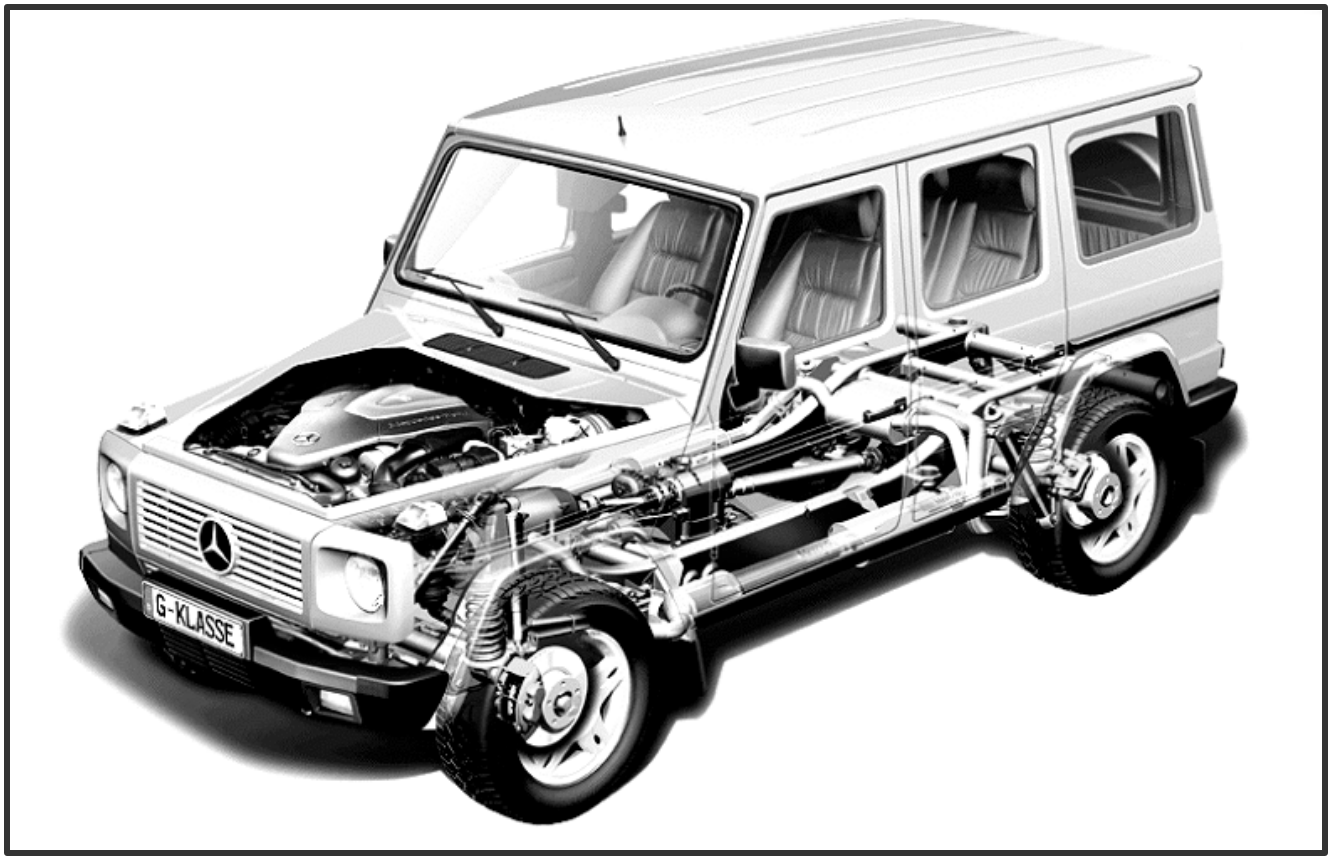
Mercedes-Benz

G-Class
Transfer Case



Starting MY2002

Objectives

At the end of this presentation, you should be able to:

1. Explain the function of the G-class transfer case
2. Describe the customer operation of High/Low speed selection and locking of center differential
3. List the mechanical components used in the G-class transfer case
4. Describe the power flow through the transfer case in High, Low and Low with locked differential
5. List the electrical components used in the G-class transfer case
6. List the vacuum components used in the G-class transfer case
7. Describe how the center differential lock is actuated
8. Locate background and diagnostic information concerning the G-class transfer case

Contents

Traction Advantages

- Transfer case with High and Low range
- Locking center differential in transfer case
- Additional locking differentials at front and rear axles provide increased off-road capabilities

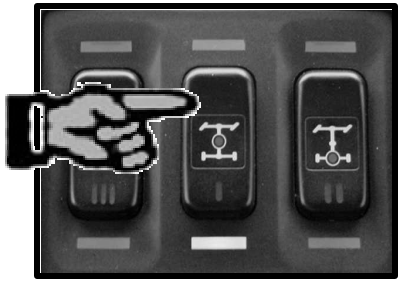
Selecting High/Low Range

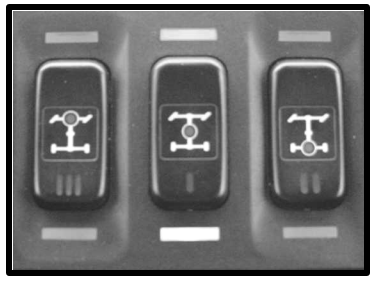
- Low range can be selected for driving off-road or on steep grades
  - Do with engine running, transmission in “N”, and vehicle speed < 25 mph
  - Transmission upshifting can only be done manually
- High range can be reselected for normal driving
  - Switch out of Low range with engine running, transmission in “N”, and vehicle speed < 40 mph
- Neutral can be selected with engine stopped, ignition switch in position 1 or 2, and parking/service brakes applied. Next, press and hold “Low” for > 4 seconds. Reverse procedure to deselect.
- “L”, “H” or “N” will be displayed in instrument cluster as appropriate

Locking Differentials

- Differential locks should not be used on paved roads-drivetrain components can be damaged
- Use when driving off-road, fording or when driving on snowy, icy or muddy surfaces
- Center differential lock (in transfer case) must be engaged before front or rear differentials are allowed to engage
- Engaging differential locks causes ABS, BAS and ESP to be switched OFF
- To avoid damage to transfer case, engage center differential lock only when vehicle speed is = 5 mph, and when all wheel speeds are equal

Lock request



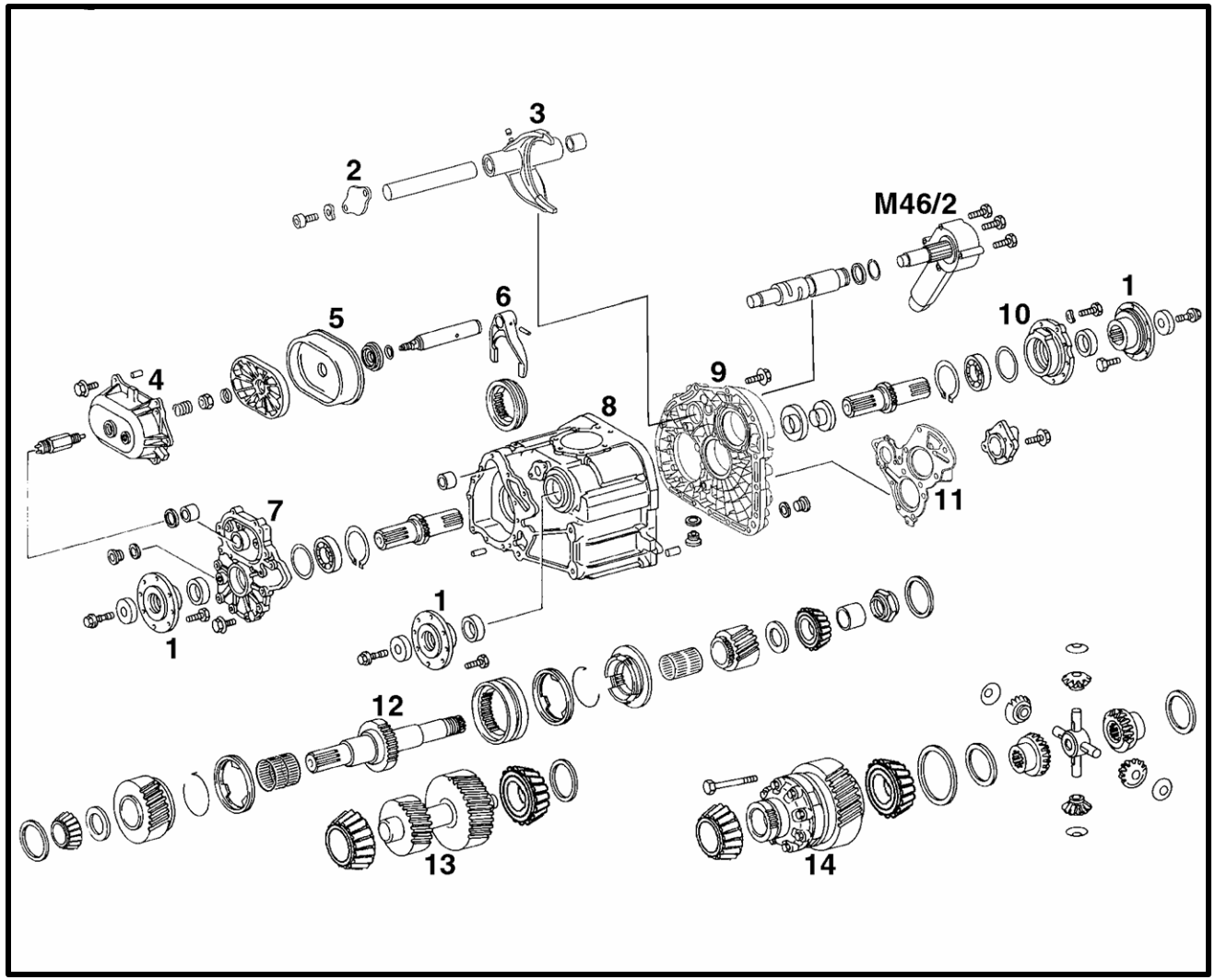


Lock engaged

Transfer Case-Mechanical Components

1. Coupling flange
2. End cover
3. Shift fork
4. Shift cylinder housing
5. Diaphragm
6. Differential lock shift mechanism
7. Front transmission cover
8. Transmission housing
9. Intermediate flange
10. Rear axle input shaft cover
11. Intermediate flange cover
12. Input shaft
13. Countershaft
14. Differential

(M46/2) Transfer case actuator motor

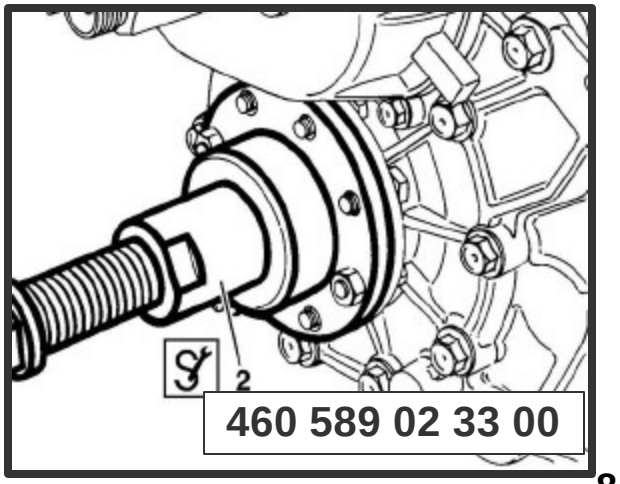


Coupling Flanges

Flange position is vital:

- mark propeller shaft to flange
- mark flange to shaft

Tool for removing coupling flanges



Concentricity of Coupling Flanges

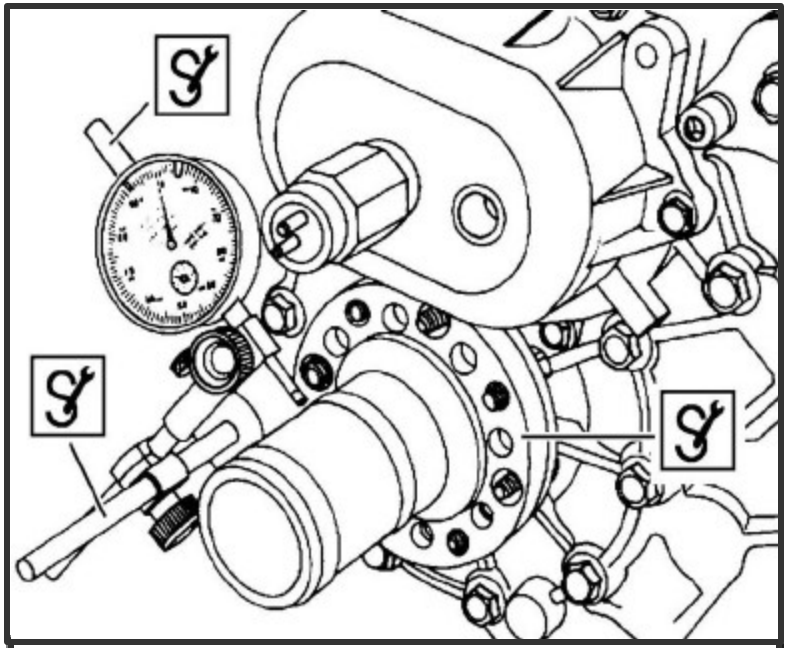
Check concentricity of flange:

- for vibration complaint
- after replacement of coupling flange

Specification: £ 0.07 mm

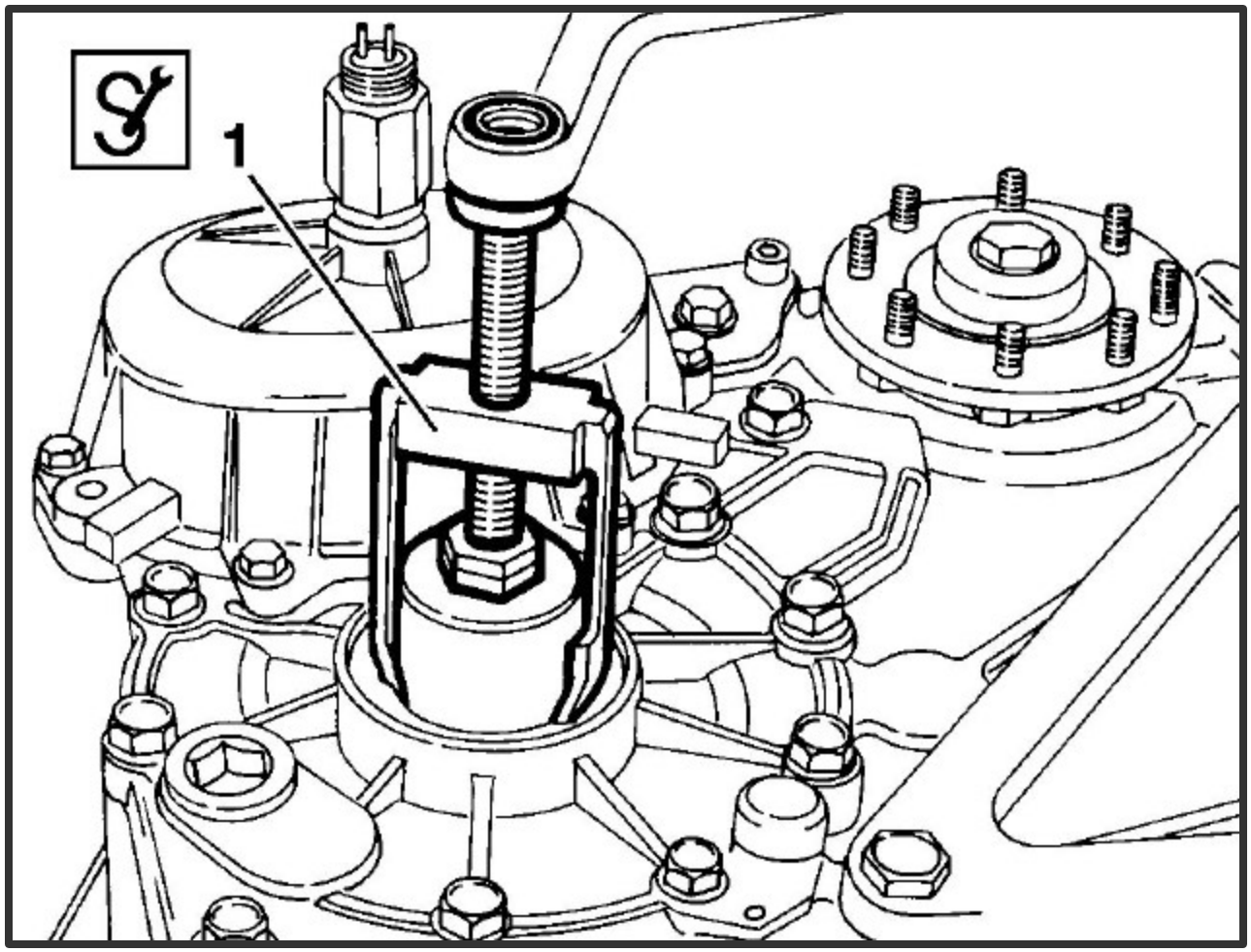
If there are deviations, perform adjustment:

1. Offset flange 180º clockwise & recheck
2. If not within specification offset flange 90º clockwise & recheck
3. If not within specification offset flange 180º clockwise & recheck
4. If the specified concentricity value is not achieved, replace flange & recheck



Measuring flange	460 589 01 23 00
Dial gauge	001 589 53 21 00
Dial gauge holder	363 589 02 21 00

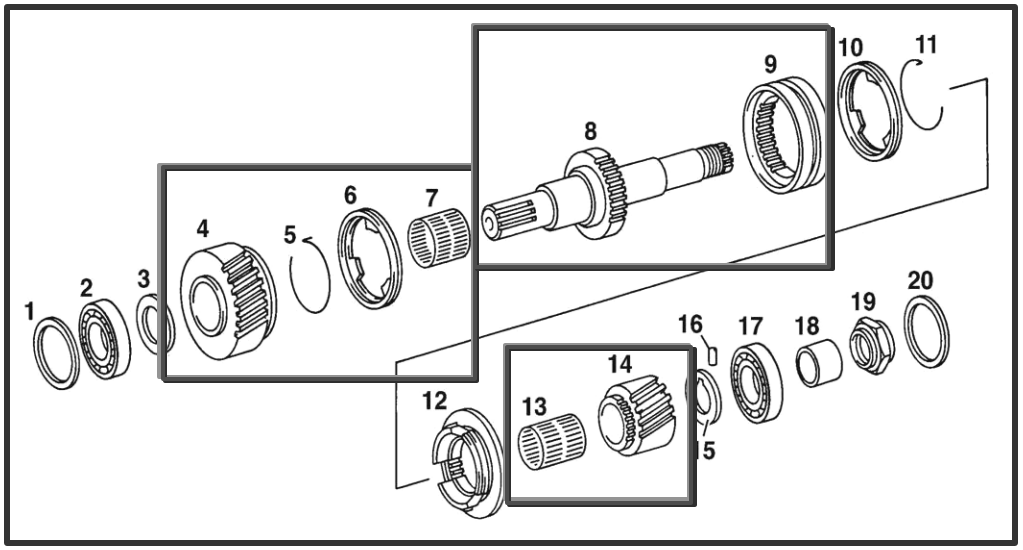
Removing Radial Shaft Seals

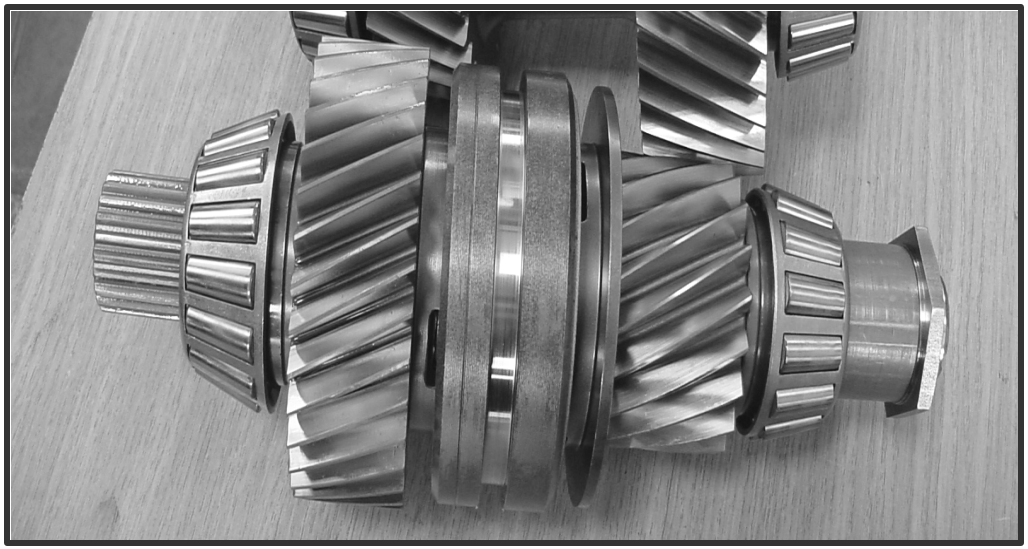


Puller part # 463 589 00 33 00 28 B

Input Shaft

1. Washer
2. Tapered roller bearing
3. Washer
4. High range gear
5. Spring
6. Synchronizer cone
7. Needle roller bearing
8. Input shaft
9. Sliding sleeve
10. Synchronizer cone
11. Spring
12. Synchronizer ring
13. Needle roller bearing
14. Low range gear
15. Washer
16. Straight pin
17. Tapered roller bearing
18. Spacer nut
19. Nut
20. Washer

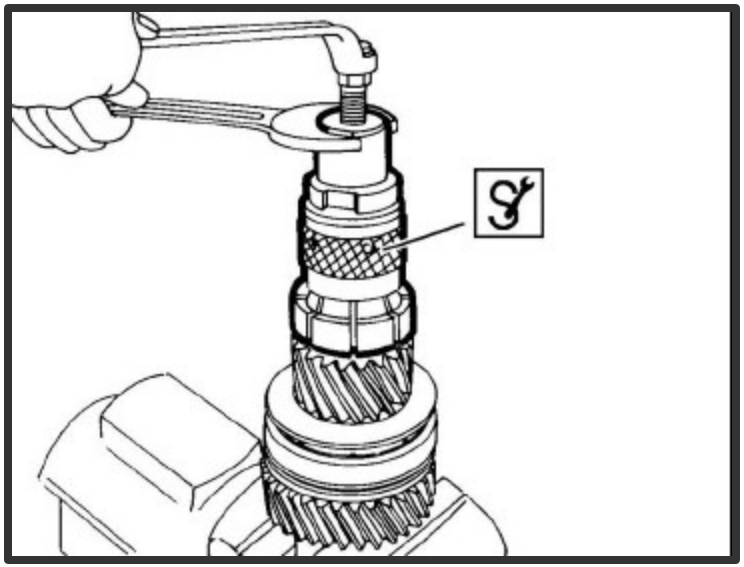




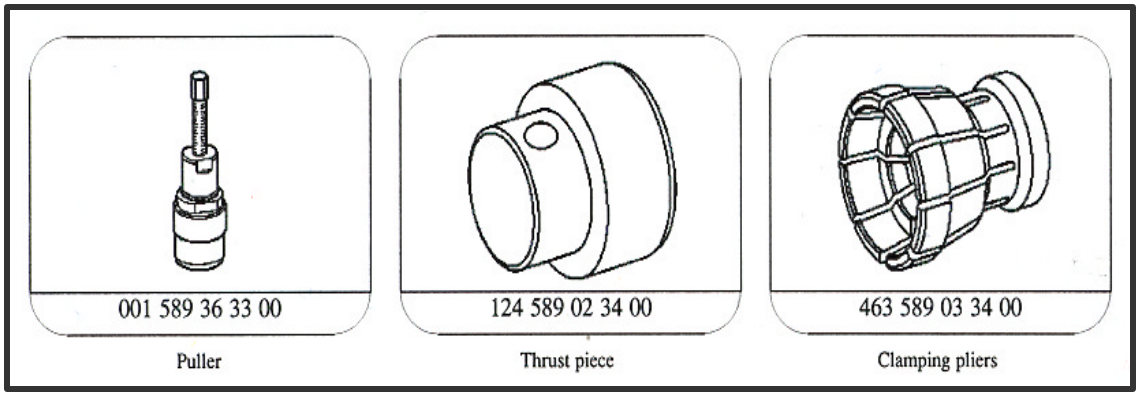
Input Shaft

Input shaft serviceable

- use correct tools as described in WIS to disassemble / assemble shaft
- when installing new bearings heat bearings to 120ºC Max.

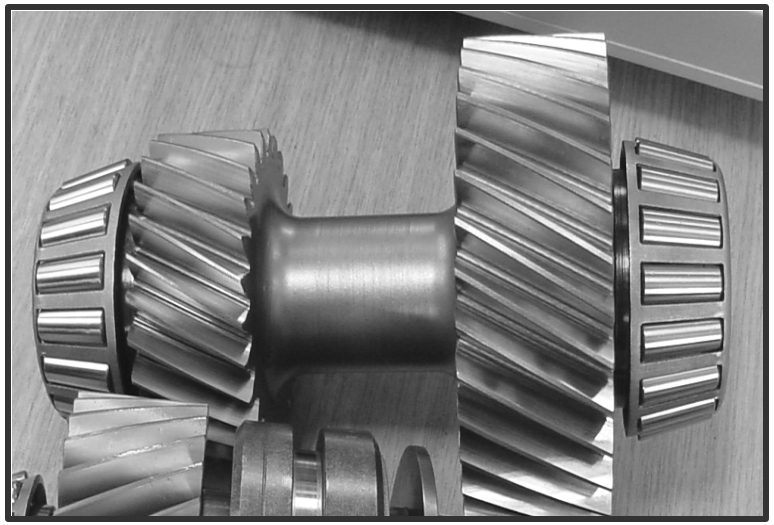


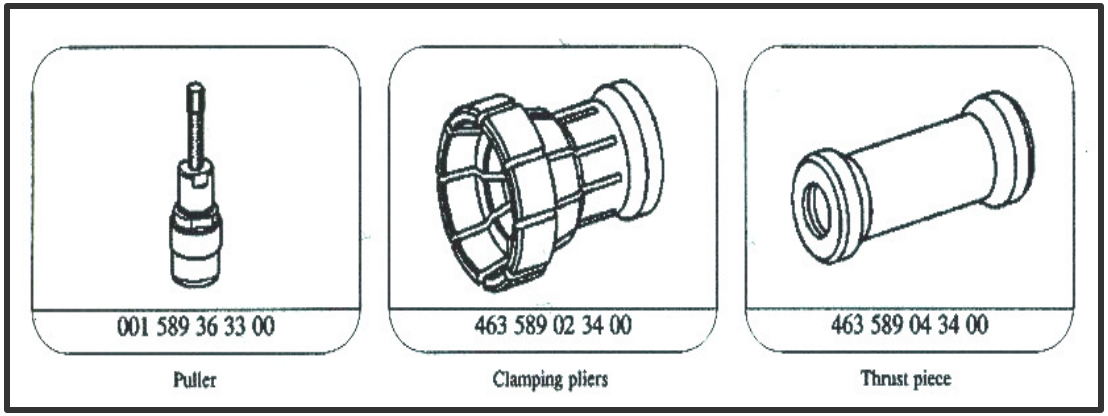
If parts are replaced adjust input shaft preload



Countershaft

- Countershaft gears not serviceable
  - if damaged, replace assembly
- Countershaft bearings serviceable
  - use correct tools as described in WIS to disassemble / assemble shaft
  - when installing new bearings heat bearings to 120ºC Max.

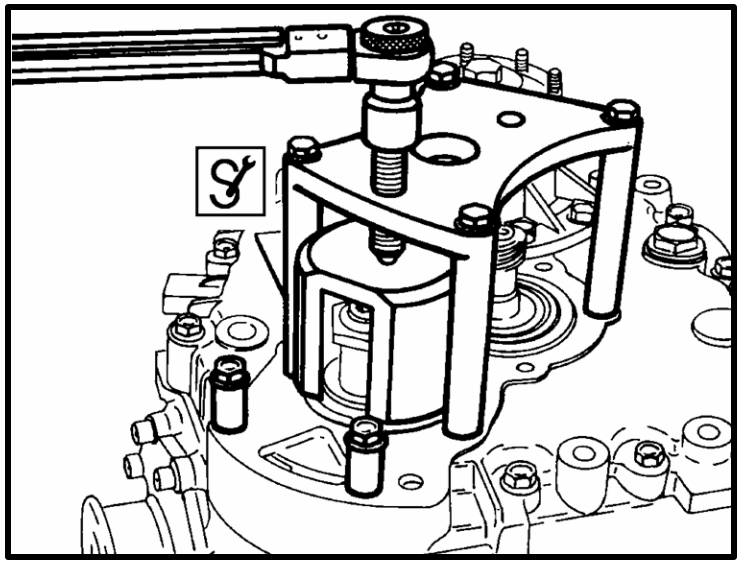




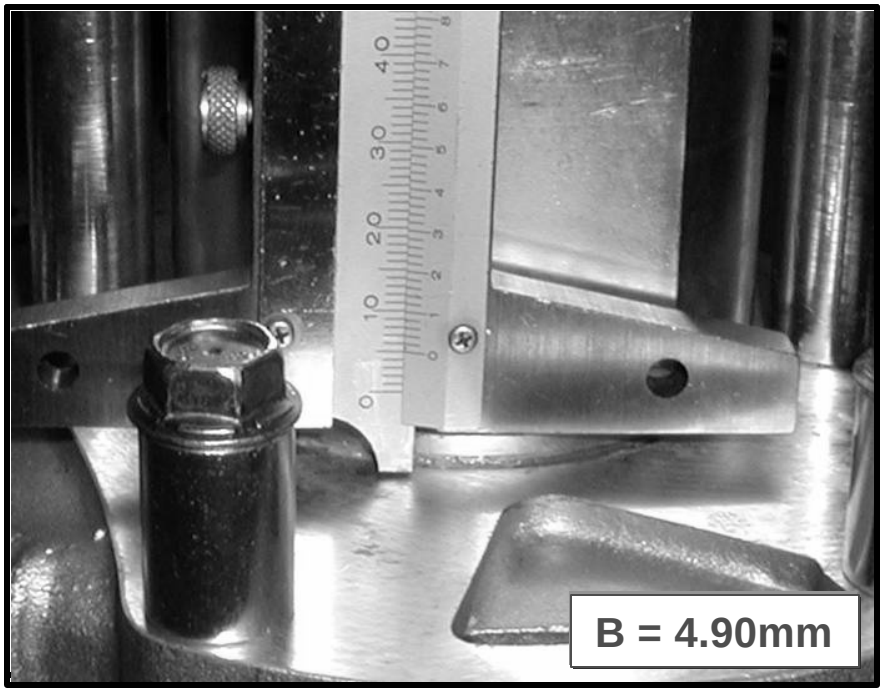
If parts are replaced adjust countershaft axial play

Axial Play Measurement

Procedure is the same for the input and countershaft. The following example shows input shaft.



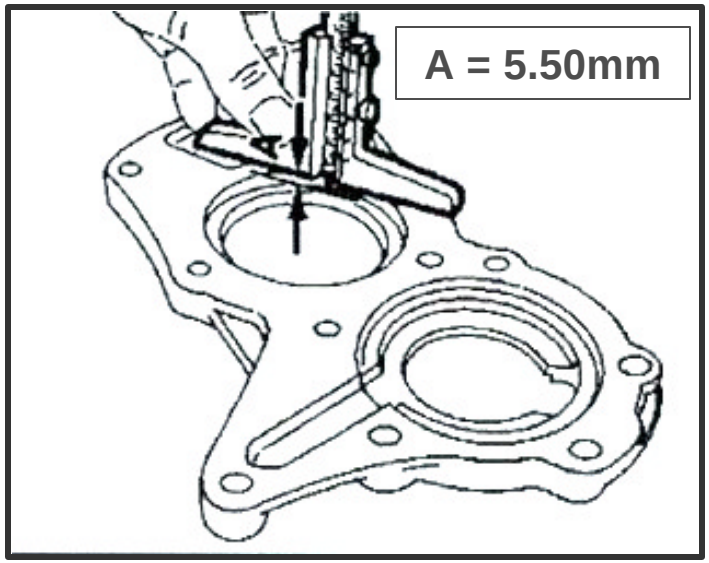
Thrust device #463 589 00 21 00



1) Install thrust device with spacers & tighten compressing bolt to 15 Nm
2) Spin input shaft approx. 10 times to position the bearings
3) Measure distance between outer race and intermediate flange
   - B *(example 4.90mm)*

Axial Play Adjustment

4) Measure depth between intermediate flange cover and bearing seat - A

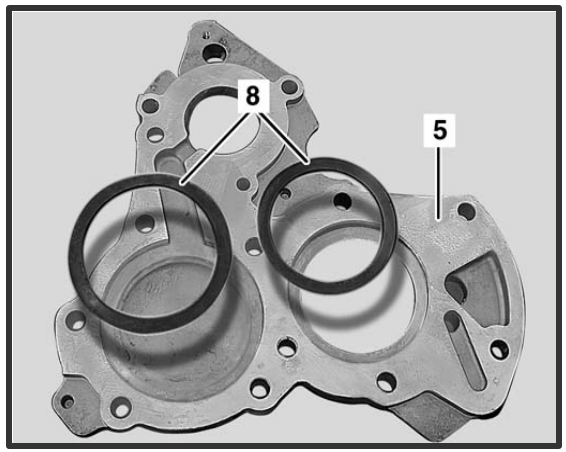


Calculation example:

Depth	A	5.50 mm
Distance	B	− 4.90 mm
Difference		= ***0.60 mm***
Preload on bearings		+ *0.10 mm*
Shims required		= **0.70 mm**

Spec is 0 mm play + preload of (0.1 mm ± 0.05)

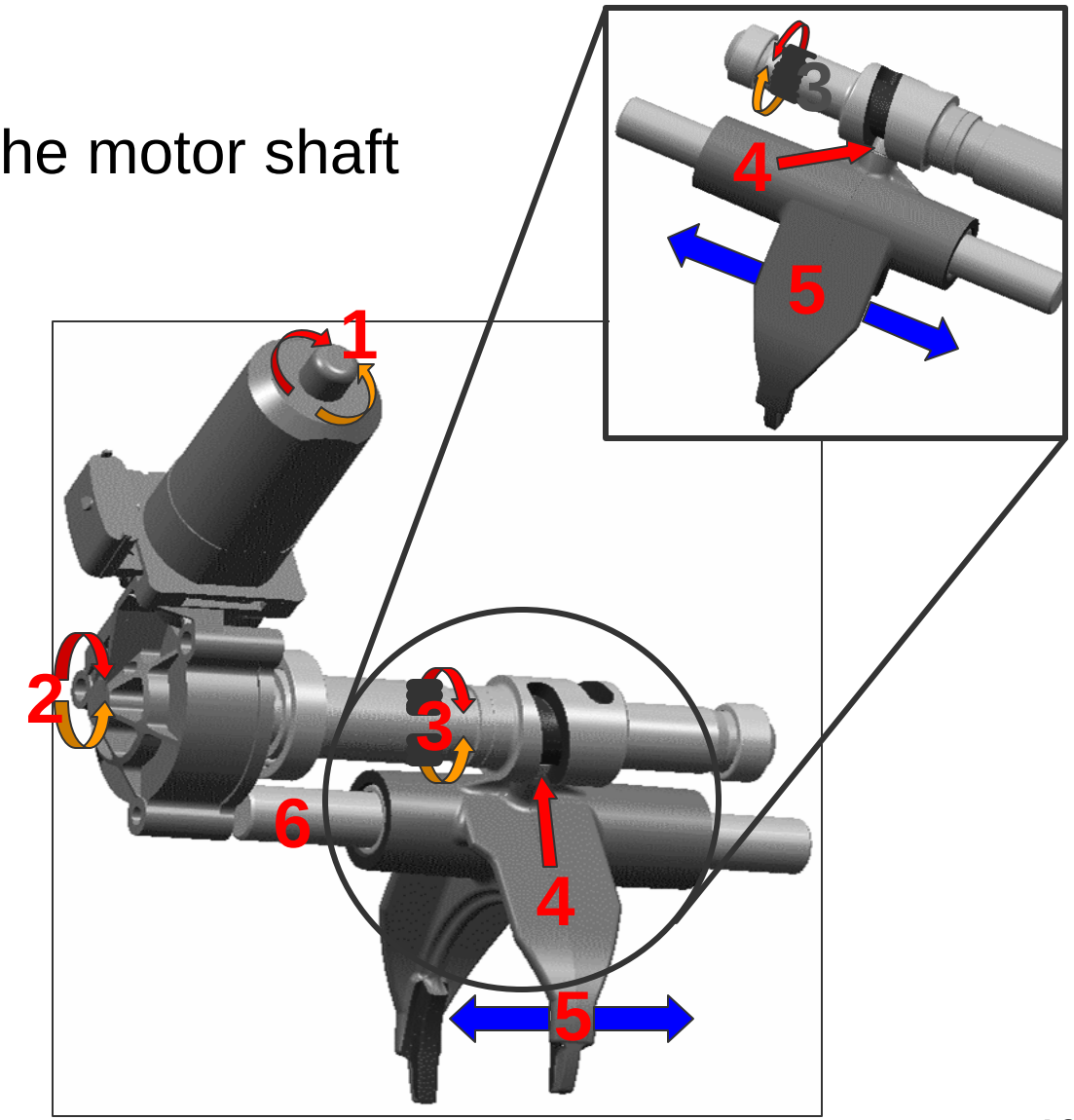
5) Install the appropriate shims:
available thickness ➔ 0.1, 0.15, 0.3 & 1.0 mm



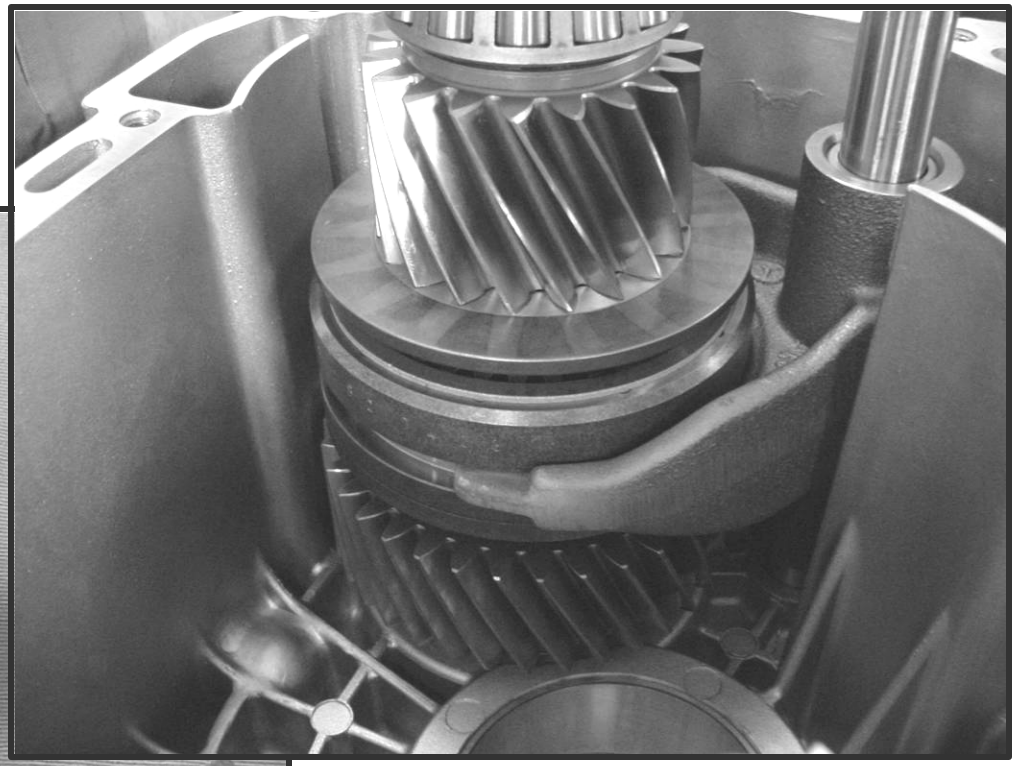
High / Low Shift Fork Operation

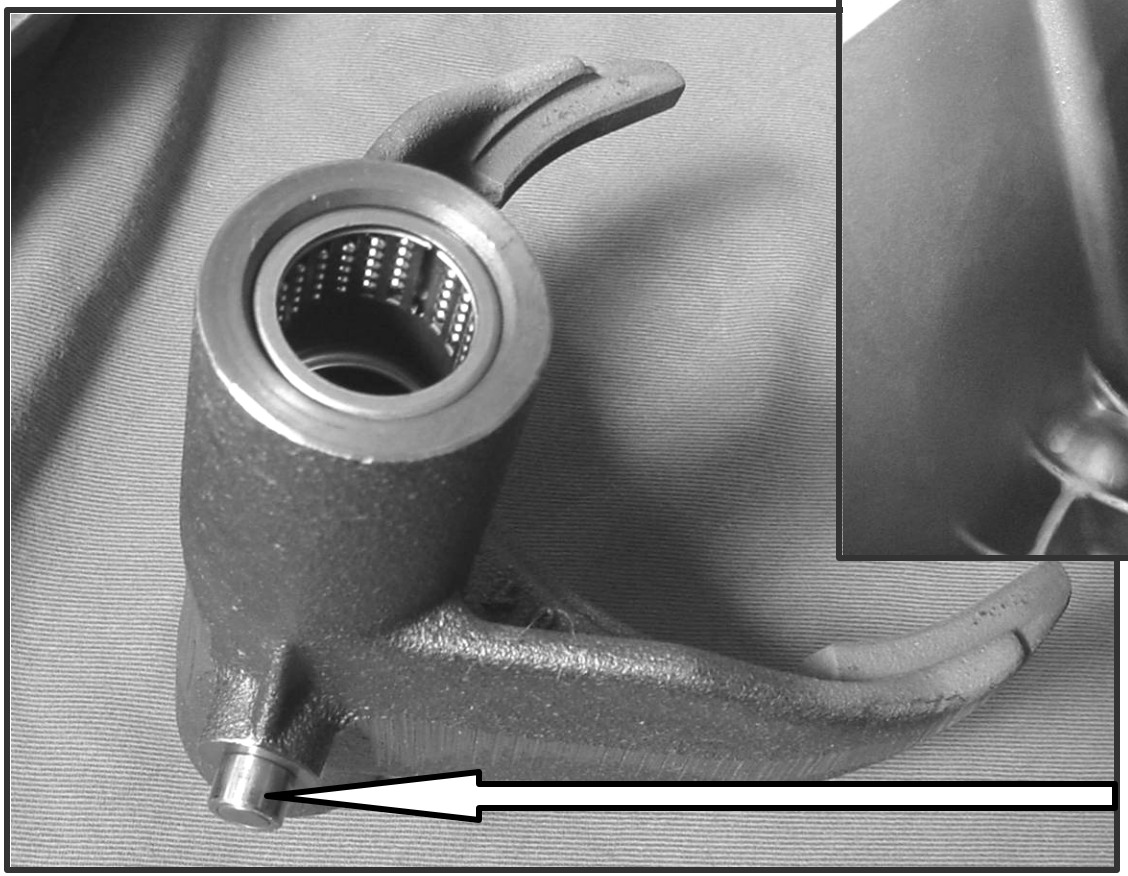
Controlled by rotating the motor shaft

1) Motor (M46/2)
2) Worm gear
3) Actuating wheel
4) Barrel sleeve
5) Shift fork
6) Shifter shaft



High / Low Shift Fork Details

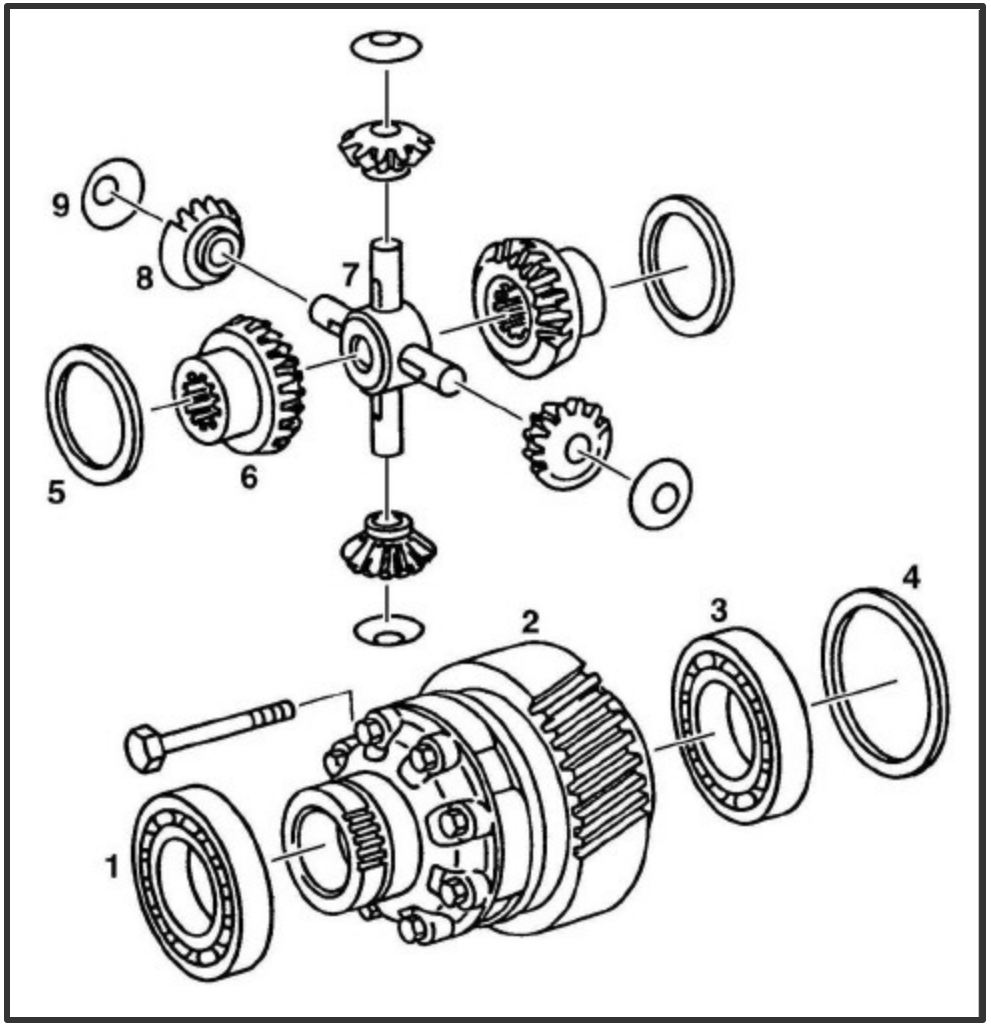




Removable barrel bushing

Center Differential-Exploded View

1. **Front tapered roller bearing *(shown with inner & outer race)***
2. **Differential housing**
3. **Rear tapered roller bearing *(shown with inner & outer race)***
4. **Shim**
5. **Thrust washer**
6. **Shaft bevel gears**
7. **Differential spider gears**
8. **Differential bevel gears**
9. **Spherical washers**

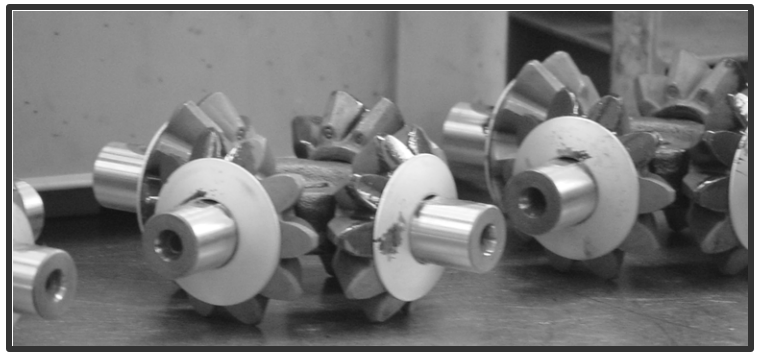


Center Differential

- Center differential serviceable
  - use correct tools as described in WIS to disassemble / assemble
  - when installing new bearings heat bearings to 120ºC Max.

- If replace differential bevel gears
  - check friction torque of differential AR28.50-P-1023-05B

- If other parts are replaced
  - adjust center differential axial play AR28.50-P-1023-04B

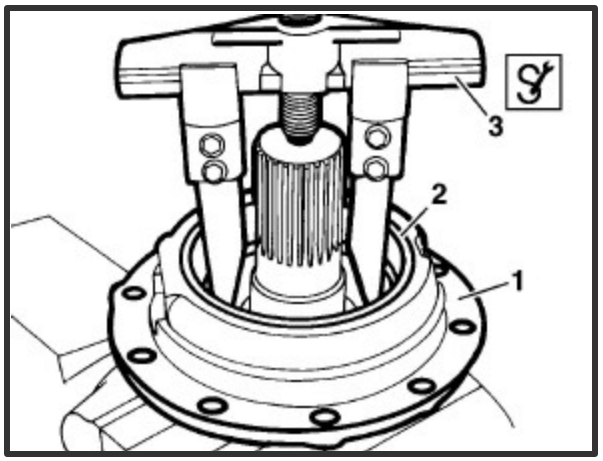


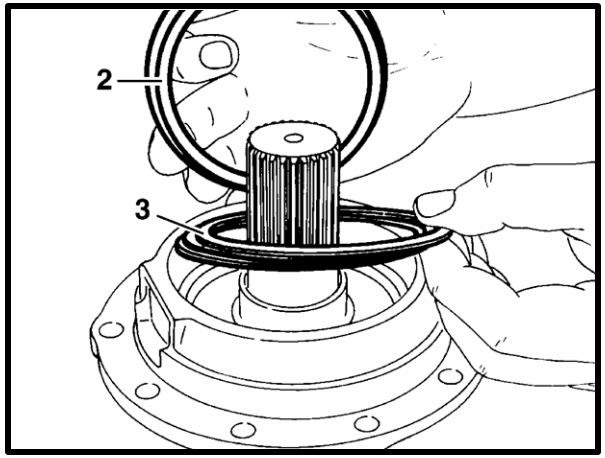
Measuring Center Differential Axial Play

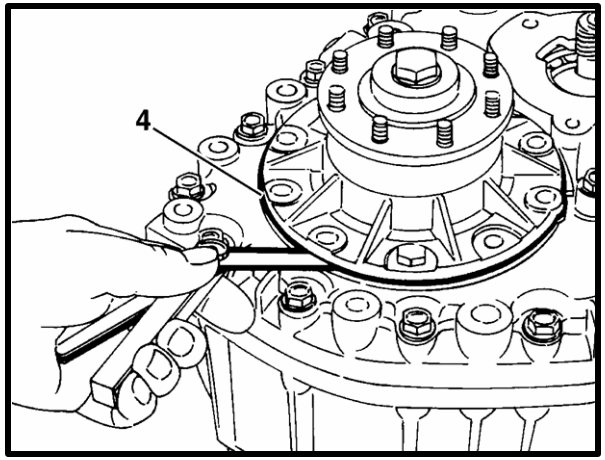
1. **Remove outer race (2) and shims (3) from axle input shaft bearing cap (4)**
2. **Install new outer race with a 1.0 mm shim**
3. **Install axle input shaft cover (4) with 3 equally spaced bolts (5 Nm)**
4. **Measure gap at bearing cap with feeler gauge - (e.g. 0.80 mm)**
5. **Calculate correct shim required: Specification = 0.1 mm (+/- 0.05 mm)**

   0.80 mm - 0.10 = 0.70 mm shim (shims available 0.1, 0.15, 0.3 & 1.0 mm)

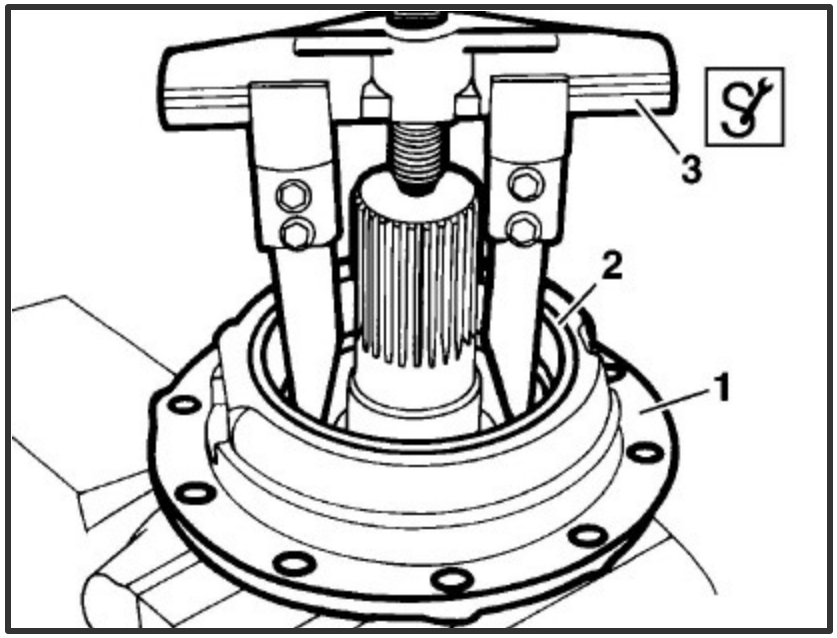
6. **Remove outer race and reinstall with appropriate shims**

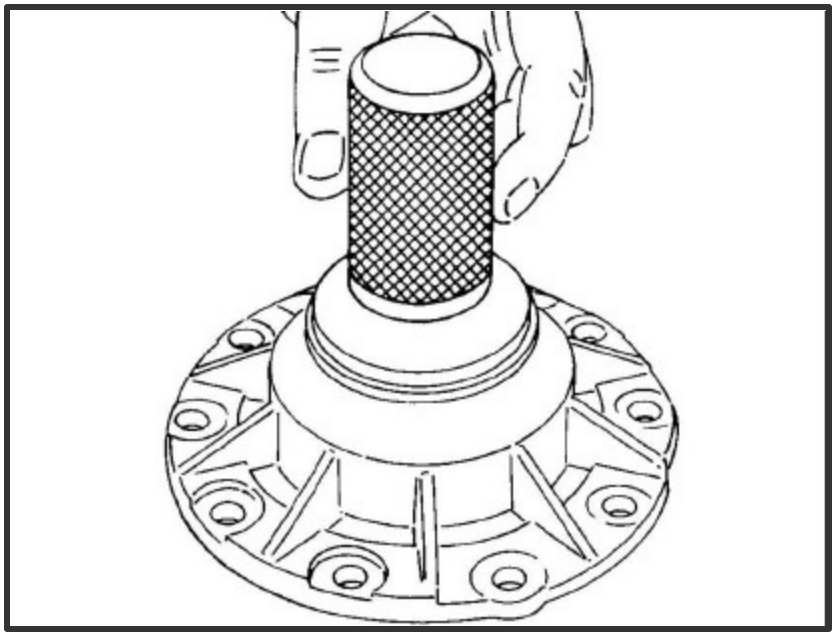






Bearing Cap



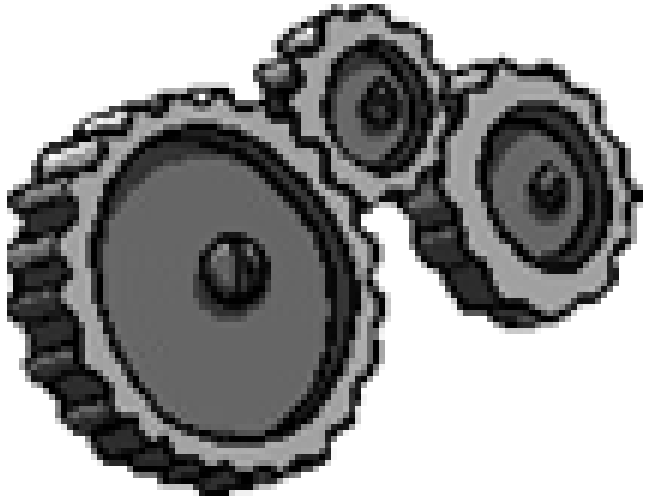


Puller 000 589 88 33 00 28 B

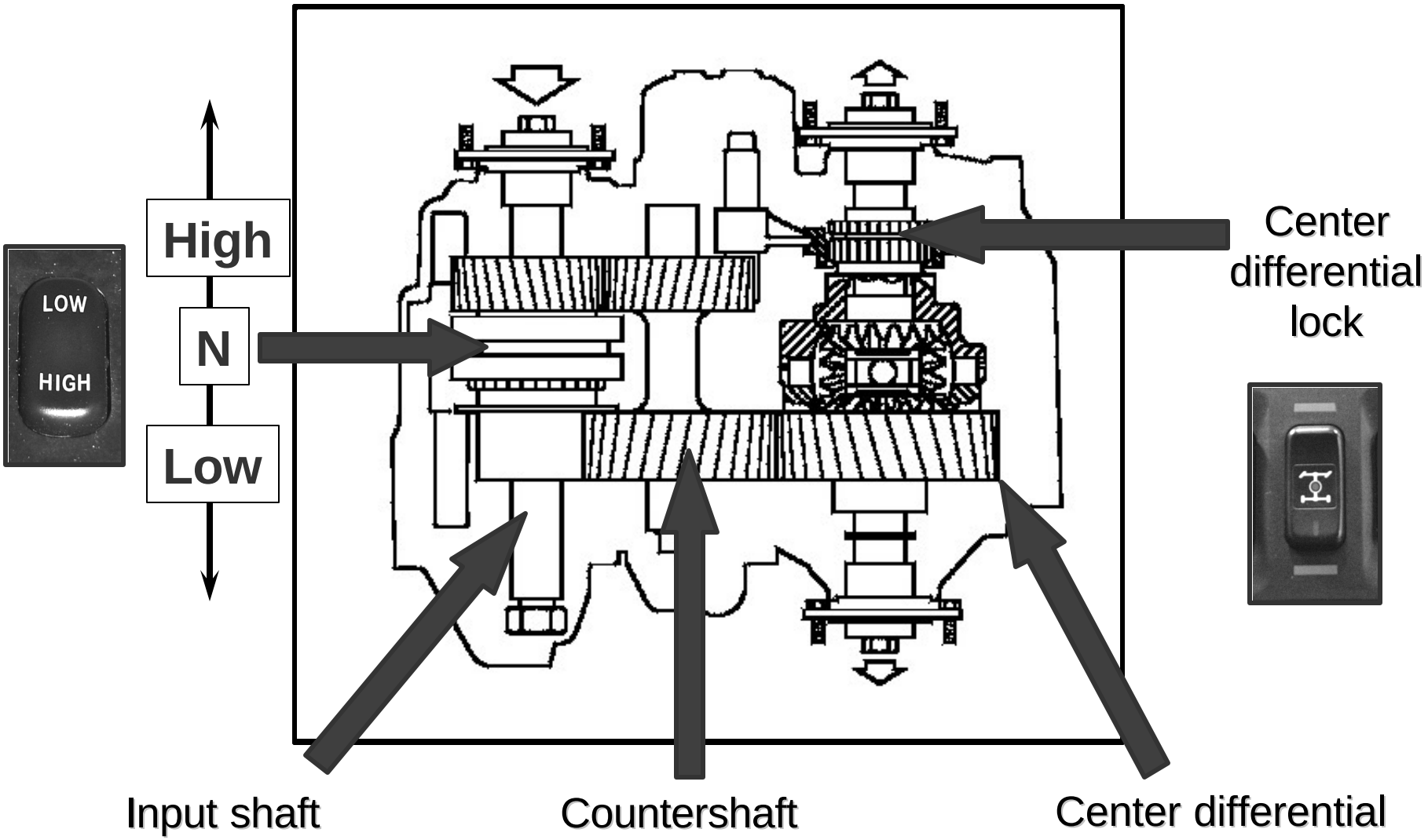
- Used with puller arms
- 463 589 05 34 00 (26C)
- Thrust piece 463 589 01 34 00 (28B)

Drift punch 463 589 00 15 00 28 B

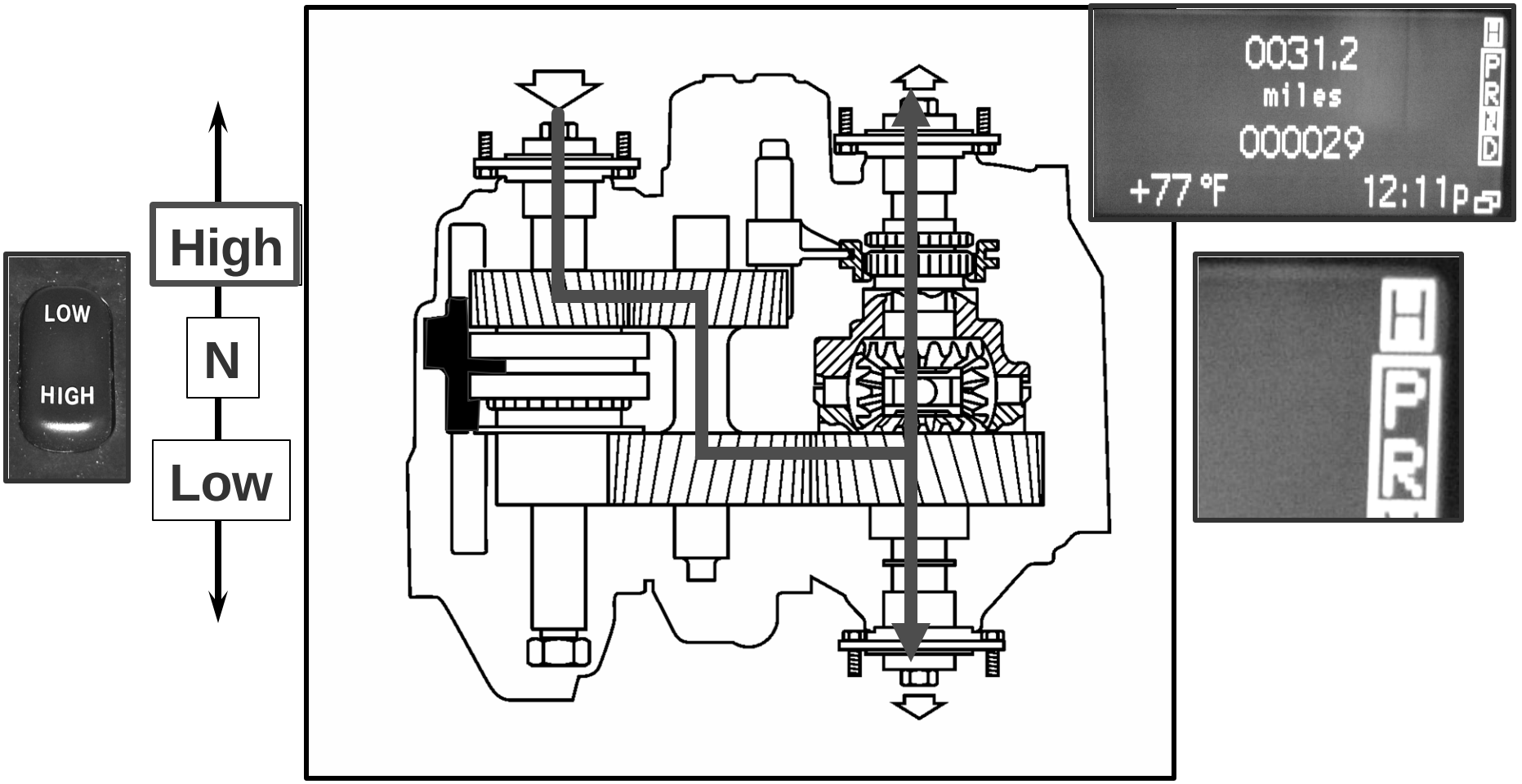
Transfer Case Power Flow



Transfer Case Gears & Controls

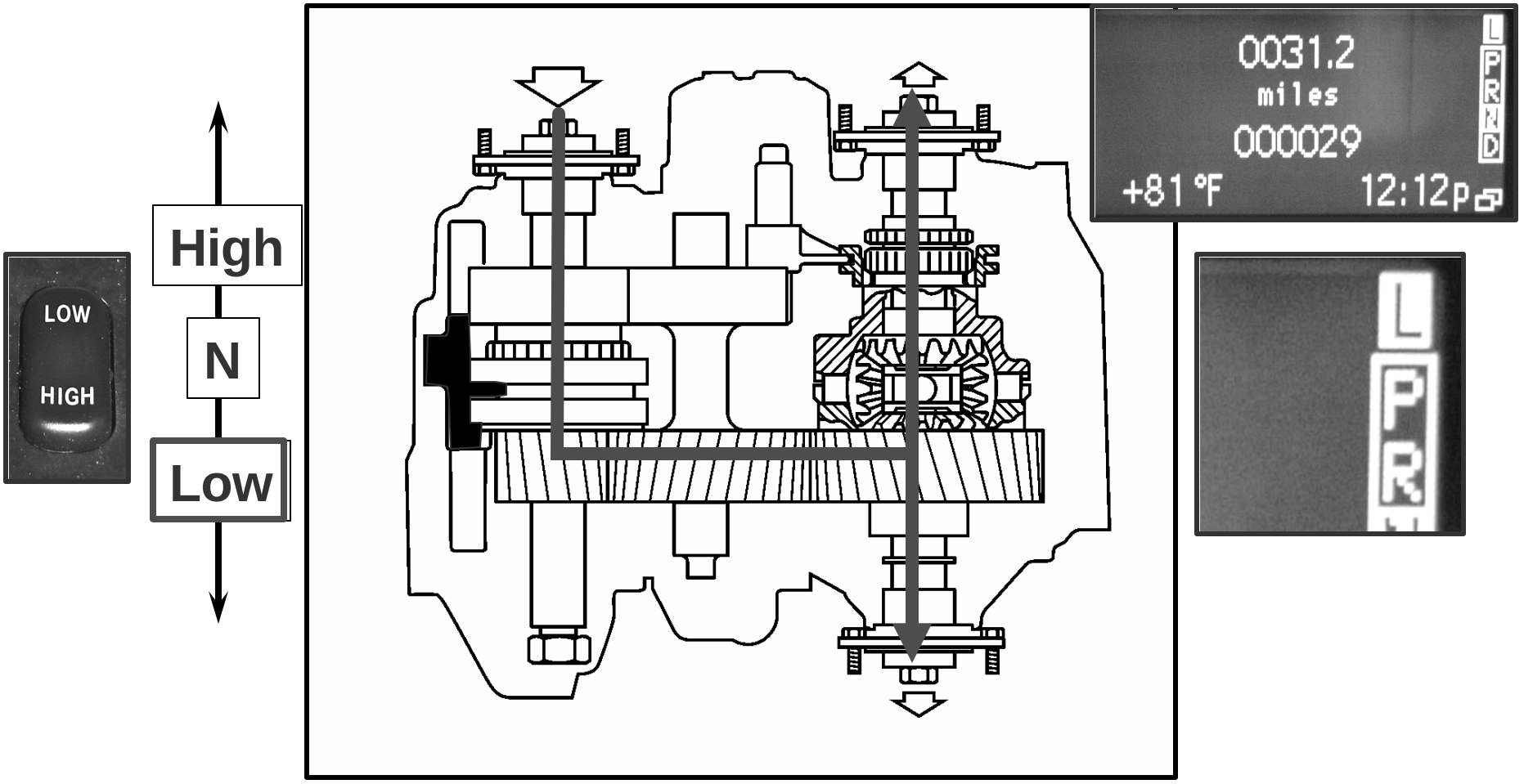


High Range Power Flow



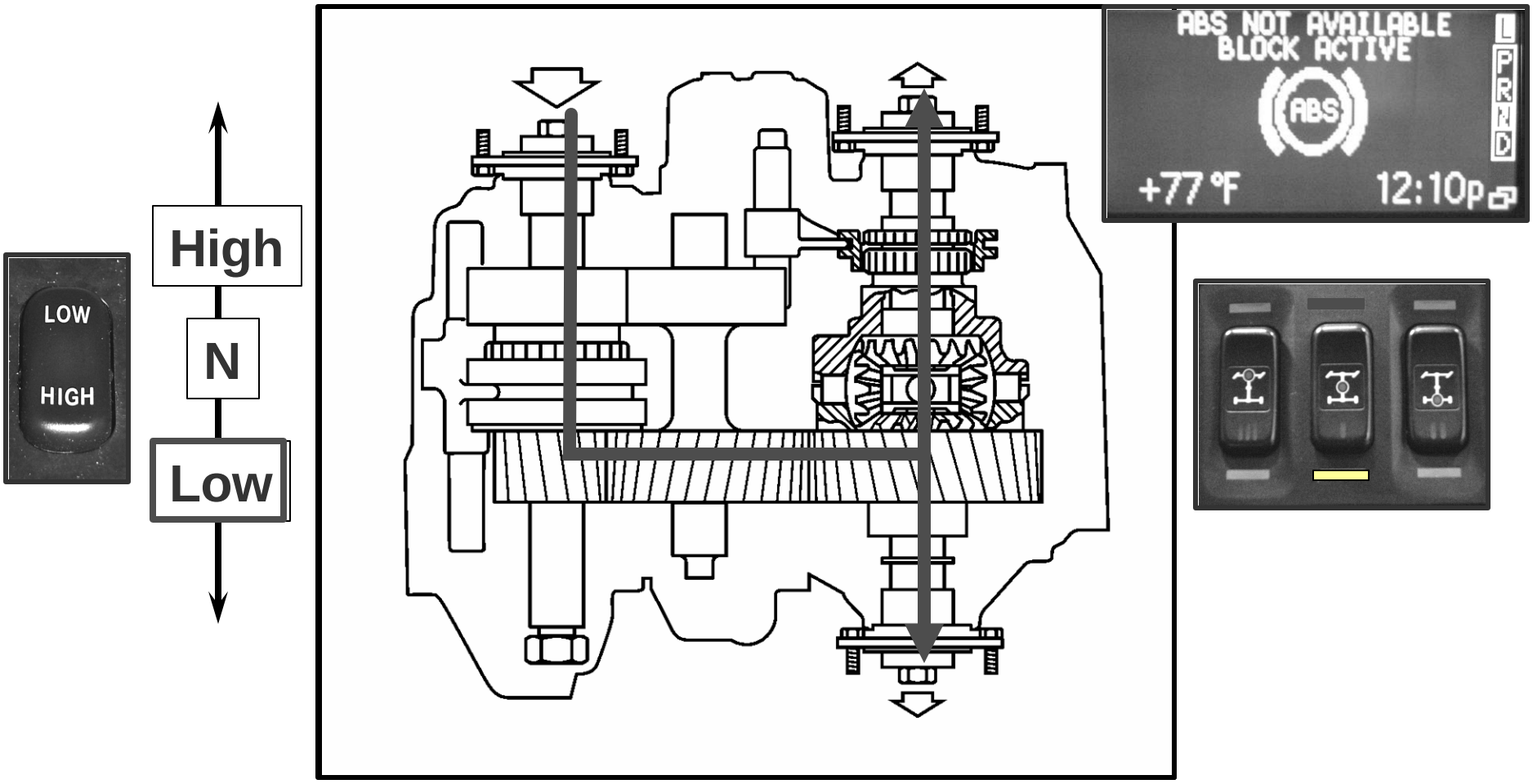
1.05:1

Low Range Power Flow

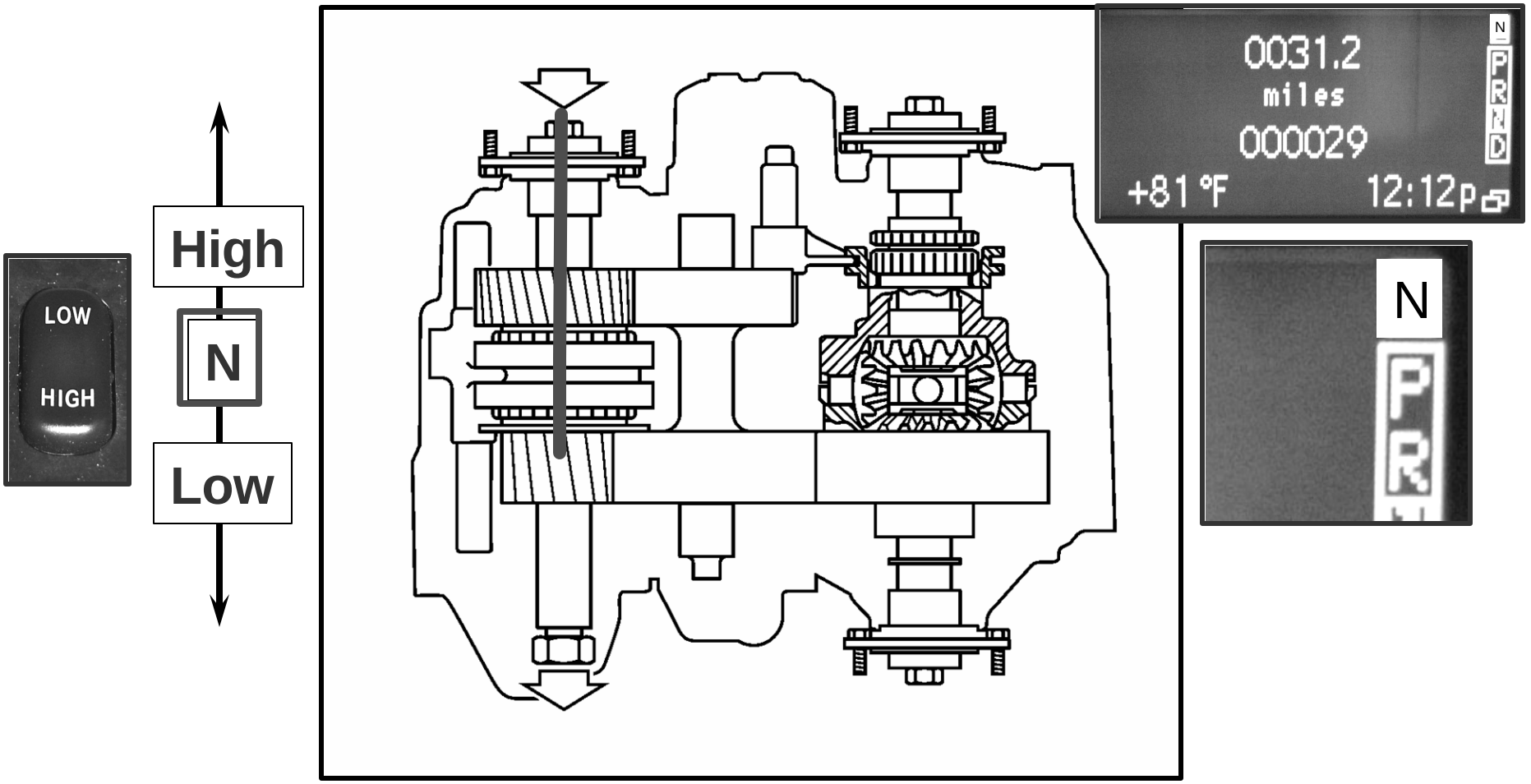


2.15:1

Low Range Power Flow-Ctr. Diff. Locked



Neutral Position



Input shaft bearings can be damaged if engine runs for extended period of time with transmission not in park. (no oil reaches bearings)

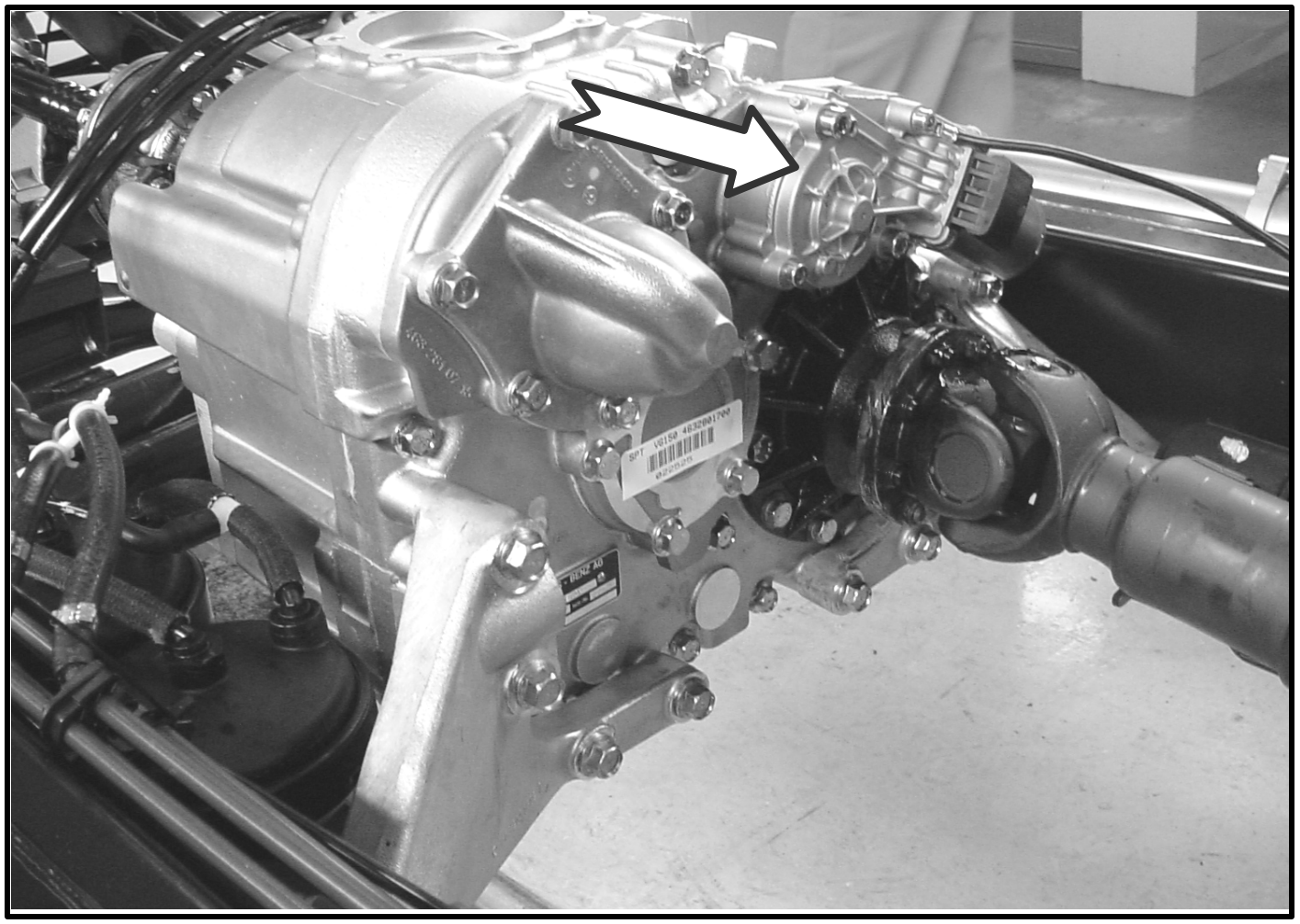
Transfer Case-Electrical Components

- High /Low range control:
  - High/Low switch on console (S97/5)
  - H, L, N readouts in instrument cluster
  - Transfer case motor (M46/2) to operate High/Low shift fork
  - Transfer case control module (N15/7)

- Center differential lock control:
  - Differential Lock Switch Group (S76) on dash
  - Vacuum pump (M40)
  - Switchover valve (Y68)

High/Low Switch (S97/5) and Indicator

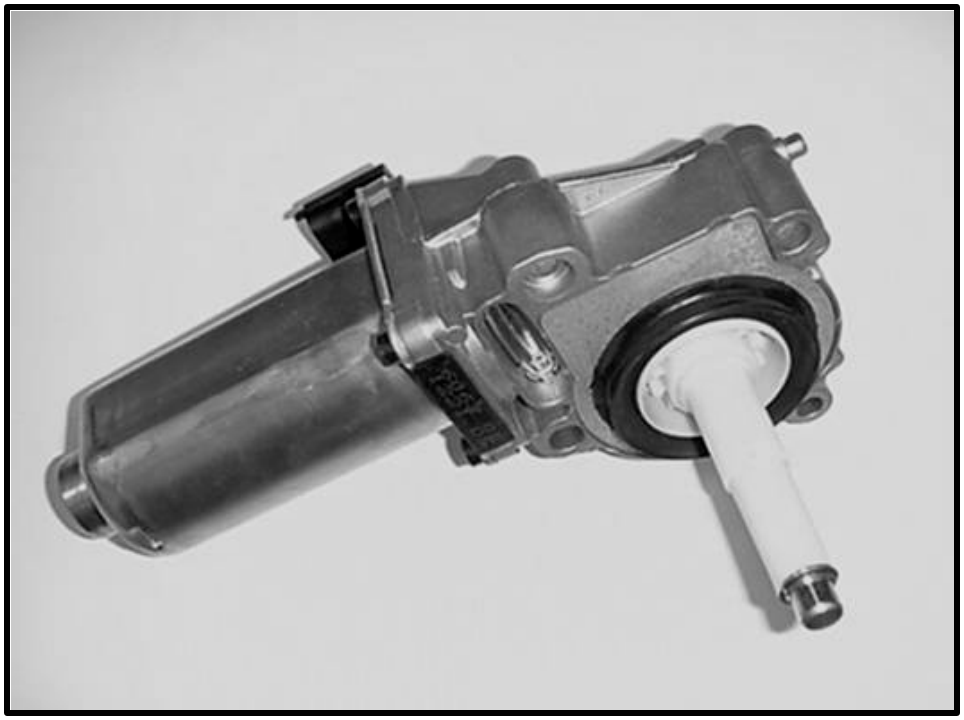
Transfer Case Motor (M46/2) Location



Location: on the rear of the transfer case

Transfer Case Motor (M46/2)

- DC electric motor reversible with polarity change
- Hall effect technology for rotational speed and direction
- Must be adapted with SDS / DAS after:
  - installation / replacement
  - control module replacement



Transfer Case Control Module (N15/7)

Task:
Activates TC shift operation if all conditions are met

Inputs:
- TC switch (S97/5)
- TC case motor (M46/2)
- CAN data from
  ME-SFI / ESP
  ESM / ETC

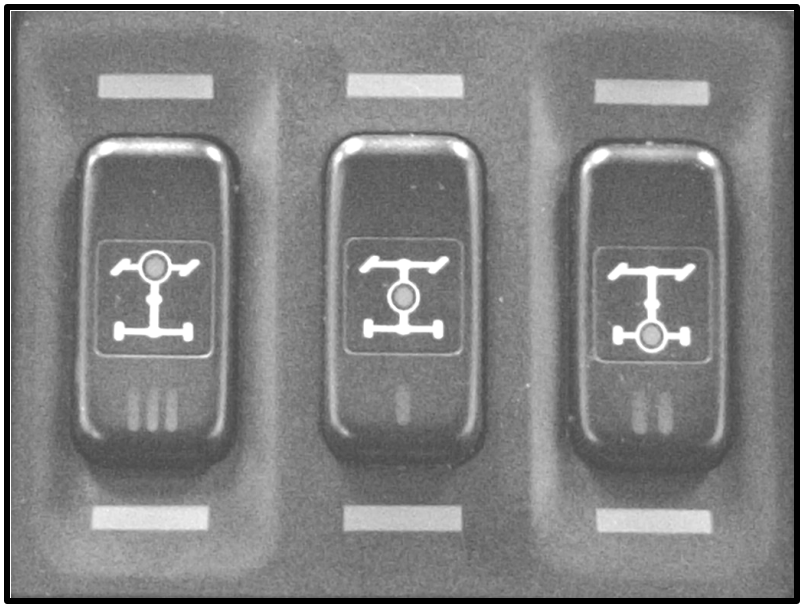
Outputs:
- TC motor (M46/2)
- Instrument cluster

Diagnostics available using
SDS / DAS

Location: under center console storage compartment

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 after 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

Operation

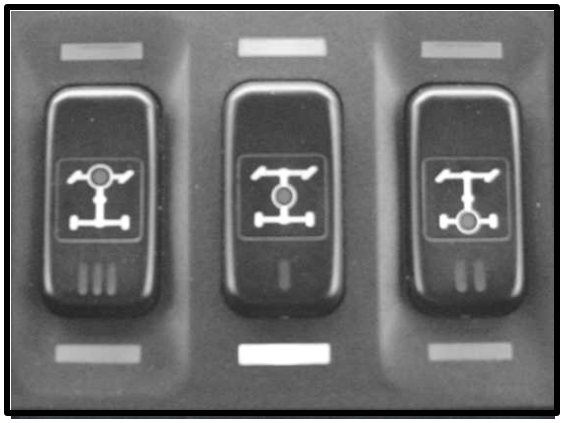
- Fixed sequence (cannot be changed)
  - (1)center, (2)rear, (3)front
- Lock request: Yellow indicator

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

  MF Display: **“ESP NOT AVAILABLE”**

  “ABS NOT AVAILABLE”

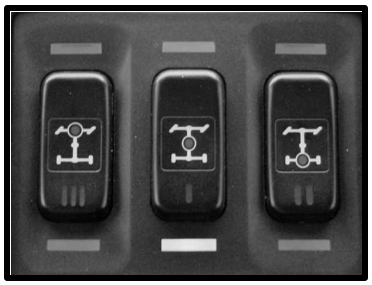
  “BAS NOT AVAILABLE”



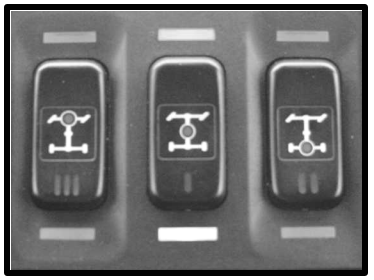
Note: 2002 MF warning display shown

MY2003 Instrument Cluster Display

Lock request



Lock engaged



Warning display changed for 2003 due to NHTSA mandate

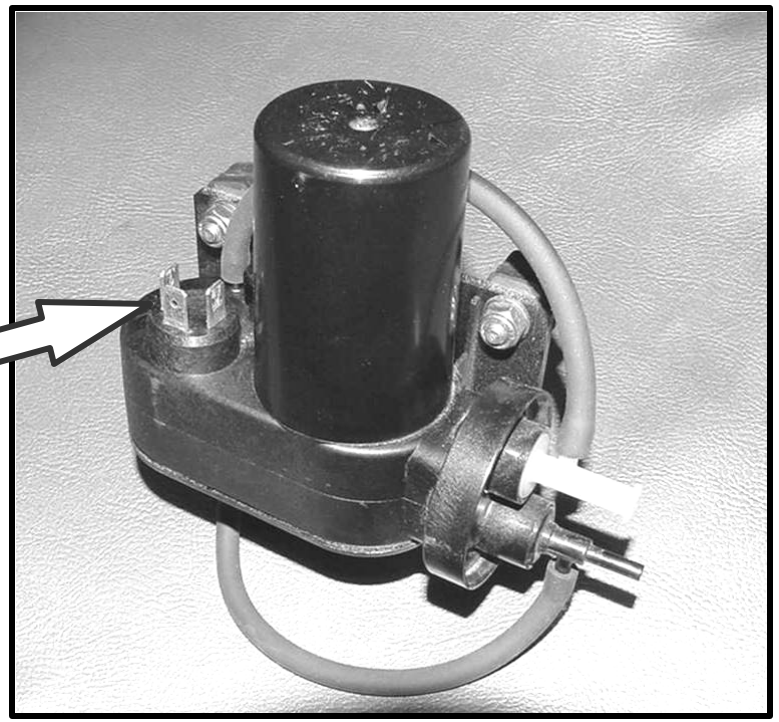
Vacuum Pump (M40)

Task: Supplement manifold vacuum for the differential lock system.

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

Pump motor connector +/-

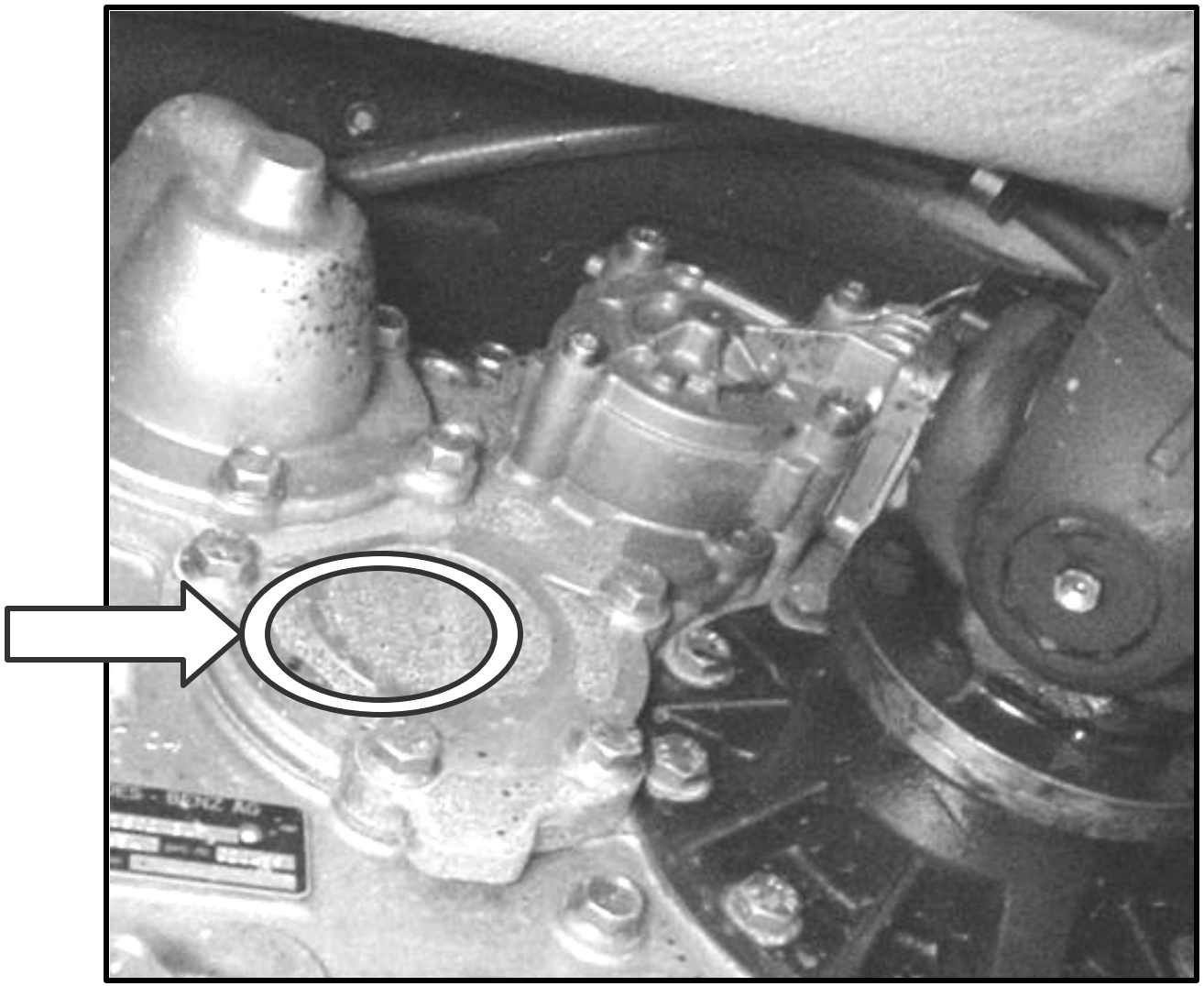
Mechanical internal pressure sensor



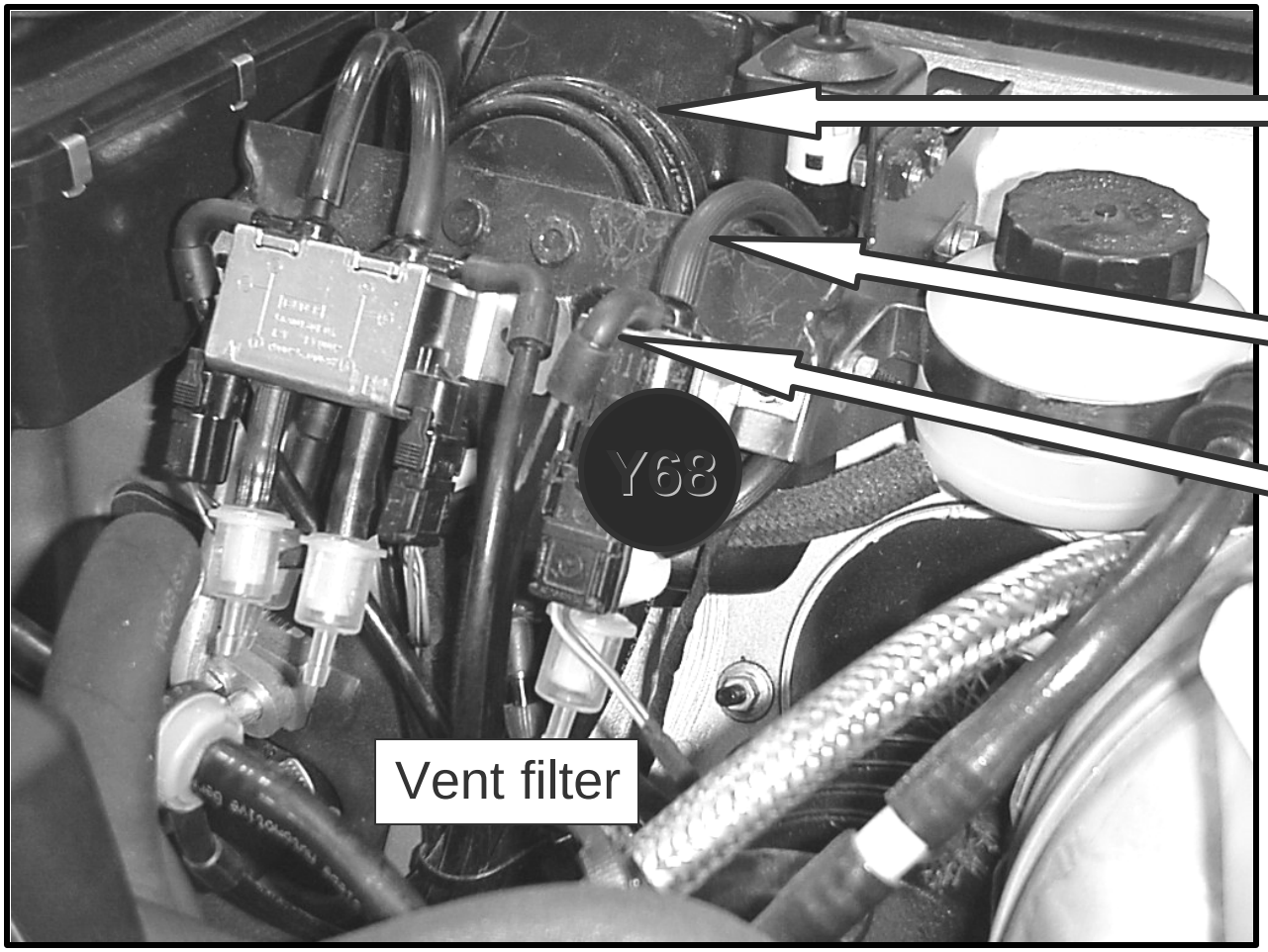
Location: at left side of engine compartment next to air intake

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

Vacuum Reservoir



Switchover Valve (Y68)



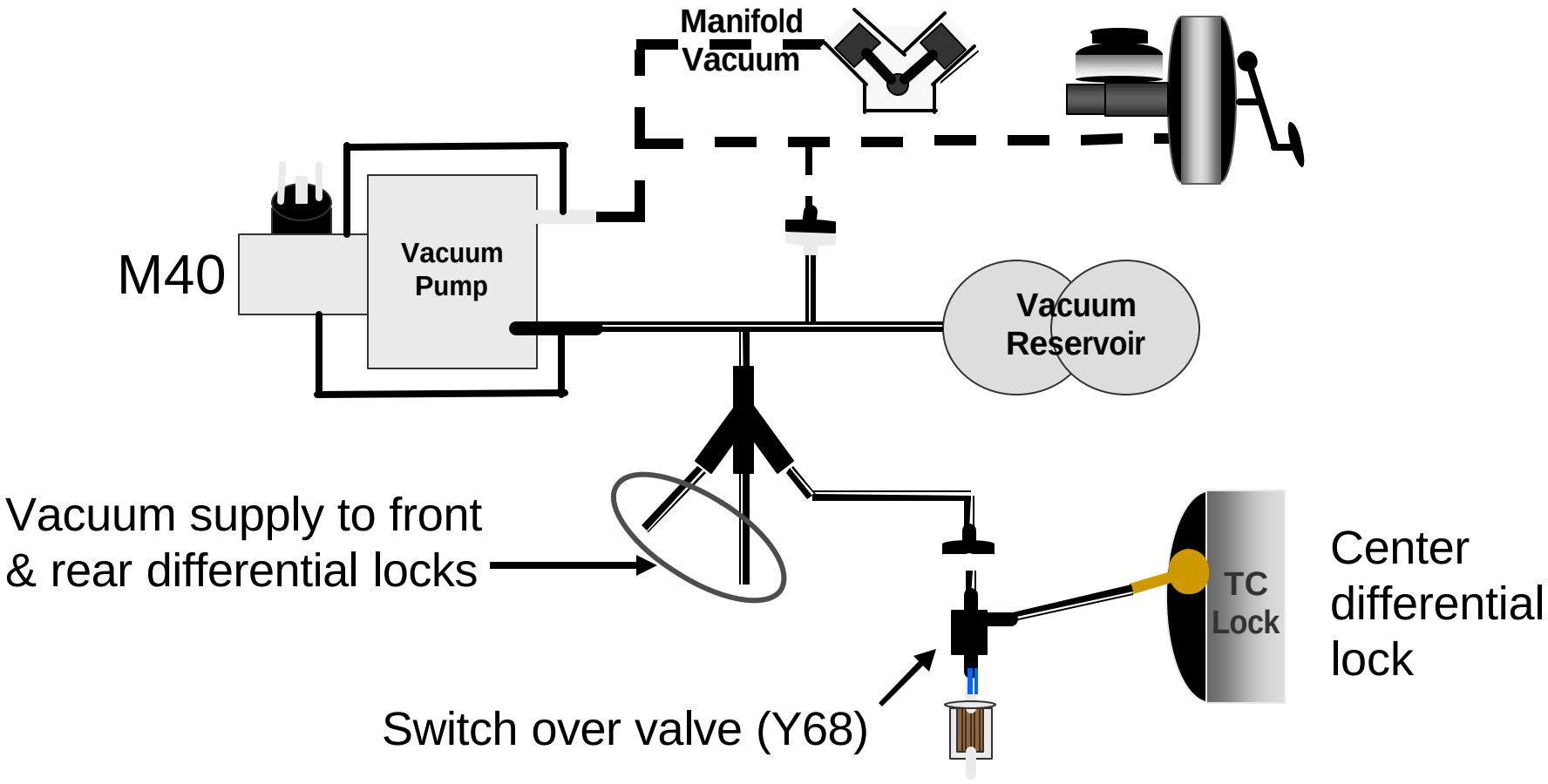
Breather lines for axles, transfer case & diff. lock

Vacuum supply from pump

Vacuum output

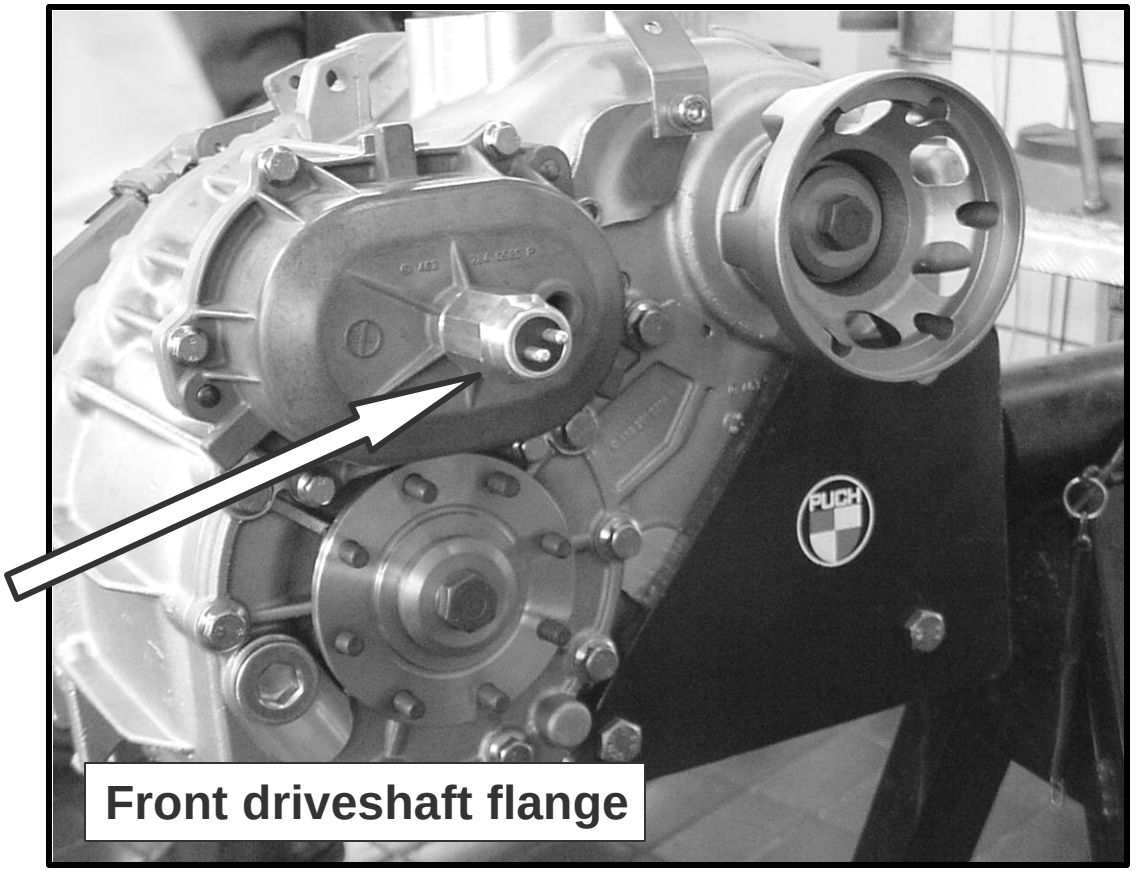
Location: mounted on the firewall to right of the brake booster

Transfer Case-Vacuum Components



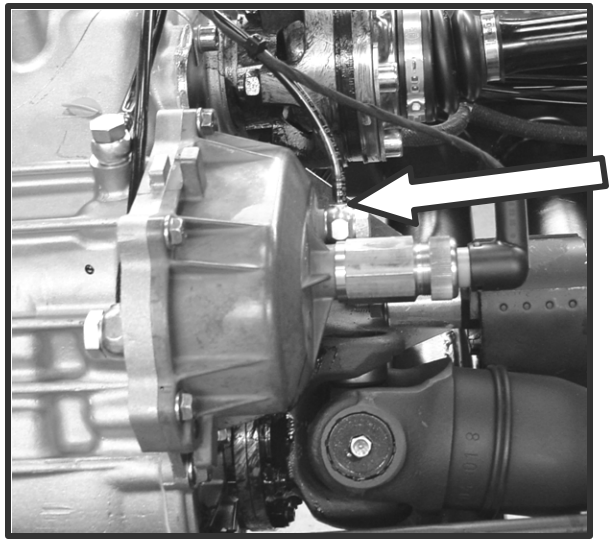
Transfer Case Differential Lock

- Operated by vacuum
- Locks front & rear driveshafts together
- Locking confirmed by switch S76/7 and indicated as red light on dash switch

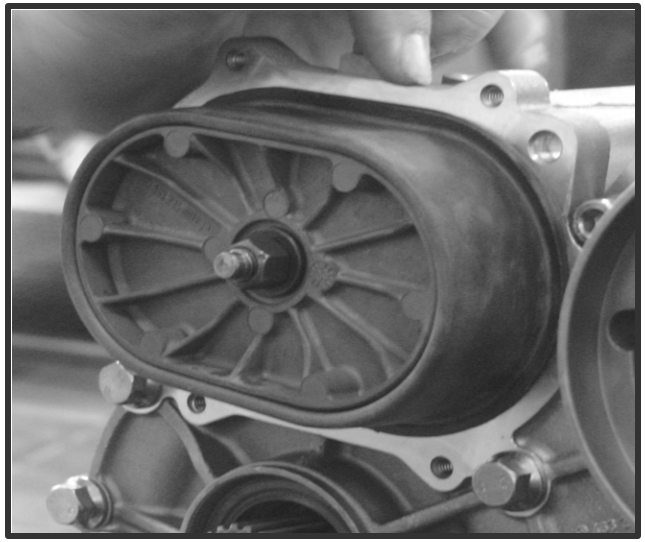


Location: front of transfer case

Differential Lock

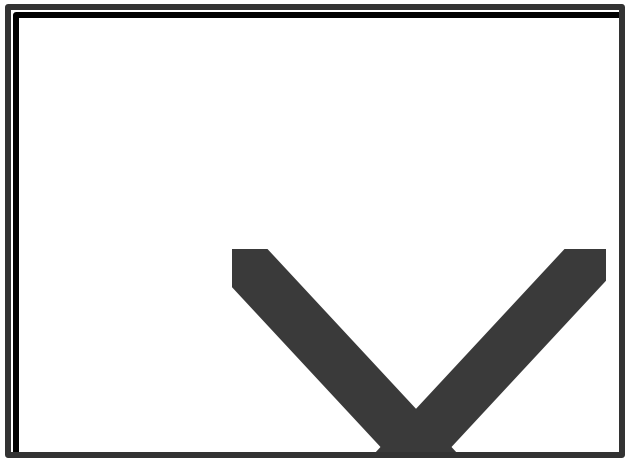


Vacuum line from switchover valve

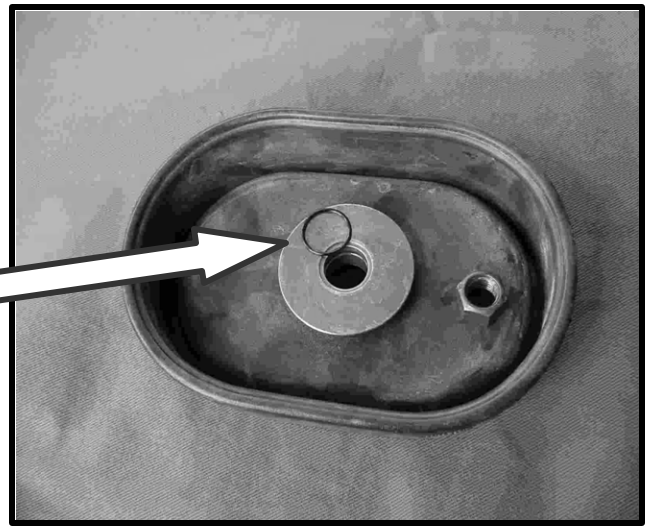


Shift Cylinder Housing

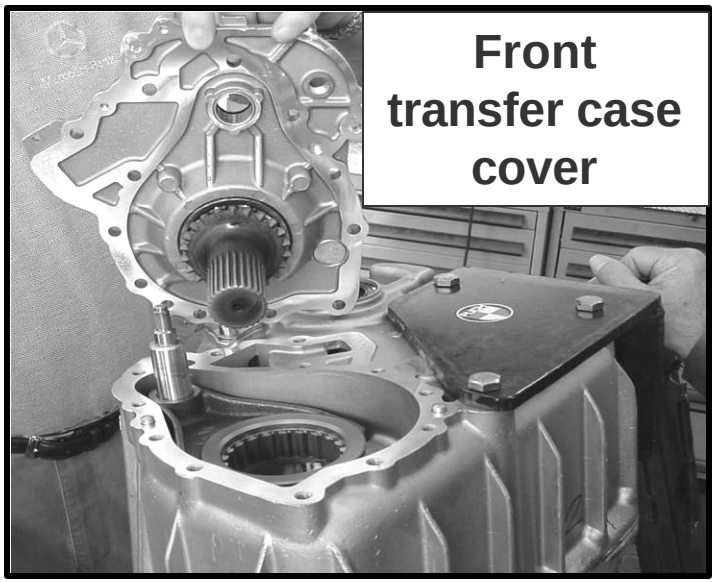
Diaphragm



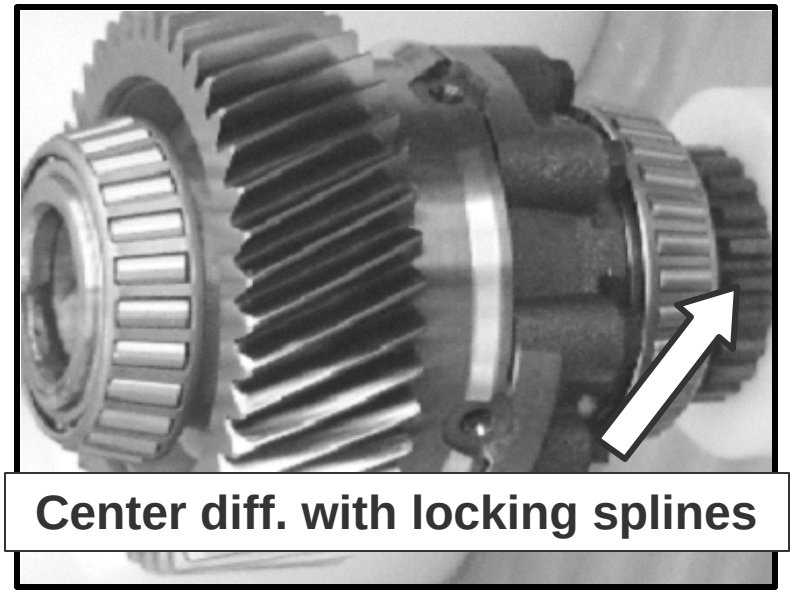
O-ring



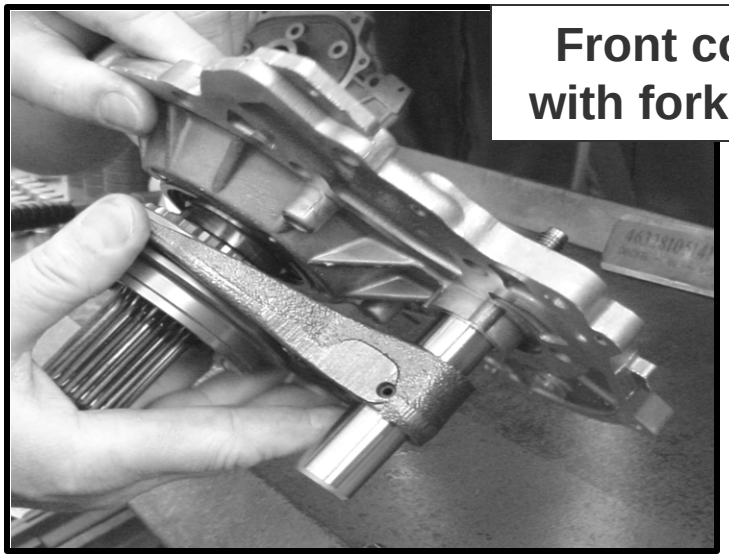
Center Differential Lock Components



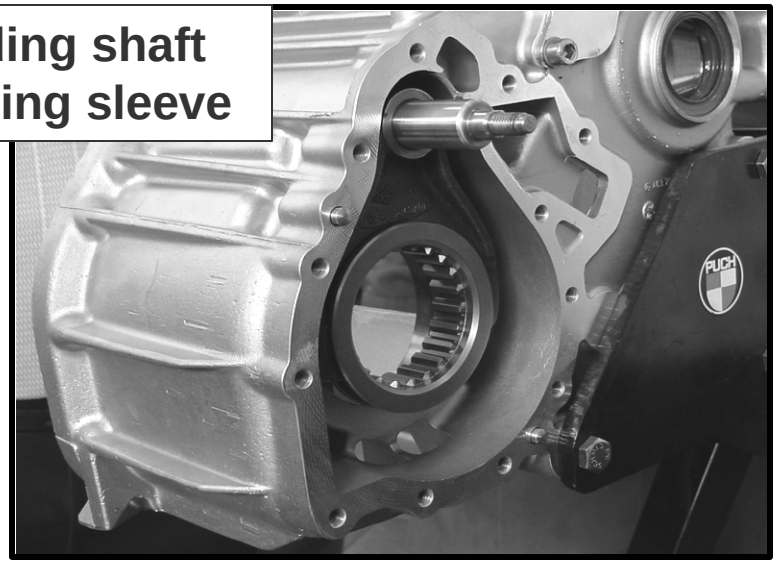
Front transfer case cover



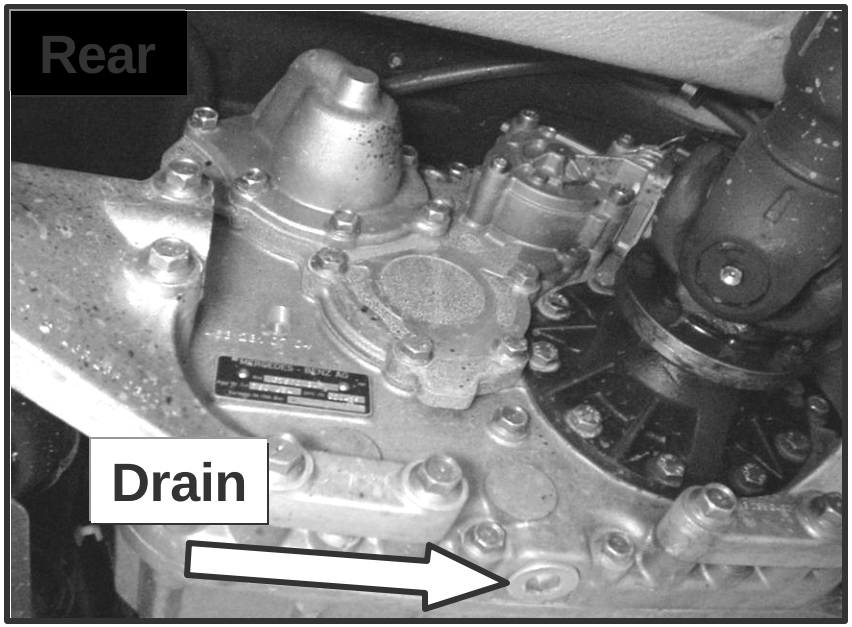
Center diff. with locking splines

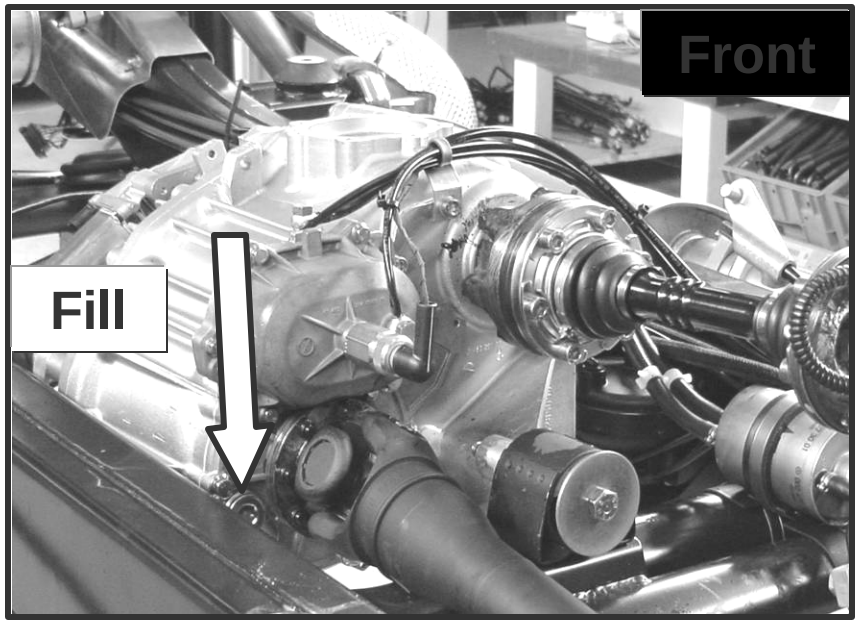


Front cover, sliding shaft with fork and sliding sleeve



Transfer Case Maintenance





- Every B service check oil level (check cold)
- Oil change - 60,000 miles or 5 years since last change
- Oil grade - DEAGEAR Synthetic SAE 75W - 90
  (sheet # 231.1 car / off road vehicles)
  2.8 liters or 2.9 quarts