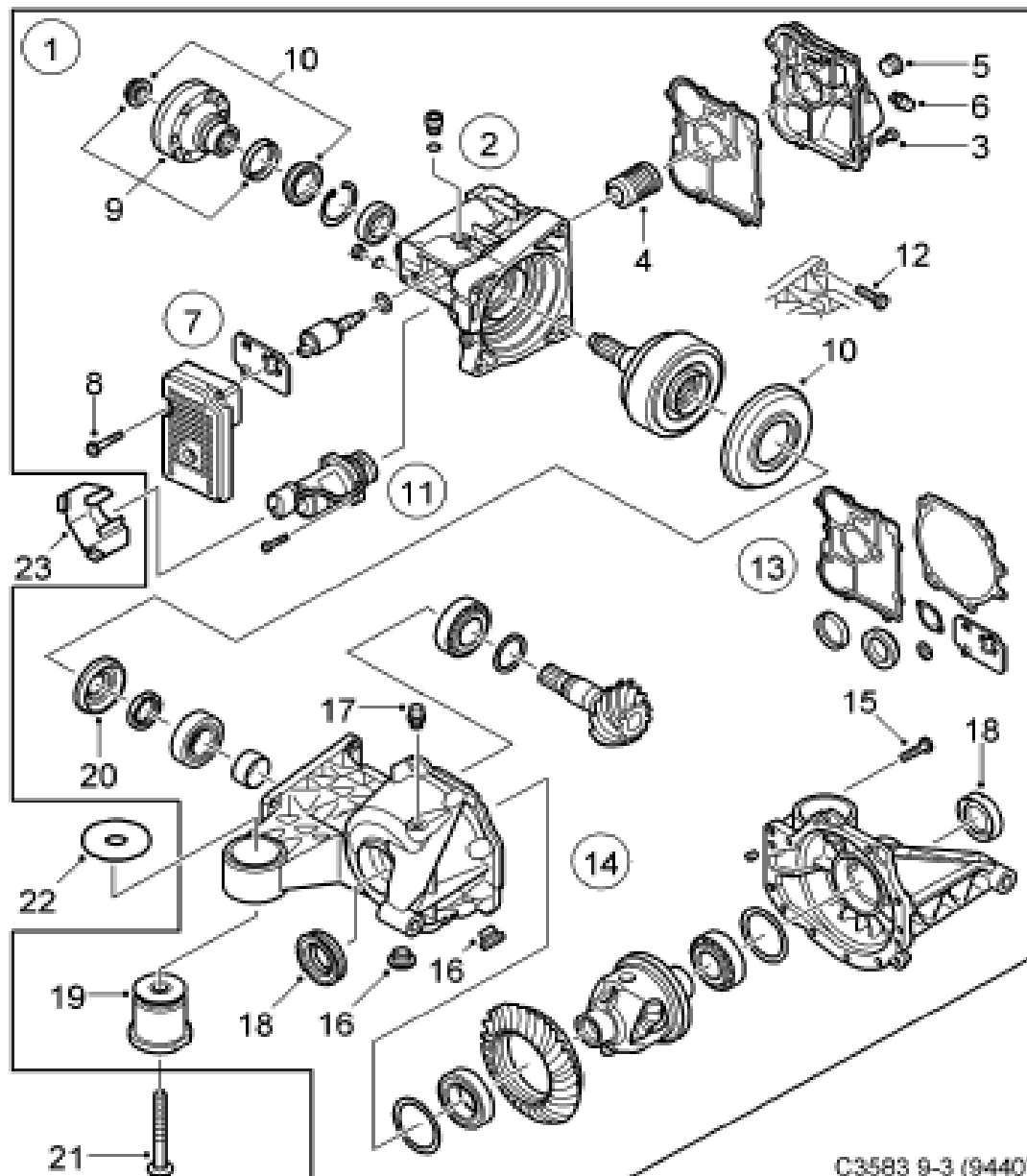
# ***Measures after changing the control module***

- Connect Tech 2 and use TIS 2000 to check whether the control module needs to be programmed. Access the menu "SPS", select "Read control module data" and follow the instructions. The intention is that the control module shall be loaded with the latest available software and in addition adapted to the car model and market
- After SPS programming: Check that the clock is set correctly and that pinch protection is working. If necessary, set the date and time and carry out Calibration of pinch protection.

# ***ALL Menu***

- When the control module is fitted and in some cases SPS programmed, Tech 2 must be used to "marry" the control module to the car. Access the menu "All" and select control module under "Add/Remove". Then select "Add" and follow the instructions. The ignition key must be in the ON position. TIS 2000 may need to be used.

With out  
ELSD



With ELSD

