G Class
Differential Locks
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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

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

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

Differential Locks

Warning! Never use differential locks on paved roads! Engaged differential locks limit the ability to move around curves.
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

Inputs:
• Differential lock confirmation switches
• 58d lighting

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

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

- Rear diff. Lock (Y68/1)
- Front diff. Lock (Y68/2)
- Center diff. Lock (Y68)
- Breather lines for axles, transfer case & diff. lock

Location: mounted on the firewall right of the brake booster
Differential Lock Switchover Valves

- Vacuum supply
- Output vacuum lines for rear
- Output vacuum lines for center & front
- Vent filters
Pressure Intensifier Units

Task:
- Convert vacuum to hydraulic
- Provide hydraulic pressure

Location: inside of left frame rail

Breather
Front axle
Rear axle
Driving direction
From fluid reservoir
from switchover valves
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

- Differential lock reservoir
- ~0.4 bar vacuum from switch over valve
- Pressure intensifier unit
- Shift cylinder
- ~15.0 bar hydraulic pressure

axle circuit illustrated
Axle 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

Disengaged

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.