Mercedes-Benz

G Class
Differential Locks

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To help avoid personal injury to you or others, and to avoid damage to the vehicle on which you are working, you must always refer to the latest Mercedes-Benz Technical Publication and follow all pertinent instructions when testing, diagnosing or making repair.
Illustrations and descriptions in this training reference are based on preliminary information and may not correspond to the final US version vehicles. Refer to the official introduction manual and WIS when available.

Published by Mercedes-Benz USA, LLC
Printed in U. S.A.

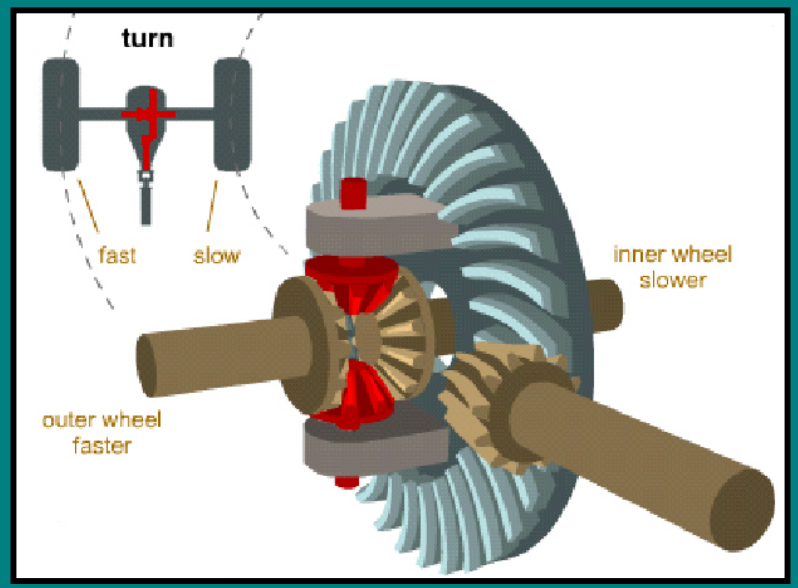
Why Use Differential Locks?

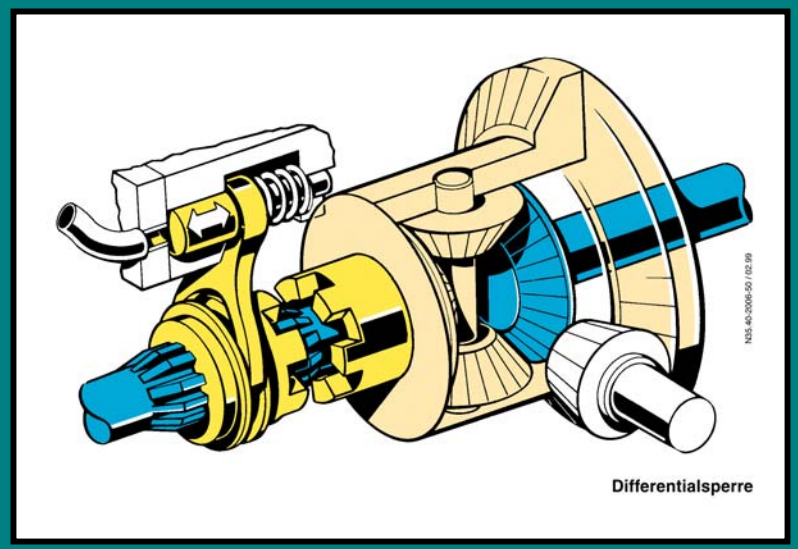
A differential allows the driven wheels to turn at different speeds when turning a corner (open differential).

In off-road conditions one or several wheels can lose traction. The differential allows the torque to go to the wheels that are easiest to turn.

Result: spinning wheels !!

A differential lock secures one axle shaft to the rotating differential case. The differential “spider’ gears can no longer allow a difference in speed, both axle shafts turn at the same speed.





When To Use Differential Locks

Differential locks should be engaged for traction improvement while:

- Driving off-road
- Fording
- Driving on snowy, icy or muddy surfaces

1 - Center lock switch
2 - Rear lock switch
3 - Front lock switch

Engaging differential locks while on paved roads can damage drivetrain components.

Operation

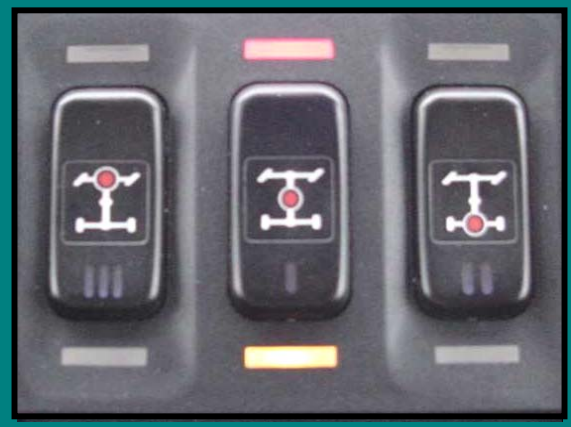
- Fixed sequence (cannot be changed)
  - center, rear, front
- Lock request: Yellow indicator

  MF Display: **“ESP NOT AVAILABLE”**
- Lock confirmation: Red indicator

  MF Display: **“ESP NOT AVAILABLE”**

  “ABS NOT AVAILABLE”

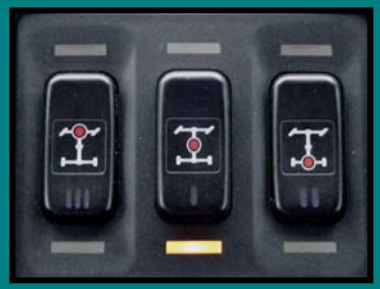
  “BAS NOT AVAILABLE”



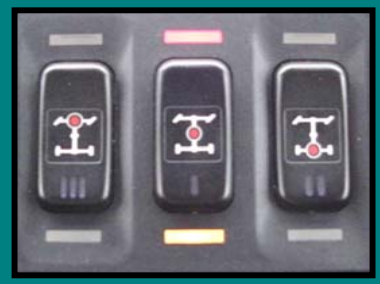
Note: 2002 MF warning display shown

2003 MF Display

Lock request



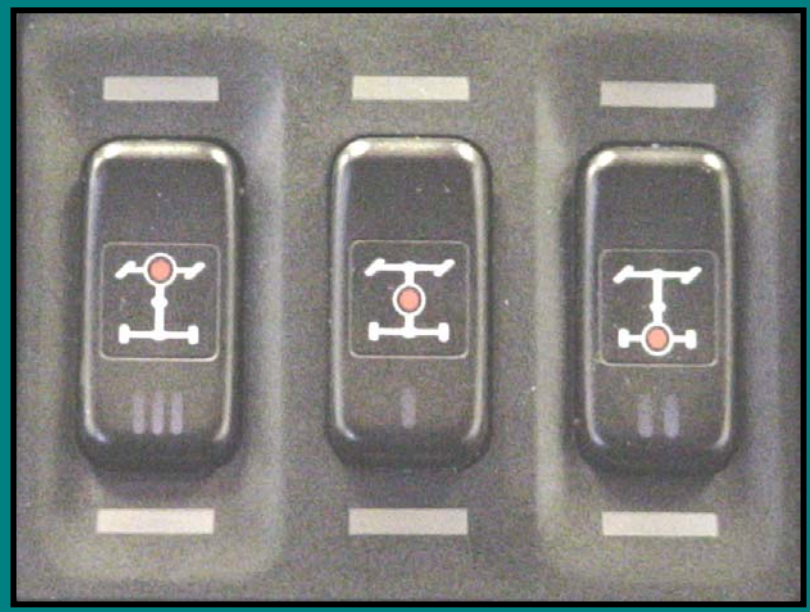
Lock engaged



Warning display changed for 2003 due to NHTSA mandate

Differential Lock Switch Group (S76)

Task:
- Activates the individual differential lock
- Monitors differential lock engagement
- Ensures engagement sequence
- Indicates condition
  - off, request or engaged
- Time delay
  - ensures differential locks stay engaged for ~ 30 seconds when ignition switched off

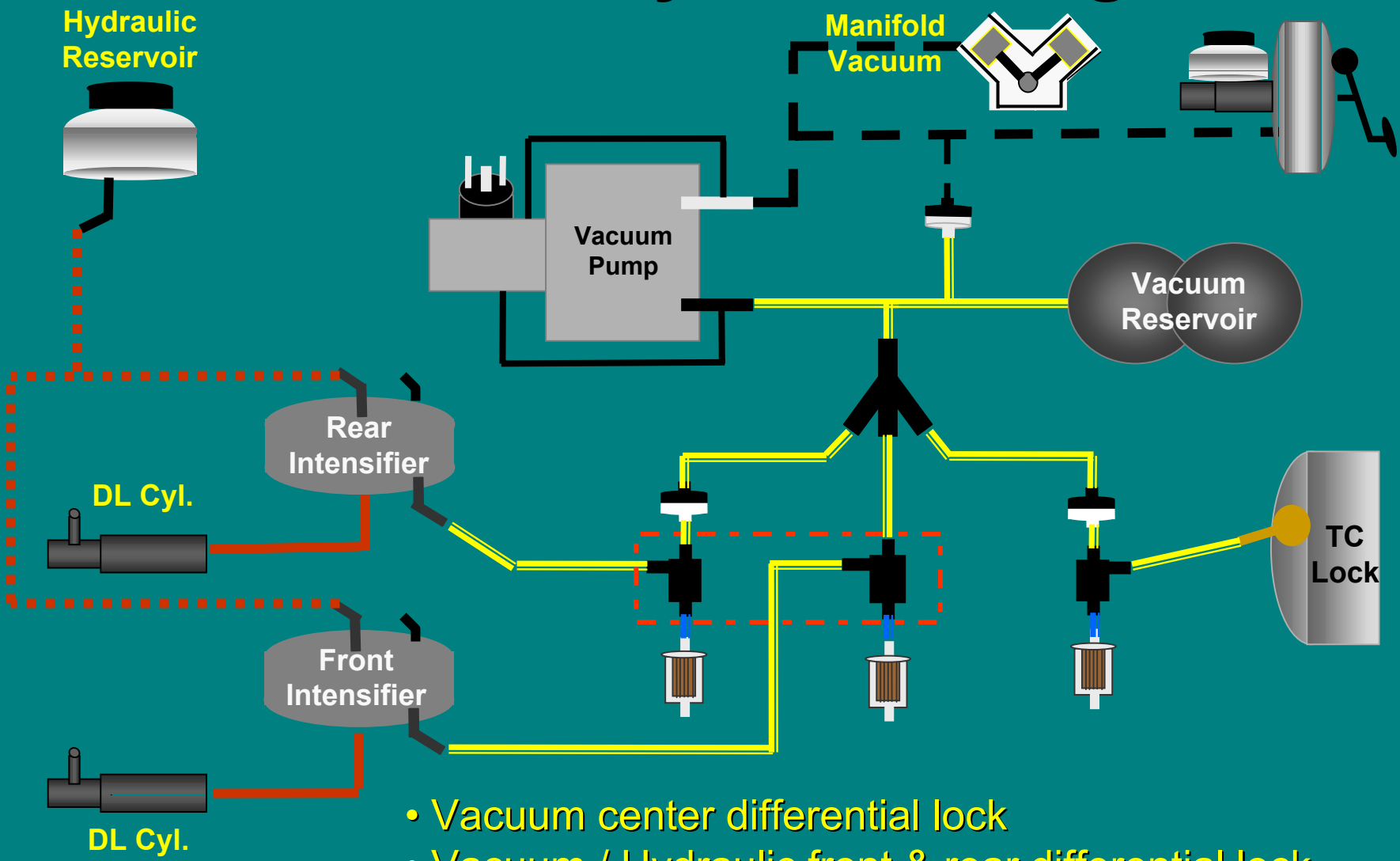


- No self-diagnostics
- Guided test available in SDS / DAS

Inputs:
- Differential lock confirmation switches
- 58d lighting

Outputs:
- Differential lock relay
- Front & rear differential lock switchover valves
- ESP

Vacuum and Hydraulic Diagram

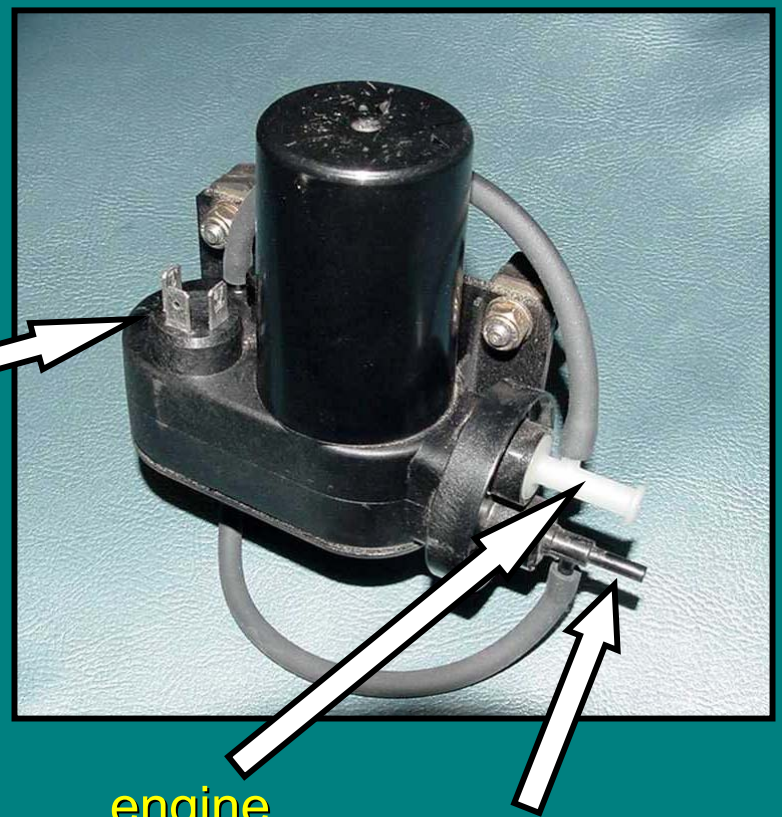


- Vacuum center differential lock
- Vacuum / Hydraulic front & rear differential lock
- Check valves on center & rear vacuum supply

Vacuum Pump (M40)

Task: Supplement manifold vacuum for the differential lock system.

Differential lock request, pump runs:
- Key on, until vacuum reaches approx. 550 mbar
- Engine running, continuously



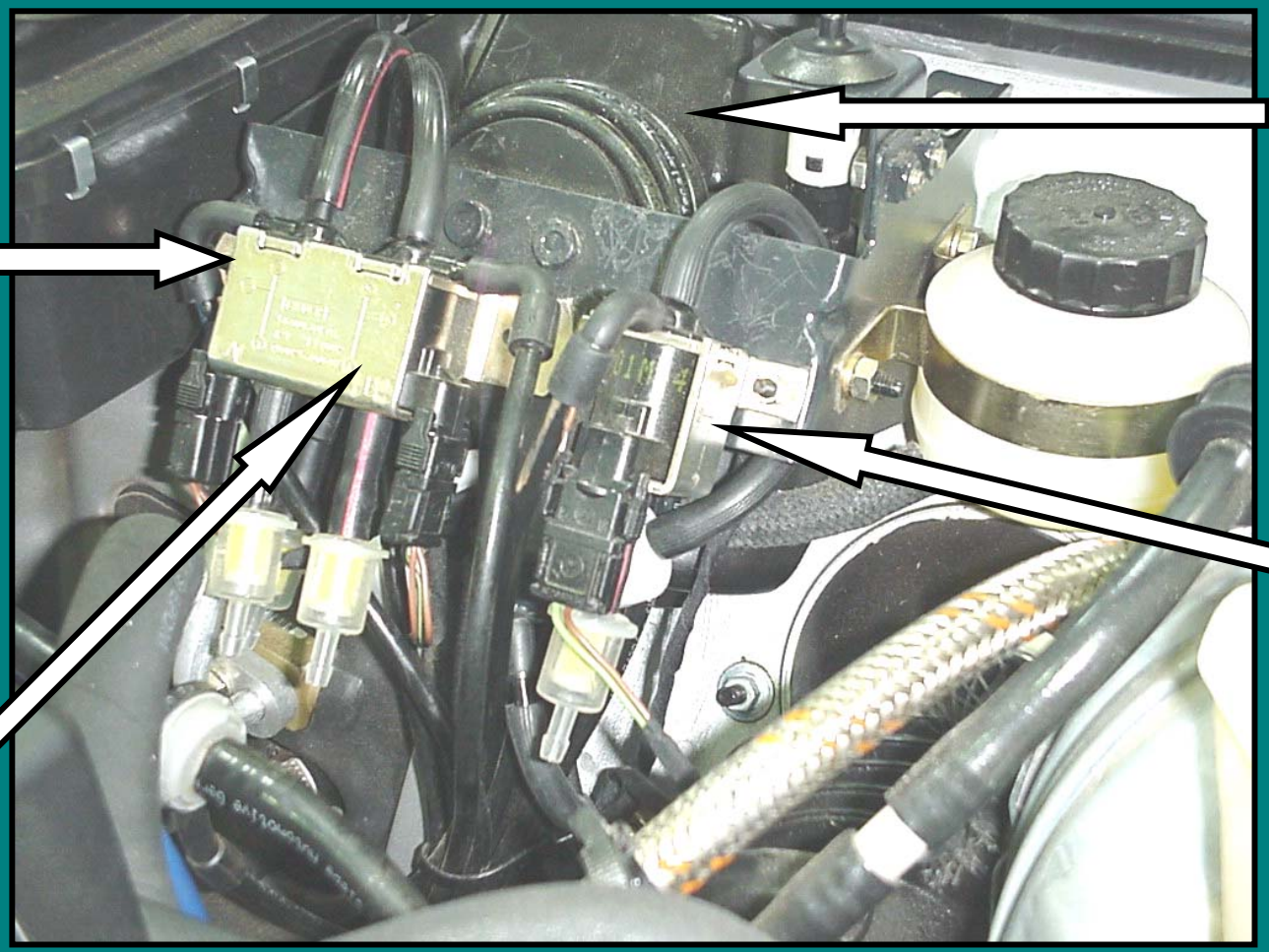
Note: Front differential lock may disengage if vac leak / pump weak on heavy throttle application

Differential locks engage ~400mbar
Differential locks disengage ~200mbar

Vacuum Reservoir

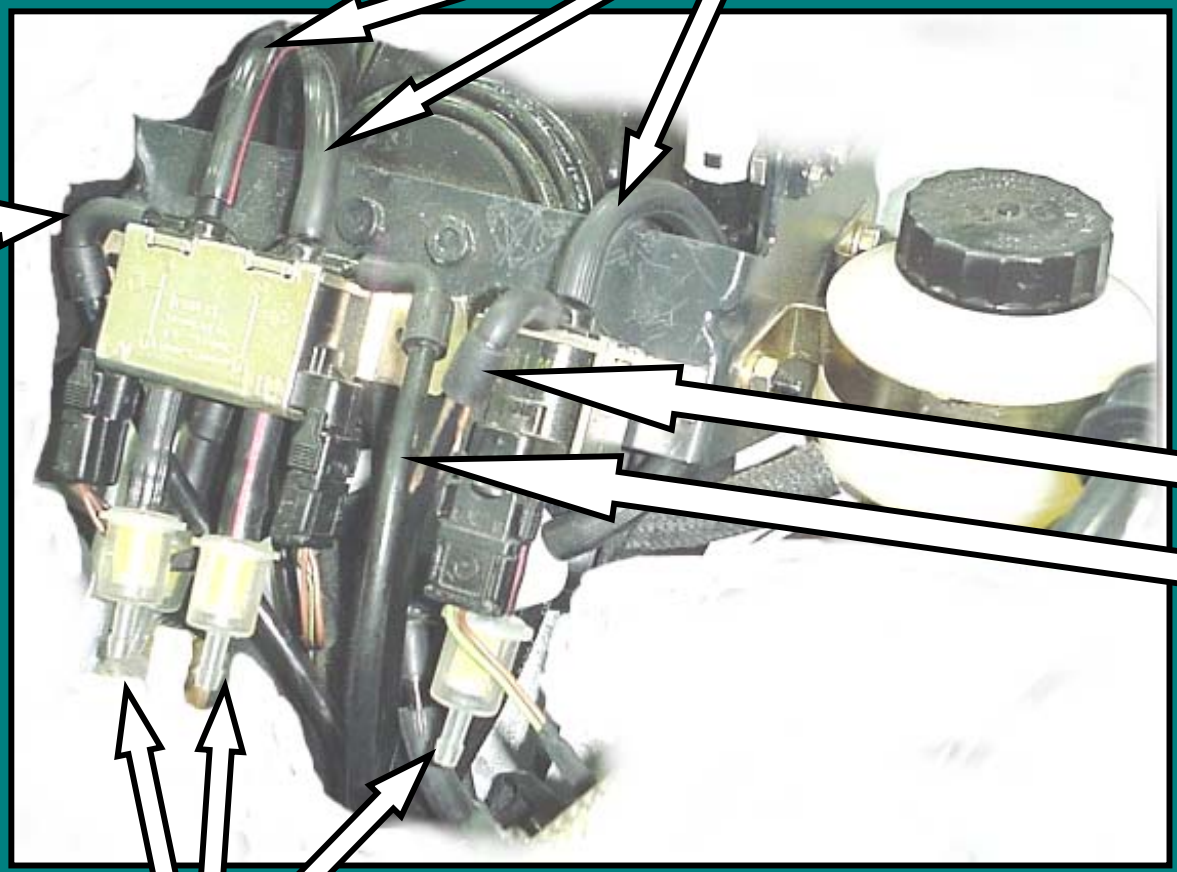
Location: left inner fender well

Differential Lock Switchover Valves



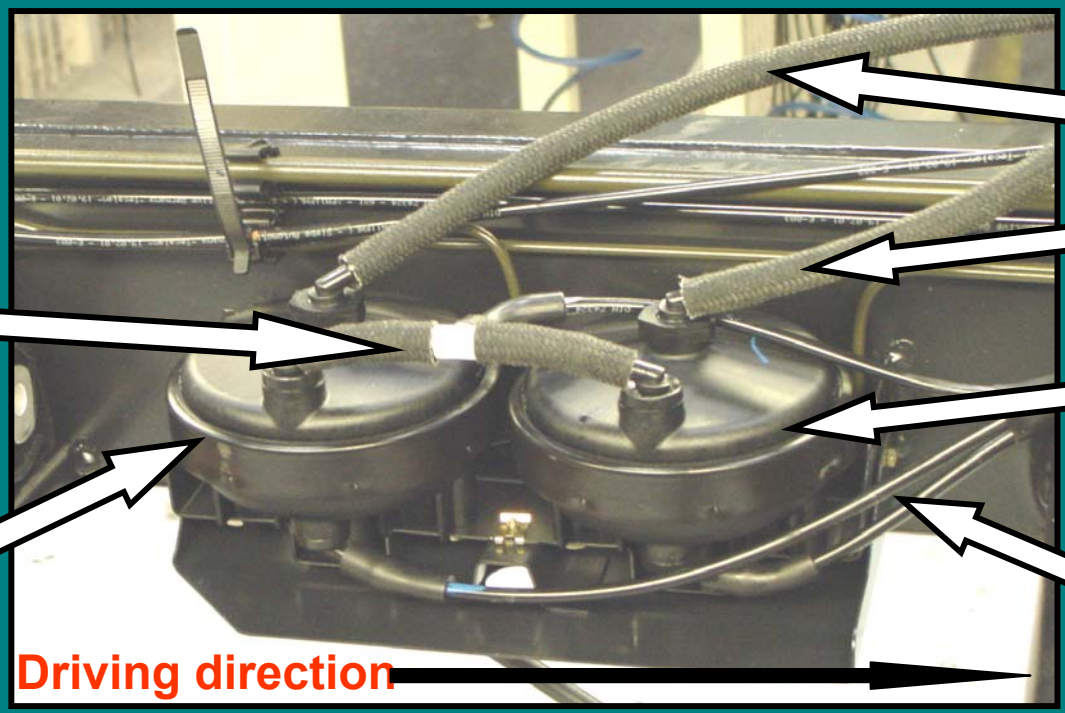
Location: mounted on the firewall right of the brake booster

Differential Lock Switchover Valves



Pressure Intensifier Units

Task:
- Convert vacuum to hydraulic
- Provide hydraulic pressure

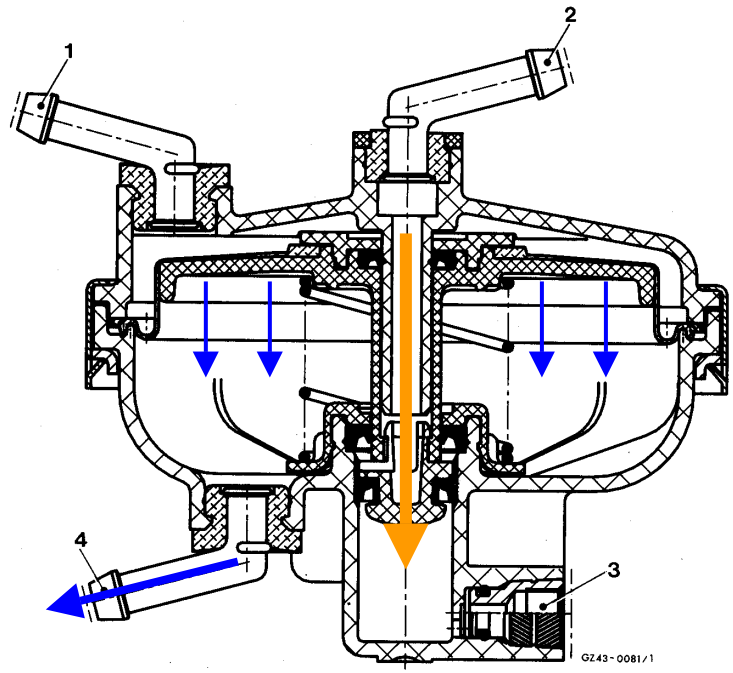


Location: inside of left frame rail

Pressure Intensifier Unit

Function:

- Vacuum is applied to a large area diaphragm
- Diaphragm and hydraulic piston are pulled in a downward direction
- Downward movement of the piston creates hydraulic pressure of approximately 15 bar
- When vacuum is removed the spring force will return the diaphragm and hydraulic piston to its rest position



Pressure Intensifier

(pneumatic system-hydraulic system)

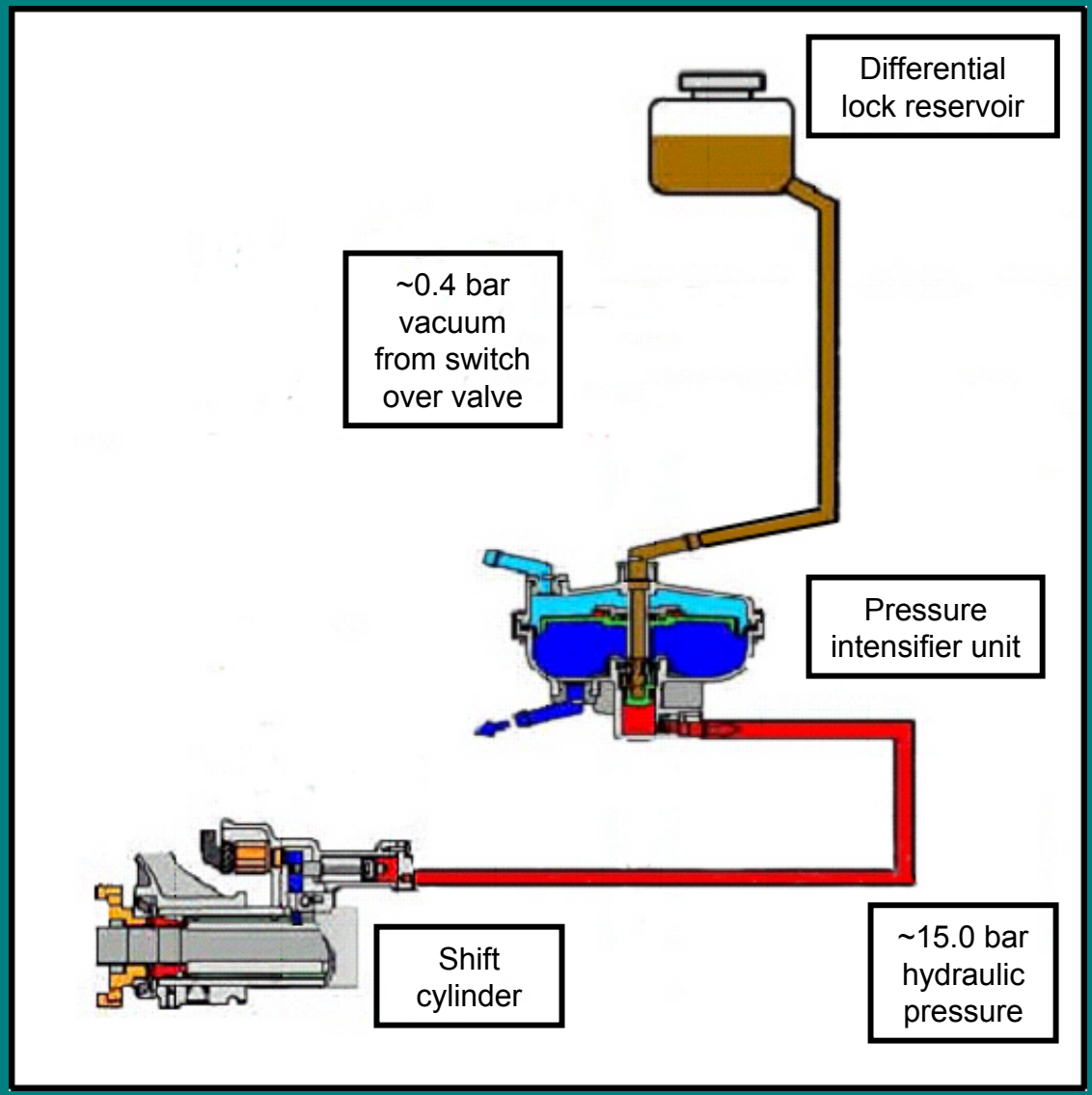
1. vent

2. hydraulic reservoir

3. Shift cylinder

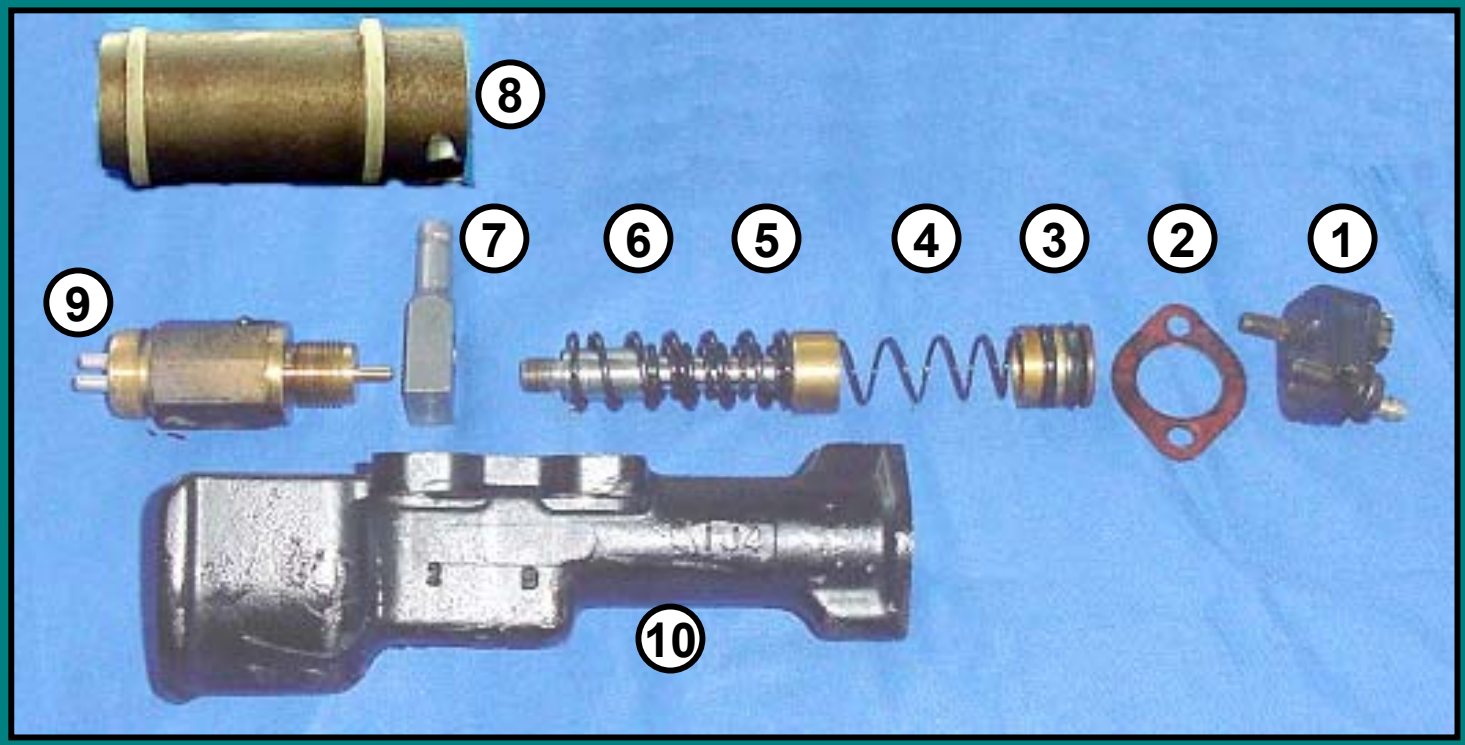
4. vacuum

Hydraulic Circuit



axle circuit illustrated

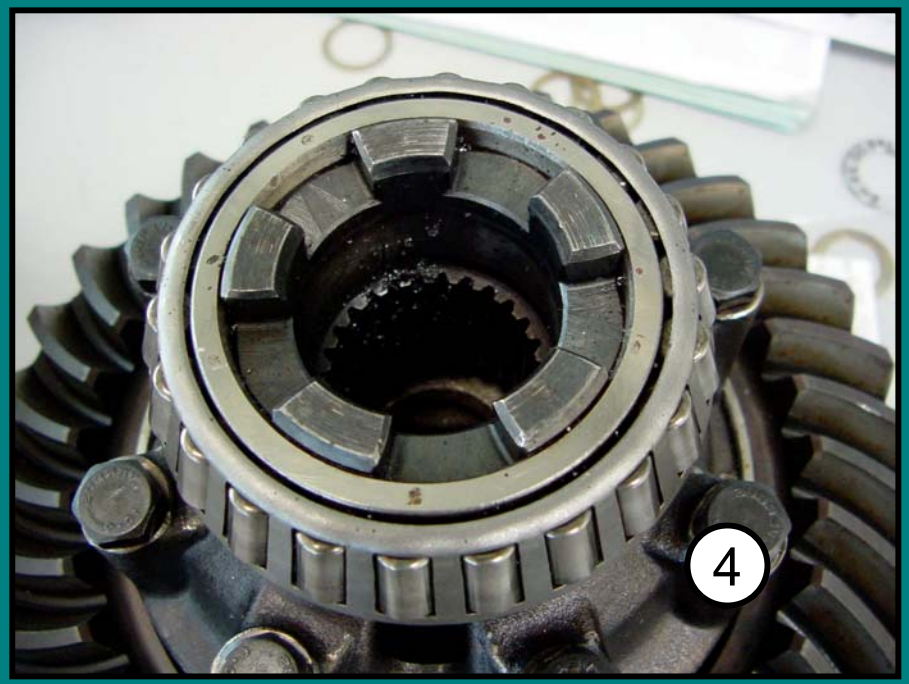
Axle Shift Cylinder

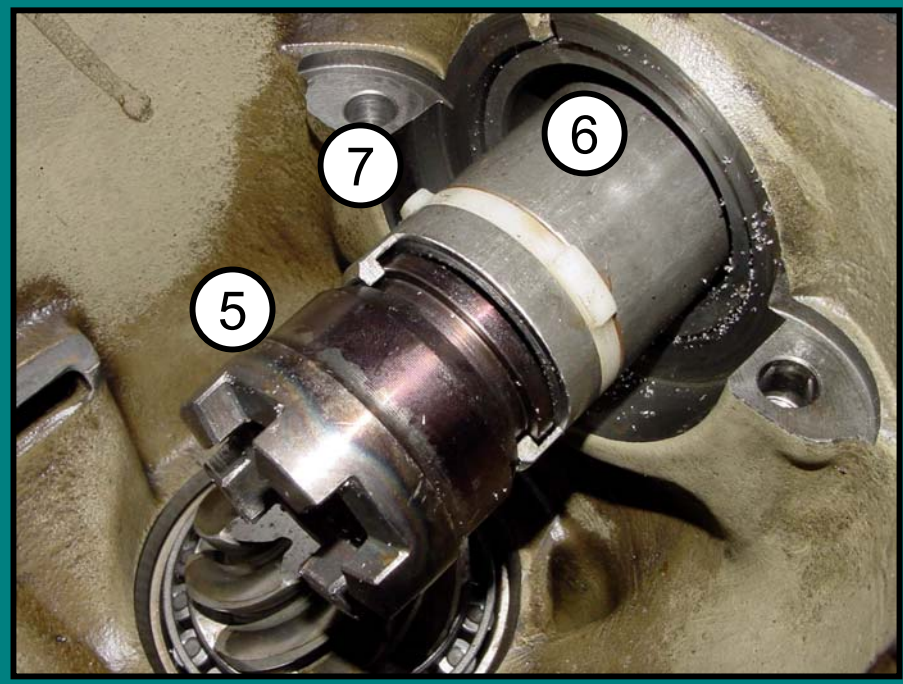


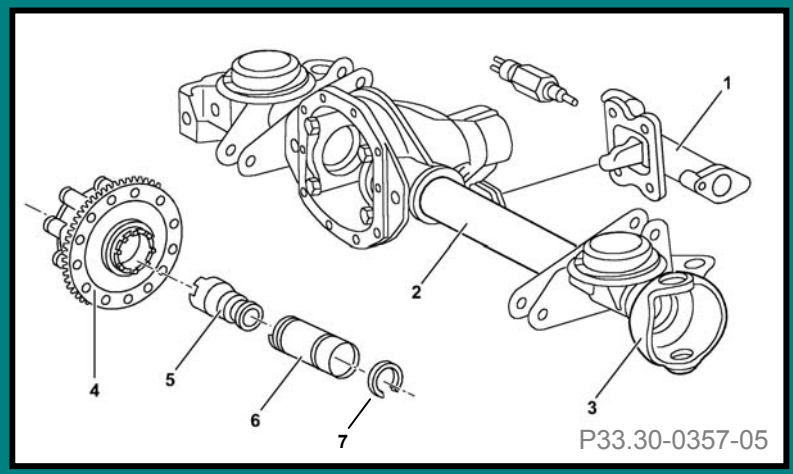
1 End cover with bleeder nipple
2 Gasket
3 Shift piston
4 Spring
5 Shaft
6 Compression spring
7 Lever
8 Shift sleeve
9 Confirmation switch
10 Shift cylinder

- Hydraulic force moves the shift piston
- Piston movement causes mechanical movement of the shaft and lever
- Switch S76/8,9 confirms lever at end stop (engaged)

Axle Locking Elements

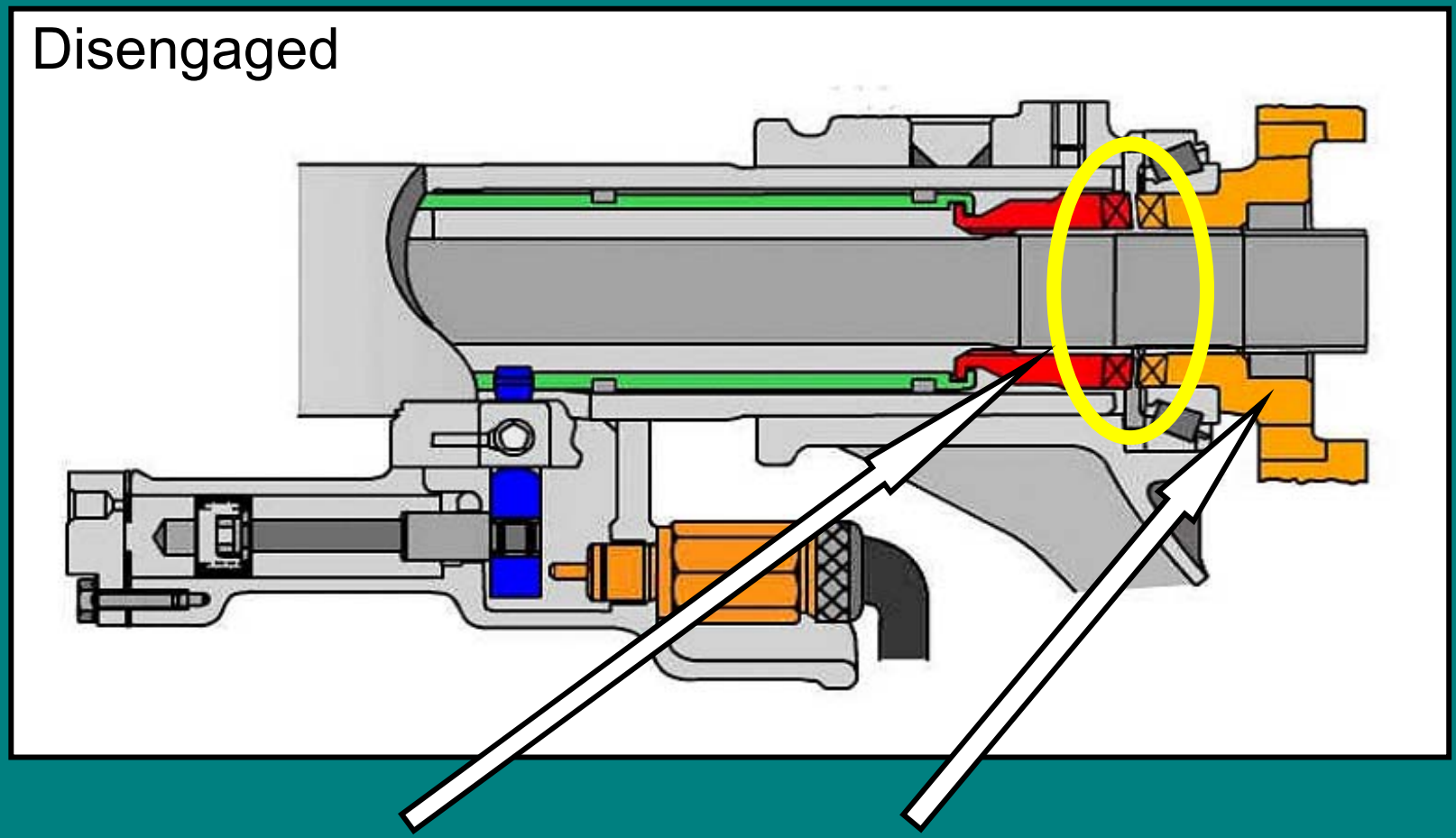






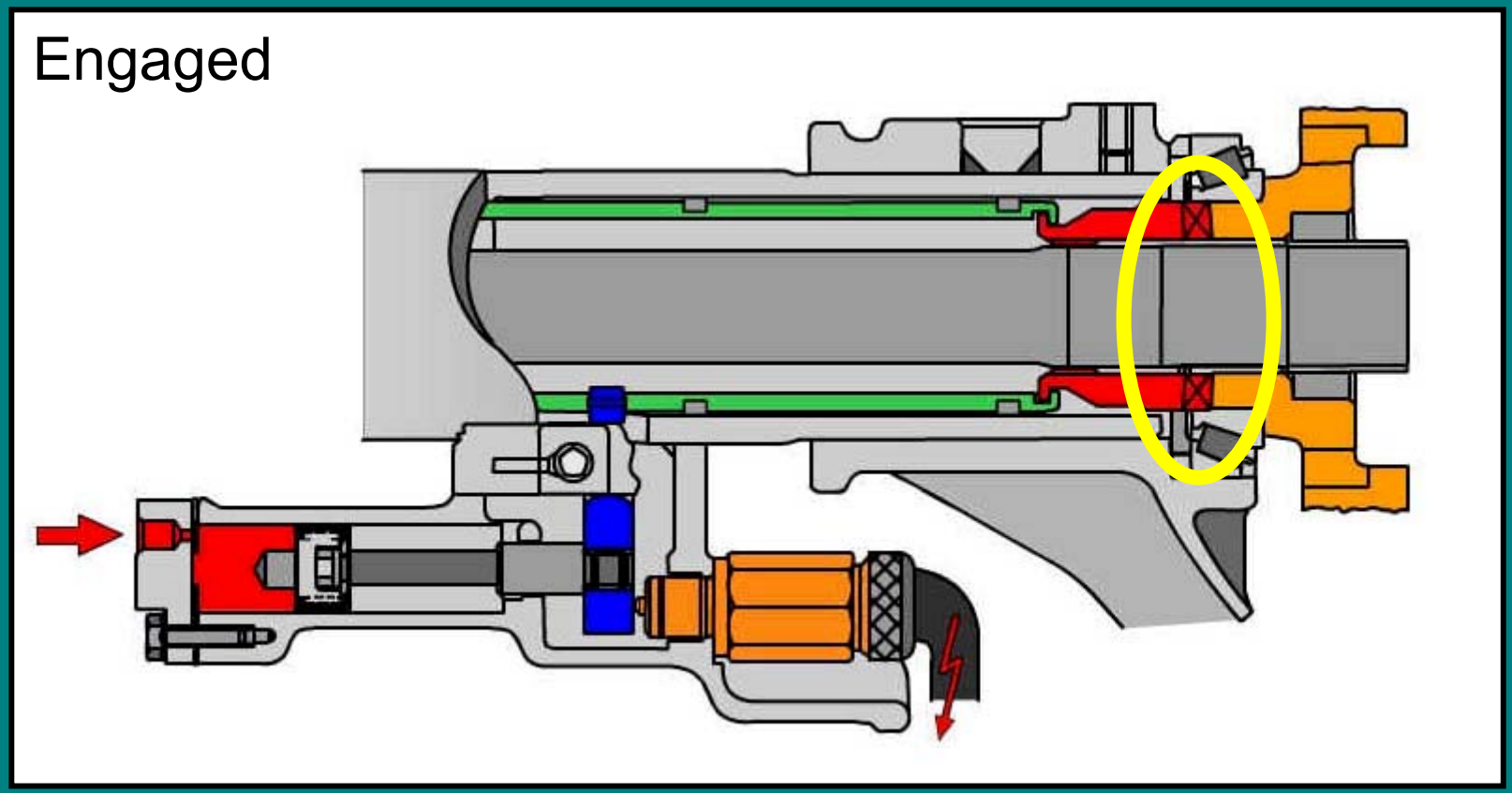
1. Shift cylinder
2. Axle tube
3. Joint housing
4. Center drive
5. Shift sleeve
6. Shift tube
7. Polyamide ring

Axle Differential Lock



Shift sleeve not engaged with center drive

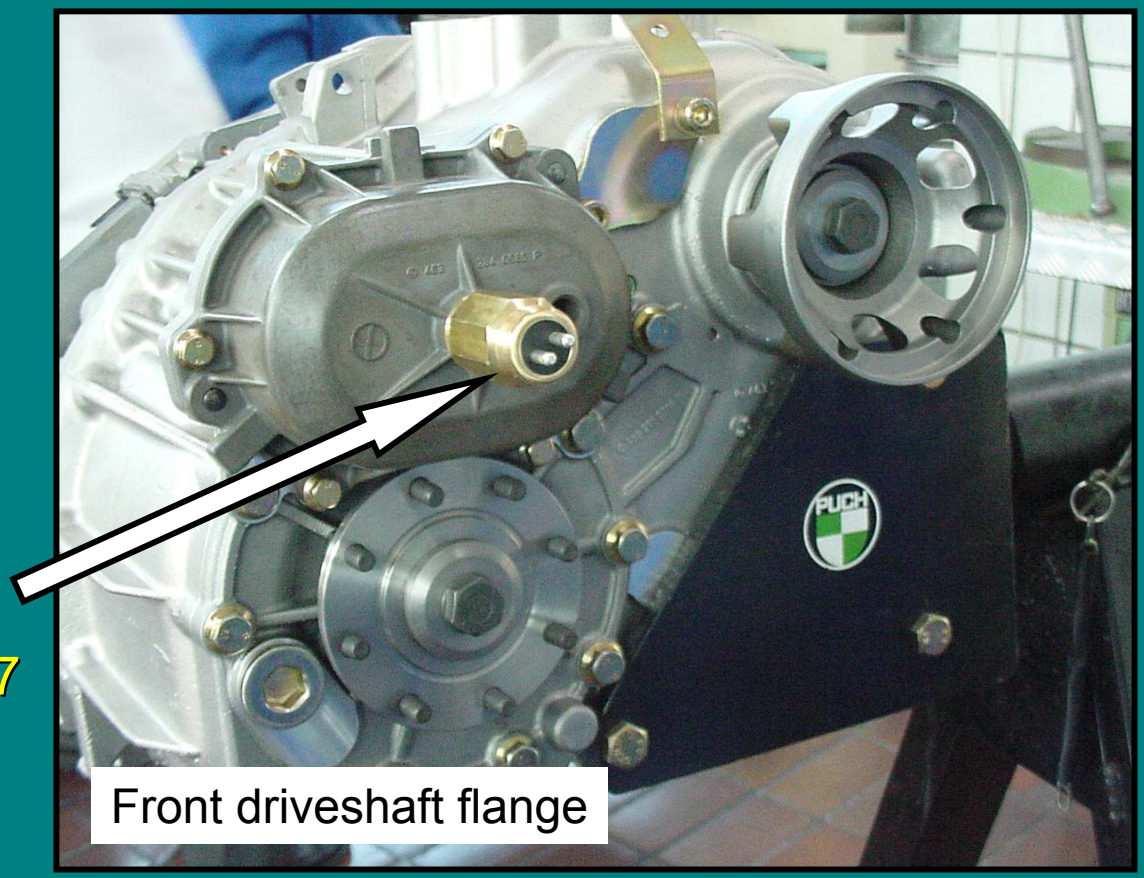
Axle Differential Lock



- Adjust shift cylinder position when lock engaged
- Shift lever can be bent if engaged while wheel slipping
- If shift lever bent or incorrectly adjusted the switch will not be operated

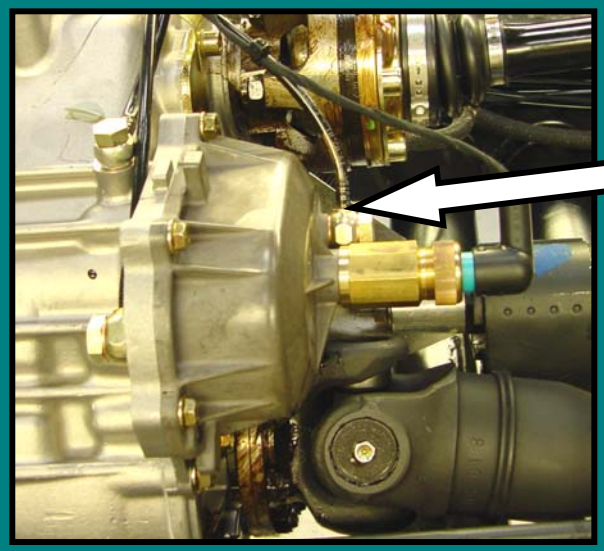
Transfer Case Differential Lock

- Operated by vacuum only
  (No hydraulic circuit)
- Locks front & rear
  driveshafts together
- Locking confirmed by S76/7



Location: front of transfer case

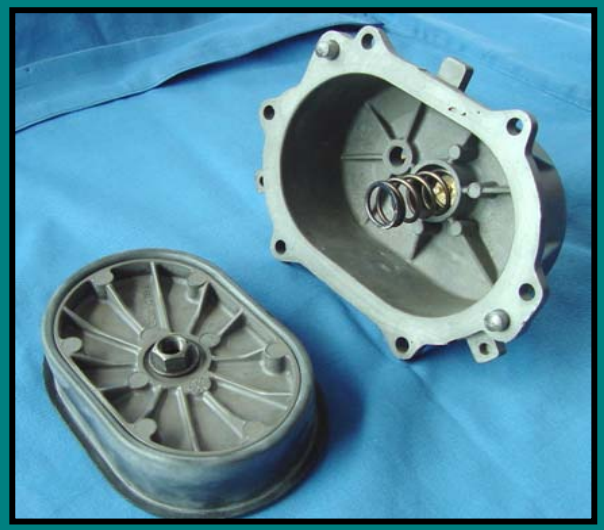
Differential Lock



Vacuum line

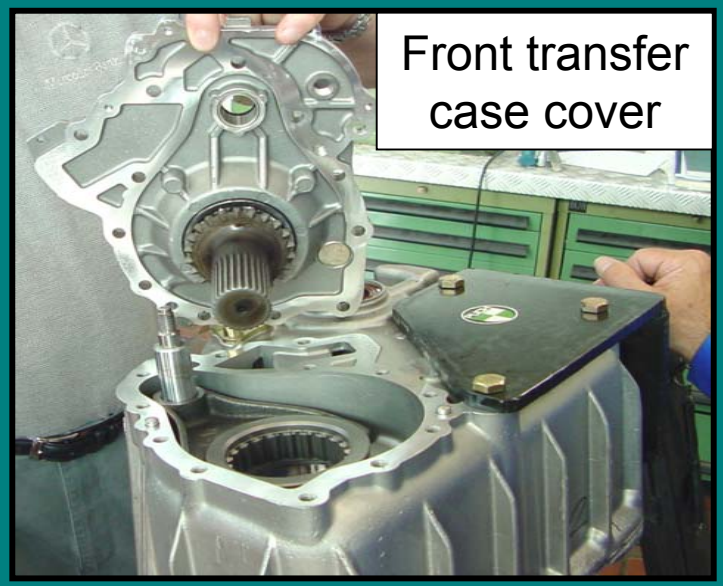
Shift Cylinder Housing

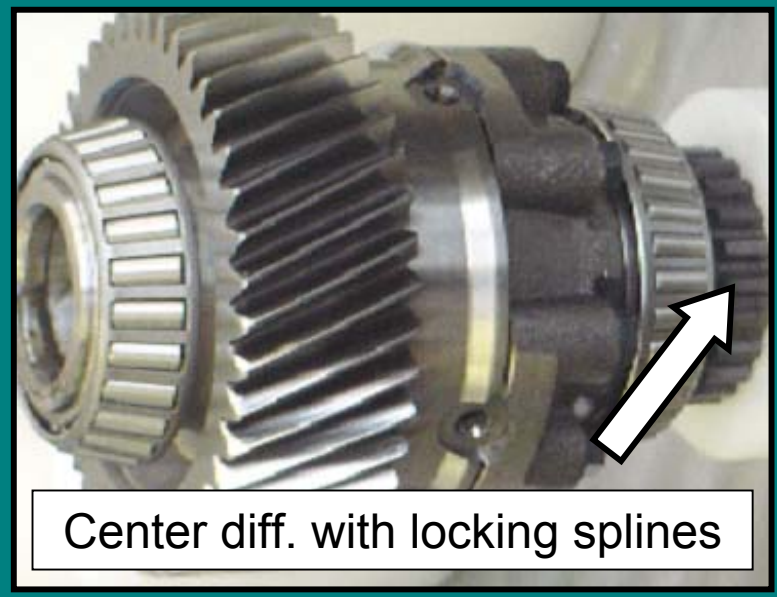
Diaphragm

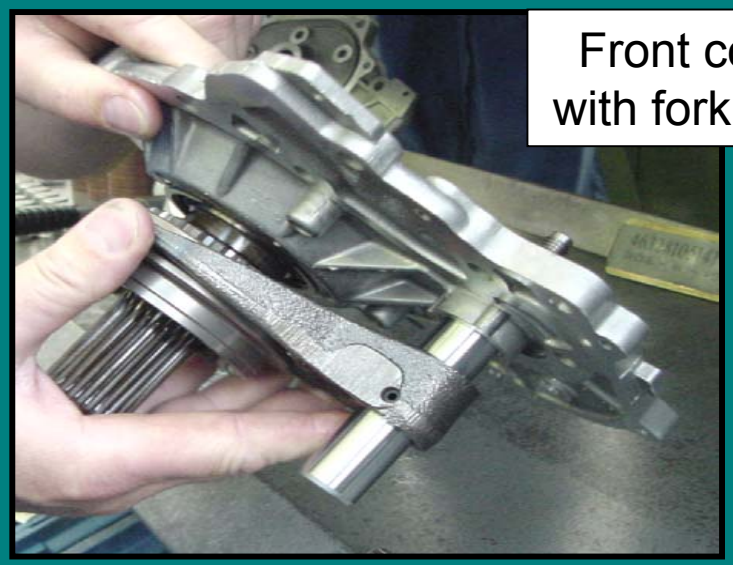


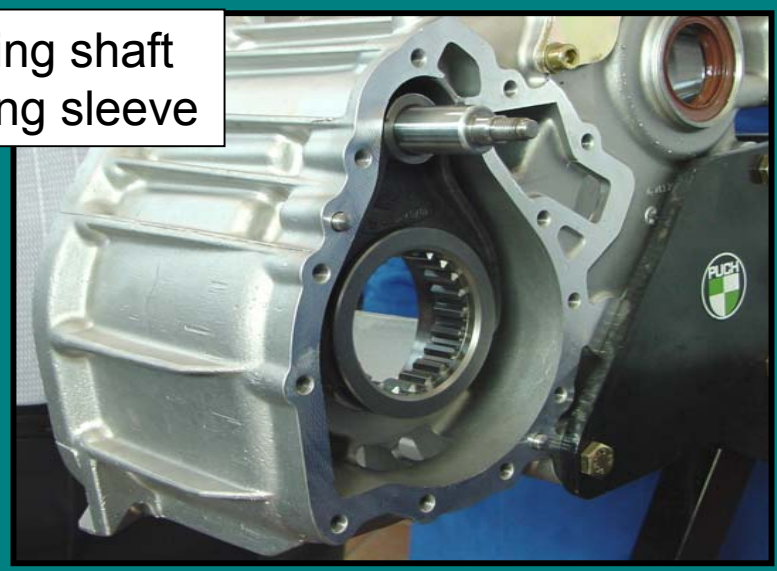
O-ring

Differential Lock


Front transfer case cover


Center diff. with locking splines

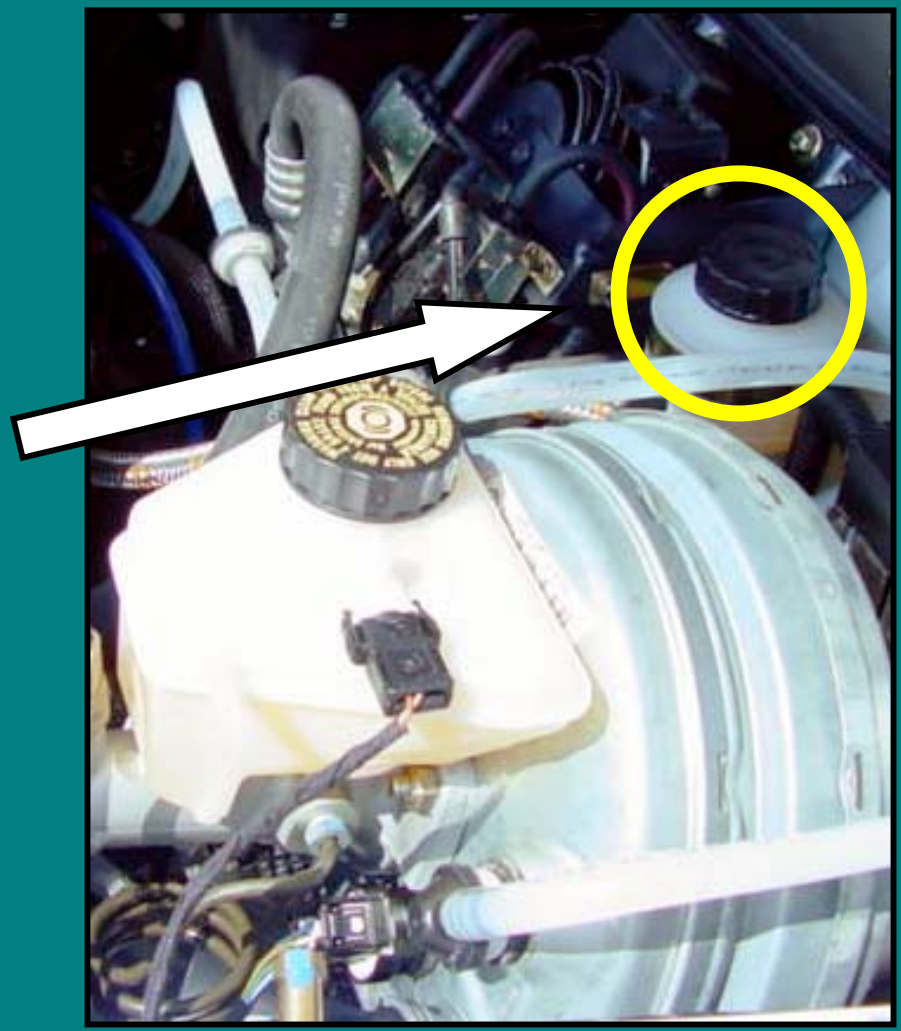

Front cover, sliding shaft with fork and sliding sleeve



Maintenance

Every A & B service:

- Check & correct fluid level
- DOT 4 Plus brake fluid
- Engage differential locks for short distance



Preventative maintenance every 3 - 5 years:

- Replace fluid

Maintenance

The WIS job number for bleeding the front and rear differential locks is AR33.40-P-0701GG.