

51 - REAR AXLE AND FINAL DRIVE

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DESCRIPTION

The welded steel rear axle casing houses a separate spiral bevel type differential unit, which is off set to the right of the vehicle centre line. The differential unit drives the rear wheels via the axle shafts and fully floating hubs which are mounted on tapered roller bearings.

Lubrication

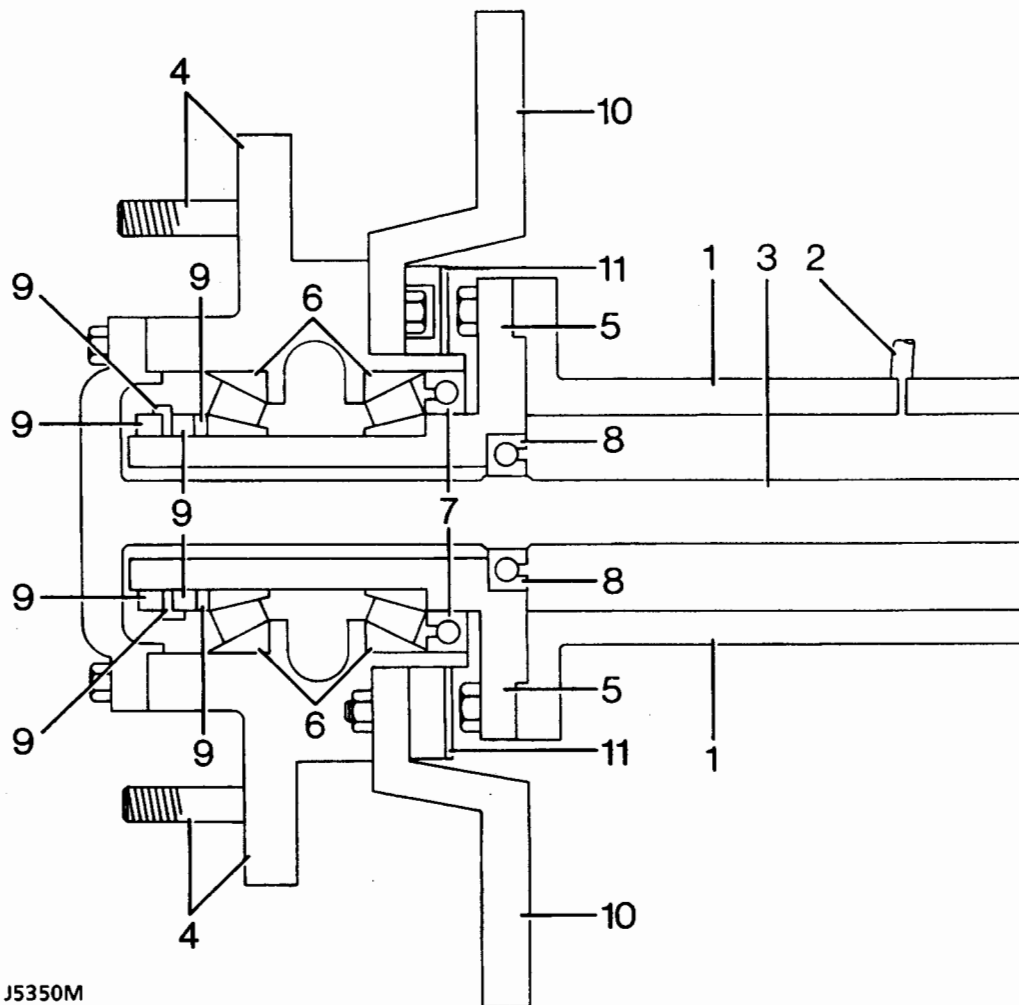
The differential is lubricated with oil and the hub bearings with grease. The hub bearings are fitted

with inner and outer seals. The outer seals prevent the differential oil mixing with the hub grease and the inner seals prevent dirt ingress into the hub.

Ventilation

Ventilation of the hub bearings is through the outer oil seals and the differential ventilation pipe, which terminates at a high level.

The wheel hubs on axles with ABS brakes share the same construction to non ABS axles except for the addition of a sensor ring 11 on the brake disc 10.



J5350M

Rear axle hub

- | | |
|----------------------------|---|
| 1. Axle casing | 7. Inner hub seal |
| 2. Ventilation pipe | 8. Outer hub/axle shaft seal |
| 3. Axle shaft | 9. Hub lock plate, thrust washer and nuts (2) |
| 4. Wheel studs and hub | 10. Brake disc |
| 5. Wheel bearing stub axle | 11. Sensor ring, ABS |
| 6. Wheel bearings (2) | |



FAULT DIAGNOSIS

Complaint - Oil leaks

An external leak of lubrication from the hub seals can be caused by a faulty internal seal. For example, if the internal seals which separate the differential from the hubs are faulty and the vehicle is operating or parked on an embankment. Oil from the differential may flood one hub causing a leak and leave the differential lacking lubrication.

When a seal is found to be leaking check the axle ventilation system, as a blockage can cause internal pressure to force oil past the seals.

See 'Description and Operation' for illustrations of oil seal locations.

When investigating hub seal leaks check the grease for dilution with oil. Check also the differential level and oil for metal particles and the condition of internal seals.

If the vehicle is driven in deep water with defective oil seals, water may contaminate the lubricants and raise the differential level giving a false impression that the housing has been overfilled with oil.

Do not assume that a high oil level in the differential is due to over filling or, that a low level is because of an external leak.



REAR AXLE

Service repair no - 51.25.01

Remove



WARNING: Remove and refit of axle requires a further two persons to steady the axle when lowering or repositioning

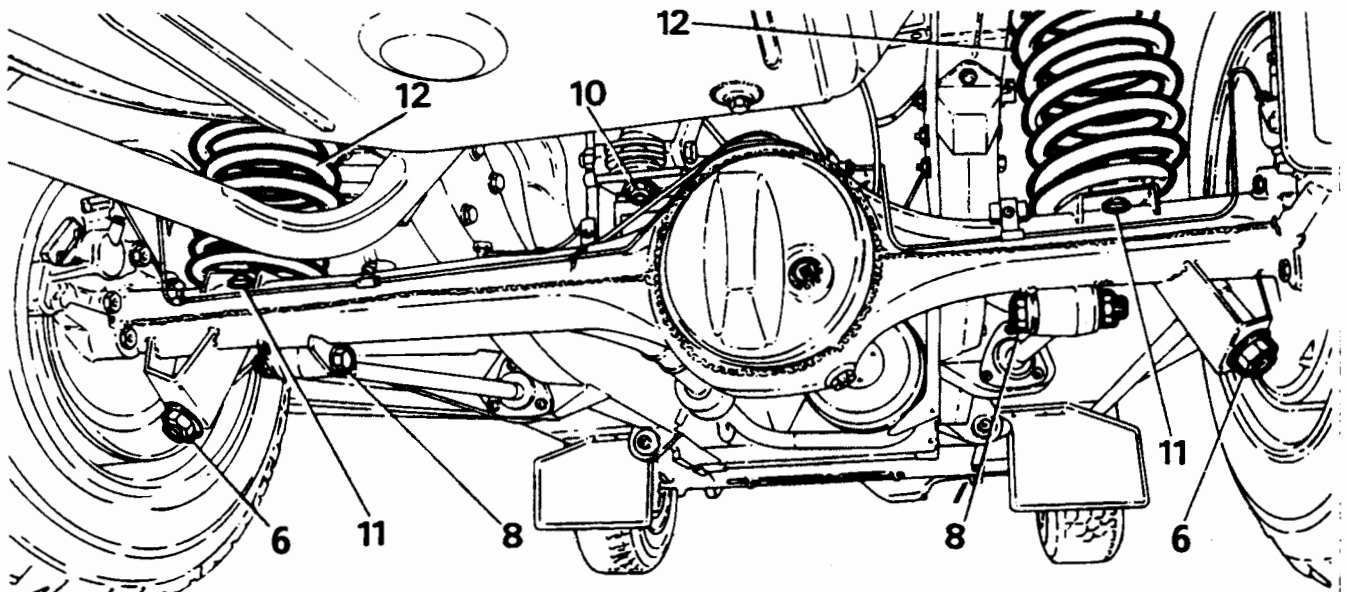
axle.

1. Drain brake system.
2. Support chassis rear.
3. Remove road wheels.
4. Support axle weight with hydraulic jack.
5. Disconnect ABS wiring harness multi-plug at jump hose bracket, if applicable.
6. Disconnect shock absorbers.
7. Disconnect flexible brake hose at connection under floor.
8. Disconnect lower links at axle.
9. Mark differential and propeller shaft flanges with identification marks for assembly. Remove four nuts and bolts. Lower propeller shaft and tie to one side.

10. Disconnect pivot bracket ball joint at axle bracket.
11. Release bolts and remove coil spring retaining plates.
12. Lower axle and remove road springs.
13. Disconnect anti-roll[sway] bar links to axle. **See REAR SUSPENSION, Repair, Anti-Roll[Sway] Bar Ball Joint Links**
14. Remove axle assembly.

Refit

15. Position axle and fit lower links. Tighten to **176 Nm**
16. Reverse removal procedure.
17. Tighten pivot bracket ball joint to axle to **176 Nm**.
18. Tighten propeller shaft to differential drive flange to **47 Nm**
19. Bleed brake system. **See BRAKES, Repair, Brake System Bleed**



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REAR BRAKE DISC NON ABS

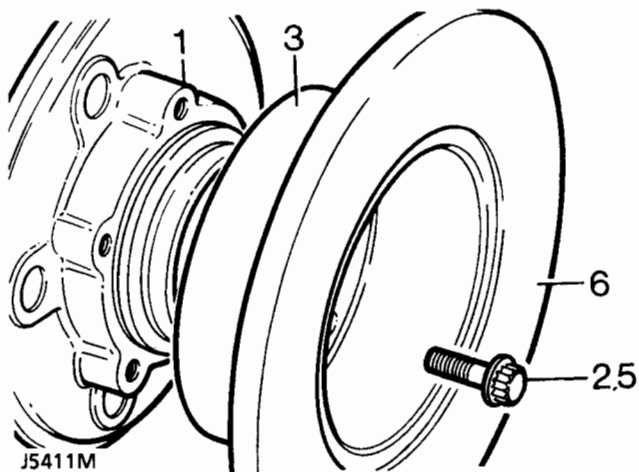
Service repair no - 70.10.11.

Remove

1. Remove rear hub assembly. *See Rear Hub Assembly*
2. Remove disc bolts.
3. Remove disc from rear hub.

Refit

4. Fit disc to rear hub.
5. Fit disc bolts. Tighten to **73 Nm**.
6. Check total disc run out, this must not exceed 0,15 mm. If necessary reposition disc.



7. Fit rear hub assembly. *See Rear Hub Assembly*

Disc reclamation

8. Check disc thickness. This dimension may be reduced to minimum thickness of 12 mm. Machine equal amounts off each face.

REAR BRAKE DISCS ABS

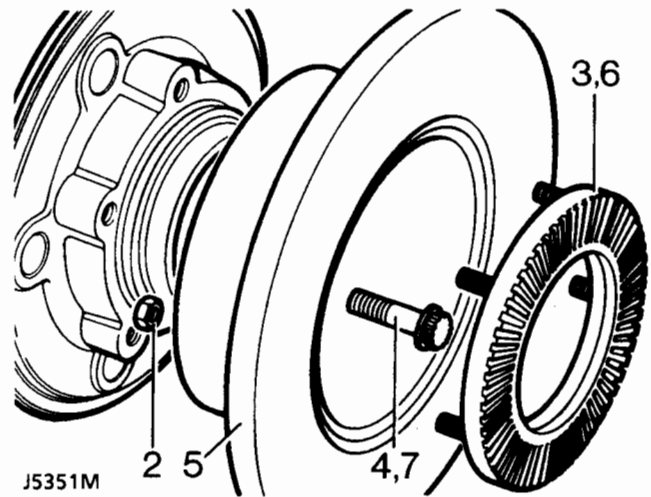
Service repair no - 70.11.11.

Remove

1. Remove rear hub assembly. *See Rear Hub Assembly*
2. Remove five nyloc nuts.
3. Remove sensor ring.
4. Remove five hub to disc retaining bolts.
5. Remove disc from hub.

Refit

6. Fit disc onto hub.
7. Apply loctite 270 and fit hub to disc retaining bolts. Tighten to **73 Nm**.
8. Using new nyloc nuts fit sensor ring.



9. Check total disc run out, this must not exceed 0,15 mm. If necessary reposition disc.
10. Fit hub assembly. *See Rear Hub Assembly*

Disc reclamation

11. Check disc thickness. This dimension may be reduced to a minimum thickness of 12 mm. Machine equal amounts off each face.



REAR HUB ASSEMBLY

Service repair no - 64.15.01

Remove

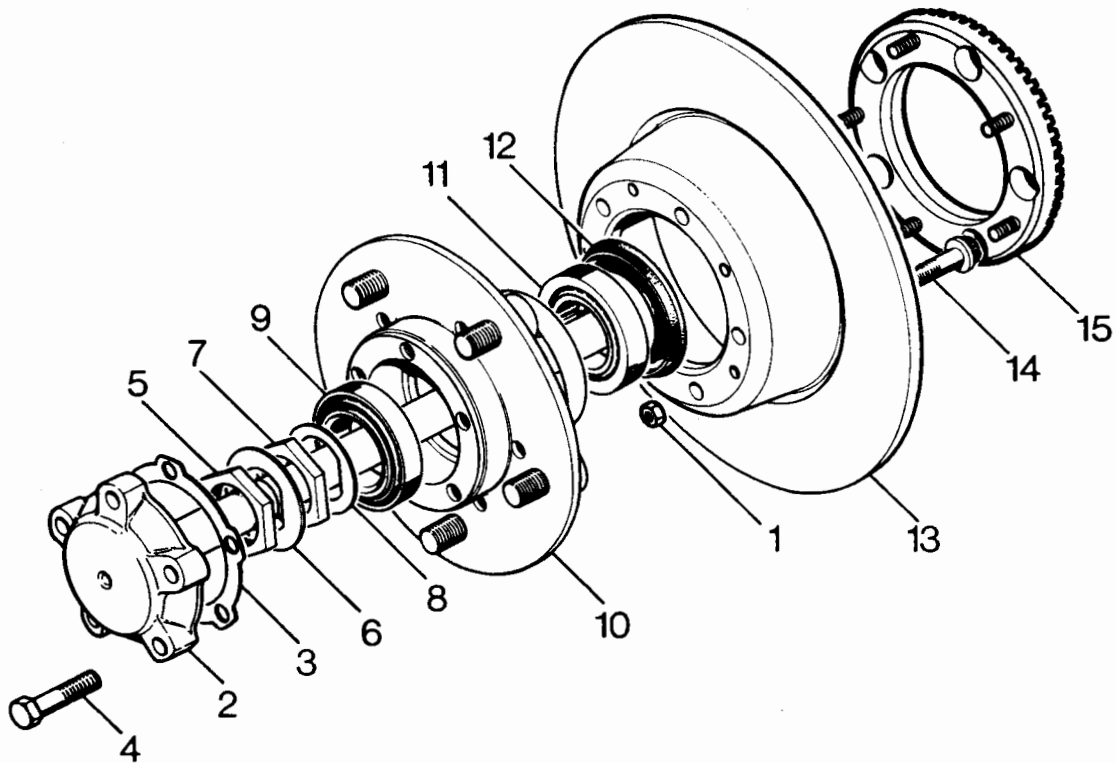
1. Place rear axle onto axle stands and remove road wheel.
2. Release brake hose clips and remove brake caliper bolts. Secure to one side.

! WARNING: Take care not to kink brake hose.

3. Remove five bolts and withdraw axle shaft.
4. Remove joint washer.
5. Bend back lock washer tabs.
6. Remove locknut and lock washer.
7. Remove hub adjusting nut.
8. Remove spacing washer.
9. Remove hub and brake disc assembly complete with bearings.

REAR HUB COMPONENTS

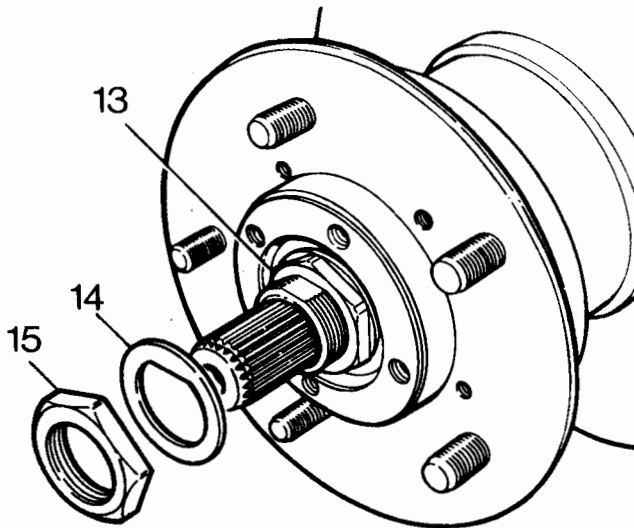
1. Sensor ring retaining nut ABS.
2. Axle shaft.
3. Axle shaft joint washer.
4. Axle shaft retaining bolt (five off).
5. Lock nut.
6. Lock washer.
7. Hub adjusting nut.
8. Spacing washer.
9. Outer bearing.
10. Hub.
11. Inner bearing.
12. Grease seal.
13. Brake disc.
14. Disc retaining bolt (five off).
15. Sensor ring ABS.



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Refit

10. Clean stub axle. Retract ABS sensor slightly from sensor sleeve, if applicable
11. Fit hub assembly to stub axle.
12. Fit spacing washer.
13. Fit hub adjusting nut. Tighten to **61 Nm**. Back off adjusting nut 90°. Tighten to **4 Nm**. This will give the required hub end float of 0,010mm
14. Fit a new lock washer.
18. Fit brake caliper. Tighten to **82 Nm**. Secure brake pipes to axle casing.
19. If applicable, set ABS brakes sensor. Push sensor in until it touches sensor ring then rotate hub to set sensor.
20. Fit road wheel, remove axle stands and final tighten road wheel nuts to **126 Nm**.
21. Operate footbrake to locate brake pads before driving vehicle.



J5353M

15. Fit locknut. Tighten to **61 Nm**.
16. Tab over lock washer to secure adjusting nut and locknut.
17. Using a new joint washer fit axle shaft to hub, secure with five bolts. Tighten to **65 Nm**.



AXLE DIFFERENTIAL ASSEMBLY

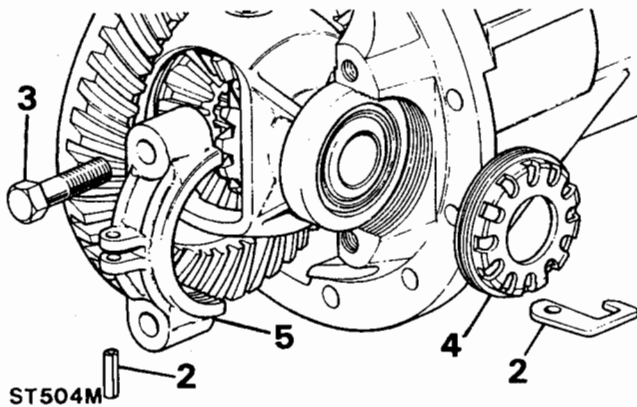
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DISMANTLE



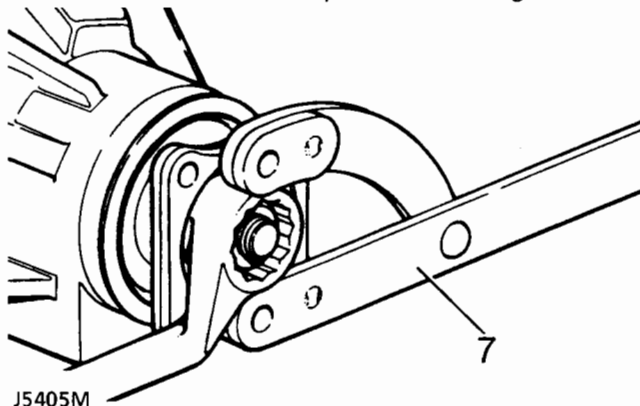
NOTE: Mark differential components so their original positions relative to other components is maintained. Bearing caps must not be interchanged.

1. Remove axle shafts then differential assembly from axle.
2. Remove roll pin securing bearing nut locking fingers to bearing caps. Remove locking fingers.
3. Loosen bearing cap bolts and mark caps for assembly.
4. Using service tool LRT-54-508, remove bearing adjusting nuts.
5. Remove bearing cap bolts and bearing caps.
6. Remove crown wheel differential unit and bearings.



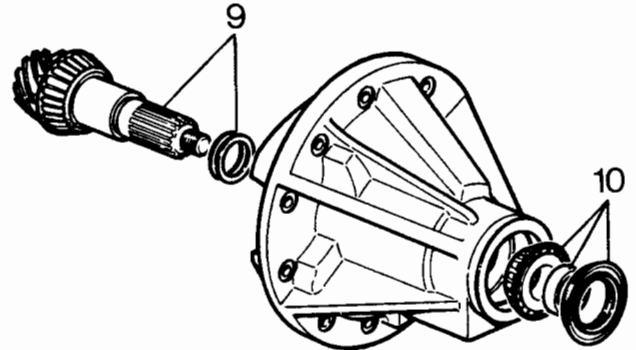
Remove pinion FRONT AXLE DIFFERENTIAL ONLY

7. Remove pinion flange nut using service tool LRT-51-003 to restrain flange.
8. Remove washer and pinion drive flange.



J5405M

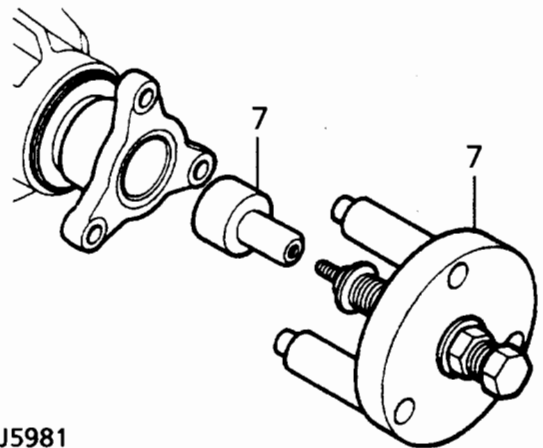
9. Remove pinion complete with bearing and outer bearing shims.
10. Remove pinion flange oil seal, spacer and bearing.



J5354M

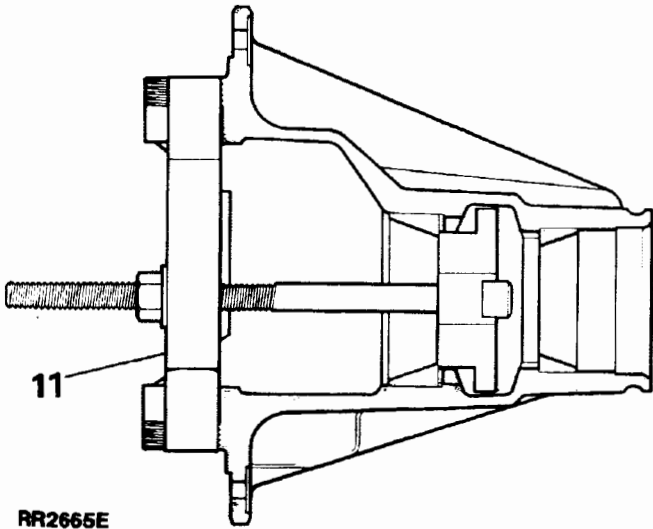
Remove pinion REAR AXLE DIFFERENTIAL ONLY

7. Remove pinion flange centralising peg using service tool LRT 51-008.
8. Remove pinion flange nut using service tool LRT-51-003 to restrain flange.
9. Remove pinion complete with bearing and outer bearing shims.
10. Remove pinion flange oil seal, spacer and bearing.



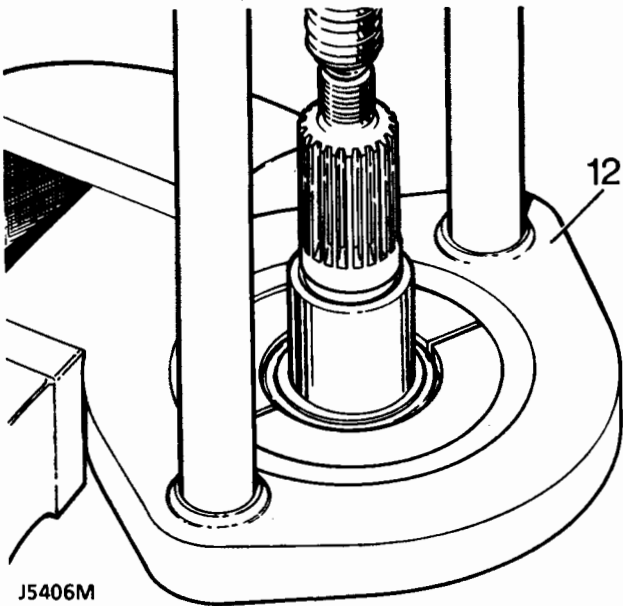
J5981

11. Using service tool LRT-54-505, remove pinion head bearing track and shim and drive out outer bearing of differential housing.



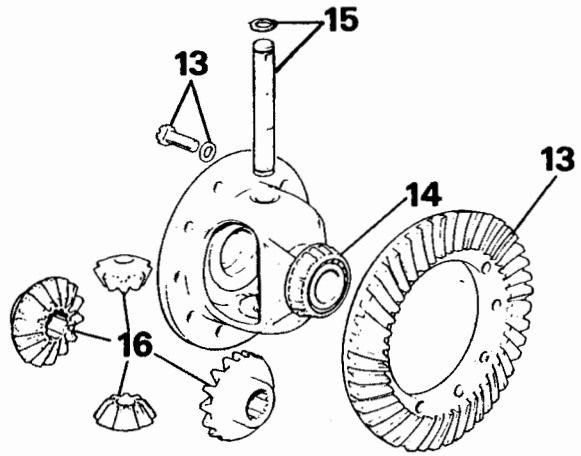
RR2665E

12. Remove pinion head bearing with service tool LRT-99-002.



J5406M

13. Remove bolts and washers securing crown wheel to differential flange. Remove crown wheel.
 14. Remove differential carrier bearings.
 15. Remove circlips and extract differential cross shaft.
 16. Withdraw differential gears and pinions.
 17. Clean all components.



ST509M

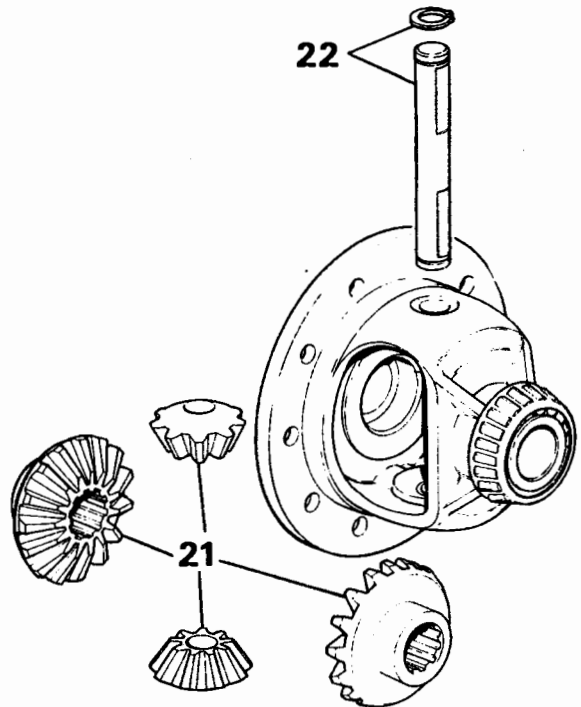
INSPECTION

18. Check all bearings for wear and pitting.
 19. Check all gears for wear, scuffing, pitting and damaged teeth.
 20. Supplied as matched sets are: crown wheel and pinion, pinion housing and bearing caps.

ASSEMBLE

Differential gears

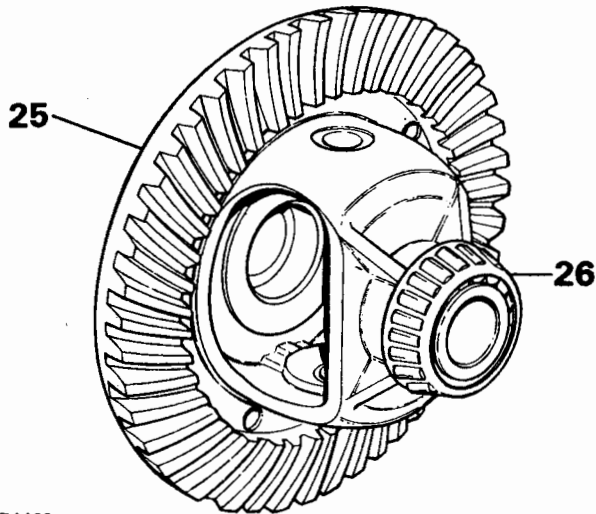
21. Fit differential gears to differential housing.
 22. Fit differential cross shaft and circlips.



ST510M

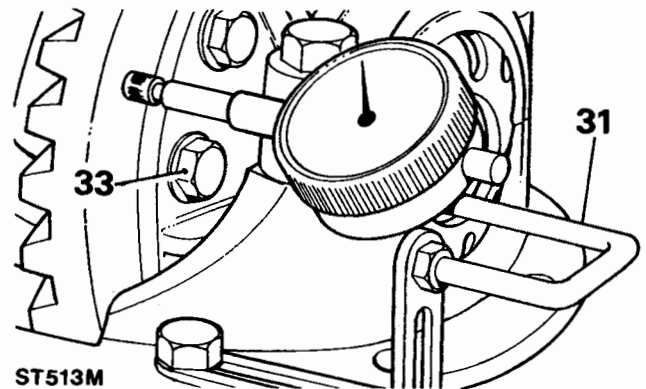


- 23. Check gear for freedom of rotation and backlash. Nominal backlash should be present. Excess backlash necessitates replacement of gears or differential housing.
- 24. Check serial number marked on pinion end face matches that on crown wheel.
- 25. Clean and fit crown wheel.
- 26. Fit carrier bearings and assemble tracks to bearings.



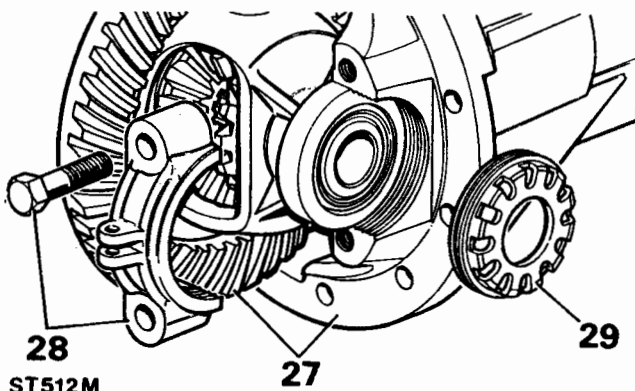
ST511M

- 30. Tighten bearing cap bolts to **90 Nm**.
- 31. Check crown wheel for run-out. This should not exceed 0,10 mm. If exceeded examine crown wheel and mounting flange for burrs, grit, etc. Refit and recheck. A buckled or damaged differential housing flange is corrected by replacing differential gear housing.
- 32. After checking run out remove differential housing from pinion housing.
- 33. Remove crown wheel bolts and refit using Loctite 'Studlock'. Tighten to **58 Nm**.



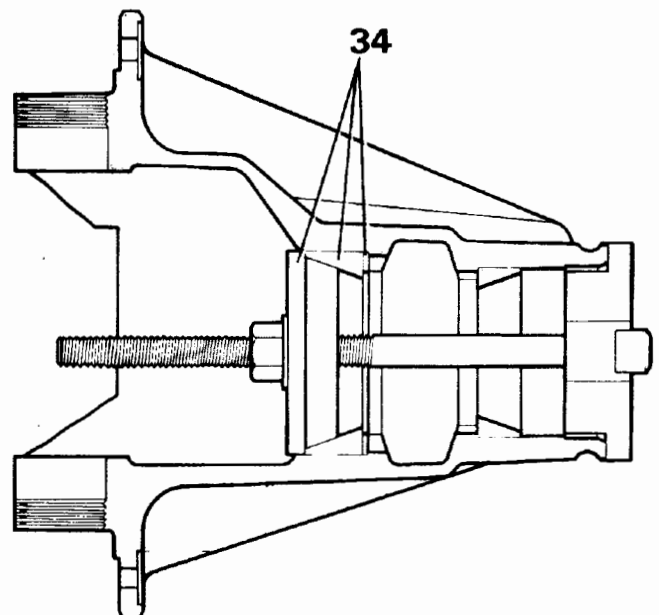
ST513M

- 27. Place differential housing with crown wheel and bearings in pinion housing.
- 28. Fit bearing caps and bolts. Do not tighten bolts.
- 29. Fit bearing adjusting nuts and adjust to obtain zero end float.



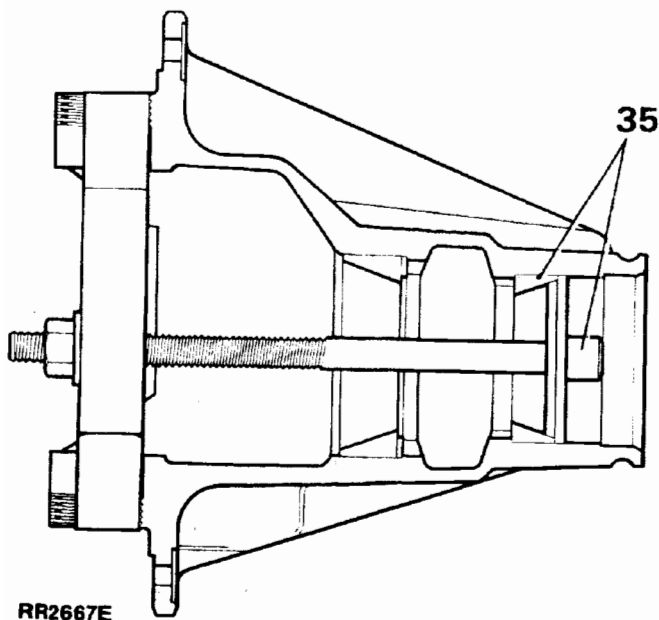
ST512M

- 34. Fit pinion head bearing track and original shim to pinion housing. Use service tools LRT-54-505 and LRT-54-506. If fitting a new shim use minimum 1.27 mm thickness.

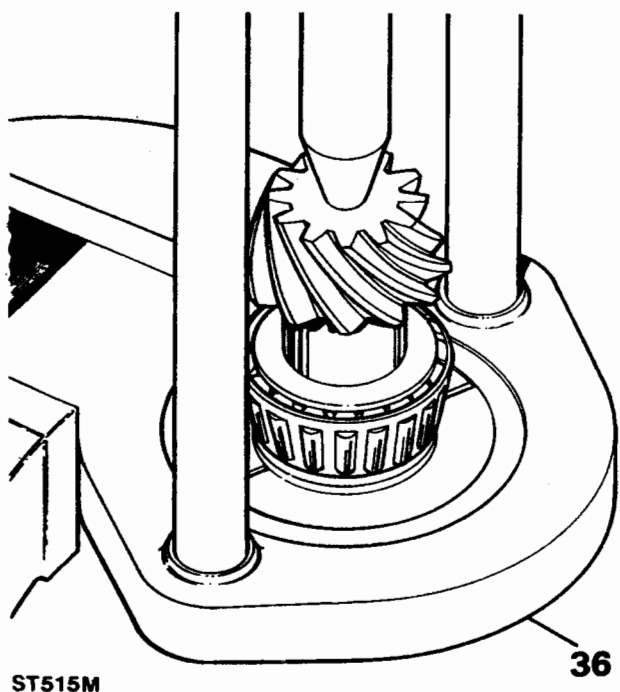


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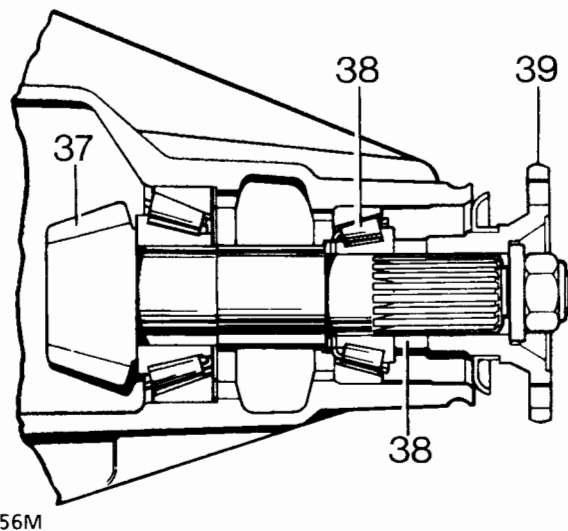
35. Fit pinion outer bearing track to pinion housing. Use service tools LRT-54-505 and LRT-54-507.



36. Fit pinion head bearing to pinion. Use service tool LRT-54-502.



37. Fit pinion into its location without shims for bearing pre-load.
38. Fit outer bearing, and spacer (front axle differential only).
39. Fit driving flange, washer and nut.



40. Do not fit oil seal at this stage.
41. Tighten pinion flange nut until force required to rotate pinion is **3 Nm** if new bearings are fitted. This will pre-load bearings to check pinion height dimension.



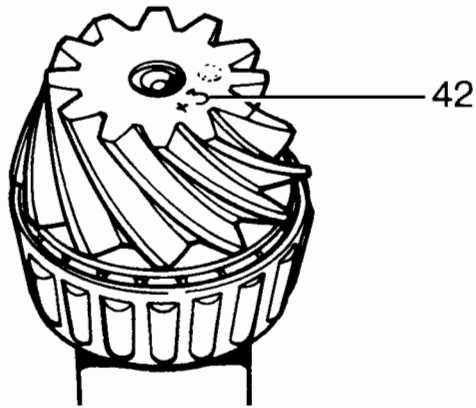
NOTE: If using original bearings, pre-load figure is 1.5 Nm.

Drive pinion markings



NOTE: Markings on end face adjacent to serial number are of no relevance to servicing.

42. Figures marked on end face opposite to serial number show in thousandths of an inch, deviation from nominal, required to set pinion. Pinions marked plus (+) must be set below nominal. Pinions marked minus (-) must be set above nominal. Unmarked pinions must be set at nominal.



J5357M

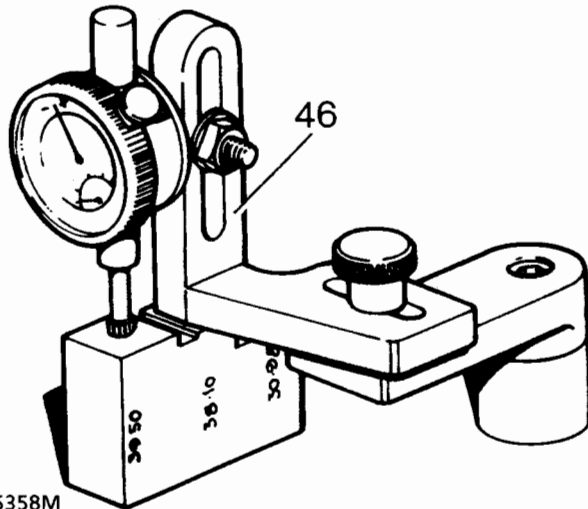
- 43. Nominal setting dimension is represented by setting gauge block LRT-54-503. Referenced from pinion end face to bottom radius of differential bearing bore.

Drive pinion adjustment

- 44. Ensure pinion end face is free of burrs around etched markings.
- 45. Remove keep disc from magnetized base of dial gauge tool.
- 46. Place dial gauge and setting block on surface plate. Zero dial gauge trace pin on setting block.

▲ **NOTE: Setting block has three height settings heights.**

Use 39.50mm setting mark for this differential.

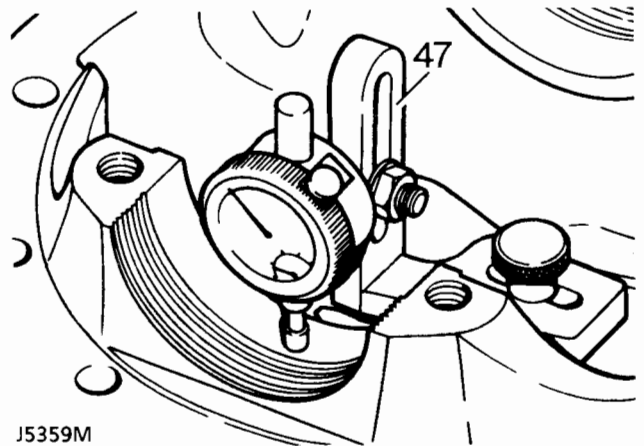


J5358M

Pinion height shims

PART No.	INCH	MM
FTC3853	.061	1.548
FTC3854	.060	1.523
FTC3855	.059	1.498
FTC3856	.058	1.473
FTC3857	.057	1.448
FTC3858	.056	1.423
FTC3859	.055	1.398
FTC3860	.054	1.373
FTC3861	.053	1.348
FTC3862	.052	1.323
FTC3863	.051	1.298
FTC3864	.050	1.273
FTC3865	.049	1.248
FTC3866	.048	1.223
FTC3867	.047	1.198
FTC3868	.046	1.173

- 47. Position dial gauge centrally on pinion end face, register on lowest point on one differential bearing bore. Note dial gauge measurement from zeroed setting.



J5359M

48. Repeat on other bearing bore. Add readings then halve sum to obtain mean reading. Note whether trace pin has moved up or down from zero.
- Where trace pin moves down, reading is equal to thickness of shims to remove, to bring pinion to nominal.
 - Where trace pin moves up, reading is equal to thickness of shims to add, to bring pinion to nominal.
49. Before adjusting shim thickness: check pinion face marking. If a plus (+) figure, subtract in thousandths of an inch from shim thickness figure.
50. If pinion has a minus (-) figure, add amount to shim thickness figure.
Adjust shim thickness under pinion head bearing track as necessary.

INCH	=	MM
.001	=	.025
.002	=	.05
.003	=	.075
.004	=	.10
.005	=	.125
.006	=	.15
.007	=	.175
.008	=	.20
.009	=	.225
.010	=	.25

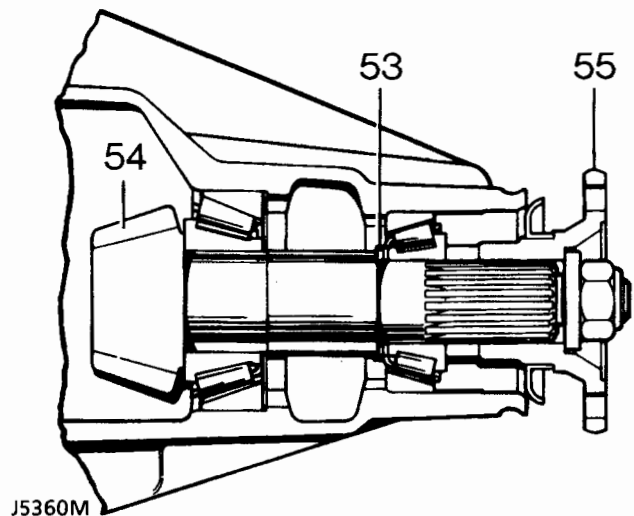


NOTE: Where dial indicator is metric conversion must be made to inches when measuring and selecting shims.

51. Recheck pinion height setting. If setting is correct, mean reading of dial gauge will agree with figure marked on pinion end face.
For example, with end face marking of +3, dial gauge reading should indicate pinion is +0.003 in.

Bearing pre-load adjustment

- Remove the pinion flange, pinion, outer bearing and spacer.
- Slide new shim, of same thickness as original (bearing pre-load) into position on pinion shaft. If fitting a new shim use thickest shim 2.155 mm.
- Fit pinion to pinion housing and fit outer bearing and spacer (front differential only).
- Fit driving flange, washer and nut.
- Do not fit oil seal at this stage.



57. Tighten pinion flange nut to **130 Nm**. Force to rotate pinion shaft is 3Nm using new bearings. Change shim as necessary to obtain reading. Thicker shim will reduce pre-load. Thinner shim will increase pre-load.



NOTE: If using original bedded in bearings, pre-load figure is 1.5 Nm.

58. Remove pinion flange.

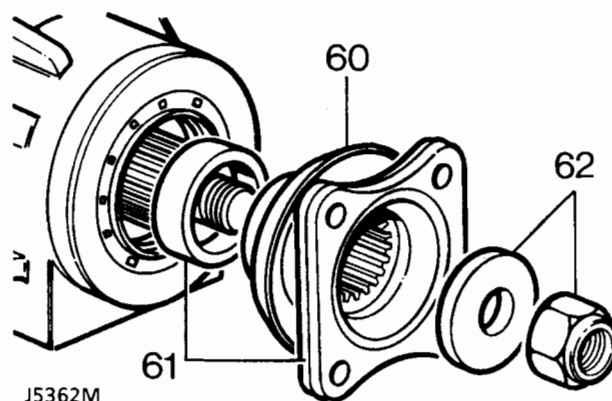


PINION PRELOAD SHIMS

PART No.	INCH	MM
FTC3869	.085	2.155
FTC3870	.084	2.130
FTC3871	.083	2.105
FTC3872	.082	2.080
FTC3873	.081	2.055
FTC3874	.080	2.030
FTC3875	.079	2.005
FTC3876	.078	1.980
FTC3877	.077	1.955
FTC3878	.076	1.930
FTC3879	.075	1.905
FTC3880	.074	1.880
FTC3881	.073	1.855
FTC3882	.072	1.830
FTC3883	.071	1.805
FTC3884	.070	1.780
FTC3885	.069	1.755
FTC3886	.068	1.730
FTC3887	.067	1.705
FTC3888	.066	1.680
FTC3889	.065	1.655
FTC3890	.064	1.630
FTC3891	.063	1.605
FTC3892	.062	1.580
FTC3893	.061	1.555
FTC3894	.060	1.530
FTC3895	.059	1.505
FTC3896	.058	1.480

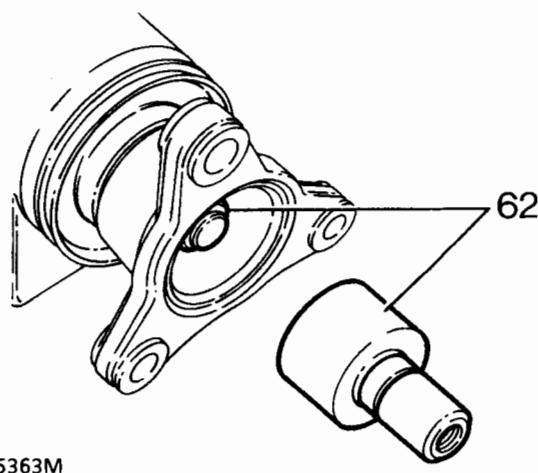
Fit pinion drive flange - front axle differential

- 60. Lubricate seal lips with axle oil.
- 61. Fit spacer and pinion drive flange to differential.
- 62. Secure flange with washer and nylon nut. Tighten to **130 Nm**.



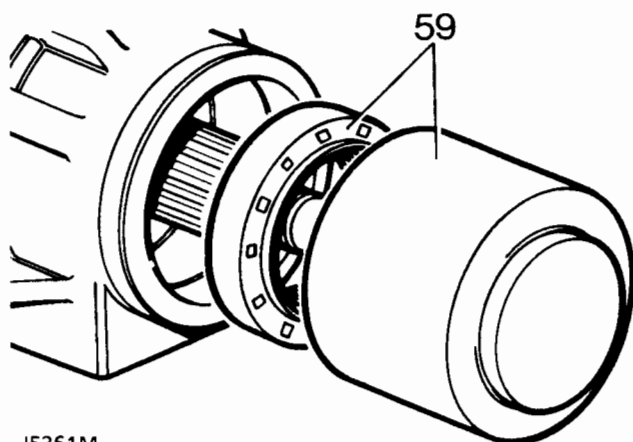
Fit pinion drive flange - rear axle differential

- 60. Lubricate seal lips with axle oil.
- 61. Fit pinion drive flange to differential and secure with washer and nylon nut. Tighten to **130 Nm**.
- 62. Coat centralizing peg with Loctite 601 or 638 and fit over pinion retaining nut in drive flange.



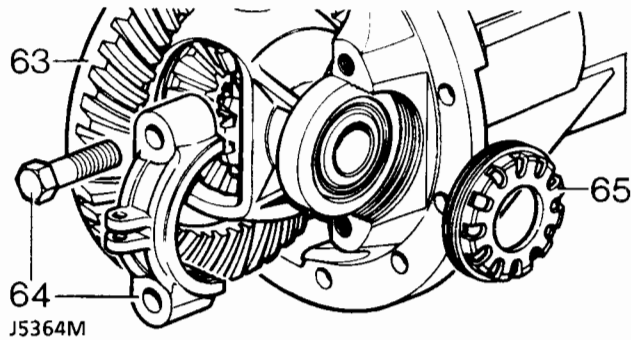
Fitting Pinion Oil Seal

- 59. Coat outer diameter of seal with grease. Fit seal lip side leading flush with end face of housing using tool LRT-51-001.

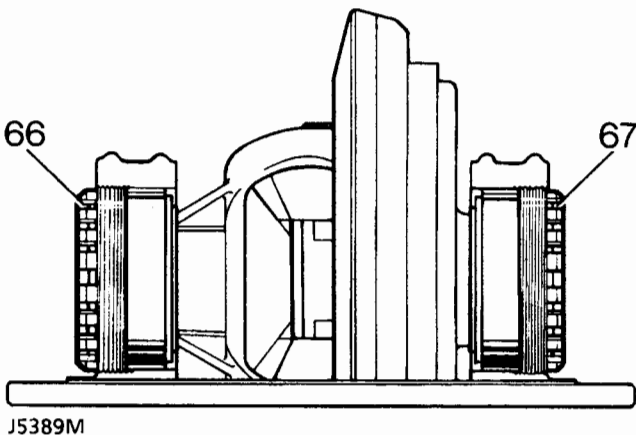
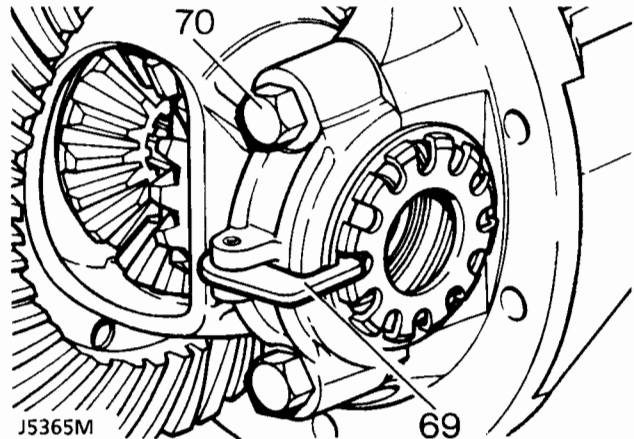


CROWN WHEEL/PINION BACKLASH ADJUSTMENT

63. Place differential housing in pinion housing.
64. Fit bearing caps and partly tighten bolts.



68. Tighten left nut until it contacts bearing. Continue turning until a backlash of 0,10 to 0,17 mm is met. **DO NOT** loosen right nut otherwise bearing preload will be affected.
69. Fit locking fingers and roll pins. Align locking finger with a slot.
70. Evenly tighten bearing cap bolts to **90 Nm**.



65. Fit bearing adjusting nuts.
66. Mesh crown wheel to pinion. Using service tool LRT-54-508 loosen left bearing adjuster nut.
67. Tighten right nut until crown wheel/pinion backlash is just removed.

71. Recheck crown wheel/pinion backlash.
72. Lubricate bearings and gears.



REAR HUB ASSEMBLY

Service repair no - 61.15.13.

Overhaul

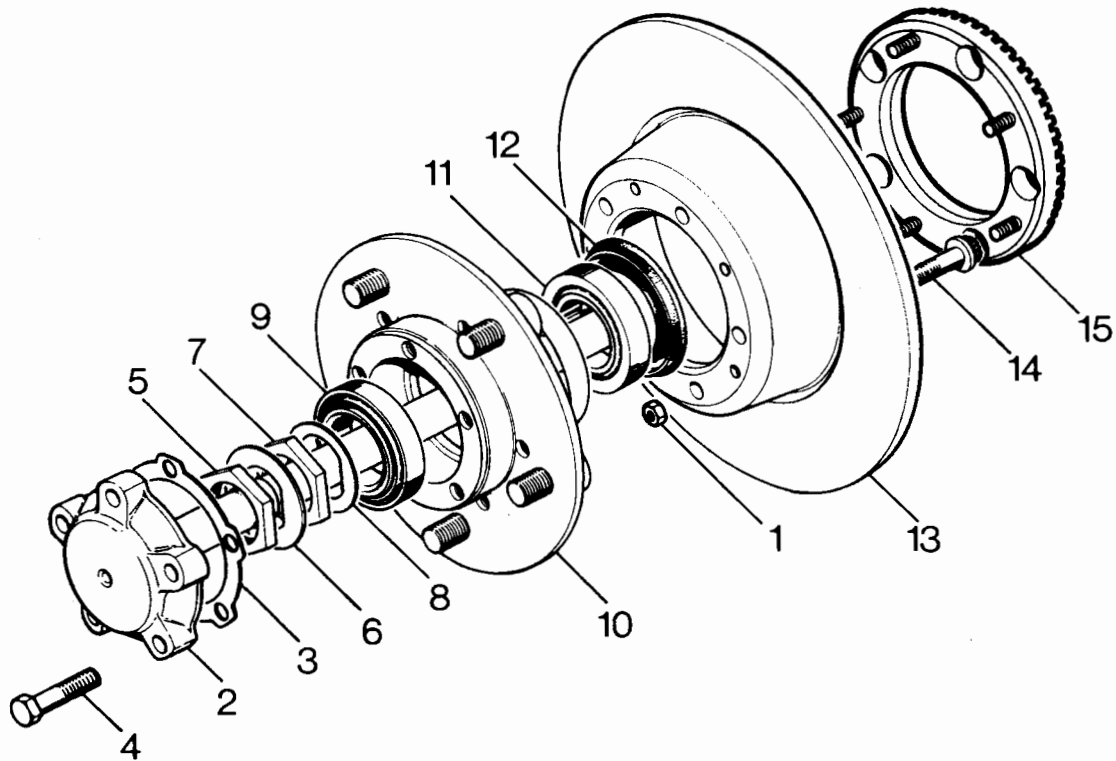
1. Remove rear hub assembly. *See Repair, Rear Hub Assembly*
2. Remove outer bearing.
3. Remove five nyloc nuts and withdraw ABS sensor ring, if applicable.
4. Mark, for reassembly, position of hub to brake disc.

5. Remove five bolts and separate hub from brake disc.



WARNING: A maximum of two road wheel retaining studs can be renewed. Should more studs be unserviceable fit new hub with studs.

6. Remove grease seal and inner bearing from hub.
7. Remove inner and outer bearing tracks.



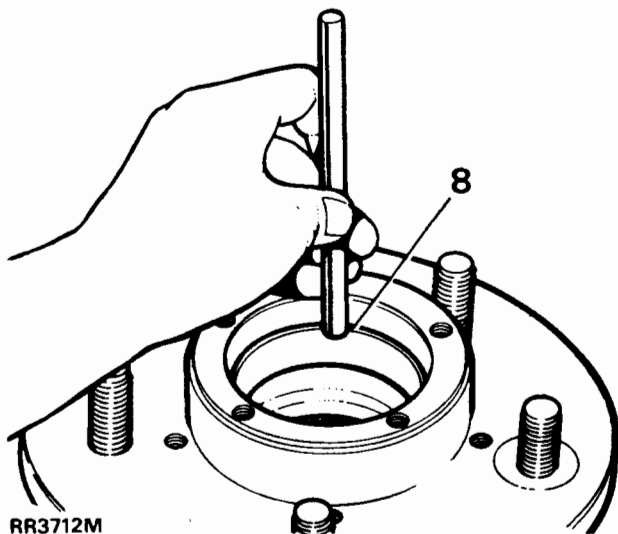
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REAR HUB COMPONENTS

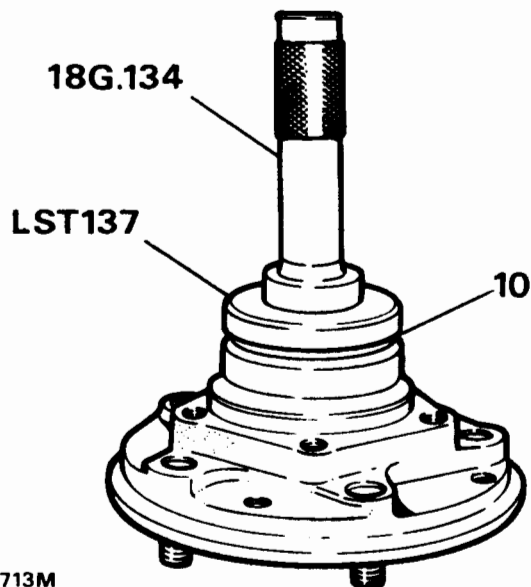
- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Sensor ring retaining nut ABS. 2. Axle shaft. 3. Axle shaft joint washer. 4. Axle shaft retaining bolt (five off). 5. Lock nut. 6. Lock washer. 7. Hub adjusting nut. 8. Spacing washer. | <ol style="list-style-type: none"> 9. Outer bearing. 10. Hub. 11. Inner bearing. 12. Grease seal. 13. Brake disc. 14. Disc retaining bolt (five off). 15. Sensor ring ABS. |
|--|---|

Refit

8. Clean hub and fit inner and outer bearing tracks.



9. Pack hub inner bearing with grease and fit to hub.
10. With lip side leading fit a new seal flush with rear face of hub. Using service tool LRT-54-003 seal replacer and drift. Apply grease between seal lips.



11. Assemble brake disc to the hub, line up reassembly marks. Applying Loctite 270, fit and tighten retaining bolts to **73 Nm**.
12. If necessary, where applicable, renew sensor ring studs applying Loctite 270 to threads. Fit sensor ring using new nyloc nuts. Tighten to **9 Nm**. Ensuring it is correctly fitted to avoid tooth run out.
13. Pack hub outer bearing with grease and fit to hub.
14. Fit rear hub assembly. **See Repair, Rear Hub Assembly**

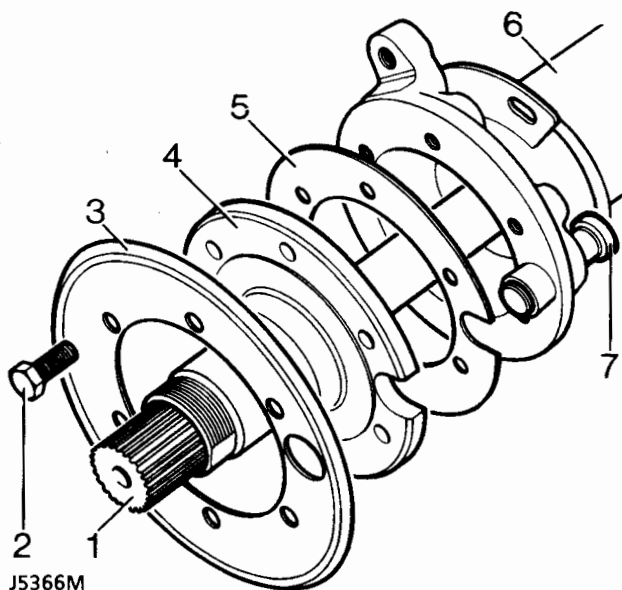


REAR STUB AXLE

Service repair no - 64.15.22.

STUB AXLE COMPONENTS

1. Rear axle shaft.
2. Stub axle to axle casing bolt.
3. Mudshield.
4. Stub axle.
5. Stub axle joint washer.
6. Axle case.
7. Sensor ABS.

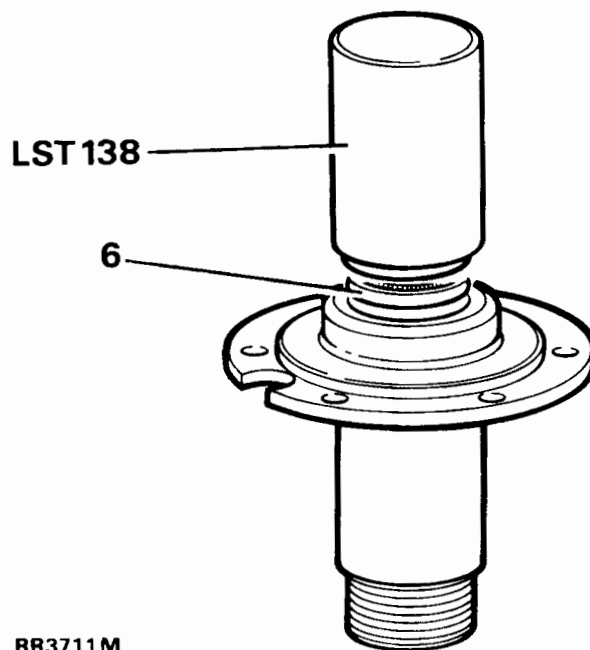


Overhaul

1. Remove hub assembly. *See Repair, Rear Hub Assembly*
2. Remove six bolts from stub axle to axle casing.
3. Remove mudshield.
4. Remove stub axle and joint washer.
5. Remove rear axle shaft from axle casing.

Renew rear stub axle oil seal

6. Remove and discard oil seal. Lubricate seal and lip with EP90 oil. Using special tool LST 138 fit new oil seal lipside trailing so that seal is flush with rear face of stub axle.



Refit

7. Fit new joint washer, stub axle and mudshield with bolts. Tighten to **65 Nm**.
8. Fit rear axle shaft avoid damaging stub axle seal.
9. Refit rear hub assembly. *See Repair, Rear Hub Assembly*



AXLE DIFFERENTIAL DATA

Pinion bearing pre-load:	
(new bearings)	3 Nm
(bearings bedded in)	1,5 Nm
Crown wheel run-out	0,10 mm
Crown wheel/pinion backlash	0,10 to 0,17 mm

REAR HUB

Rear hub end float	0,010 mm
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TORQUE VALUES



NOTE: Torque wrenches should be regularly checked for accuracy to ensure that all fixings are tightened to the correct torque.

	Nm
REAR AXLE	
Pinion housing to axle case	41
Crown wheel to differential case	58
Differential bearing cap to pinion housing	90
Differential drive flange to drive shaft	47
Bevel pinion nut	129
Lower link to axle	176
Pivot bracket ball joint to axle	176
REAR HUB ABS VEHICLES	
Hub driving member to hub	65 *
Brake disc to hub	73 *
Stub axle rear to axle case	65
Brake caliper to axle case	82
Disc shield to axle case	11
Sensor ring to brake disc ABS	9

* Apply loctite 270 prior to assembly.

Torque values below cover all screws and bolts used, unless specified otherwise.

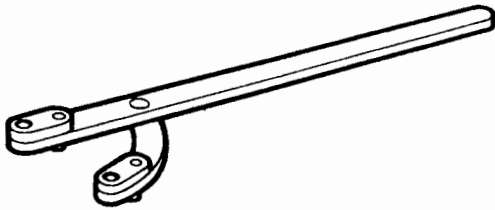
METRIC	Nm
M5	6
M6	9
M8	25
M10	45
M12	90
M14	105
M16	180

UNC / UNF	
1/4	9
5/16	24
3/8	39
7/16	78
1/2	90
5/8	136



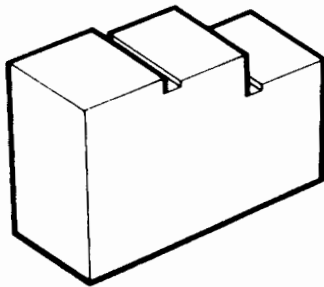
AXLE DIFFERENTIAL

LRT-51-003 Flange holder tool
18G1205



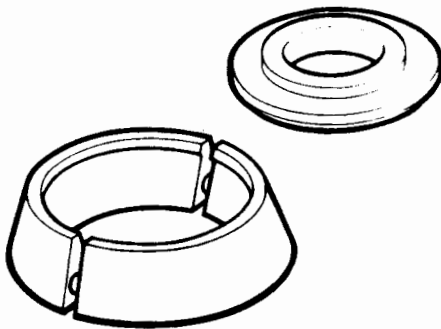
18G1205

LRT-54-504 Universal setting block
18G1914



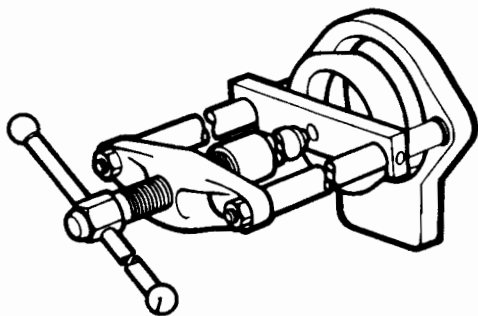
18G1914

LRT-54-502 Pinion head bearing remover/replacer
18G476

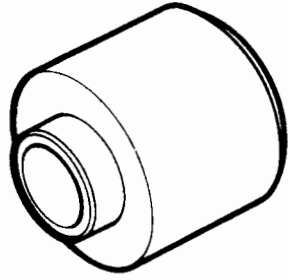


18G476

LRT-99-002 Press
MS47

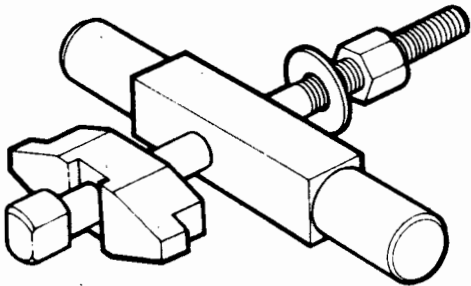


MS47



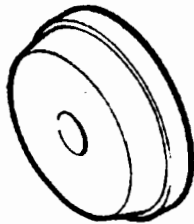
LRT-51-001 Oil seal replacer
LST106

LST106



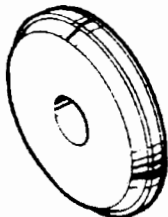
LRT-54-505 Extractor for pinion bearing races
RO262757A

262757A



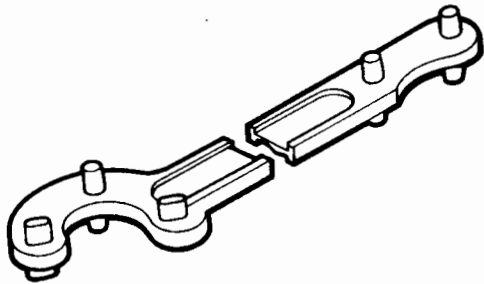
LRT-54-506 Replacer adapter pinion head bearing
cup
RO2627571

2627571



LRT-54-507 Adaptor pinion tail bearing cup
replacer
RO2627572

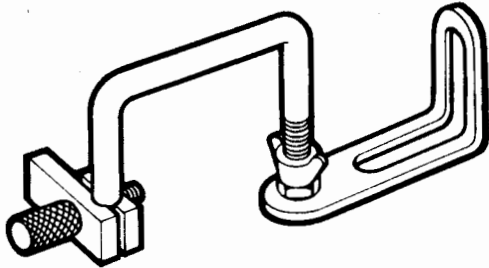
2627572



RO530105

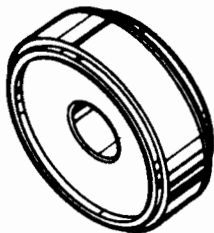
LRT-54-508 Wrench flange and carrier
RO530105 bearing nuts

REAR HUB



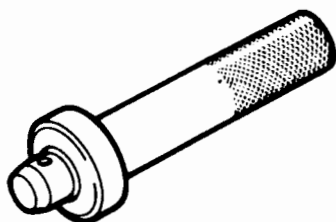
RO530106

LRT-99-503 Bracket for dial gauge and indicator
RO530106



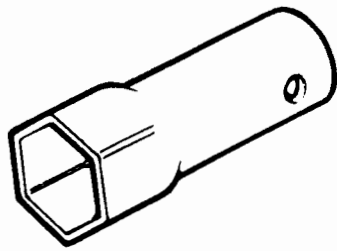
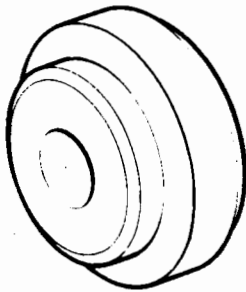
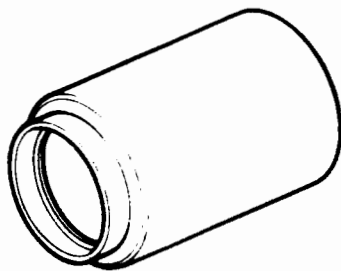
LST 5505

LRT-54-001 Oil seal replacer non ABS
LST550-5



18G134

LRT-99-003 Drift
18G134

**606435A****LRT-54-002**
RO606435A**Hub nut wrench****LST137****LRT-54-003**
LST137**Hub oil seal replacer ABS****LST138****LRT-54-004**
LST138**Oil seal replacer ABS**