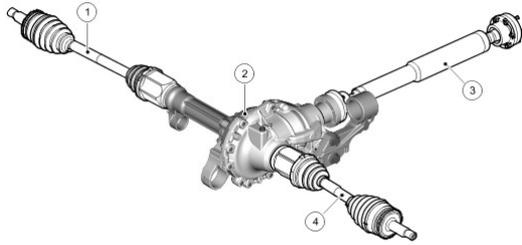


Front Drive Axle and Differential

GENERAL



E50981

Item	Part Number	Description
1	-	RH front drive halfshaft
2	-	Front differential assembly
3	-	Front driveshaft
4	-	LH front drive halfshaft

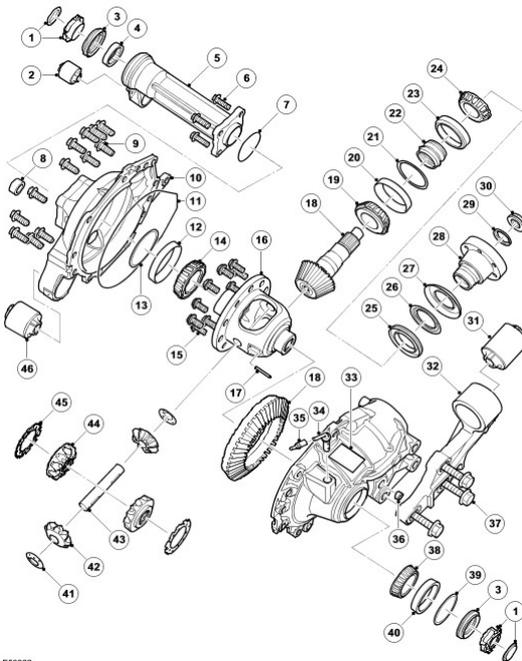
The front differential converts the 'angle of drive' through 90° and distributes drive, via the front drive halfshafts, to the front wheels.

The front differential for the V6 and V8 petrol variants have the same output ratio, but the output ratios for the TdV6 are different, depending on whether automatic or manual transmission is fitted.

The front differential is mounted on the LH side of the chassis.

FRONT DIFFERENTIAL ASSEMBLY

Front Differential - Exploded View



E50982

Item	Part Number	Description
1	-	Protection cap
2	-	Mounting bush assembly
3	-	Seal
4	-	Bearing assembly
5	-	Front tube
6	-	Bolt, 4 of
7	-	O-ring
8	-	Drain plug
9	-	Bolt, 14 of
10	-	Cover assembly
11	-	Cover seal
12	-	Roller bearing cup
13	-	Bearing preload spacer
14	-	Taper roller bearing
15	-	Bolt, 10 of
16	-	Differential case
17	-	Roll pin
18	-	Gear and pinion assembly
19	-	Taper roller bearing
20	-	Roller bearing cup
21	-	Shim
22	-	Collapsible spacer
23	-	Roller bearing cup
24	-	Taper roller bearing
25	-	Oil seal

26	-	Inner deflector
27	-	Outer deflector
28	-	Flange
29	-	Pinion nut retainer
30	-	Pinion nut
31	-	Mounting bush assembly
32	-	Axle mounting bracket
33	-	Data label
34	-	Breather tube
35	-	Cap
36	-	Fill plug
37	-	Bolt, 3 of
38	-	Taper roller bearing
39	-	Bearing preload spacer
40	-	Roller bearing cup
41	-	Thrust washer
42	-	Planet gear
43	-	Shaft
44	-	Sunwheel
45	-	Thrust washer
46	-	Mounting bush assembly

The casing comprises two halves with machined mating faces. When assembled, the cast iron casing halves are sealed with a thin film of Loctite 5999 sealant and secured together with fourteen bolts. A breather tube is fitted to the casings. This allows a plastic tube to be fitted and routed to a high point in the engine compartment, preventing the ingress of water when the vehicle is wading.

The RH casing is fitted with a drain plug. The front differential unit contains approximately 0.7 litre of oil for a dry fill.

The differential is a conventional design using a hypoid gear layout. This employs a hypoid bevel pinion gear and crown wheel, with the pinion offset above the centre line of the crown wheel. This design allows for a larger pinion gear to be used, which has the advantages of increased gear strength and reduced operating noise.

The front differential is available in three ratios. V8 and V6 petrol engine vehicles use a front differential with a final drive ratio of 3.73:1 and TdV6 diesel engine vehicles use a final drive ratio of 3.07:1, for vehicles with manual transmission, and 3.54:1 for vehicles with automatic transmission. Changing the number of teeth between the crown-wheel drive gear and pinion gear changes the ratio.

The differential comprises a pinion shaft and hypoid bevel gear, a crown wheel drive gear with an integral cage, which houses two planet gears. Two sun wheels are also located in the cage and pass the rotational drive to the drive shaft shafts.

The pinion shaft is mounted on two opposed taper roller bearings with a collapsable spacer located between them. The spacer is used to hold the bearings in alignment and also collapses under the pressure applied to the pinion nut. This allows the nut to be tightened to a predetermined torque, which collapses the spacer, setting the correct bearing preload.

The pinion shaft has an externally splined outer end which accepts and locates the input flange, which is retained by the pinion nut. The opposite end of the output flange has an internal spline which provides positive location for the front propeller shaft. The flange has an external O-ring seal which seals against the front propeller shaft shroud preventing the ingress of dirt and moisture into the splines. An oil seal is pressed into the LH casing and seals the input flange to the differential unit. The pinion shaft has a hypoid bevel gear at its inner end which mates with the crown wheel drive gear.

The crown wheel drive gear is located on the carrier and secured with ten screws. The carrier is mounted on taper roller bearings located in each casing half. The bearings are press fitted into the casing and a spacer is located on the outside face to set backlash and apply preload to the bearing.

The carrier is fitted with a shaft onto which the two planet gears are mounted. The shaft is secured in the carrier with a roll pin. The sun wheels are located in pockets within the carrier and mesh with the planet gears. Thrust washers are located between the carrier and the sun wheels and hold the sun wheels in mesh with the planet gears. Each sun wheel has a machined, splined, bore to accept the drive shaft. A groove is machined in the bore to locate the snap ring fitted to the drive shaft, providing positive drive shaft location.

Differential Operation

The operating principles of the front and rear differentials are the same. Rotational input from the propeller shaft is passed via the input flange to the pinion shaft and pinion gear. The angles of the pinion gear to the crown wheel drive gear moves the rotational direction through 90°.

The transferred rotational motion is now passed to the crown wheel drive gear, which in turn rotates the carrier. The shaft, which is secured to the carrier, also rotates at the same speed as the carrier. The planet gears, which are mounted on the shaft, also rotate with the carrier. In turn, the planet gears transfer their rotational motion to the left and right hand sun wheels, rotating the drive shafts.

When the vehicle is moving in a forward direction, the torque applied through the differential to each sun wheel is equal. In this condition both drive shafts rotate at the same speed. The planet gears do not rotate and effectively lock the sun wheels to the carrier.

If the vehicle is turning, the outer wheel will be forced to rotate faster than the inner wheel by having a greater distance to travel. The differential senses the torque difference between the sun wheels. The planet gears rotate on their axes to allow the outer wheel to rotate faster than the inner one.

SERVICE

The oil used in the front differential is Castrol SAF-XO. The oil contains unique additives, which enhance the differentials operation. No other oil must be used in the front differential.

Front Differential Serviceable Components

- Halfshaft seals
- Needle roller bearing assemblies
- Chassis bush/fixings
- Lubricant.