

LT230T

TRANSFER GEARBOX



Overhaul Manual

LT230T
Verdeelbak revisieboek

LT230T
Boîte de transfert
Manuel de révision

LT230T
Verteilergetriebe
Überholungsanleitung

LT230T
Riduttore
Manuale di revisione

LT230T
Caja de transferencia
Manual de revisión

LT230T
Caixa de velocidades manual
Manual de revisão



LT230T TRANSFER BOX

OVERHAUL MANUAL

This transfer box is fitted to the following models:

**Serial No. Prefixes: 20D, 22D, 32D, 43D, 47D,
56D, 57D, 58D, 59D, and 60D - Defender**

**Serial No. Prefixes: 28D, 34D, 41D, 42D -
Discovery**

**Serial No. Prefixes: 14D, 15D, 20D, 26D, 27D, 28D
and 30D - Range Rover Classic**

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INTRODUCTION

How to use this manual

To assist in the use of this manual the section title is given at the top and the relevant sub-section is given at the bottom each page.

This manual contains procedures for overhaul of the LT230T transfer box. For all other information regarding adjustments and removal of oil seals, consult the Repair Manual for the model concerned.

This manual is divided into 3 sections:

- Description and Operation,
- Overhaul and
- Data, Torque & Tools.

To assist filing of revised information, each sub-section is numbered from page 1.

Individual items are to be overhauled in the sequence in which they appear in this Manual. Items numbered in the illustrations are referred to in the text.

Overhaul operations include reference to Service Tool numbers and the associated illustration depicts the tool. Where usage is not obvious the tool is shown in use. Operations also include reference to wear limits, relevant data, torque figures, specialist information and useful assembly details.

WARNINGS, CAUTIONS and Notes have the following meanings:



WARNING: Procedures which must be followed precisely to avoid the possibility of injury.



CAUTION: Calls attention to procedures which must be followed to avoid damage to components.



NOTE: Gives helpful information.

References

Operations covered in this manual do not include reference to testing the vehicle after repair. It is essential that work is inspected and tested after completion and if necessary a road test of the vehicle is carried out particularly where safety related items are concerned

Dimensions

The dimensions quoted are to design engineering specification with Service limits where applicable.

INTRODUCTION

REPAIRS AND REPLACEMENTS

When replacement parts are required it is essential that only Land Rover recommended parts are used.

Attention is particularly drawn to the following points concerning repairs and the fitting of replacement parts and accessories.

Safety features and corrosion prevention treatments embodied in the car may be impaired if other than Land Rover recommended parts are fitted. In certain territories, legislation prohibits the fitting of parts not to the manufacturer's specification.

Torque wrench setting figures given in this Manual must be used. Locking devices, where specified, must be fitted. If the efficiency of a locking device is impaired during removal it must be renewed.

The terms of the vehicle Warranty may be invalidated by the fitting of other than Land Rover recommended parts. All Land Rover recommended parts have the full backing of the vehicle Warranty.

Land Rover Dealers are obliged to supply only Land Rover recommended parts.

SPECIFICATION

Land Rover are constantly seeking to improve the specification, design and production of their vehicles and alterations take place accordingly. While every effort has been made to ensure the accuracy of this Manual, it should not be regarded as an infallible guide to current specifications of any particular component or vehicle.

This Manual does not constitute an offer for sale of any particular component or vehicle. Land Rover Dealers are not agents of the Company and have no authority to bind the manufacturer by any expressed or implied undertaking or representation.

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TRANSFER BOX

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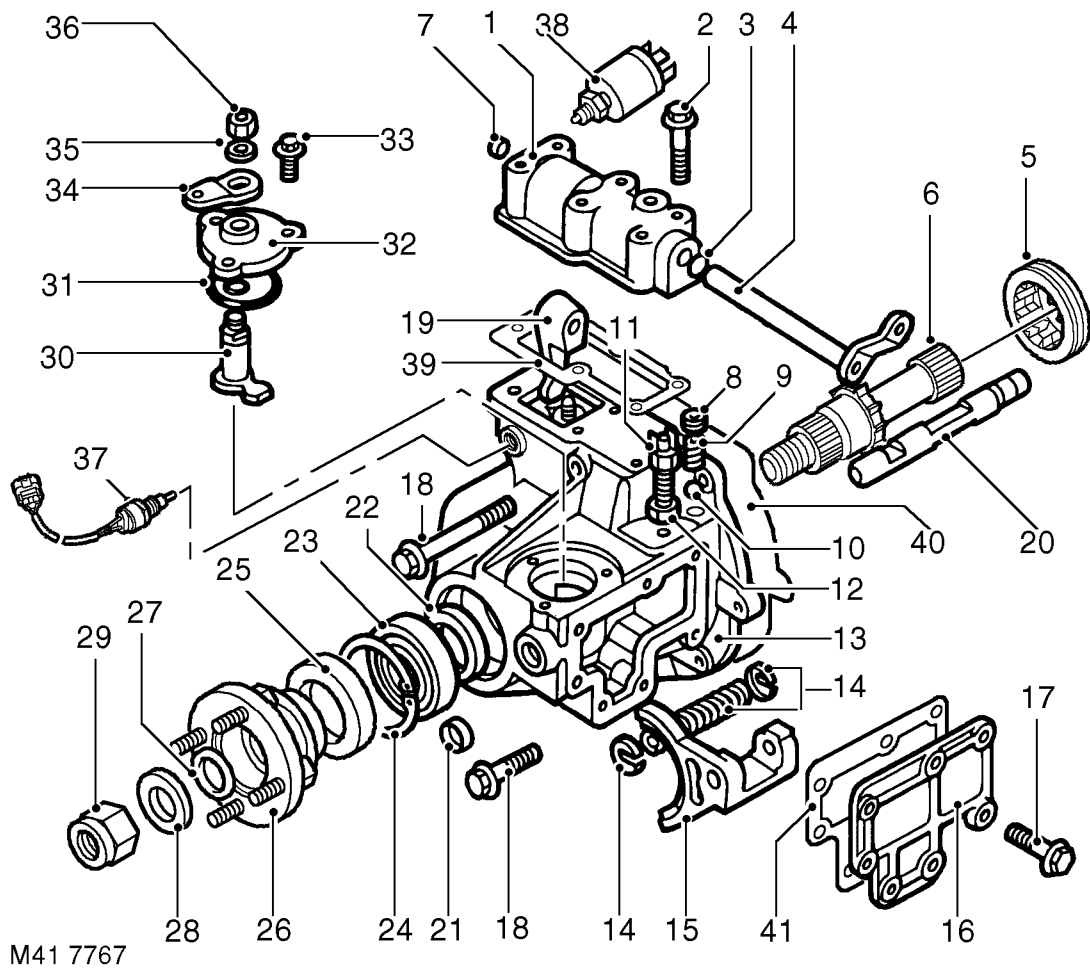
DATA, TORQUE & TOOLS

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TRANSFER BOX





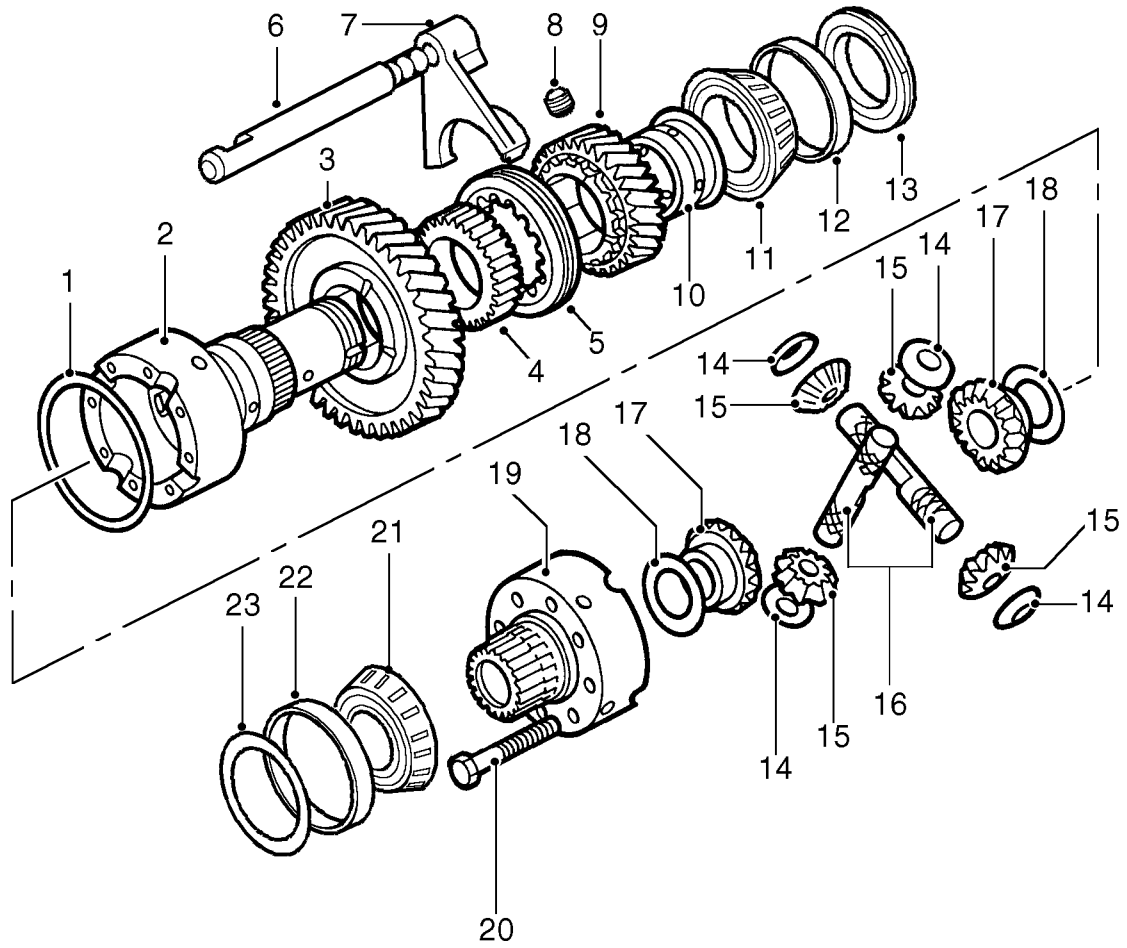
FRONT OUTPUT HOUSING COMPONENTS

1. High/low cross shaft housing
2. Bolt - high/low cross shaft housing
3. 'O' ring
4. High/low cross shaft and lever
5. Dog clutch
6. Front output shaft
7. Hollow plug
8. Detent plug - differential lock
9. Detent spring - differential lock
10. Detent ball - differential lock
11. Differential lock warning lamp switch
12. Locknut **
13. Front output housing
14. Spring and clips - differential lock
15. Differential lock selector fork
16. Side cover
17. Bolt - side cover
18. Bolt - front output housing
19. High/low selector finger
20. Differential lock selector shaft
21. Plug
22. Bearing spacer
23. Output shaft bearing
24. Circlip
25. Oil seal
26. Output shaft flange and mud shield
27. Felt washer
28. Steel washer
29. Self-locking nut
30. Differential lock selector finger and shaft
31. 'O' rings
32. Differential lock selector housing
33. Bolt - housing
34. Selector lever
35. Washer
36. Self-locking nut
37. Low detect switch - later boxes - if fitted
38. Low detect switch - early boxes - if fitted
39. Gasket - high/low cross shaft housing *
40. Gasket - front output housing *
41. Gasket - side cover plate *

* Up to serial no. 288709E

** Later boxes - spacer fitted in place of locknut

TRANSFER BOX



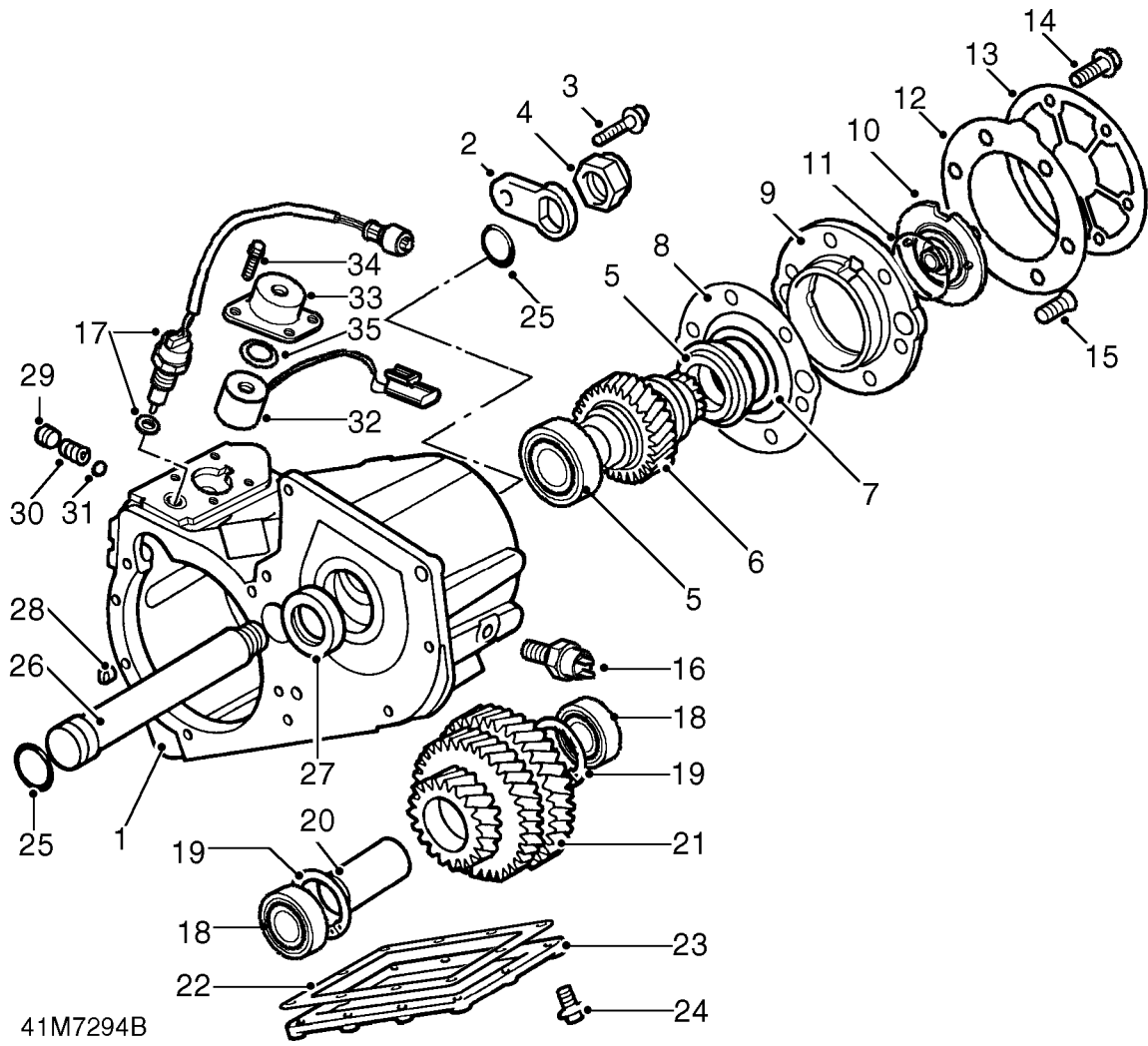
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DIFFERENTIAL COMPONENTS

- | | |
|--------------------------------------|---------------------------------------|
| 1. Retaining ring | 13. Bearing retaining nut |
| 2. Differential carrier - rear half | 14. Dished thrust washers |
| 3. Low range gear | 15. Planet gears |
| 4. High/low hub | 16. Cross shafts |
| 5. High/low selector sleeve | 17. Sun gears |
| 6. High/low selector shaft | 18. Selective thrust washers |
| 7. High/low selector fork | 19. Differential carrier - front half |
| 8. Setscrew - high/low selector fork | 20. Bolt - differential carriers |
| 9. High range gear | 21. Differential front bearing |
| 10. High range gear bush | 22. Bearing outer track |
| 11. Differential rear bearing | 23. Selective shim |
| 12. Bearing outer track | |

TRANSFER BOX





MAIN CASING COMPONENTS

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Main casing 2. Retaining plate 3. Bolt - retaining plate 4. Stake nut - intermediate shaft 5. Bearings and outer tracks - mainshaft input gear 6. Mainshaft input gear * 7. Selective shim 8. Gasket ** 9. Mainshaft input gear bearing housing 10. Oil feed plate *** 11. 'O' ring *** 12. Gasket ** 13. Cover plate/power take-off cover * 14. Bolt - cover plate 15. Countersunk screw - bearing housing 16. Oil temperature switch *** 17. Neutral warning lamp switch and washer *** | <ol style="list-style-type: none"> 18. Bearings and outer tracks - intermediate gears 19. Circlips 20. Collapsible spacer **** 21. Intermediate gears 22. Gasket ** 23. Bottom cover plate 24. Bolt - bottom cover plate 25. 'O' rings - intermediate shaft 26. Intermediate shaft 27. Mainshaft oil seal 28. Locating dowel 29. Detent plug - high/low selector 30. Detent spring - high/low selector 31. Detent ball - high/low selector 32. Interlock solenoid *** 33. Cover - interlock solenoid *** 34. Bolt - interlock solenoid cover *** 35. Belleville washer *** |
|--|--|

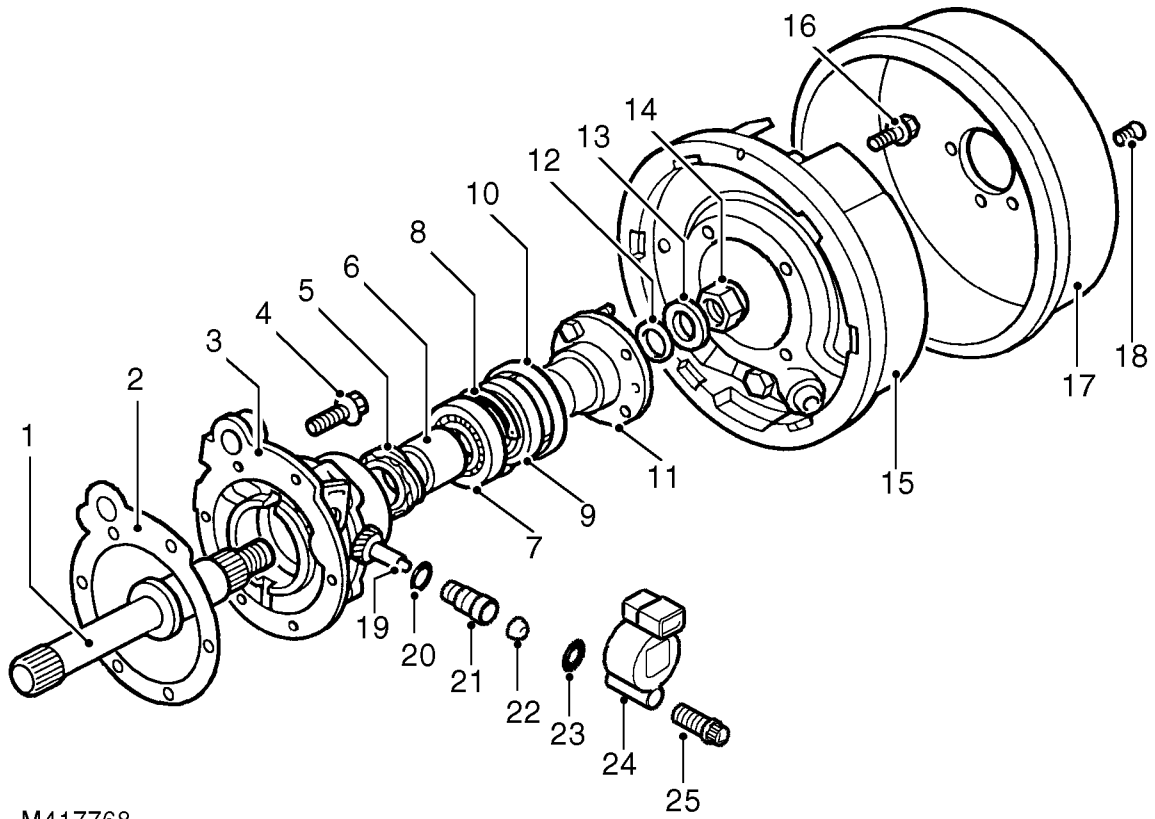
* Defender mainshaft input gear and Discovery power take-off cover plate illustrated

** Up to serial no. 288709E

*** If fitted

**** Selective length - non-collapsible spacer fitted on later transfer boxes

TRANSFER BOX



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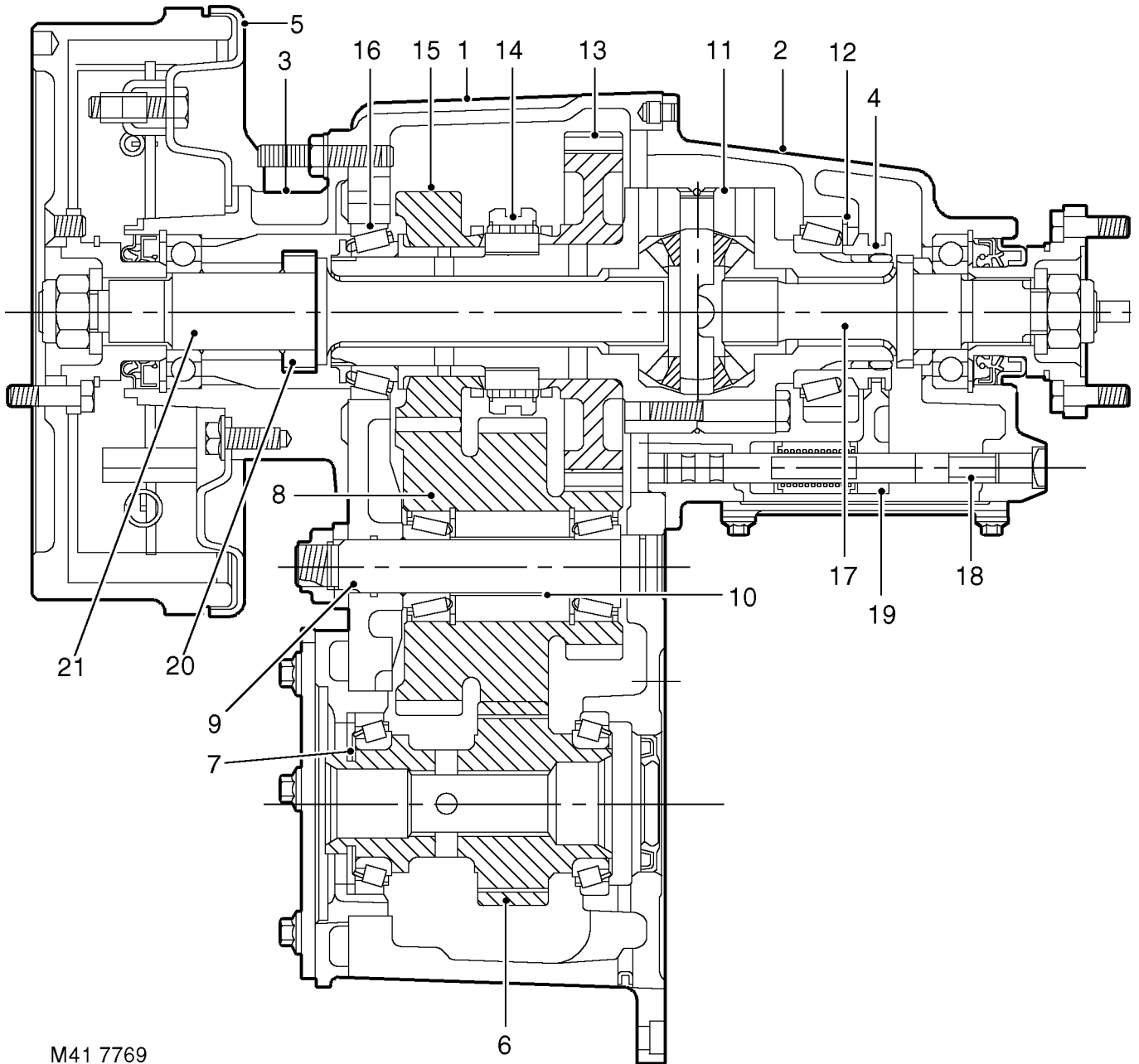
**REAR OUTPUT HOUSING AND TRANSMISSION
BRAKE COMPONENTS**

1. Rear output shaft
2. Gasket *
3. Rear output housing
4. Bolt - rear output housing
5. Speedometer drive gear
6. Spacer
7. Output shaft bearing
8. Circlip
9. Oil seal
10. Mud shield
11. Output shaft flange
12. Felt washer
13. Steel washer
14. Self-locking nut
15. Transmission brake backplate
16. Bolt - transmission brake backplate
17. Transmission brake drum
18. Countersunk screw
19. Speedometer driven gear
20. 'O' ring
21. Speedometer driven gear housing
22. Seal
23. 'O' ring **
24. Vehicle speed sensor **
25. Allen screw **

* Up to serial no. 288709E

** If fitted

TRANSFER BOX



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TRANSFER BOX CROSS SECTION

1. Main casing
2. Front output housing
3. Rear output housing
4. Dog clutch
5. Transmission brake
6. Mainshaft input gear
7. Selective shim - input gear bearing pre-load
8. Intermediate gear cluster
9. Intermediate shaft
10. Spacer - intermediate shaft bearing pre-load
11. Differential assembly
12. Selective shim - differential bearing pre-load
13. Low range gear
14. High/low selector sleeve and hub
15. High range gear and bush
16. Differential rear bearing
17. Front output shaft
18. Differential lock selector shaft
19. Selector fork
20. Speedometer drive gear
21. Rear output shaft

TRANSFER BOX

DESCRIPTION

Introduction

The LT230T transfer box is mounted at the rear of the main gearbox and transmits drive to the front and rear axles via the propeller shafts.

Construction

The transfer box comprises three main assemblies, the main casing, front output housing and rear output housing.

The main casing carries the mainshaft input gear, the intermediate gears and the differential together with the high/low range gears, selector shaft and fork.

The front output housing carries the front output shaft and flange, high/low cross shaft, housing and selector and the differential lock selector shaft and fork. A dog clutch on the front output shaft is operated by the differential lock selector fork to engage/disengage the differential lock.

The rear output housing carries the rear output shaft and flange and the speedometer drive and driven gears. A mechanically operated transmission brake is attached to the housing, the brake drum being attached to the output flange.

All housings and cover plates are sealed to the the main casing by gaskets or sealant; mud and water ingress being prevented by mud shields and throwers located at each end of the output housings and on the drive flanges.

Mainshaft input gear

The gearbox output shaft is splined into the mainshaft input gear which is supported by taper roller bearings.

Input gear bearing pre-load is achieved by the use of a selective shim located in the bearing housing. An additional power take-off gear is located at the rear of the input gear for certain applications.

Intermediate gears

The intermediate gear cluster is supported by taper roller bearings located at each end of the cluster and running on the intermediate shaft which, in turn, is supported at the front and rear by the main casing.

Intermediate gear bearing pre-load is achieved by means of compression applied to a spacer positioned between the bearings. Early transfer boxes are fitted with a collapsible spacer whilst later boxes have a selective length, non-collapsible spacer fitted. The amount of compression applied to the spacer is by means of a nut on the end of the intermediate shaft.

Differential Assembly

The differential assembly is supported at the front and rear by taper roller bearings, the bearing outer tracks being located in the front and rear output housings. Bearing pre-load is achieved by means of a shim located in the front output housing.

The differential rear shaft carries the low range gear, high/low selector sleeve and hub, high range gear and bush and the differential rear bearing; these components being secured to the shaft by a special nut.

The differential assembly comprises front and rear half carriers with integral shafts and sun and planet gears mounted on cross shafts within the half carriers. Dished, non-selective thrust washers control the engagement of the planet gears with the sun gears whilst selective thrust washers are used to control the engagement of the sun gears and load to turn of the differential. The differential carrier halves are bolted together, a retaining ring providing positive location of the cross shafts.

The high/low selector shaft and fork are located at the side of the differential, movement of the shaft, fork and selector sleeve being controlled by the high/low selector finger. A spring loaded detent ball fitted in the main casing, locates in grooves in the shaft.

For certain markets, an interlock solenoid is fitted in the main casing.



Front output housing assembly

The front output shaft is supported in the front output housing by a single bearing and is splined into the differential front shaft.

The high/low cross shaft is located in a housing bolted to the top of the output housing and is connected to the high/low selector finger which locates in a slot in the selector shaft.

The differential lock selector housing is also bolted to the top of the front output housing, the selector finger passes through the housing and locates in a slot in the differential lock selector shaft. The shaft passes through the selector fork which is located beneath a plate bolted to the side of the output housing. A spring loaded detent ball fitted in the output housing locates in grooves in the shaft.

A differential lock warning lamp switch, operated by movement of the selector fork and shaft is screwed into the top of the output housing.

For certain markets, a low detect switch, operated by the high/low selector is screwed into the cross shaft housing on early boxes or into the side of the output housing on later boxes.

Rear output housing assembly

The rear output shaft is supported in the rear output housing by a single bearing and is splined into the differential rear shaft. The output shaft also carries the speedometer drive gear which meshes with the driven gear located in the rear output housing.

Lubrication

Lubrication is by splash, oil filler/level plugs are located in the main casing. An oil temperature switch is also fitted for certain applications.

OPERATION

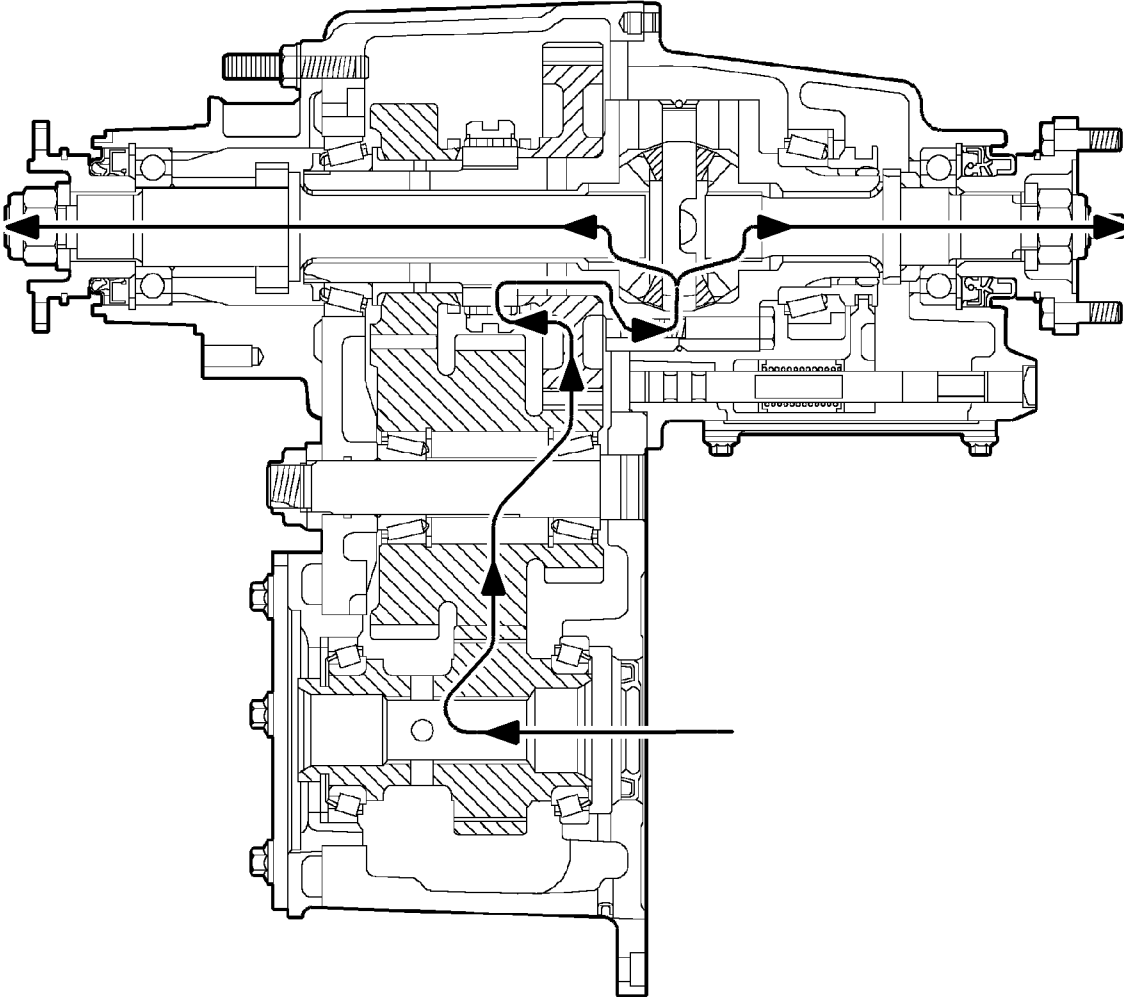
The gearbox input shaft transmits power to the mainshaft input gear which is in constant mesh with one of the intermediate gears. The intermediate gears are in constant mesh with the high and low range output gears running on the differential rear shaft.

Power is transmitted to the output shafts by locking either the high or low range gears to the differential rear shaft. This is achieved by means of the high/low selector fork, sleeve and splined hub.

The differential lock, when applied, prevents all available power being transmitted to the road wheels offering least resistance and is especially useful for 'off-road' conditions. When selected, the selector fork engages a dog clutch on the differential shaft with a gear on the front output shaft; this locks the differential and provide fixed drive thereby transmitting equal power to both output shafts.

TRANSFER BOX

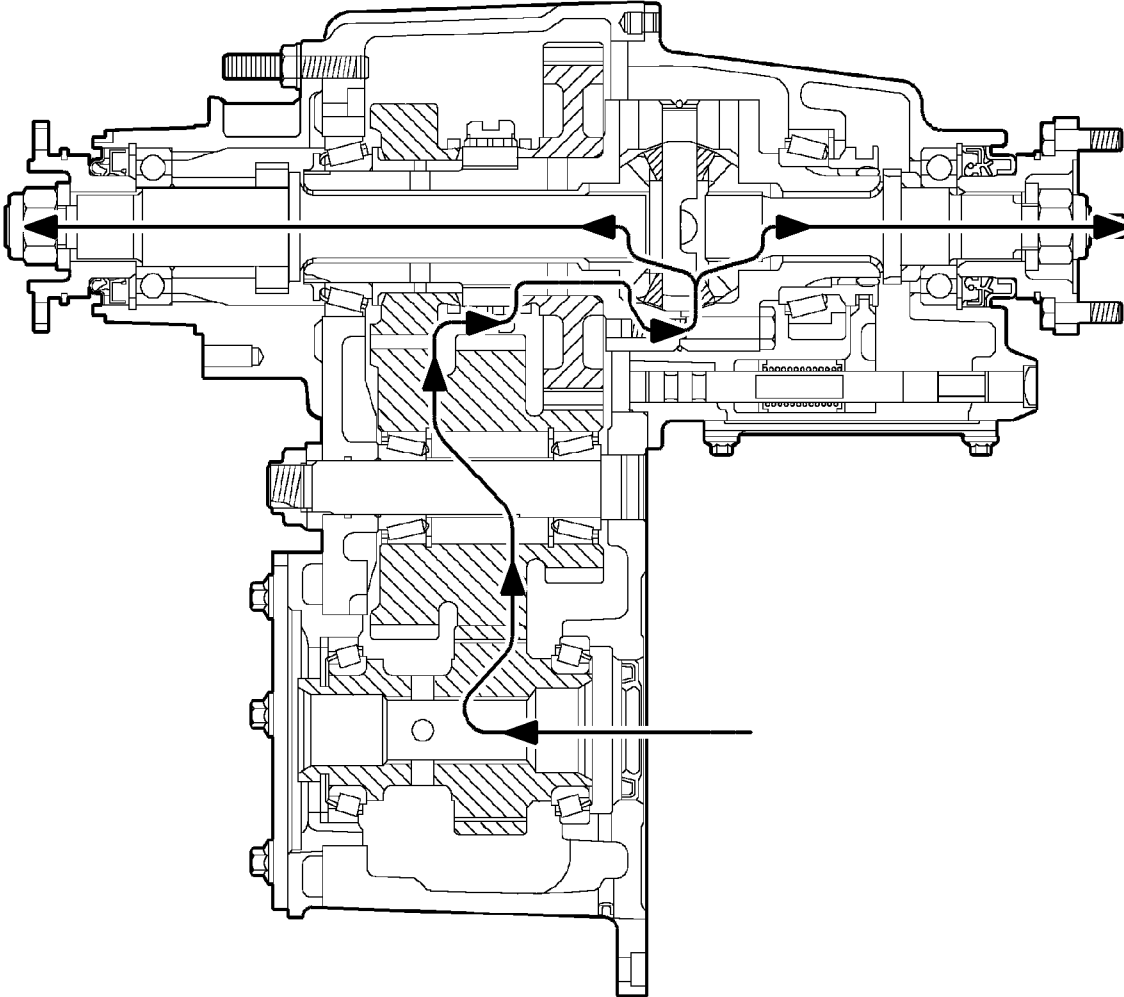
Power flow - transfer box in LOW ratio



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Power flow - transfer box in HIGH ratio

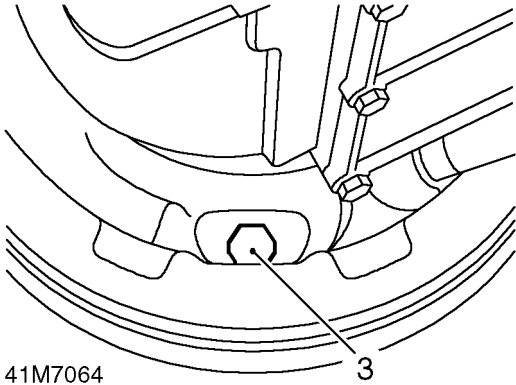


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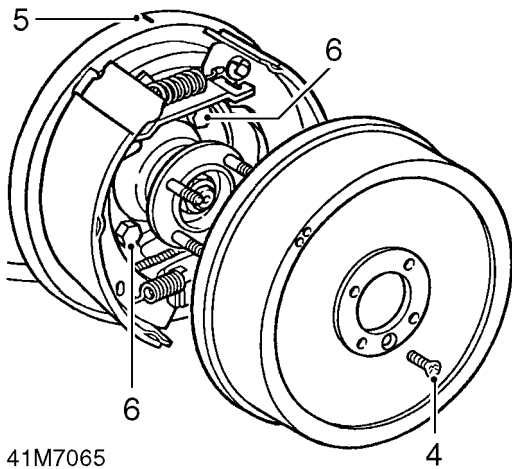


TRANSFER BOX DISMANTLING

1. Clean exterior of transfer box.
2. Drain and discard the oil, refit drain plug.



3. Loosen bolt to release transmission brake adjustment.

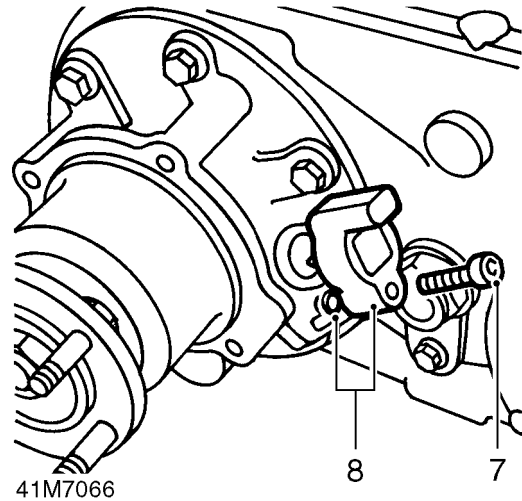


4. Remove countersunk screw securing transmission brake drum, remove drum.

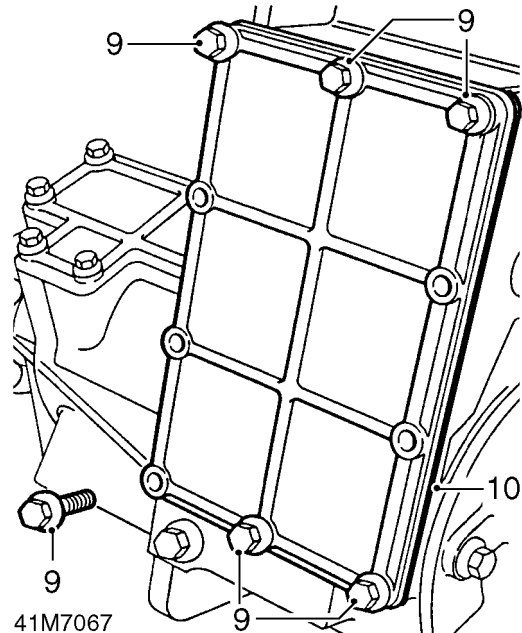


NOTE: 2 screws may be fitted.

5. Make suitable alignment marks between transmission brake backplate and rear output housing.
6. Remove 4 bolts securing transmission brake backplate, remove backplate.

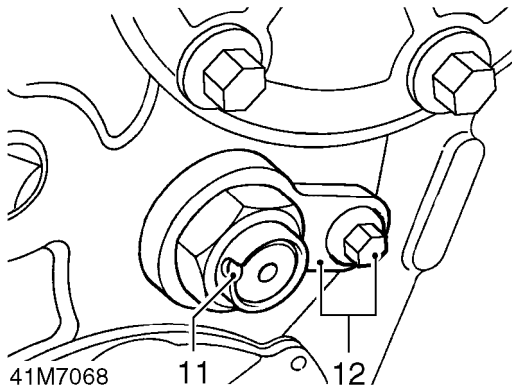


7. Remove Allen screw securing vehicle speed sensor - if fitted.
8. Remove vehicle speed sensor, remove and discard 'O' ring - if fitted.

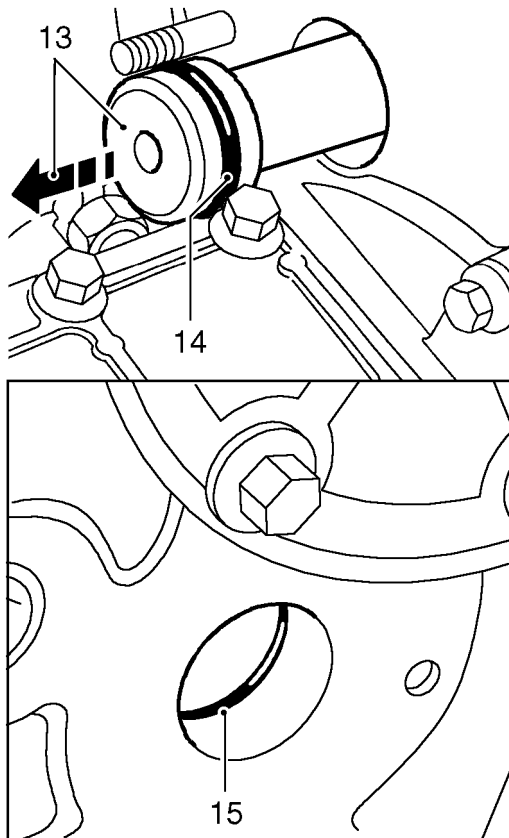


9. Remove 6 bolts securing bottom cover, remove cover.
10. *Up to serial no. 288709E:* Remove and discard gasket.

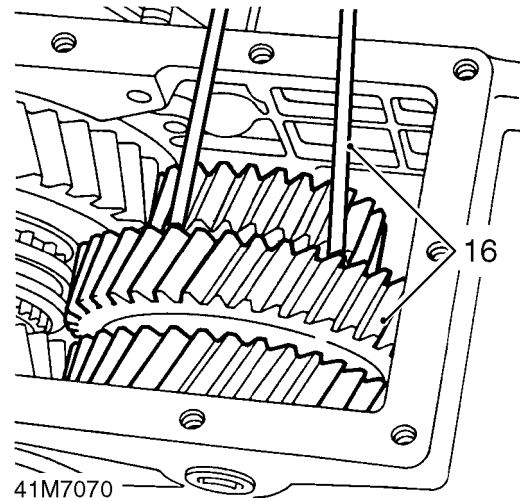
TRANSFER BOX



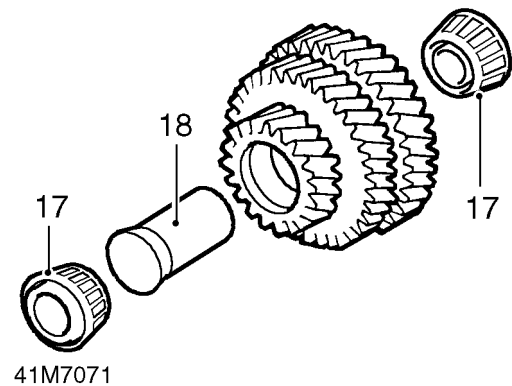
11. Release staking from intermediate shaft nut, remove and discard nut.
12. Remove bolt securing anti-rotation plate, remove plate.



13. Using a soft metal drift on threaded end of intermediate shaft, drive shaft out of main casing.
14. Remove and discard 'O' ring from intermediate shaft.
15. Remove and discard 'O' ring from main casing.

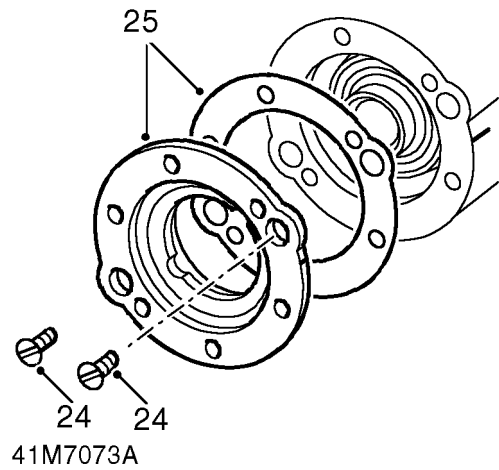
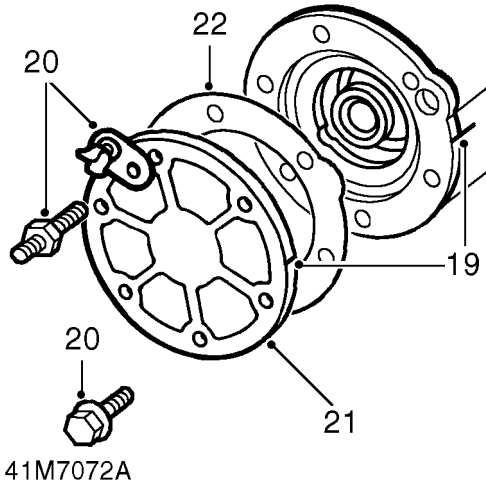


16. Wrap a suitable length of wire around intermediate gears and using assistance, lift gears out of main casing.



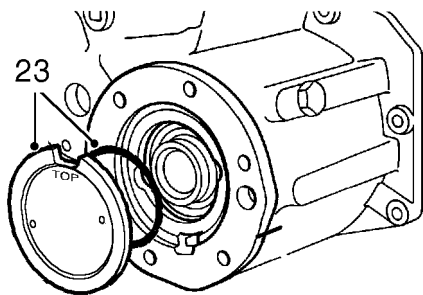
- NOTE: Collapsible spacer illustrated.**
17. Remove and discard 2 taper roller bearings from intermediate gears.
 18. Remove and discard spacer from intermediate gears.

CAUTION: Identify type of spacer fitted i.e. collapsible or selective length non-collapsible. Collapsible spacers can be identified by deformation of the spacer having occurred during setting of intermediate bearing pre-load. Collapsible spacers must be replaced by selective length non-collapsible spacers. Do not fit collapsible spacers, in place of selective length spacers. Do not remove bearing tracks at this stage.



NOTE: Discovery cover plate illustrated.

- 19. Make suitable alignment marks between cover plate/power take-off cover, mainshaft input gear bearing housing and main casing.
- 20. Noting fitted position of stud nut and harness/speedometer cable clip, remove 5 bolts and stud nut securing cover plate/ power take-off cover, recover clip.
- 21. Remove cover plate/power take-off cover.
- 22. *Up to serial no. 288709E:* Remove and discard gasket.

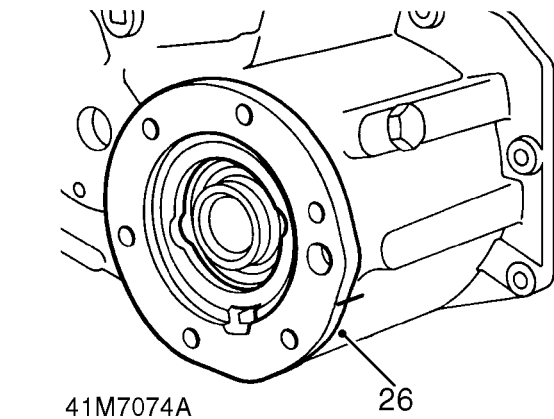


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- 23. Remove oil feed plate - if fitted, remove and discard 'O' ring.



CAUTION: Do not remove mainshaft input gear bearing track at this stage.



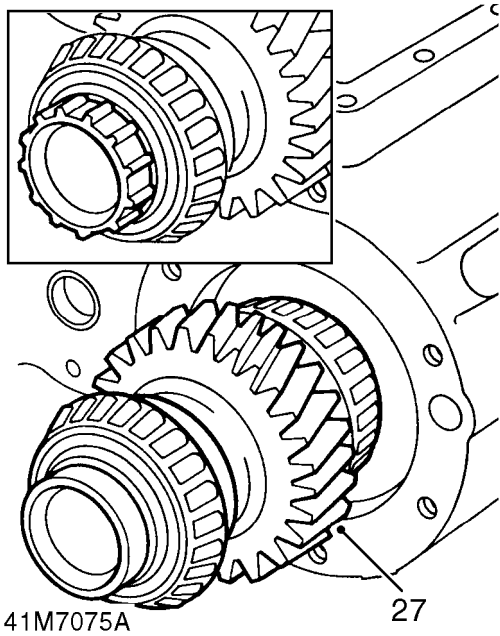
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- 26. *From serial no. 288709E:* Remove mainshaft input gear bearing housing.



CAUTION: Do not remove mainshaft input gear bearing track at this stage.

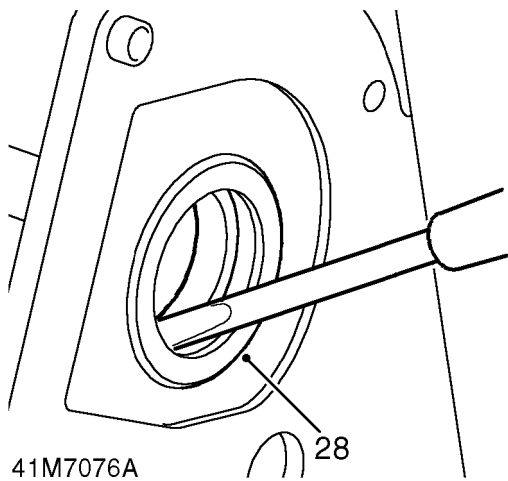
TRANSFER BOX



27. Remove mainshaft input gear together with taper roller bearings.



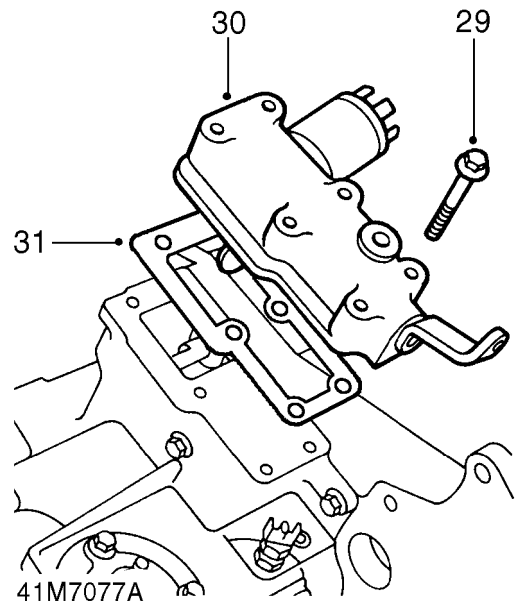
NOTE: Input gear fitted to Defender transfer boxes has an additional dog tooth gear - see inset on illustration.



28. Remove and discard mainshaft oil seal from main casing.



CAUTION: Do not remove mainshaft input gear bearing track at this stage.

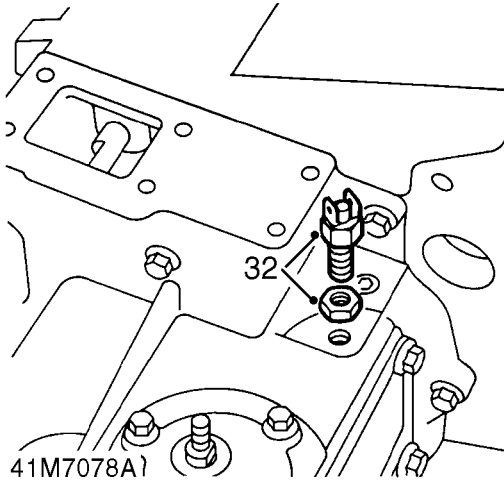


NOTE: Low detect switch fitted to early boxes illustrated.

29. Remove 6 bolts securing high/low cross shaft housing.
30. Remove cross shaft housing.
31. *Up to serial no. 288709E:* Remove and discard gasket.



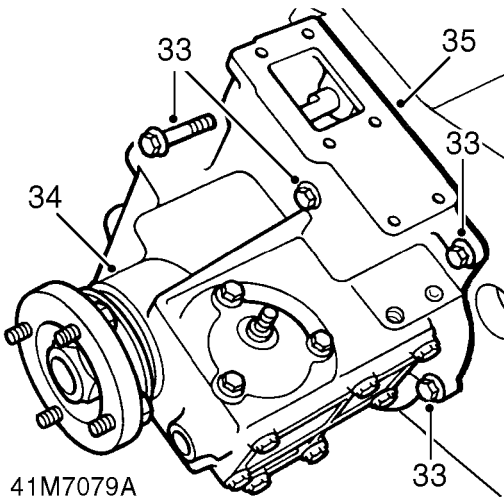
CAUTION: Do not carry out further dismantling of cross shaft housing at this stage.



32. Loosen locknut and remove differential lock warning lamp switch from front output housing.



NOTE: On later boxes, locknut is replaced by a spacer.



33. Noting fitted position of longest bolt, remove 8 bolts securing front output housing to main casing.
 34. Remove front output housing.

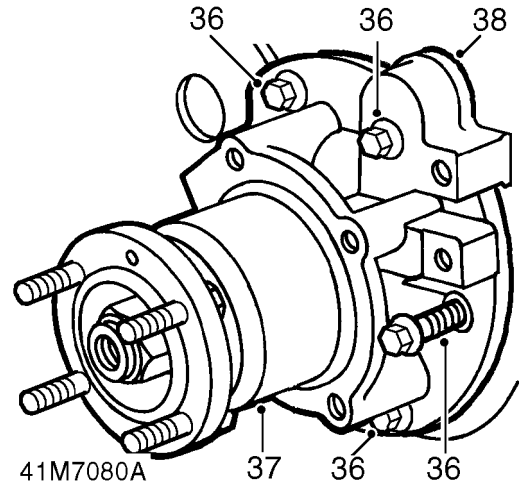


NOTE: Dowel located.

35. Up to serial no. 288709E: Remove and discard gasket.



CAUTION: Do not carry out further dismantling of front output housing at this stage.



36. Noting their fitted position, remove shoulder bolt, 5 bolts and 2 washers securing rear output housing to main casing.
 37. Remove rear output housing.



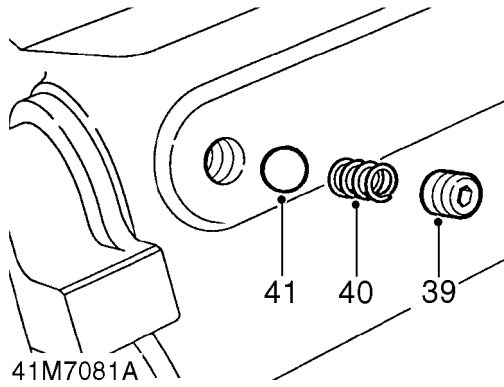
NOTE: Dowel located.

38. Up to serial no. 288709E: Remove and discard gasket.



CAUTION: Do not carry out further dismantling of rear output housing at this stage.

TRANSFER BOX



39. Remove plug securing high/low selector shaft detent spring and ball.
40. Remove detent spring.
41. Remove ball using a stick magnet.

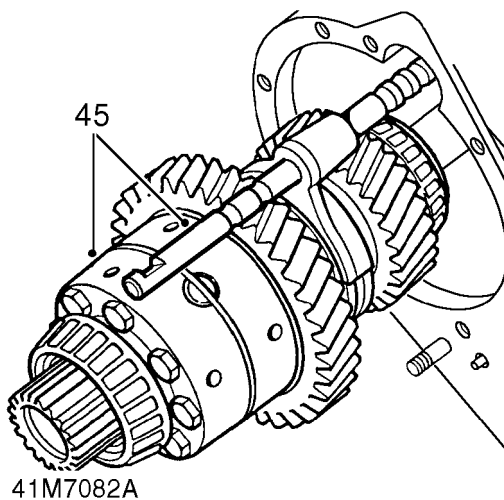


CAUTION: Suitably identify plug, detent spring and ball to their fitted positions, do not interchange with differential lock selector shaft detent components.

If fitted

42. Remove 4 bolts securing interlock solenoid cover, remove cover and Belleville washer.
43. Remove interlock solenoid.
44. Remove neutral warning lamp switch and washer.

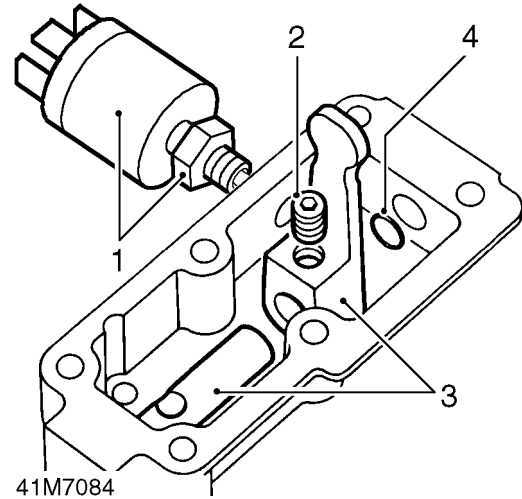
All transfer boxes



45. Withdraw differential assembly together with high/low selector shaft and fork.

COMPONENT DISMANTLING

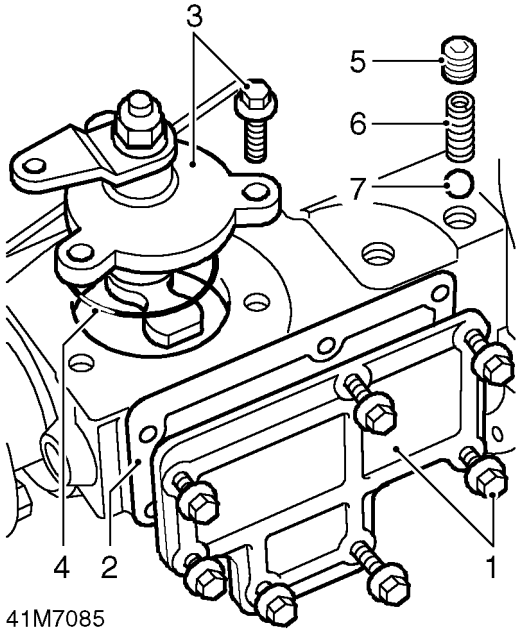
High/low cross shaft housing



1. Loosen locknut and unscrew low detect switch - if fitted.
2. Remove setscrew securing high/low selector finger to cross shaft.
3. Withdraw cross shaft from housing, recover high/low selector finger.
4. Remove and discard 'O' ring.



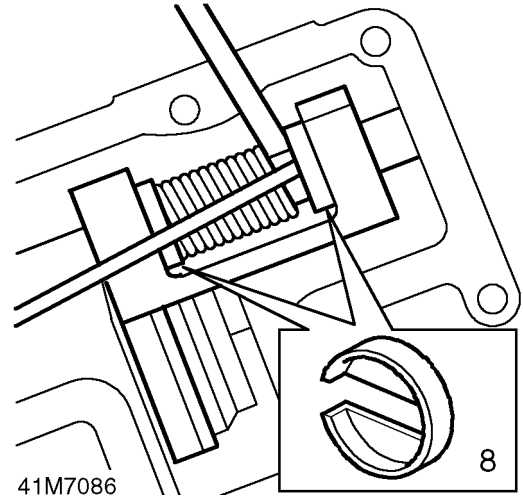
Front output housing



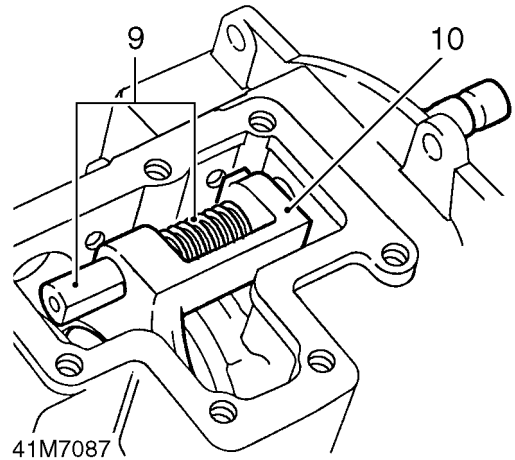
1. Remove 7 bolts securing differential lock selector side cover, remove cover.
2. *Up to serial no. 288709E:* Remove and discard gasket.
3. Remove 3 bolts securing differential lock selector housing, remove housing and selector as an assembly.
4. Remove and discard 'O' ring from selector housing.
5. Remove plug securing differential lock detent spring and ball.
6. Remove detent spring.
7. Remove ball using a stick magnet.



CAUTION: Suitably identify plug, detent spring and ball to their fitted positions, do not interchange with high/low selector shaft detent components.

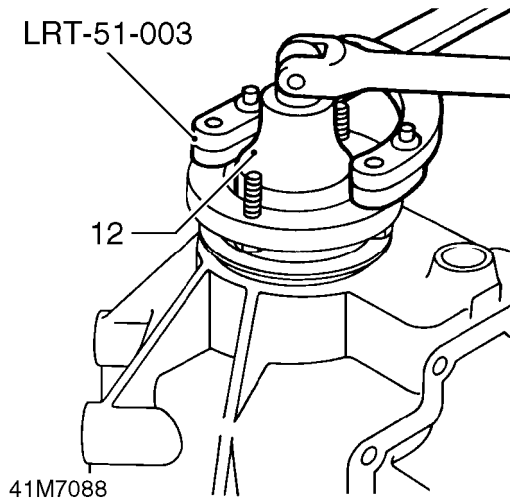


8. Compress differential lock selector fork spring and remove retaining clip from each end of spring.

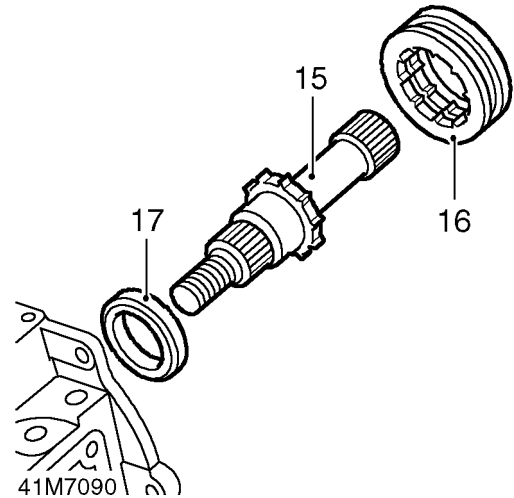


9. Withdraw differential lock selector shaft from front output housing, recover spring.
10. Remove differential lock selector fork.

TRANSFER BOX

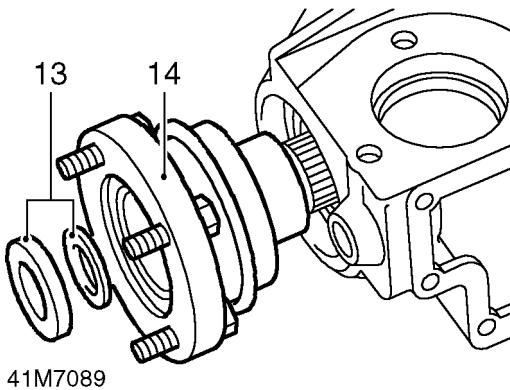


11. Position propeller shaft flange holding tool **LRT-51-003** to output shaft flange.
12. Remove and discard self-locking nut.



15. Using a mallet, drive output shaft out of front output housing.

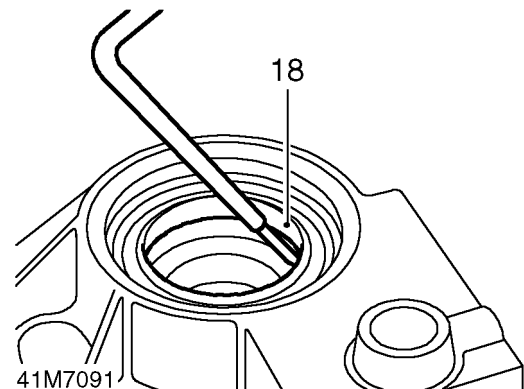
NOTE: If it is necessary to use a hand press to remove output shaft, position thrust button LRT-370-11/2 between shaft and press mandrel.



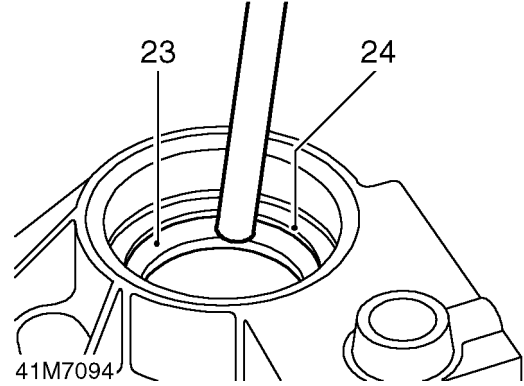
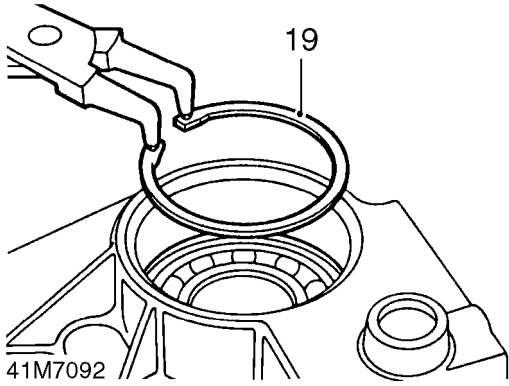
13. Remove and discard steel and felt washers.
14. Remove output shaft flange together with mud shield.

NOTE: A replacement output flange will be supplied together with new mud shield and output shaft oil seal.

16. Noting its fitted position, remove dog clutch from output shaft.
17. Noting its fitted position, remove bearing spacer from output shaft.

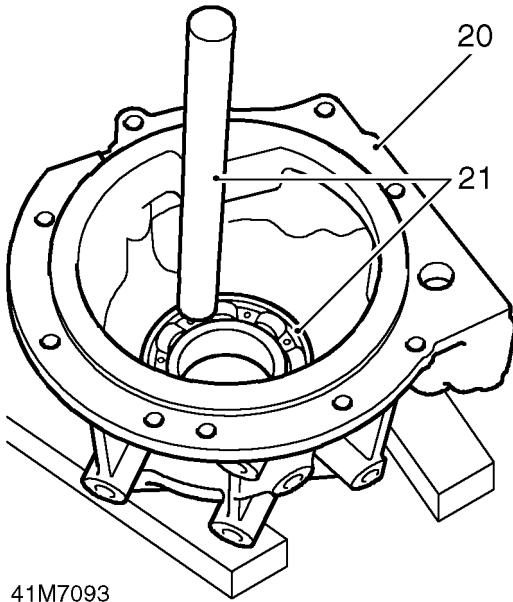


18. Taking care not to damage front output housing, remove and discard output shaft oil seal.



19. Using suitable circlip pliers, remove and discard circlip retaining output shaft bearing.

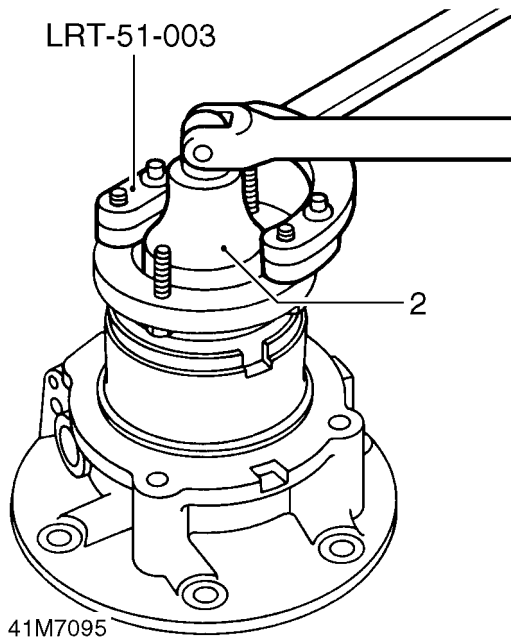
22. Invert front output housing.
 23. Using a soft metal drift, drive differential bearing track out of housing, discard bearing track.
 24. Remove selective shim.



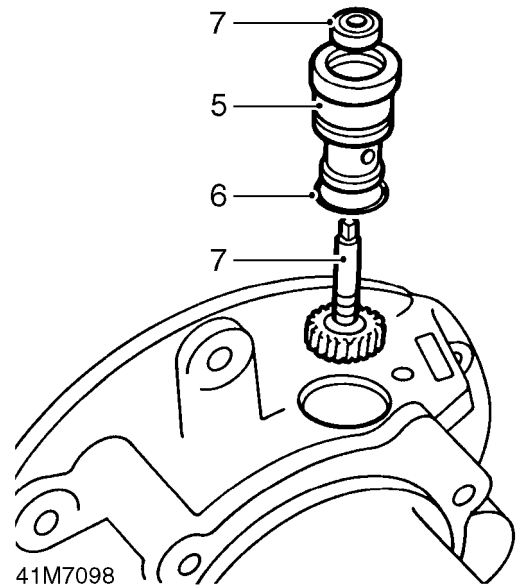
20. Support front output housing on suitable blocks of wood.
 21. Using a soft metal drift, drive output shaft bearing out of housing; discard bearing.

TRANSFER BOX

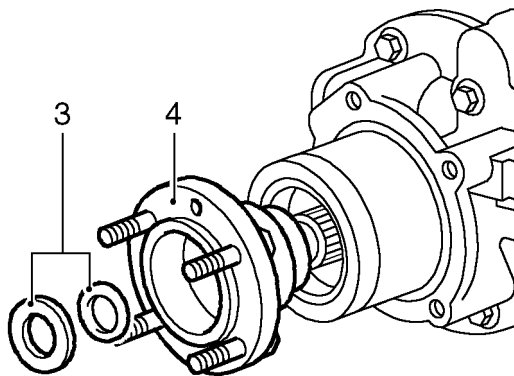
Rear output housing



1. Position propeller shaft flange holding tool **LRT-51-003** to output shaft flange.
2. Remove and discard self-locking nut.



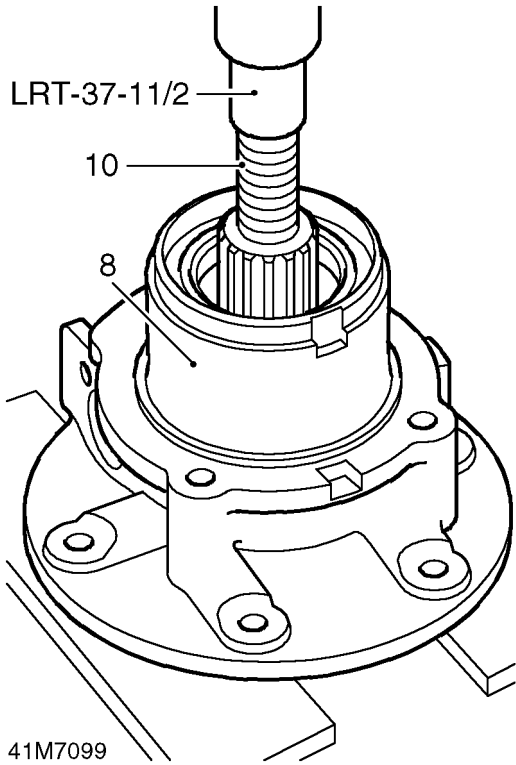
5. Carefully lever speedometer driven gear and housing out of rear output housing.
6. Remove and discard 'O' ring.
7. Withdraw speedometer driven gear from housing, remove and discard oil seal from housing.



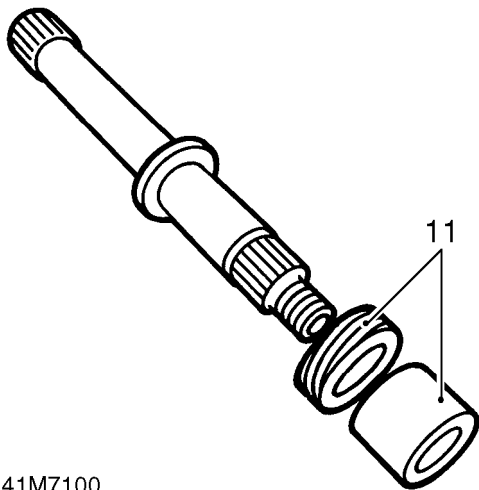
3. Remove and discard steel and felt washers.
4. Remove output shaft flange together with circlip.



NOTE: A replacement output flange will be supplied together with new output shaft oil seal.

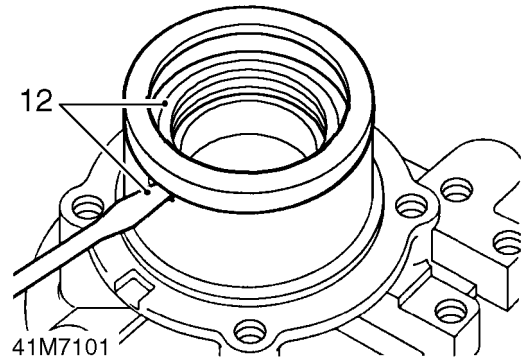


- 8. Position rear output housing on bed of hand press.
- 9. Position thrust button **LRT-37-11/2** between end of output shaft and press mandrel.
- 10. Press output shaft out of housing.



41M7100

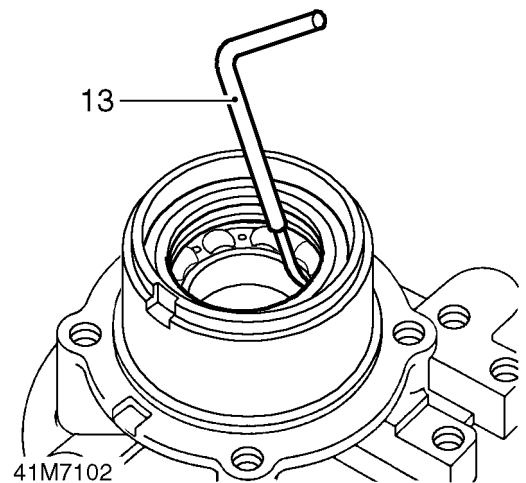
- 11. Recover spacer and speedometer drive gear from output shaft.



- 12. Using a screwdriver inserted in slot in rear output housing, lever mud shield out of housing.

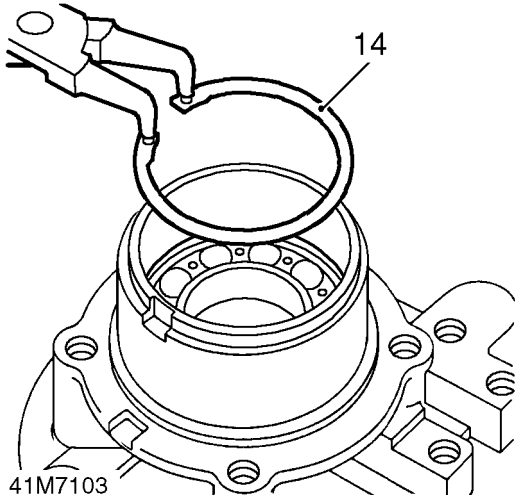


CAUTION: Discard mud shield if it is damaged.

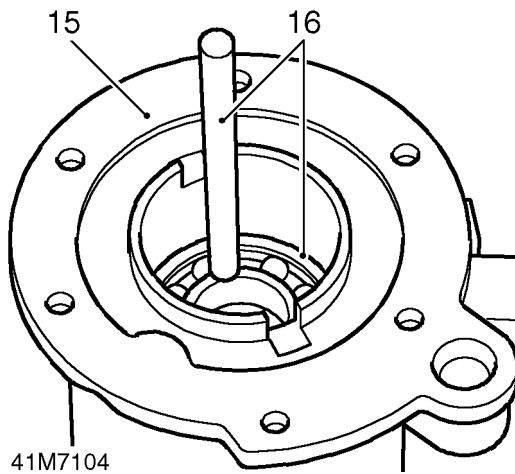


- 13. Taking care not to damage rear output housing, remove and discard output shaft oil seal.

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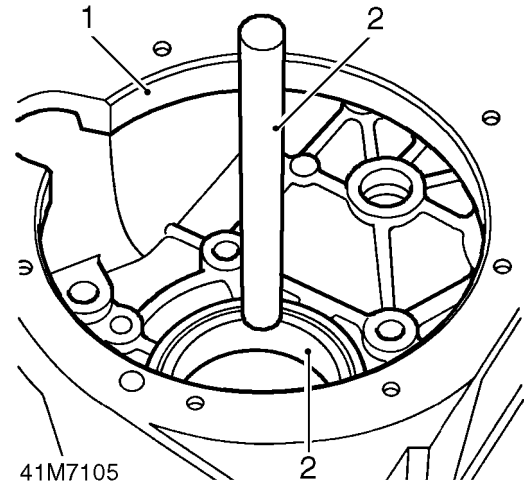


14. Using suitable circlip pliers, remove and discard circlip retaining output shaft bearing.

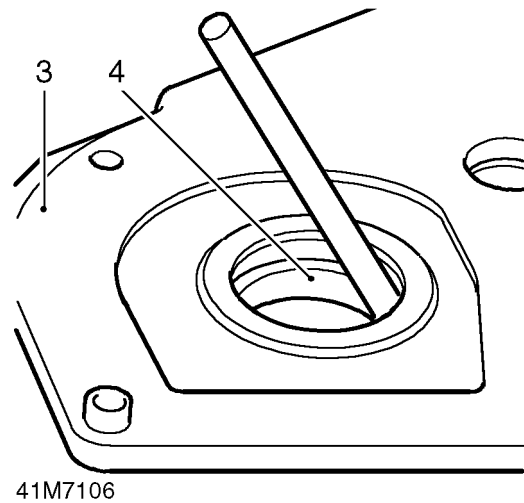


15. Support rear output housing on suitable blocks of wood.
16. Using a soft metal drift, drive output shaft bearing out of housing; discard bearing.

Main casing



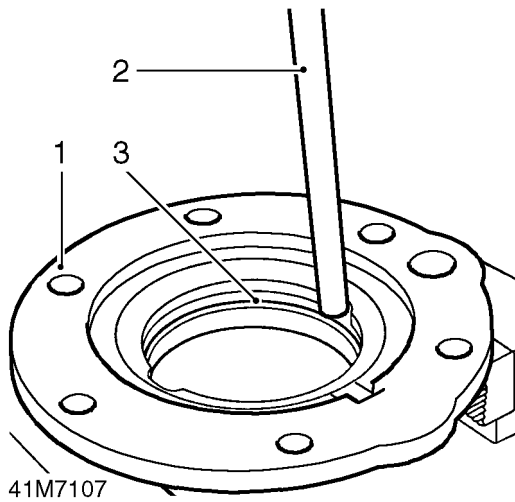
1. Support main casing on suitable blocks of wood.
2. Using a soft metal drift, drive differential rear bearing track out of main casing; discard bearing track.



3. Invert main casing.
4. Using a soft metal drift, drive mainshaft input gear bearing track out of main casing; discard bearing track.

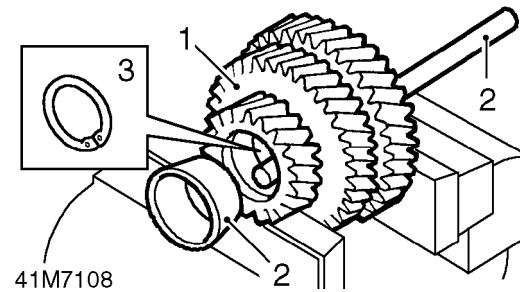


Mainshaft input gear bearing housing



1. Secure mainshaft input gear bearing housing in a soft-jawed vice.
2. Using a soft metal drift, drive input gear bearing track out of housing; discard bearing track.
3. Remove selective shim.

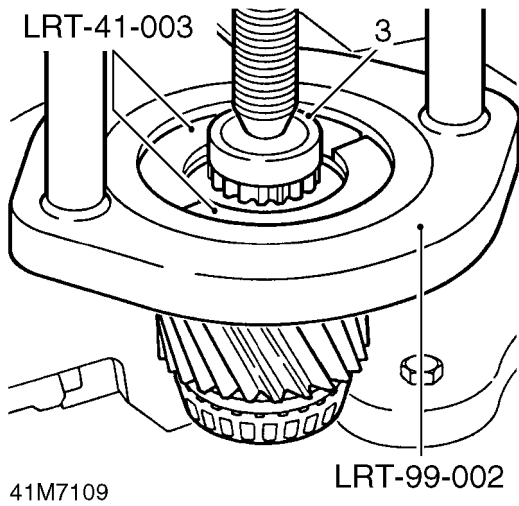
Intermediate gears



1. Secure intermediate gears in a soft-jawed vice.
2. Using a soft metal drift, drive intermediate shaft bearing track out of gears; discard bearing track.
3. Remove and discard circlip.
4. Repeat above procedure for remaining bearing track.

TRANSFER BOX

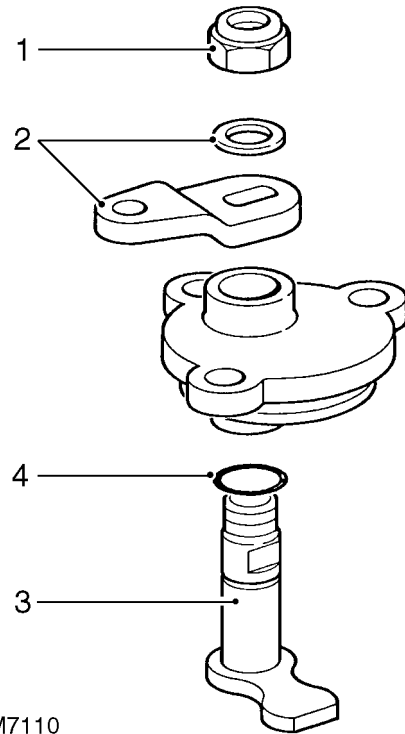
Mainshaft input gear assembly



NOTE: Defender input gear illustrated.

1. Secure hand press **LRT-99-002** in a vice.
2. Assemble collars **LRT-41-003** around bearing to be removed.
3. Position mainshaft in hand press, remove and discard bearing.
4. Repeat above procedure for remaining bearing.

Differential lock selector

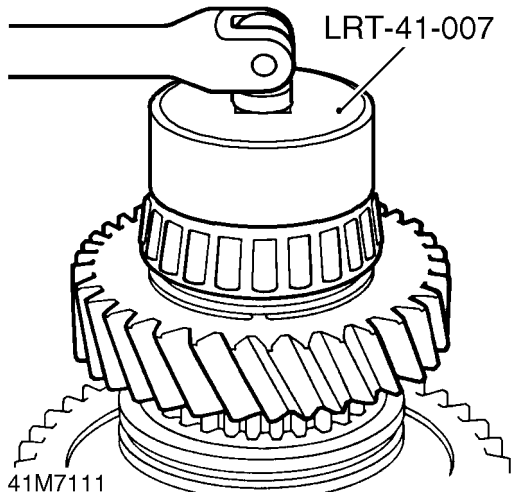


1. Remove and discard self-locking nut retaining selector lever.
2. Remove washer and selector lever.
3. Withdraw selector finger and shaft from housing.
4. Remove and discard 'O' ring.

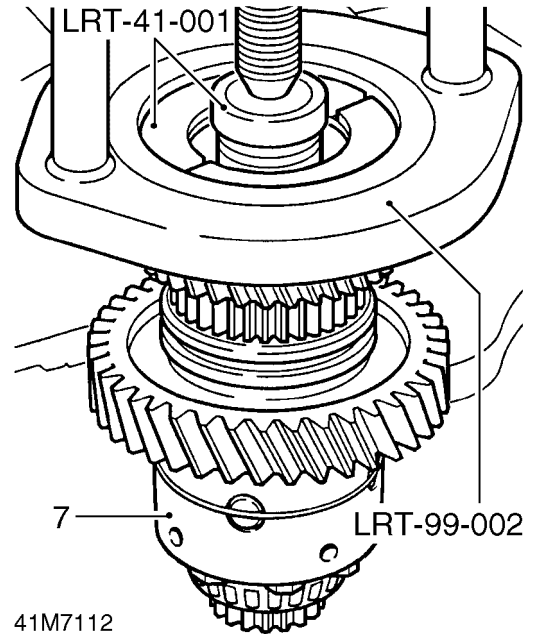


Differential

1. Secure differential in a soft-jawed vice.
2. Remove staking from bearing retaining nut.



3. Remove nut using tool **LRT-41-007**; discard nut.



4. Secure hand press **LRT-99-002** in a vice.
5. Secure collars **LRT-41-001** around rear bearing.

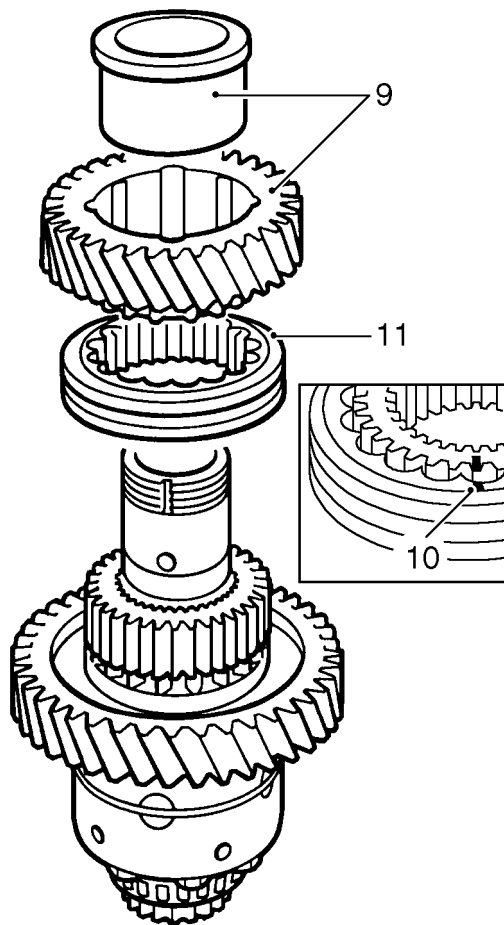
NOTE: This bearing is adjacent to threaded end of differential shaft.

6. Position differential in hand press with thrust button, part of tool **LRT-41-001** between press mandrel and differential shaft.
7. Press differential out of bearing.

CAUTION: Take care that differential does not drop out of bearing.

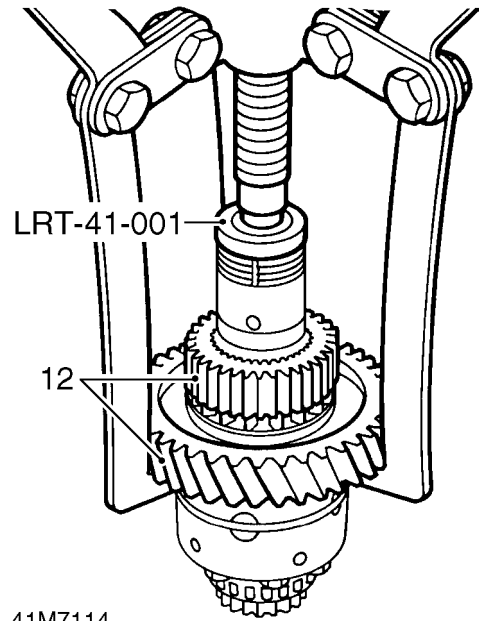
8. Remove differential from press, discard bearing.

TRANSFER BOX



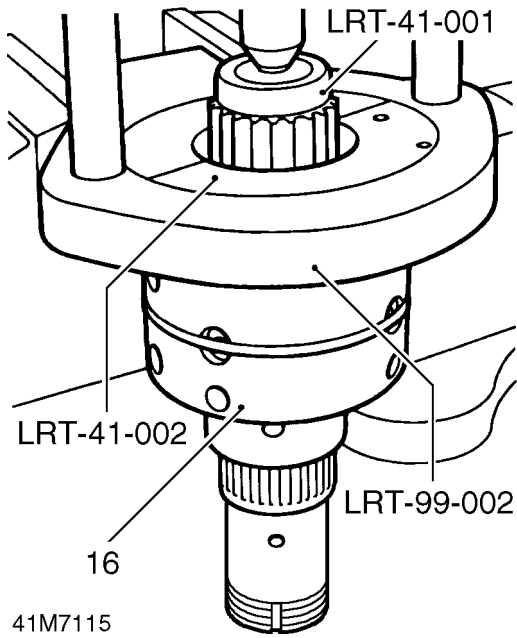
41M7113

9. Remove high range gear and bush taking care not to disturb high/low selector sleeve.
10. Make suitable alignment marks between high/low selector sleeve and hub.
11. Remove high/low selector sleeve.




41M7114

12. Using a suitable puller and thrust button, part of tool **LRT-41-001**, remove high/low hub and low range gear.



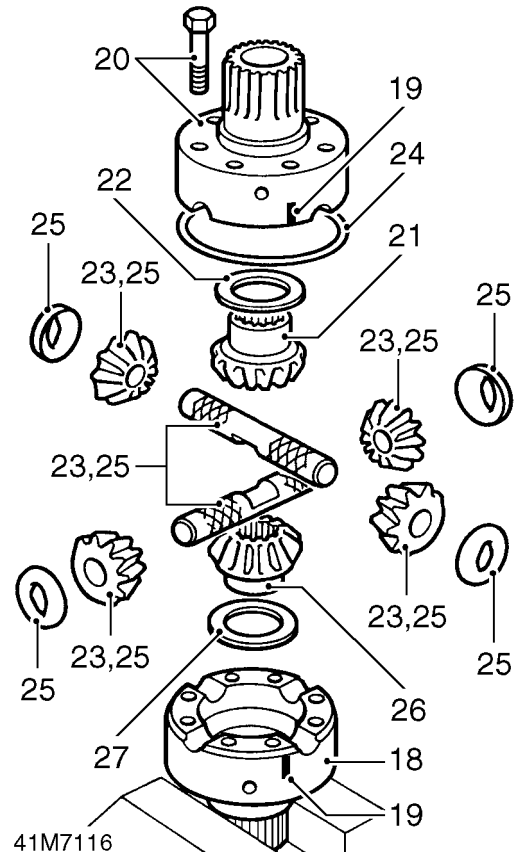
- 13. Secure hand press **LRT-99-002** in a vice.
- 14. Assemble collars **LRT-41-002** around front bearing.

 **NOTE: This bearing is adjacent to splined end of differential shaft.**

- 15. Position differential in hand press with thrust button, part of tool **LRT-41-001** between press mandrel and differential shaft.
- 16. Press differential out of bearing.

 **CAUTION: Take care that differential does not drop out of bearing.**

- 17. Remove differential from press, discard bearing.



- 18. Secure rear half of differential carrier in a soft-jawed vice.
- 19. Make suitable alignment marks between front and rear halves of differential carrier.
- 20. Remove 8 bolts securing front half of carrier to rear, remove carrier.
- 21. Suitably identify front sun gear to front half of carrier, remove sun gear.
- 22. Remove and discard thrust washer.
- 23. Suitably identify each planet gear to its shaft and fitted position of each cross shaft to rear half of carrier.
- 24. Remove retaining ring.
- 25. Remove planet gears and cross shafts, remove and discard dished thrust washers.
- 26. Suitably identify rear sun gear to rear half of carrier, remove sun gear.
- 27. Remove and discard thrust washer.

TRANSFER BOX

INSPECTING COMPONENTS

1. Clean all components, remove all traces of silicone sealant using suitable solvent and a plastic scraper.
2. *Up to serial no. 288709E:* Remove all traces of gasket using suitable gasket removal spray and a plastic scraper.
3. Clean all traces of Loctite and sealant from threads of bolts and tapped holes. Ensure holes are clean and dry.



CAUTION: Do not use a tap to clear threads in tapped holes.

4. Check all casings and covers for cracks and damage.
5. Replace any component found to be damaged.

Intermediate gears and shaft

1. Check gear teeth for cracks, chipping and uneven wear.
2. Check shaft for wear and threads for damage.



Mainshaft input gear

1. Check gear teeth for cracks, chipping and uneven wear.
2. Check that cross drillings in shaft are clear.



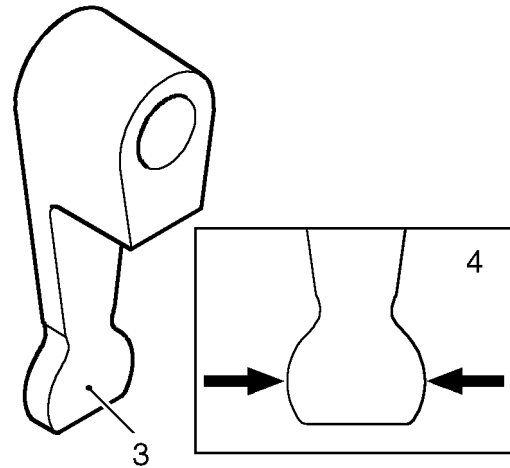
NOTE: Early transfer boxes fitted with an oil feed plate do not have cross drilled shafts. If a replacement input gear and shaft is to be fitted, the shaft will be cross drilled and it will not be necessary to fit the oil feed plate.

Defender only

3. Check that ends of dog teeth are not rounded-off or chipped.

High/low cross shaft and housing

1. Check mating surfaces of cross shaft and drilling in housing for wear.
2. Check core plug in housing for signs of leakage or corrosion, apply Loctite 326 to replacement plug.



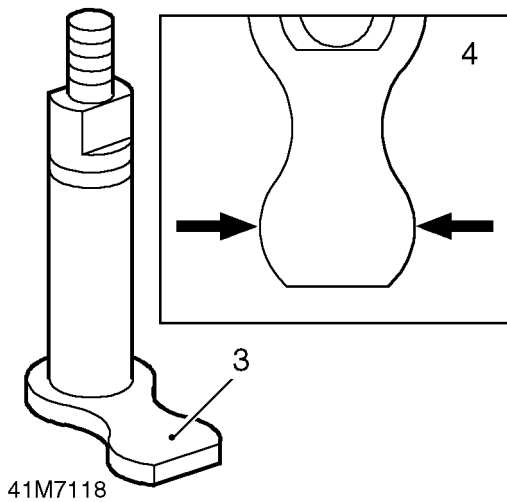
41M7117

3. Check high/low selector finger for wear.
4. Measure across widest portion of finger:
Finger width = 15.90 to 15.95 mm (0.625 to 0.627 in)

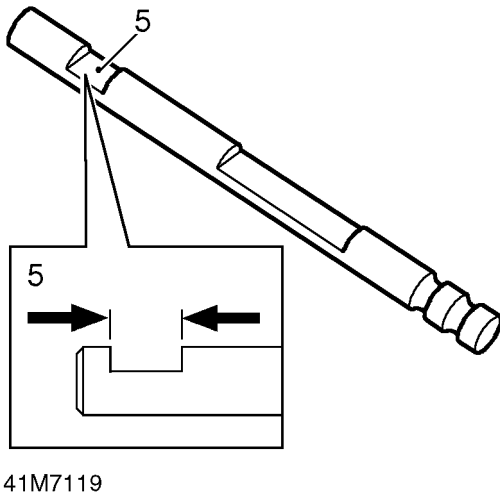
TRANSFER BOX

Front output housing and differential lock selector

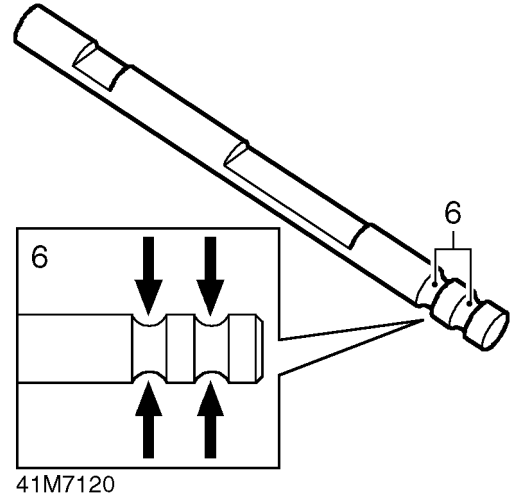
1. Check bearing track recesses in housing for damage, rectify or replace housing as necessary.
2. Check differential lock selector finger shaft and drilling in housing for wear.



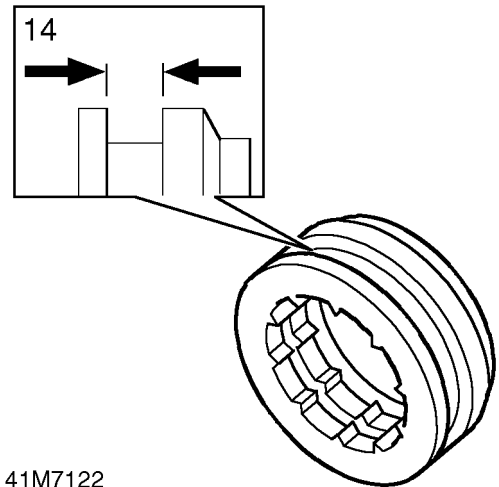
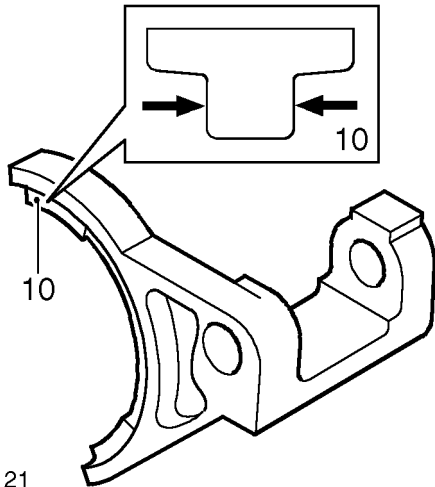
3. Check differential lock selector finger for wear.
4. Measure across widest portion of finger:
Finger width = 15.90 to 15.95 mm (0.625 to 0.627 in)



5. Check differential lock selector finger groove width in differential lock selector shaft:
Groove width = 16.0 to 16.1 mm (0.63 to 0.64 in)



6. Check detent grooves in differential lock selector shaft for wear.
7. Check differential lock detent ball for flat spots.
8. Check detent spring for distortion.
9. Check differential lock selector fork for cracks and wear.



- 10. Check differential lock selector fork finger width:
Finger width = 7.92 to 7.97 mm (0.311 to 0.313 in)
- 11. Check differential lock selector fork spring for distortion and clips for wear and damage.
- 12. Check spring free length:
Free length = 84.58 mm (3.33 in)
- 13. Check dog clutch internal teeth and grooves for wear and damage.

- 14. Check dog clutch selector fork groove width:
Groove width = 8.05 to 8.20 mm (0.32 to 0.33 in)
- 15. Check threads and splines of output shaft for damage and wear.
- 16. Check dog clutch teeth on shaft for wear and damage.

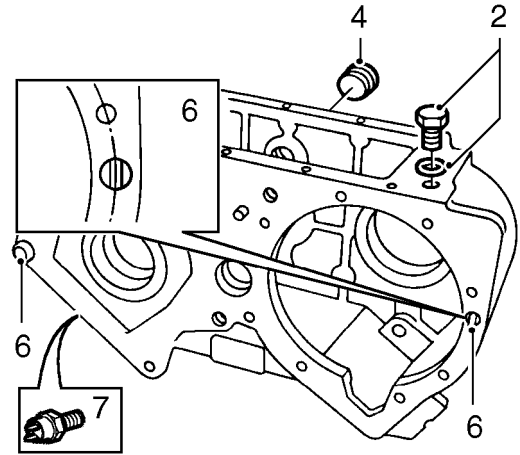
TRANSFER BOX

Rear output housing

1. Check bearing track recess in housing for damage, rectify or replace housing as necessary.
2. Check speedometer drive and driven gears for damage and wear.
3. Check splines and threads of output shaft for damage and wear.

Main casing

1. Check bearing track recesses in main casing for damage, rectify or replace casing as necessary.



41M7123A

2. Remove drain plug, discard sealing washer.
3. Fit new sealing washer, fit drain plug and tighten to 30 Nm (22 lbf.ft).
4. Remove filler plug, check threads for damage.
5. Fit but do not fully tighten filler plug.
6. Check that locating dowels are fitted in casing and that blade of front output housing dowel is positioned as shown.
7. Remove oil temperature switch - if fitted, remove sealant from threads of switch and main casing.
8. Apply Hylomar PL32 sealant to threads, fit and tighten switch.
9. Check high/low detent ball for flat spots.
10. Check detent spring for distortion.

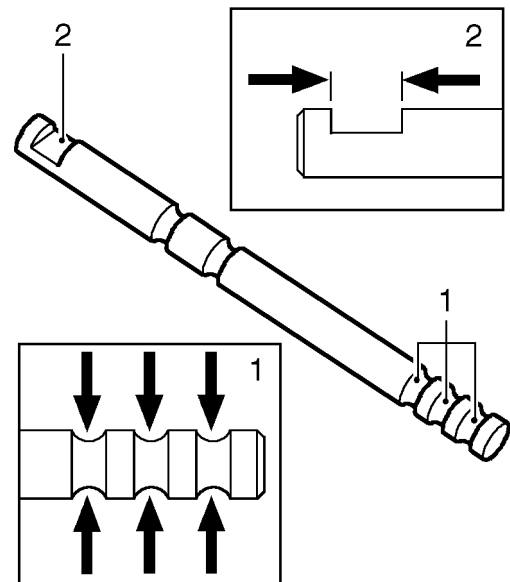


Mainshaft input gear bearing housing

1. Check bearing track recess in housing for damage, rectify or replace housing as necessary.

High/low selector fork and shaft

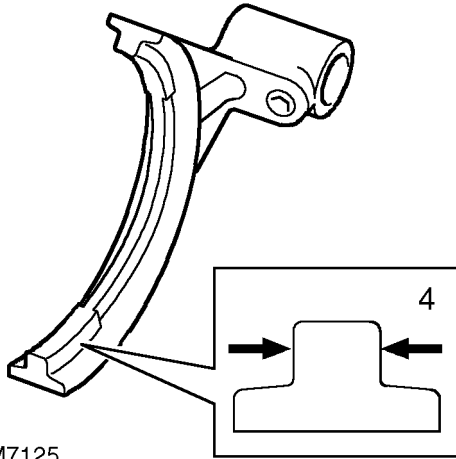
NOTE: There is no need to remove selector fork from shaft unless fork or shaft is to be replaced. If fork is removed, coat threads of setscrew with Loctite 290 prior to assembly.



41M7124

1. Check detent grooves in shaft for wear.
2. Check high/low selector finger groove width in shaft:
Groove width = 16.0 to 16.1 mm (0.63 to 0.64 in)

3. Check high/low selector fork for cracks and wear.



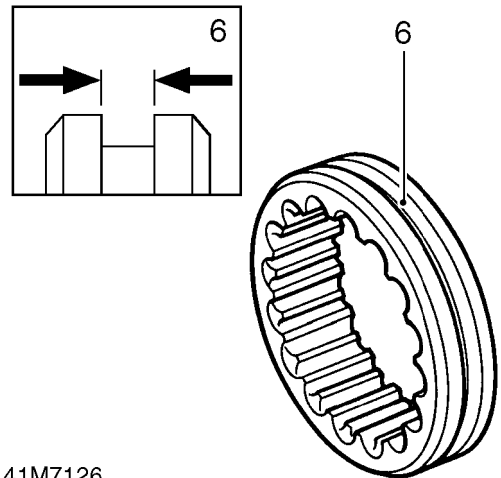
4. Check high/low selector fork finger width:
Finger width = 7.37 to 7.47 mm (0.290 to 0.294 in)

Differential

1. Check sun and planet gears for wear, cracks and chipping of teeth.
2. Check cross shafts and recesses in both halves of differential carrier for damage and wear.

CAUTION: Ensure planet gears are retained with their respective shafts.

3. Check retaining ring for distortion.
4. Check splines of differential shafts for wear and damage.
5. Check teeth of high/low hub for cracks, chipping and uneven wear.



6. Check selector fork groove width in high/low hub:
Groove width = 7.5 to 7.6 mm (0.295 to 0.30 in)
7. Check splines and teeth of high/low selector sleeve for uneven wear, cracks, damage and chipping.
8. Check teeth of high and low range gears for cracks, chipping and uneven wear.
9. Check high range gear bush for wear and damage.

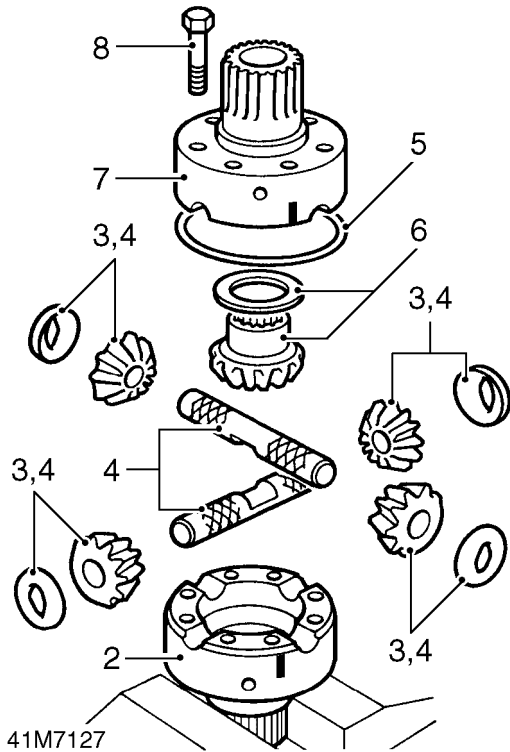


COMPONENT ASSEMBLING

1. Lubricate all components with recommended oil.

Differential

1. Lightly oil threads of differential bolts.



2. Secure rear half of differential carrier in a soft-jawed vice.
3. Fit each planet gear to its respective cross-shaft, fit new dished thrust washer to each gear.
4. Fit cross-shafts, planet gears and dished thrust washers in rear half carrier.



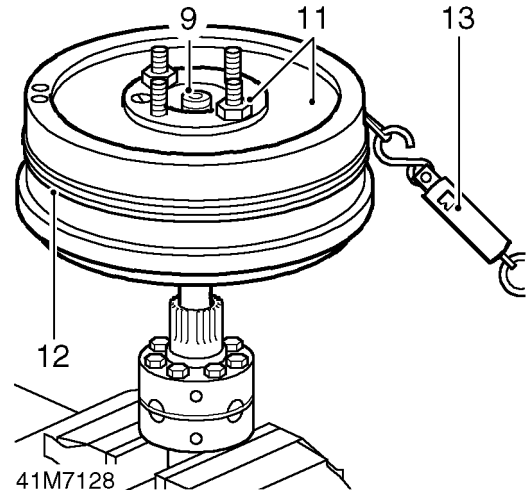
CAUTION: Ensure that cross-shafts are in their correct fitted position in rear half carrier. Do not fit sun gear into rear half carrier at this stage.

5. Fit retaining ring.
6. Fit a 1.05 mm (0.04 in) thick thrust washer to front half carrier sun gear, position gear in front half carrier.



NOTE: This is the thinnest of the thrust washers available.

7. Fit front half carrier to rear ensuring that alignment marks are together.
8. Fit bolts and tighten by diagonal selection to 60 Nm (44 lbf.ft).



9. Insert front output shaft into front half carrier, check that gears rotate freely.
10. Fit output flange on to splines of output shaft, do not fit flange nut at this stage.
11. Fit transmission brake drum to output flange, secure drum using 2 nuts.
12. Secure a length of cord around brake drum, attach one end of cord to a spring balance.
13. Tension cord and note load to turn figure recorded on spring balance when brake drum rotates.



NOTE: Used gears should rotate smoothly whilst new gears will have a 'notchy' feel as they rotate.

14. Check figure obtained against specified load to turn figure:
Used gears = 0.45 kg (1.0 lb)
New gears = 1.72 kg (3.8 lb)

15. If load to turn figure is below that specified, proceed as follows.
16. Remove front output shaft together with brake drum.
17. Remove 8 bolts securing front half differential carrier.
18. Remove front half differential carrier.
19. Remove front half carrier sun gear and thrust washer.
20. Select a thicker thrust washer from the range available.



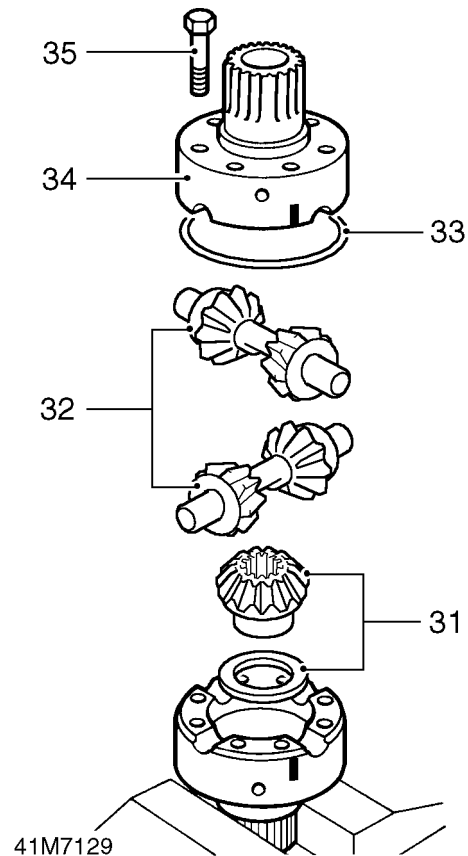
NOTE: 5 thicknesses of thrust washers are available rising in increments of 0.10 mm (0.004 in) from 1.05 to 1.45 mm (0.04 to 0.06 in).

21. Position selected thrust washer and sun gear in front half carrier.
22. Fit front half carrier to rear ensuring that alignment marks are together.
23. Fit bolts and tighten by diagonal selection to 60 Nm (44 lbf.ft).
24. Fit front output shaft and brake drum and repeat load to turn check.
25. Repeat above procedures as necessary until load to turn figure is as specified; record final figure obtained.
26. Remove brake drum from front output shaft, remove output shaft.
27. Remove bolts securing front half carrier.
28. Remove front half carrier, remove sun gear and thrust washer.



CAUTION: Keep selected thrust washer with sun gear.

29. Remove retaining ring.
30. Remove planet gears and cross shafts.



31. Fit a 1.05 mm (0.04 in) thick thrust washer to rear half carrier sun gear, position gear in rear half carrier.
32. Fit planet gears, cross shafts and dished thrust washers in rear half carrier.



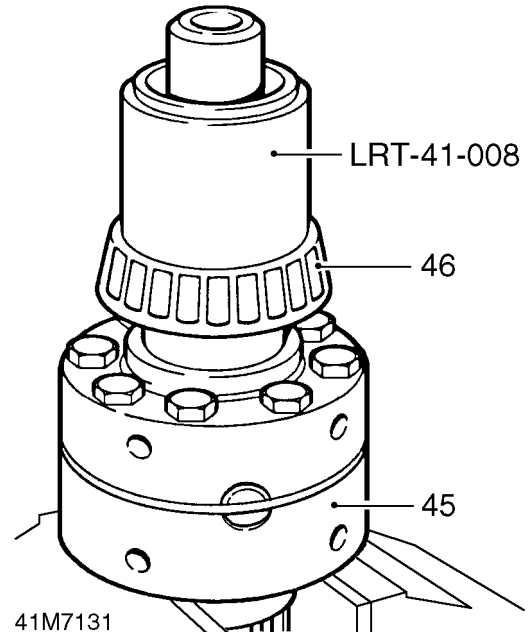
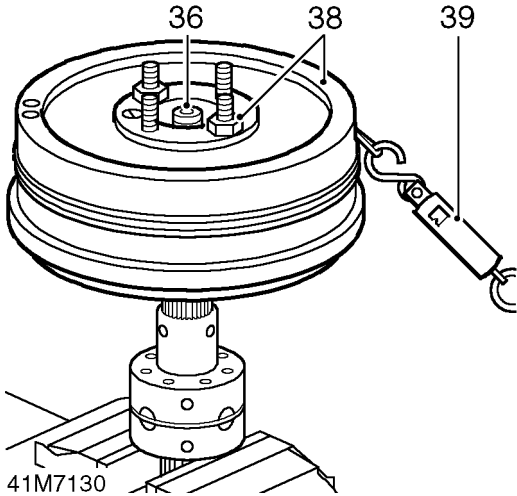
CAUTION: Ensure that planet gears are fitted to their respective cross-shafts and cross-shafts are fitted in their correct location in half carrier.

33. Fit retaining ring.
34. Fit front half carrier to rear ensuring that alignment marks are together.



CAUTION: Do not fit sun gear and thrust washer into front half carrier.

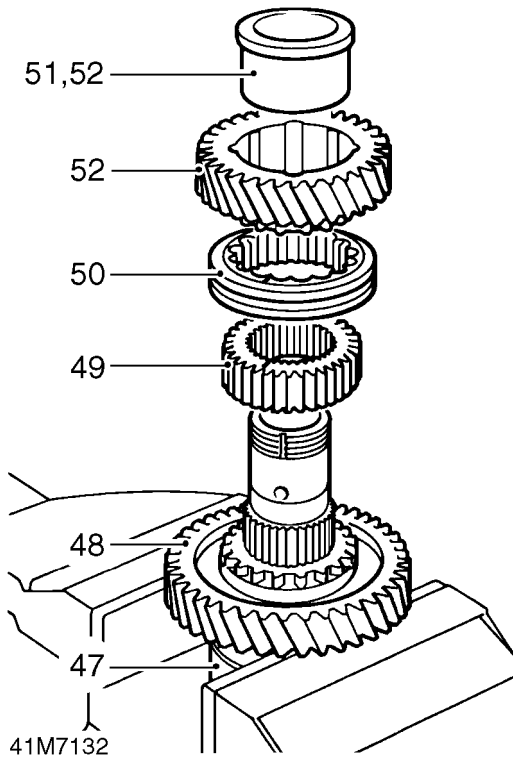
35. Fit bolts and tighten by diagonal selection to 60 Nm (44 lbf.ft).



- 36. Invert assembly in vice and then insert rear output shaft into rear half carrier, check that gears rotate freely.
- 37. Fit output flange on to splines of output shaft, do not fit flange nut at this stage.
- 38. Fit transmission brake drum to output flange, secure with 2 nuts.
- 39. Carry out load to turn check using same method as for front half carrier.
- 40. When load to turn figure is correct, record final figure.
- 41. Upon completion, fit sun gear and selected thrust washer to front half carrier.
- 42. Fit front half carrier ensuring that alignment marks are together.
- 43. Fit bolts and tighten by diagonal selection to 60 Nm (44 lbf.ft).
- 44. With differential assembled, fit rear output shaft and brake drum and check overall load to turn. This should be approximately equal to total load to turn figure of both front and rear half carriers added together:
Used gears = 0.90 kg (2.0 lb)
New gears = 3.44 kg (7.6 lb)

- 45. Secure rear half carrier in a soft-jawed vice.
- 46. Fit a new front bearing using tool **LRT-41-008**.

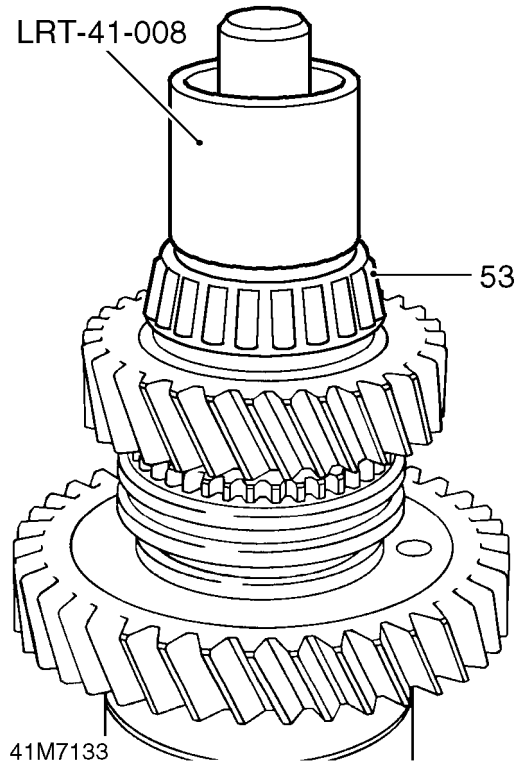
TRANSFER BOX



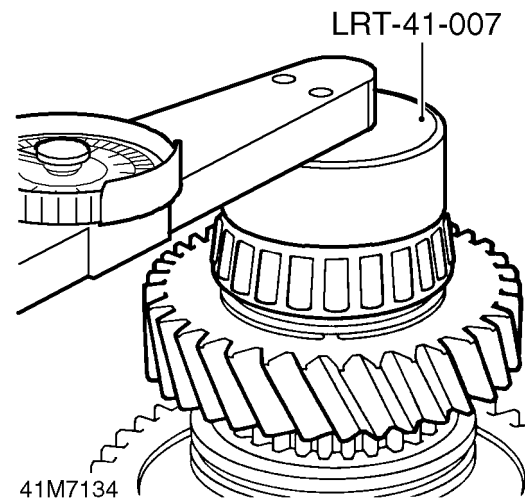
- 47. Support front half carrier in a soft-jawed vice.
- 48. Fit low range gear ensuring that dog teeth on gear are towards threaded end of shaft.

NOTE: Use a suitable hollow mandrel to fit gear if it is tight on splines.

- 49. Fit high/low hub ensuring that alignment mark made during dismantling is towards threaded end of shaft.
- 50. Fit high/low selector sleeve ensuring that alignment marks on hub and sleeve are together.
- 51. Fit bush to high range gear ensuring that collar on bush is on opposite side of gear to the dog teeth.
- 52. Fit high range gear and bush ensuring that collar on bush is towards threaded end of shaft.



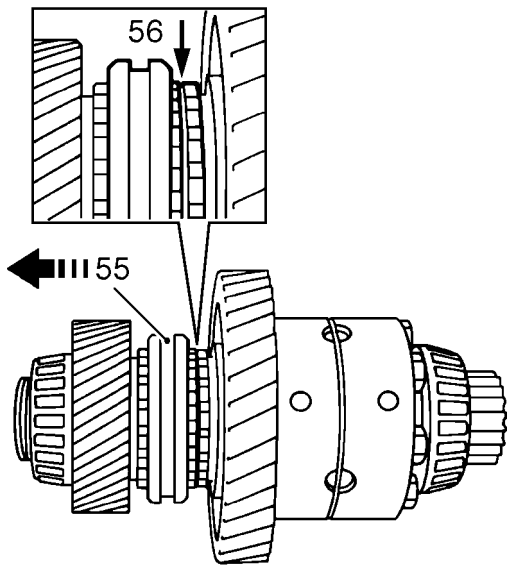
- 53. Fit a new rear bearing using tool **LRT-41-008**.



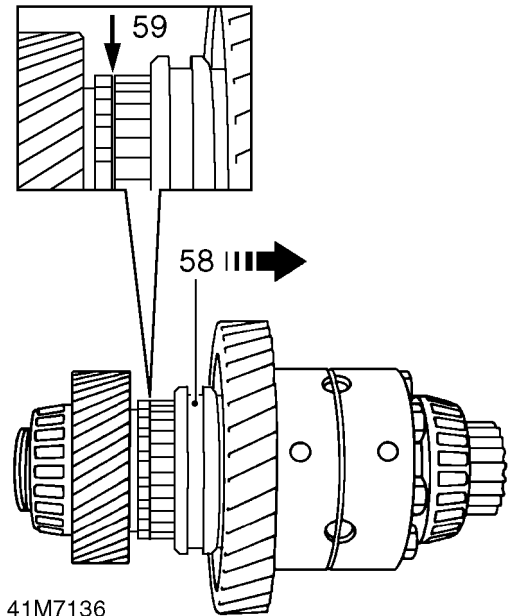
- 54. Fit a new bearing retainer nut, tighten to 72 Nm (53 lbf.ft) using tool **LRT-41-007**.



CAUTION: Do not stake nut at this stage.



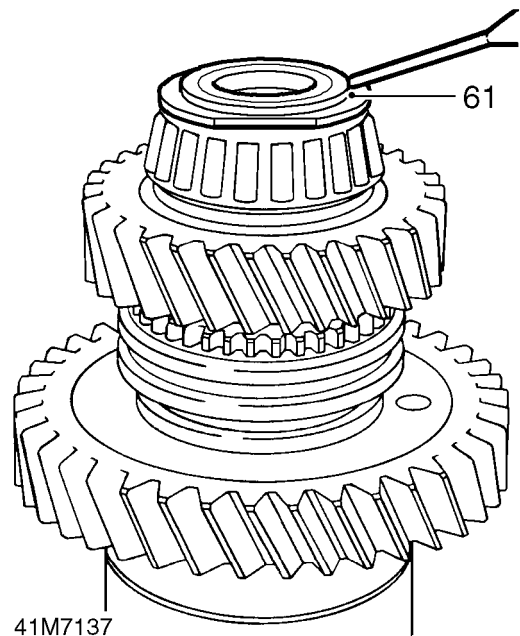
41M7135



41M7136

- 55. Slide high/low selector sleeve and hub away from low range gear.
- 56. Using feeler gauges, determine clearance between low range gear and high/low hub: Clearance = 0.05 to 0.15 mm (0.002 to 0.006 in)
- 57. If clearance is not as specified, fit a new low range gear and high/low hub and re-check.

- 58. Slide high/low selector sleeve and hub away from high range gear.
- 59. Using feeler gauges, determine clearance between high range gear and high/low hub: Clearance = 0.05 to 0.15 mm (0.002 to 0.006 in)
- 60. If clearance is not as specified, fit new high range gear and high/low hub and re-check.

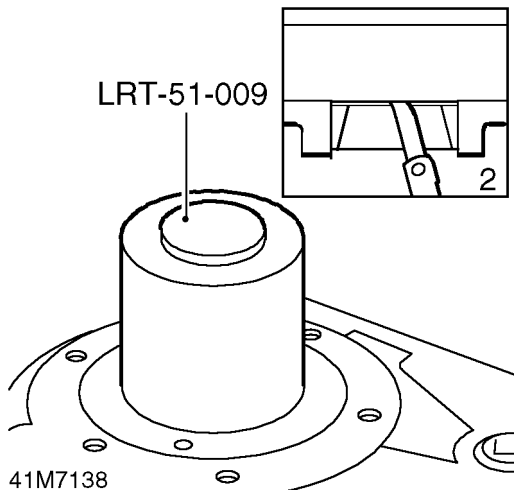


41M7137

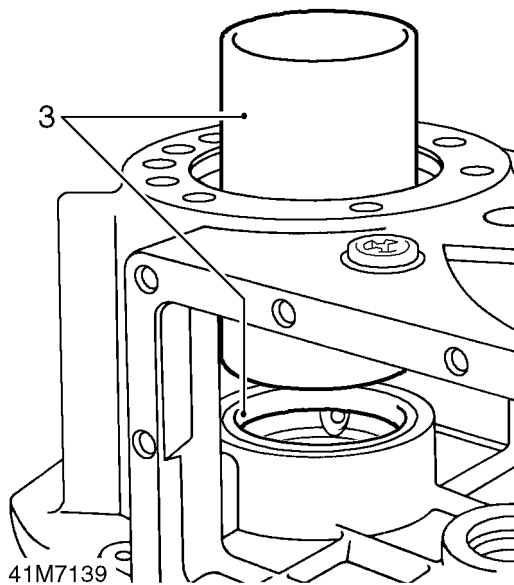
- 61. Using a round nosed punch, stake collar of nut into recess in differential shaft.

TRANSFER BOX

Main casing



1. Fit a new differential rear bearing track using tool **LRT-51-009**.
2. Using a straight edge and feeler gauges, check that bearing track is recessed 1.0 mm (0.04 in) below outer face of main casing.

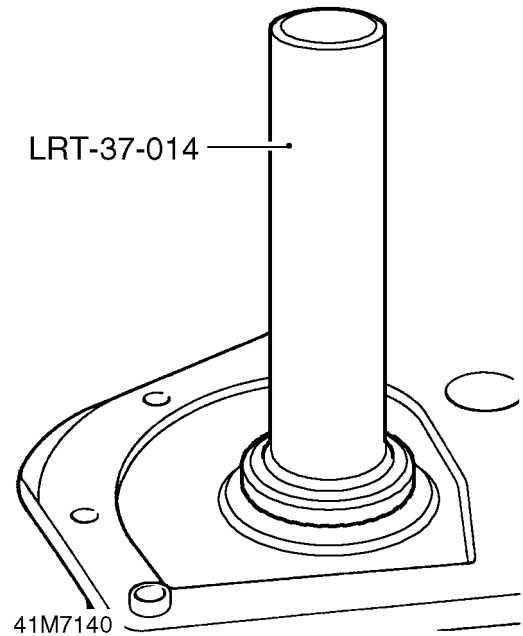


3. Using a suitable mandrel, fit a new mainshaft input gear bearing track.



CAUTION: Ensure bearing tracks are seated squarely in recesses.

4. Lubricate a new mainshaft oil seal with recommended oil.

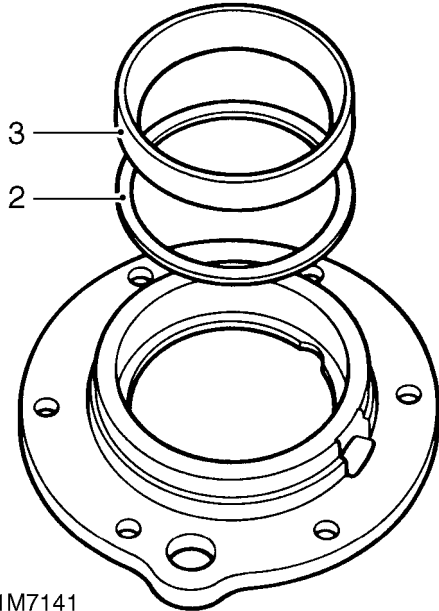


5. Invert main casing and fit oil seal, lip side facing inwards, using tool **LRT-37-014**.



Mainshaft input gear bearing housing

1. Ensure bearing track recess in housing is clean.



41M7141

2. Position a 3.15 mm (0.12 in) thick shim in bearing housing.



NOTE: This is the the thinnest of the shims available.

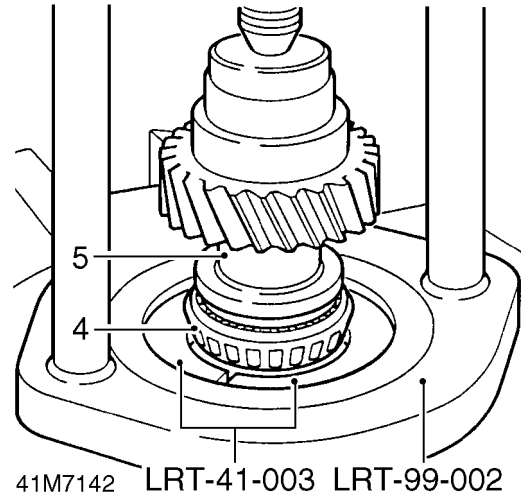
3. Using a suitable mandrel, fit new mainshaft input gear bearing track.



CAUTION: Ensure bearing track is seated squarely in recess.

Mainshaft input gear assembly

1. Lubricate new bearings with recommended oil.



2. Secure hand press **LRT-99-002** in a vice.
3. Position collars **LRT-41-003** in hand press.
4. Position new bearing on collars.



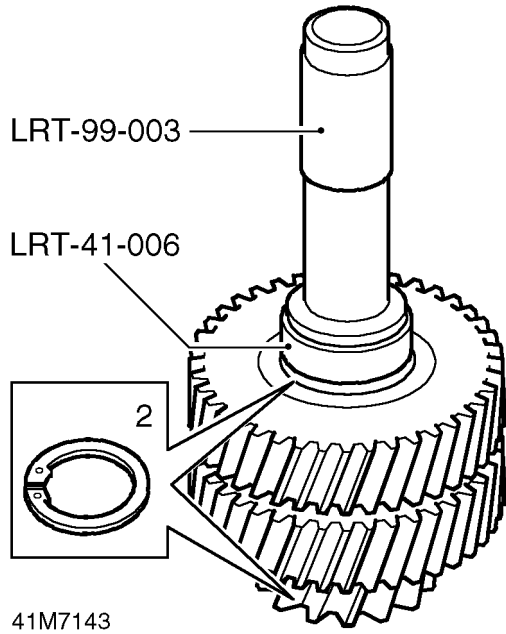
NOTE: Smallest diameter of bearing must be towards collars.

5. Locate end of mainshaft in bearing, press mainshaft through bearing.
6. Repeat above procedure for remaining bearing.

TRANSFER BOX

Intermediate gears.


1. Lubricate new bearings and bearing tracks with recommended oil.



2. Fit new circlips into intermediate gears.

 **CAUTION: Ensure that circlips are correctly seated.**

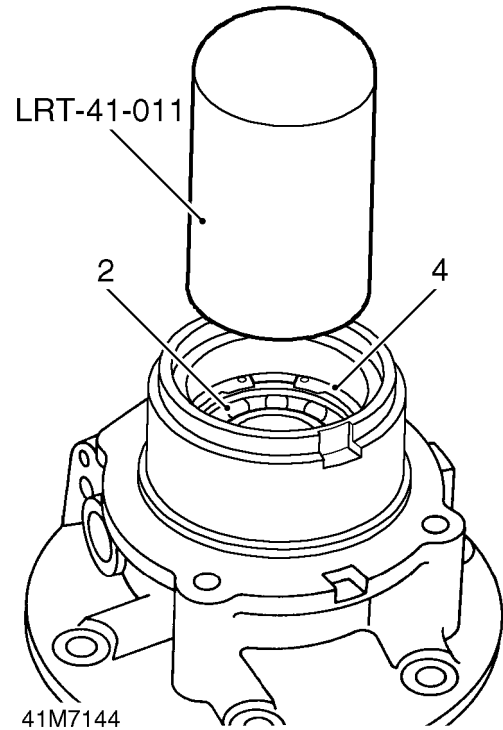
3. Fit new bearing outer tracks using tools **LRT-41-006** and **LRT-99-003**.

 **CAUTION: Ensure bearing tracks are fully seated against circlips.**

4. Retain bearings with intermediate gears.

Rear output housing

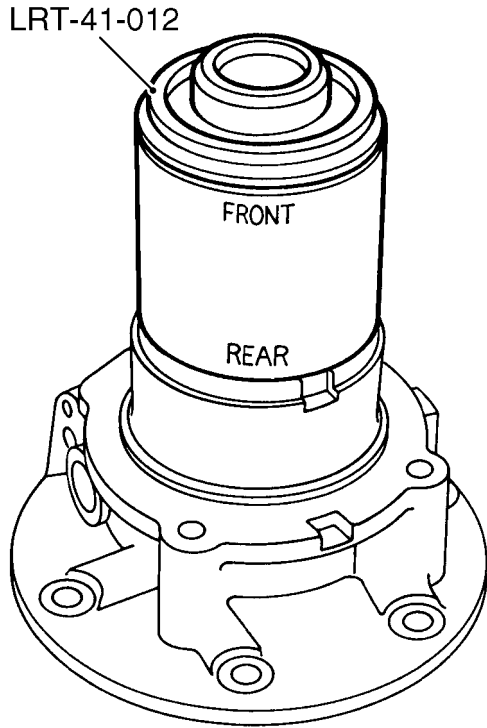
1. Heat rear output housing to 100 °C (210 °F).



2. Fit new output shaft bearing using tool **LRT-41-011**.
3. Allow housing to air cool.
4. Fit new bearing retaining circlip ensuring it is seated in groove.



- Lubricate a new output shaft oil seal with recommended oil.

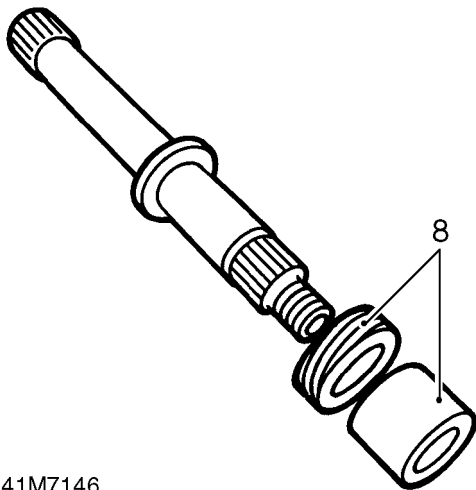


41M7145

- Fit oil seal using tool **LRT-41-012**.

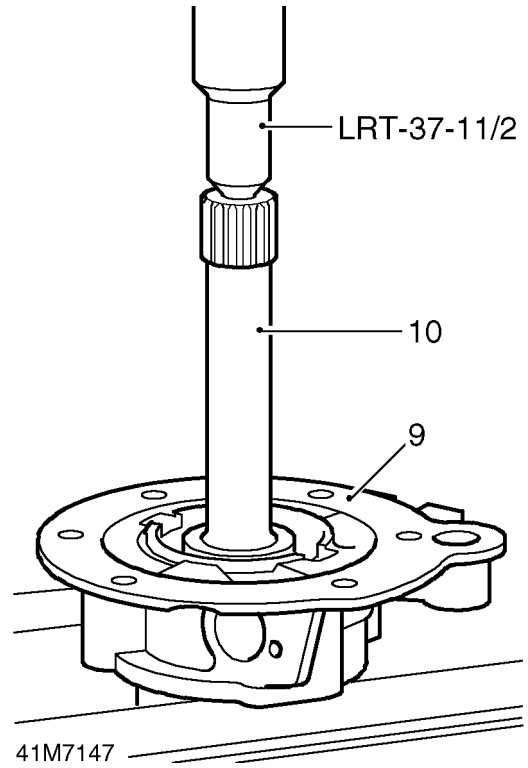
NOTE: Use end of tool marked 'REAR' to fit oil seal.

- Check that oil seal is just contacting circlip.



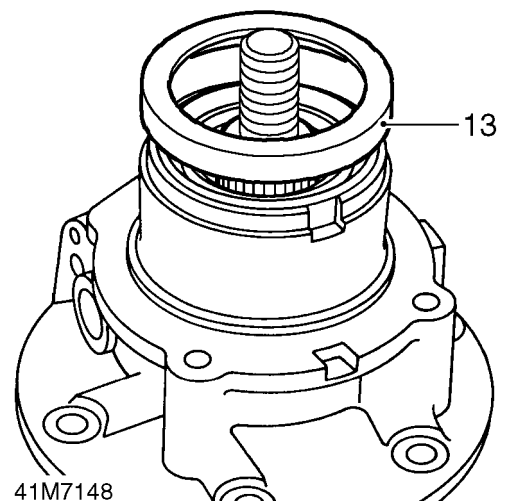
41M7146

- Slide speedometer drive gear and spacer on to output shaft.



41M7147

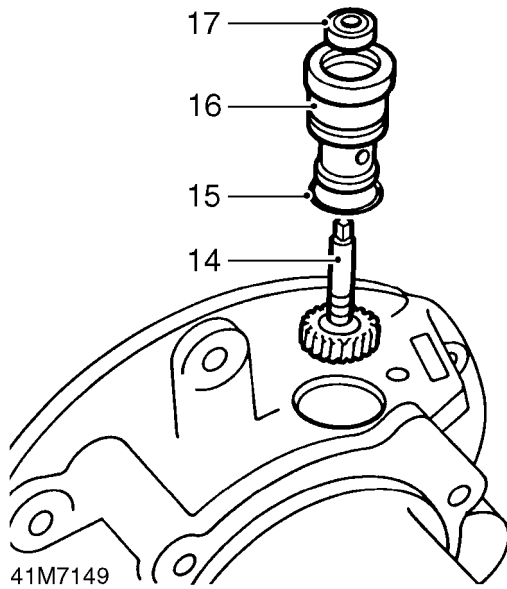
- Position rear output housing on bed of hand press.
- Locate threaded end of output shaft in bearing.
- Position thrust button **LRT-37-11/2** between end of output shaft and press mandrel.
- Press output shaft into bearing.



41M7148


- Fit mud shield with open face of shield towards oil seal.

CAUTION: Do not fit output shaft flange at this stage.

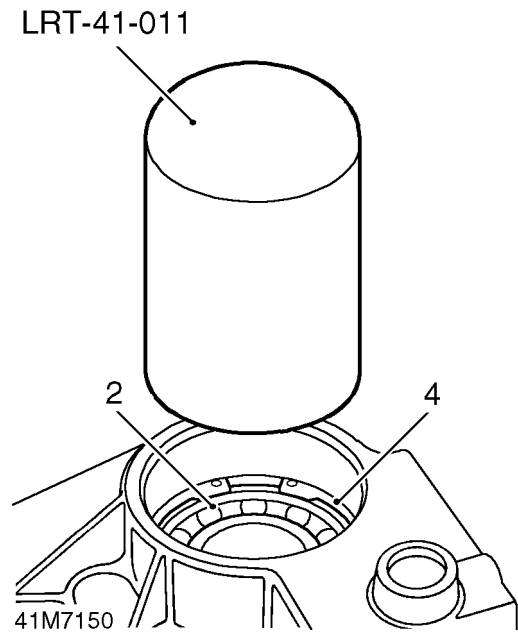


14. Fit speedometer driven gear into rear output housing ensuring that gear teeth are engaged with drive gear.
15. Lubricate a new 'O' ring with recommended oil and fit to driven gear housing.
16. Fit driven gear housing.
17. Lubricate a new oil seal with recommended oil, fit seal with lip towards driven gear housing.

Front output housing

 **CAUTION: Do not carry out assembly operations until differential bearing pre-load has been established - See Differential bearing pre-load.**

1. Heat front output housing to 100 °C (210 °F).

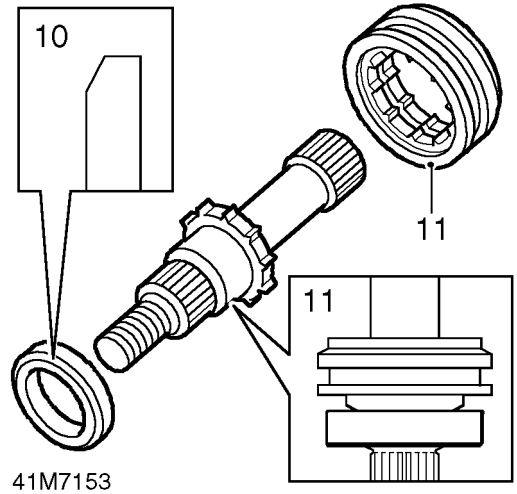
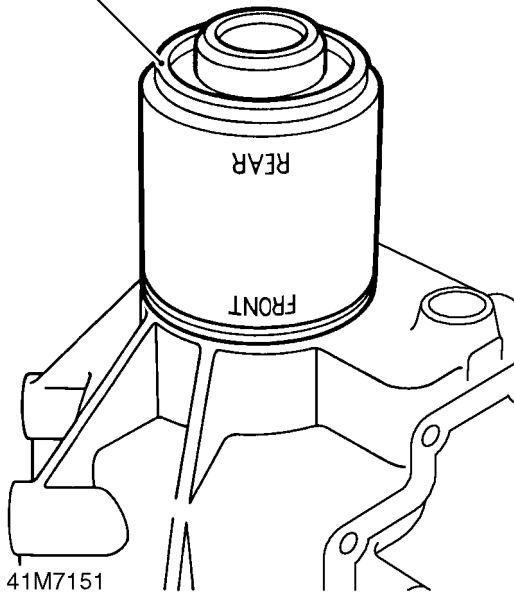


2. Fit new output shaft bearing using tool **LRT-41-011**.
3. Allow housing to air cool.
4. Fit new bearing retaining circlip ensuring it is fully seated in groove.



- Lubricate a new output shaft oil seal with recommended oil.

LRT-41-012



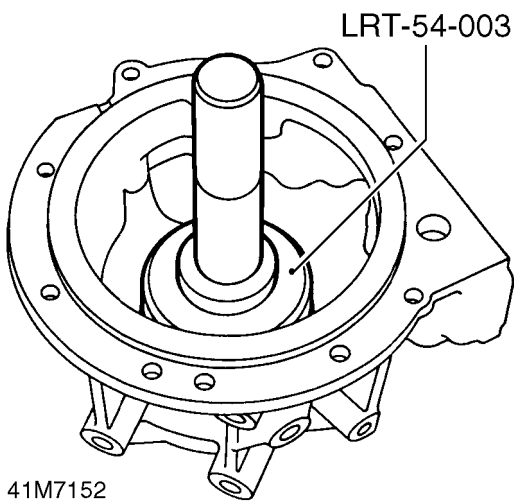
- Fit bearing spacer to output shaft ensuring that chamfer on spacer is towards threaded end of shaft.
- Fit dog clutch ensuring that flange on clutch is towards splined end of shaft.
- Using a mallet, drive output shaft into bearing.

- Fit oil seal using tool **LRT-41-012**.



NOTE: Use end of tool marked 'FRONT' to fit oil seal.

- Check that oil seal is just contacting circlip.
- Position selected shim in front output housing.

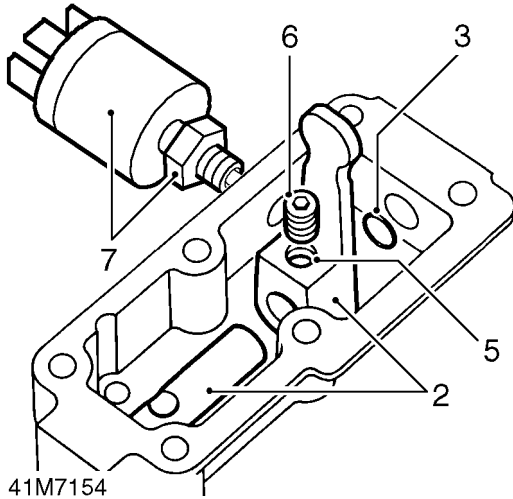


- Fit differential front bearing track using tool **LRT-54-003**.

TRANSFER BOX

High/low cross shaft housing

1. Lubricate cross shaft and new 'O' ring with recommended oil.

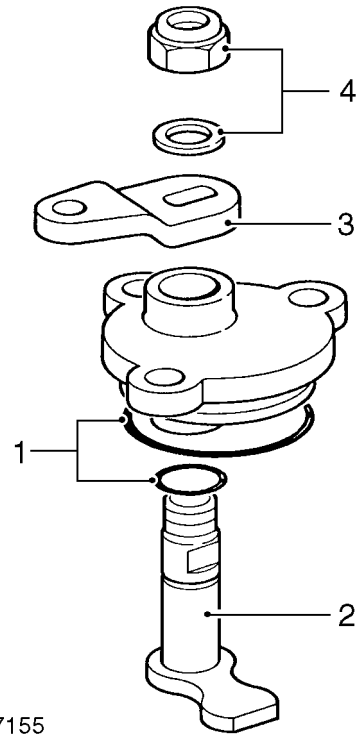


2. Insert cross shaft into housing, position high/low selector finger on shaft.
3. Fit 'O' ring to shaft, locate end of shaft in hollow plug.
4. Slide 'O' ring on to end of shaft.
5. Align hole in high/low selector finger with recess in cross shaft.
6. Apply Loctite 290 to threads of setscrew, fit and tighten screw.
7. Apply Hylomar PL32 sealant to threads of low detect switch - if fitted. Fit switch, do not tighten locknut until switch has been adjusted.



NOTE: Switch must be adjusted after transfer box is installed in vehicle.

Differential lock selector



1. Lubricate new 'O' rings with recommended oil, fit to selector finger shaft and housing.
2. Insert selector finger shaft into housing.
3. Fit selector lever ensuring that relative positions of lever and finger are as shown.
4. Fit washer and new self-locking nut, tighten nut to 15 Nm (11 lbf.ft).



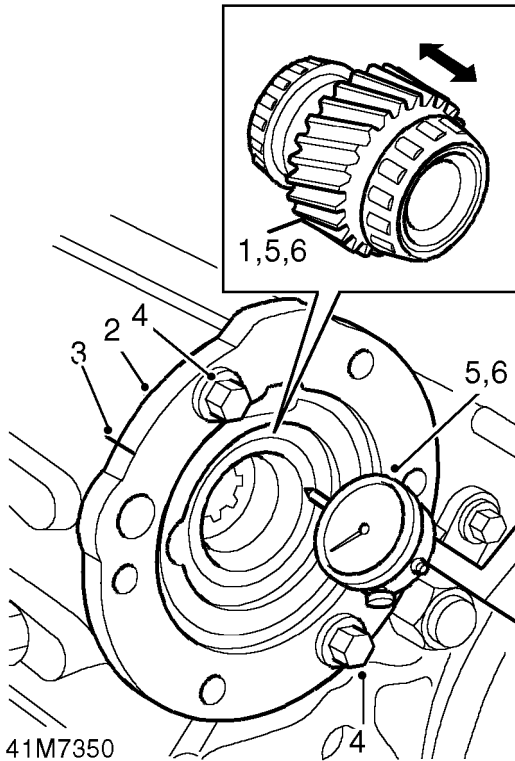
TRANSFER BOX ASSEMBLING

1. Lubricate all components with recommended oil.



CAUTION: Where use of gaskets is specified, gaskets must be fitted; do not use sealant.

Mainshaft input gear bearing pre-load



1. Position mainshaft input gear assembly in main casing.
2. *Up to serial no. 288709E:* Fit a new mainshaft input gear bearing housing gasket, dry on main casing.
3. *All transfer boxes:* Fit mainshaft input gear bearing housing ensuring reference marks are aligned.
4. Fit 2 M10 x 25 mm bolts and tighten to 25 Nm (18 lbf.ft).
5. Position suitable DTI with stylus of gauge contacting end of mainshaft, push mainshaft rearwards and zero gauge.
6. Push mainshaft forwards and note gauge reading.

7. Calculate thickness of shim required using the formula $A + B + C = D$ where:
 A = Thickness of installed shim - 3.15 mm (0.12 in)
 B = Recorded end-float
 C = Required pre-load - 0.05 mm (0.002 in)
 D = Thickness of shim required

8. If an alternative shim is required to establish correct end-float, proceed as follows:



NOTE: Do not remove mainshaft input gear bearing housing if bearing pre-load is correct.

9. Remove 2 bolts, remove mainshaft input gear bearing housing.



NOTE: Up to serial no. 288709E, retain gasket on main casing.

10. Using a soft metal drift, carefully drive input gear bearing track out of bearing housing, remove shim.



CAUTION: If bearing track is damaged during this operation, a new track must be fitted.

11. Select required shim from the range available.



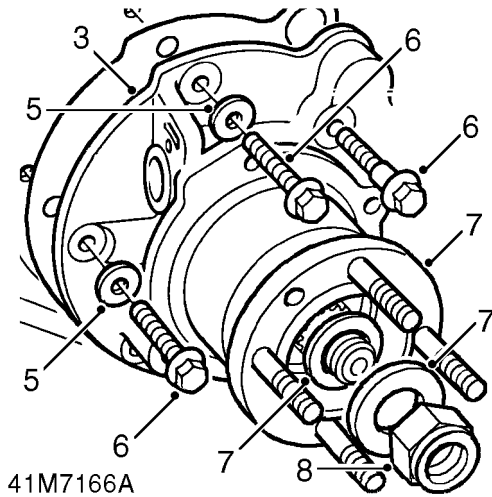
NOTE: Shims are available from 3.15 to 4.00 mm (0.12 to 0.16 in) thickness rising in increments of 0.05 mm (0.002 in).

12. Fit selected shim and using a suitable mandrel, fit input gear bearing track.
13. Fit mainshaft input gear bearing housing and temporarily secure using 2 M10 x 25 mm bolts tightened to 25 Nm (18 lbf.ft).

TRANSFER BOX

Rear output housing

1. Up to serial no. 288709E: Position a new gasket, dry on main casing.
2. From serial no. 288709E: Apply Hylosil RTV 102 sealant to mating flange of rear output housing.

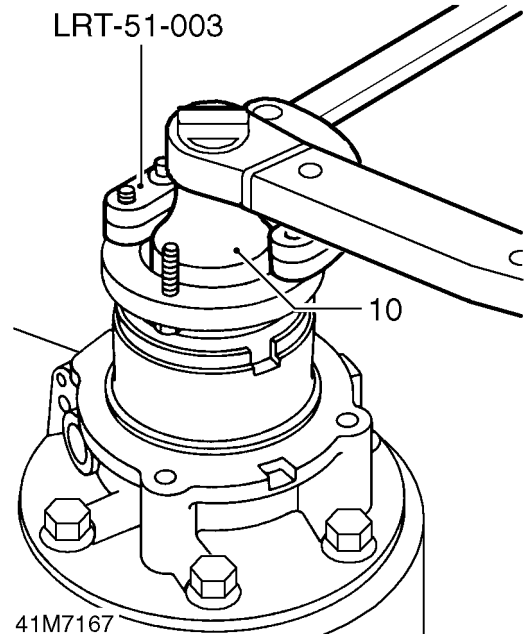


3. Fit rear output housing to main casing.

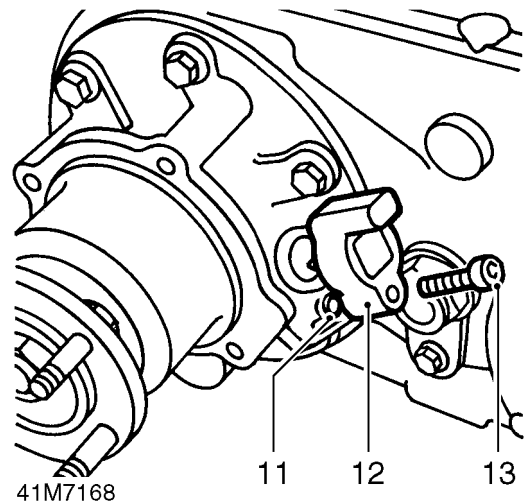


NOTE: Dowel located.

4. Apply Loctite 290 to threads of bolts and shoulder bolt.
5. Fit washers to 2 bolts.
6. Fit bolts and tighten by diagonal selection to 45 Nm (33 lbf.ft).
7. Fit output flange, new felt and steel washers to output shaft.
8. Fit a new self-locking nut.



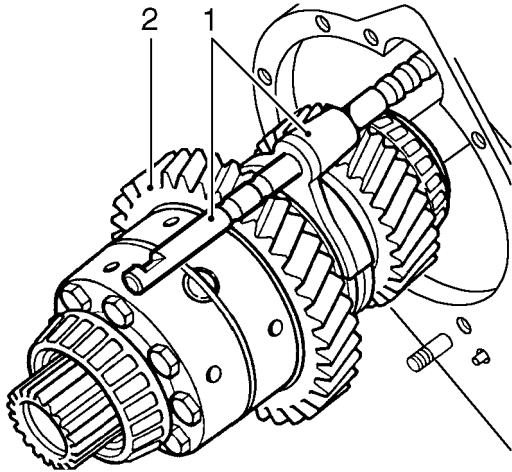
9. Position propeller shaft flange holding tool **LRT-51-003** to output flange.
10. Restrain flange, tighten nut to 162 Nm (120 lbf.ft).



11. Lubricate a new 'O' ring with recommended oil and fit to vehicle speed sensor - if fitted.
12. Fit vehicle speed sensor - if fitted.
13. Fit and tighten Allen screw.

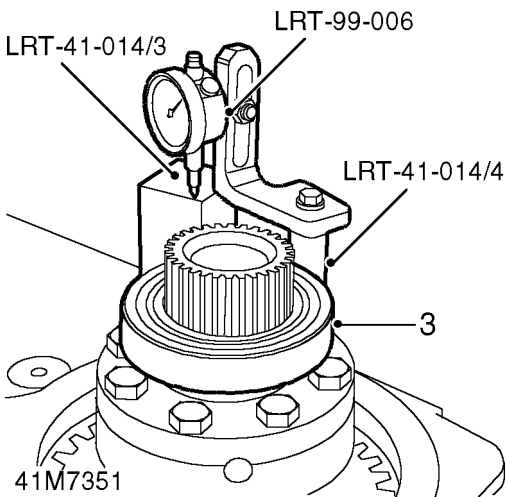


Differential bearing pre-load



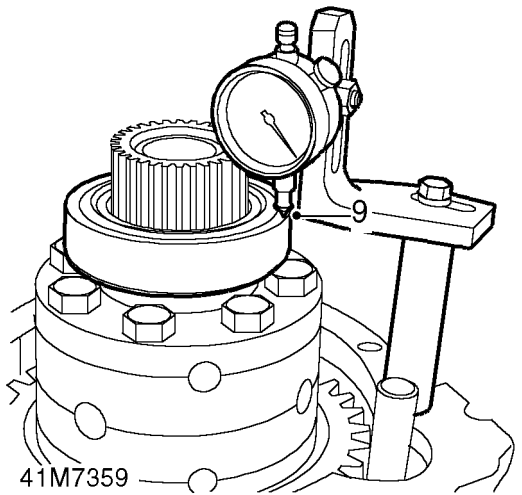
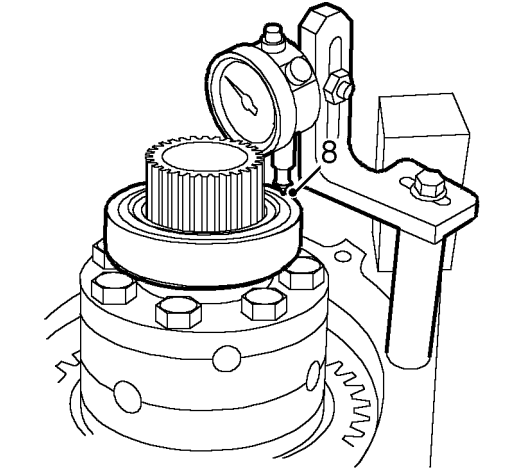
41M7270

1. Position high/low selector shaft and fork to differential ensuring that fingers of selector fork are located in high/low selector sleeve.
2. Position high/low selector shaft and differential in main casing ensuring that splines of rear output shaft are engaged in differential.



41M7351

3. Position new differential front bearing outer track on bearing ensuring that track is seated squarely.
4. Position setting block, tool **LRT-41-014/3** on main casing.
5. Screw pillar **LRT-41-014/4** into tapped hole in main casing.
6. Assemble DTI **LRT-99-006** to pillar.
7. Position stylus of DTI to setting block, zero gauge.



41M7359

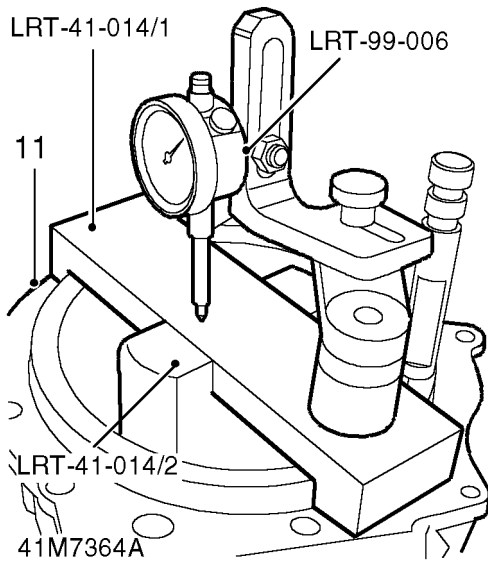
8. Position stylus of gauge on front bearing outer track, record reading obtained.
9. Position stylus of gauge on opposite side of bearing track, record reading obtained.



CAUTION: Ensure that bearing outer track is not disturbed when carrying out above operations.

10. Establish average of the 2 readings, record figure obtained.

TRANSFER BOX



21. Retain selected shim and differential front bearing outer track with front output housing.
22. *Up to serial no. 288709E:* Retain gasket with front output housing.
23. Carry out assembly of front output housing - *See Component assembling.*

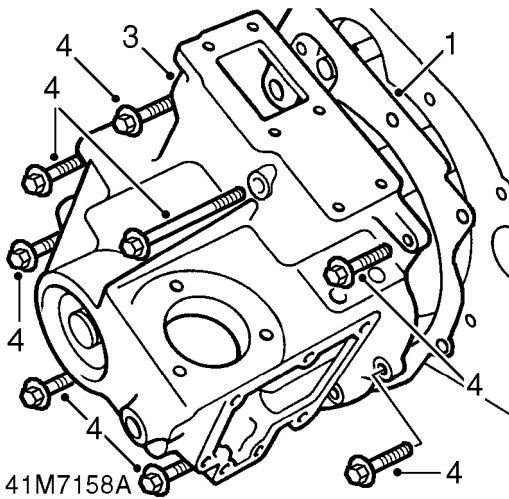
11. Position front output housing as shown.
12. *Up to serial no. 288709E:* Position a new gasket, dry, on front output housing.
13. Position depth block, tool **LRT-41-014/2** and cross-bar, tool **LRT-41-014/1** on front output housing.
14. Position DTI **LRT-99-006** on cross-bar **LRT-41-014/1**.
15. Zero DTI on depth block **LRT-41-014/2**.
16. Position DTI to cross-bar **LRT-41-014/1**, record reading obtained.
17. Remove tools.
18. *Up to serial no. 288709E:* Remove and retain gasket.
19. Using the formula:
 $3.05 \text{ mm (0.120 in)} + B - A = D$ where:
B = Height difference recorded between depth block and cross bar
A = Average of readings to differential front bearing outer track
D = Thickness of shim required to give differential bearing pre-load of 0.05 mm (0.002 in)
20. From resultant figure obtained, select appropriate thickness shim from the range available.



NOTE: Shims are available from 2.00 to 3.25 mm (0.08 to 0.13 in) thickness rising in increments of 0.05 mm (0.002 in).



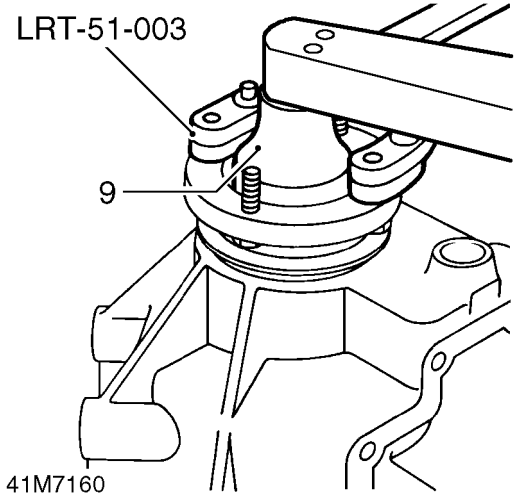
Front output housing



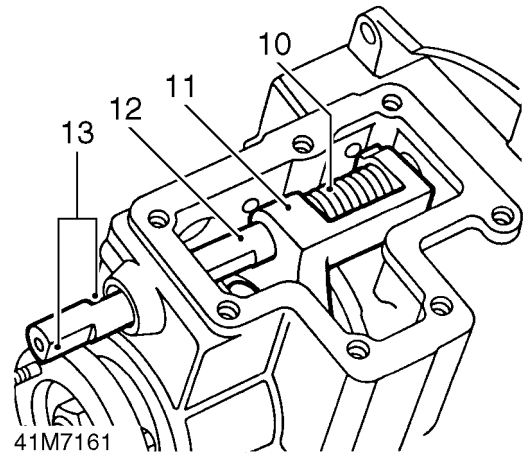
1. Up to serial no. 288709E: Fit gasket used when determining differential bearing pre-load, dry, to main casing.
2. From serial no. 288709E: Apply Hylomar RTV 102 sealant to mating flange of front output housing.

All transfer boxes

3. Fit front output housing ensuring that splines of output shaft are engaged in differential and that internal splines of dog clutch are engaged with teeth of output shaft.
4. Apply Loctite 290 to threads of bolts, fit bolts noting that longest bolt is inserted through high/low selector finger housing.
5. Tighten bolts by diagonal selection to 25 Nm (18 lbf.ft).
6. Fit output flange, new felt and steel washers to output shaft.
7. Fit a new self-locking nut.

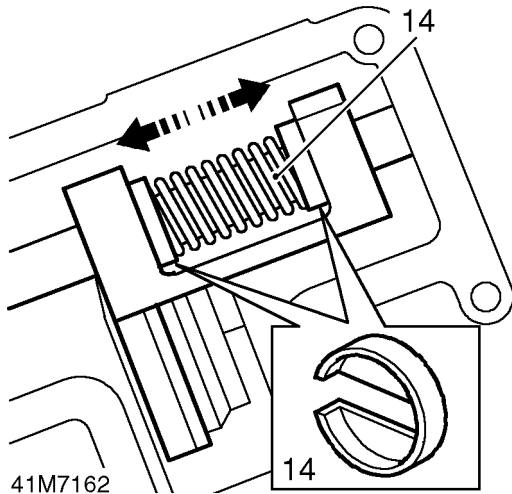


8. Position propeller shaft flange holding tool **LRT-51-003** to output flange.
9. Restrain flange, tighten nut to 162 Nm (120 lbf.ft).



10. Compress differential lock selector spring and fit to selector fork.
11. Locate fingers of selector fork in groove in dog clutch.
12. Fit differential lock selector shaft ensuring end of shaft is located in recess in rear of housing.
13. Rotate selector shaft until the two flats for the retaining clips are at right angles to the cover plate mating face.

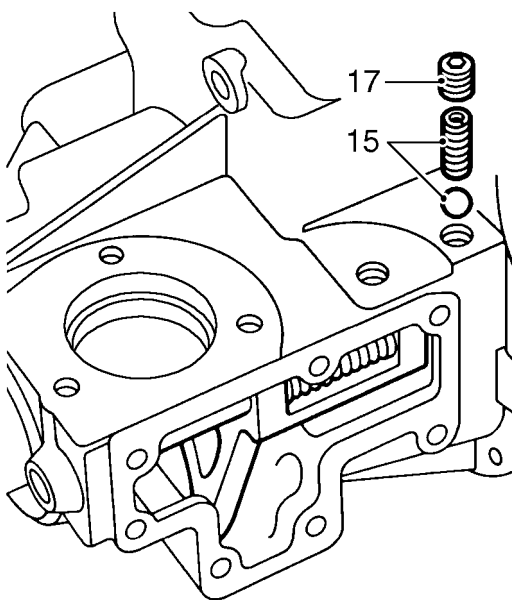
TRANSFER BOX



14. Compress selector spring and fit retaining clips at each end of spring.

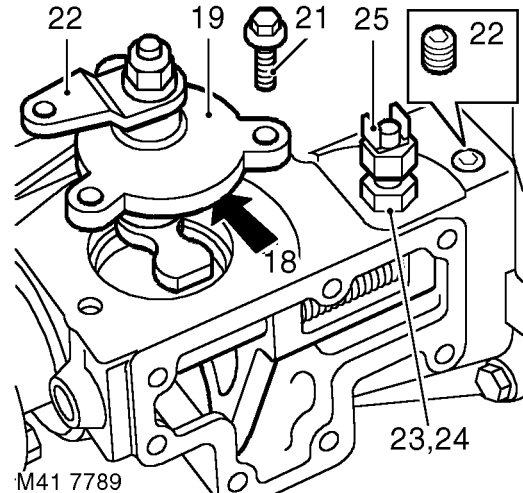


CAUTION: Ensure ends of spring are fully seated in recess in clips.



41M7163

15. Fit differential lock detent ball and spring.
 16. Apply Loctite 290 to threads of detent plug.
 17. Fit and tighten detent plug then unscrew 2 full turns.



M41 7789

18. Ensure 'O' ring is correctly located on differential lock selector housing.
 19. Fit differential lock selector assembly ensuring that selector finger is located in recess in differential lock selector shaft.
 20. Apply Loctite 290 to threads of bolts.
 21. Fit bolts and tighten to 25 Nm (18 lbf.ft).
 22. Operate differential lock selector lever and check that differential lock detent ball can be felt to positively engage and disengage with grooves in selector shaft; screw detent plug in or out until setting is correct.
 23. *Early boxes:* Fit locknut to differential lock warning lamp switch.
 24. *Later boxes:* Fit spacer to differential lock warning lamp switch ensuring that counterbore on spacer is towards top of switch.
 25. Apply Hylomar PL32 sealant to threads of differential lock warning lamp switch, fit and tighten switch.



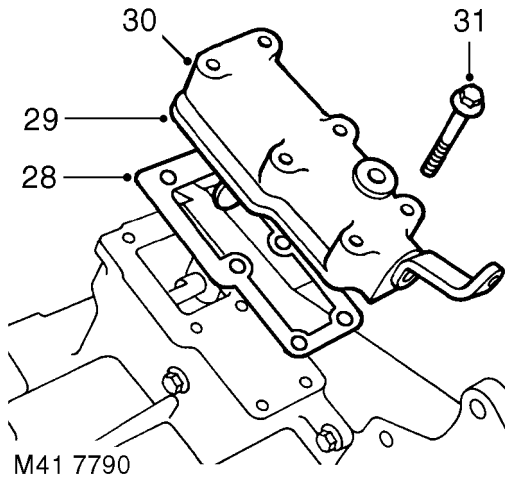
CAUTION: Do not allow sealant to contact switch plunger and where switches are fitted with a locknut, do not tighten locknut or fit differential lock side cover until switch has been adjusted.

Switches fitted with a spacer

26. Apply sealant, Part No. STC 3254 to mating face of differential lock side cover, fit cover.
 27. Apply Loctite 290 to threads of side cover bolts, fit bolts and tighten to 25 Nm (18 lbf.ft).



All boxes

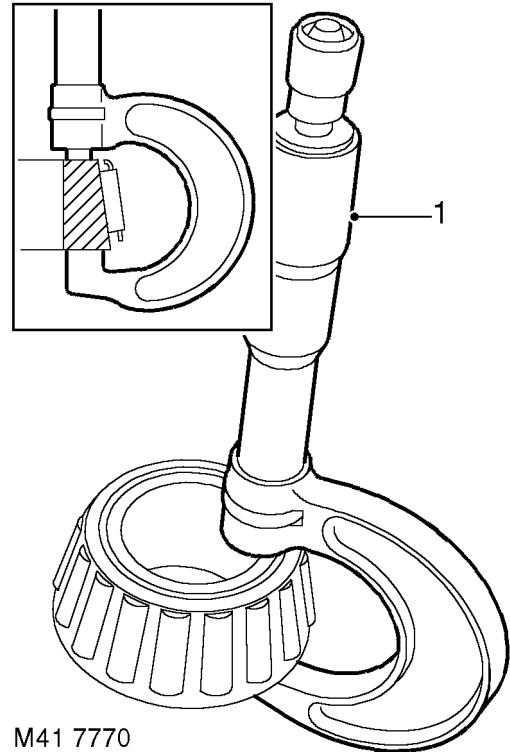


28. Up to serial no. 288709E: Apply grease to new high/low selector housing gasket, position gasket on front output housing.
29. From serial no. 288709E: Apply sealant, Part No. STC 3254 to mating flange of high/low selector housing.
30. Fit housing ensuring that high/low selector finger is located in recess in high/low selector shaft.
31. Fit 6 bolts and tighten to 25 Nm (18 lbf.ft).

Intermediate gears

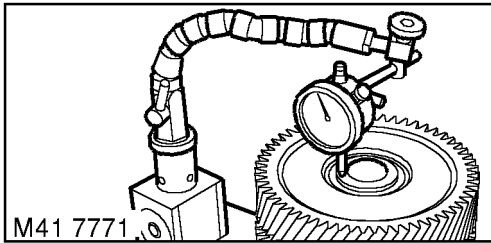
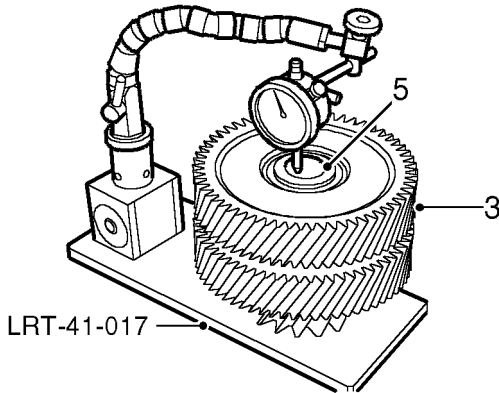


CAUTION: The spacer fitted must be of the selective length, non-collapsible type, DO NOT fit a collapsible spacer.



1. Using a micrometer, measure the width of each bearing inner track.
2. Record each reading as measurement 'A' and 'B,' both measurements should fall within range of 21.95 to 22.00 mm (0.864 to 0.866 in).

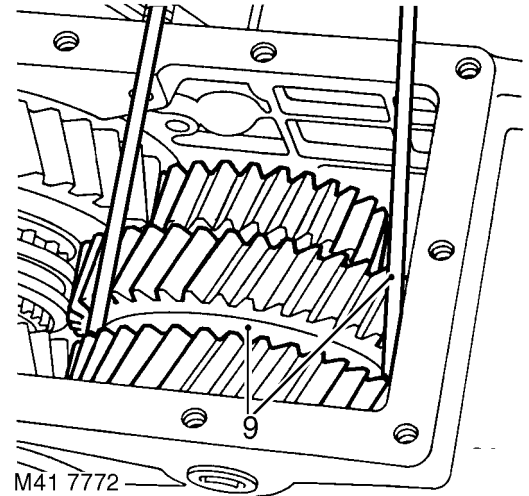
TRANSFER BOX



3. Fit bearing inner track 'A' on to tool post of **LRT-41-017** and position intermediate gears on to bearing 'A.'
4. Fit bearing inner track 'B' to intermediate gears, apply finger pressure to bearing inner tracks and rotate gears 5 to 10 turns to settle in bearing rollers.
5. Attach a DTI to base of **LRT-41-017**, zero gauge on top of tool post and take 2 measurements at 180° of the step height between the top of the tool post and the inner track of the bearing, take an average of the 2 readings and record this as measurement 'C'. Measurement 'C' should be in the range of 0.15 to 0.64mm (0.006 to 0.025in).
6. Using the formula $103.452\text{mm (4.0729in)} - 'A' - 'B' - 'C'$ calculate the length of bearing spacer required. From the result of the calculation round DOWN to the nearest length of spacer available to give a correct bearing pre-load of 0.05mm (0.002in).

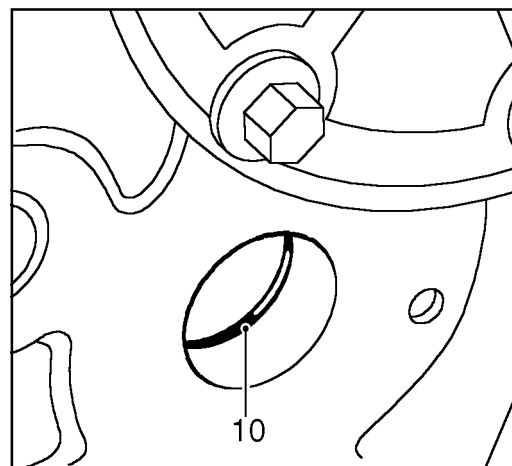
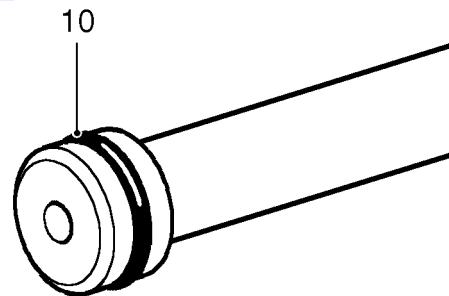
NOTE: There are 40 selective spacers available ranging in length from 58.325mm (2.296in) to 59.300mm (2.335in) in increments of 0.025mm (0.001in).

7. Remove intermediate gear assembly from **LRT-41-017**.
8. Lubricate and fit bearings and selected spacer to intermediate gears.



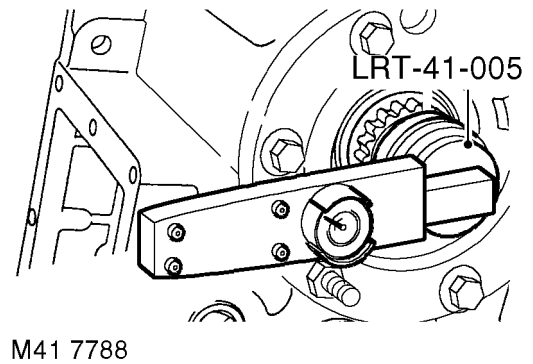
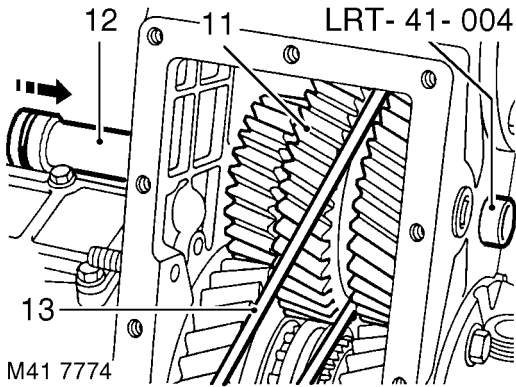
9. Wrap a suitable length of wire around intermediate gears and using assistance, lower gears into main casing ensuring that they are meshing with input and differential gears.

CAUTION: Do not remove wire at this stage.



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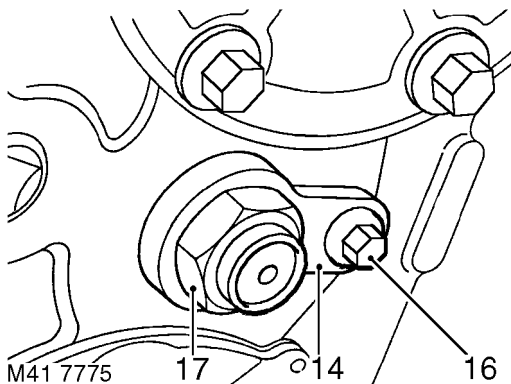
10. Lubricate new 'O' rings with recommended oil and fit to intermediate shaft and main casing.



11. Raise intermediate gears until dummy shaft **LRT-41-004** can be inserted from front output housing side of main casing.
12. Fit intermediate shaft, drift shaft into position whilst at the same time expelling dummy shaft **LRT-41-004**.

CAUTION: Ensure 'O' ring is not displaced from main casing.

13. Remove wire from around intermediate gears.

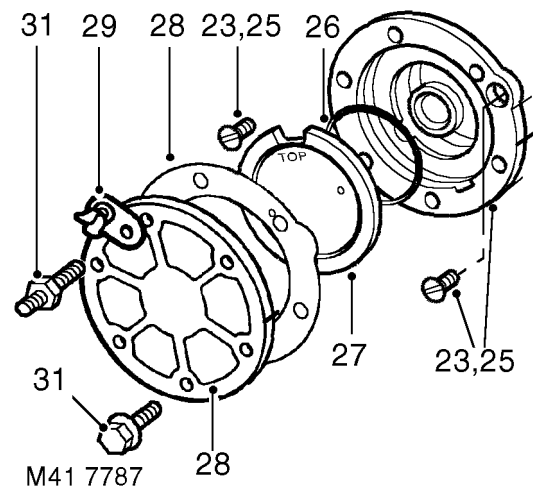


14. Rotate intermediate shaft until retaining plate can be located on flat on shaft.
15. Apply Loctite 290 to threads of retaining plate bolt.
16. Fit bolt and tighten to 25 Nm (18 lbf.ft).
17. Fit a new intermediate shaft nut and tighten to 88 Nm (65 lbf.ft).

CAUTION: Do not stake nut at this stage.

18. Select neutral.
19. Screw a suitable bolt into tapped hole in end of tool **LRT-41-005**.

20. Insert tool **LRT-41-005** in end of mainshaft.
21. Using a suitable torque meter on tool **LRT-41-005**, check torque to turn of transfer box gear train :
Torque to turn = 2.2 Nm (19 lbf.in)
22. If torque to turn figure is incorrect, intermediate gear bearing pre-load setting procedure must be repeated. When torque to turn figure is correct, remove tool **LRT-41-005** and stake flange of intermediate shaft nut into recess in intermediate shaft.



NOTE: Discovery cover plate illustrated.

23. Up to serial no. 288709E: Fit and tighten 2 countersunk screws to secure mainshaft input gear bearing housing.
24. Remove bolts used to temporarily secure mainshaft input gear bearing housing.

25. From serial no. 288709E: Remove mainshaft input gear bearing housing then apply sealant, Part No. STC 3254 to main casing mating face of bearing housing; position housing on main casing ensuring that reference marks are aligned. Fit and tighten 2 countersunk screws - if fitted.

If fitted

26. Lubricate a new 'O' ring with recommended oil and fit to oil feed plate.
 27. Fit oil feed plate ensuring that word TOP is towards top of main casing and spigots are located in cut-outs.



NOTE: If a replacement input gear having a cross-drilled shaft is to be fitted, discard oil feed plate and 'O' ring.

All transfer boxes

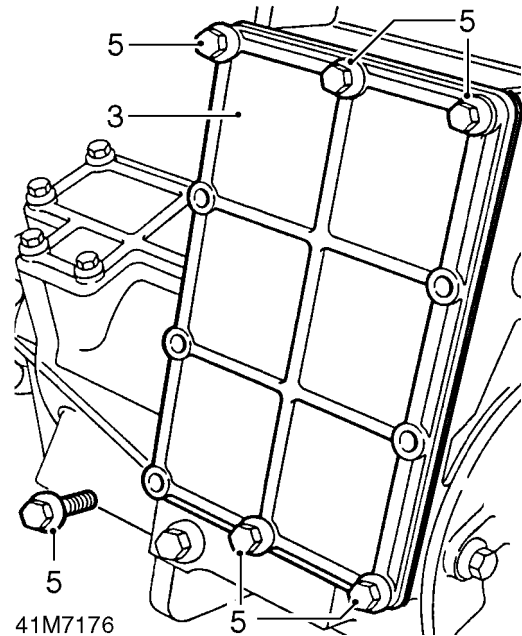
28. Apply sealant, Part No. STC 3254 or position new, dry gasket to mating face of cover plate/power take-off cover. Position plate/cover on bearing housing ensuring that reference marks are aligned.
 29. Position clip to stud nut.
 30. Apply Loctite 290 to threads of bolts and stud nut.
 31. Fit 5 bolts and stud nut and tighten by diagonal selection to 25 Nm (18 lbf.ft).



NOTE: These bolts are threaded to head.

Bottom cover

1. Up to serial no. 288709E: Position new bottom cover gasket, dry on main casing.
 2. From serial no. 288709E: Apply sealant, Part No. STC 3254 to mating face of bottom cover.



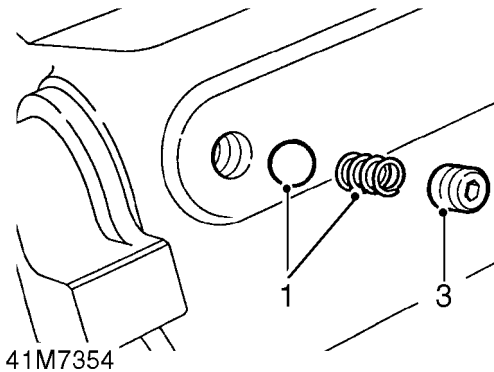
3. Fit bottom cover.
 4. Apply Loctite 290 to threads of bottom cover securing bolts.
 5. Fit bolts in positions shown and tighten by diagonal selection to 25 Nm (18 lbf.ft).



NOTE: The remaining 4 bolts should not be fitted at this stage as they are used to attach support plate LRT-99-010 when transfer box is refitted.

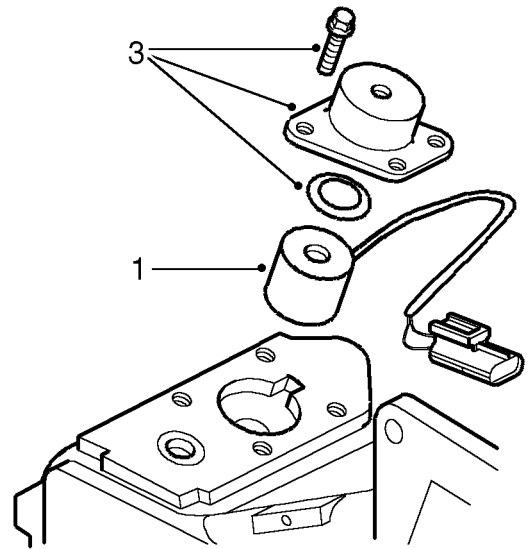


High/low selector shaft detent



1. Fit detent ball and spring.
2. Apply Loctite 290 to threads of detent plug.
3. Fit and tighten plug then unscrew 2 full turns.
4. Operate high/low selector lever and check that detent ball can be felt to positively engage and disengage with grooves in selector shaft; screw plug in or out until setting is correct.

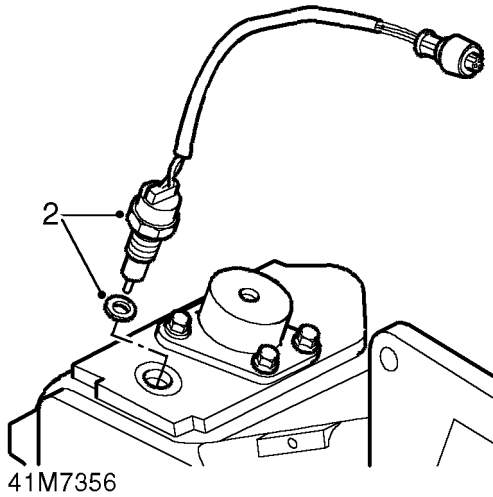
Interlock solenoid - if fitted



1. Position interlock solenoid in main casing.
2. Apply sealant, Part No. STC 3254 to mating face of solenoid cover.
3. Fit solenoid cover and Belleville washer, fit bolts and tighten to 10 Nm (8 lbf.ft).

TRANSFER BOX

Neutral warning lamp switch - if fitted

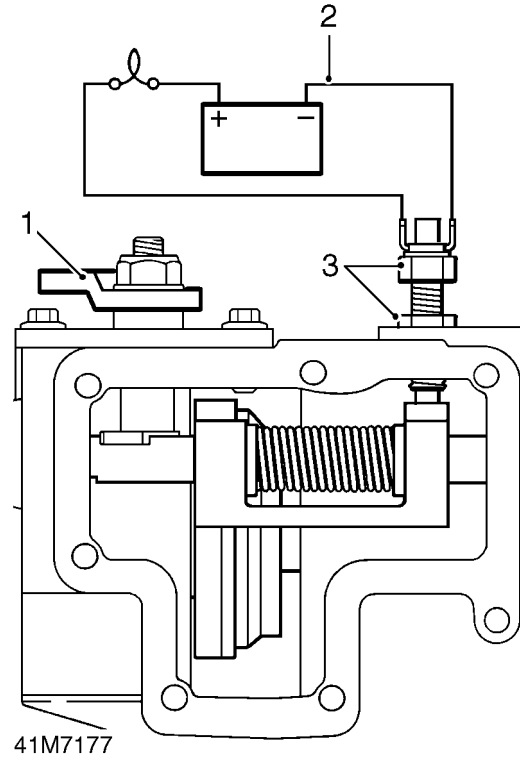


1. Apply Hylosil PL32 sealant to threads of switch.
2. Fit washer, fit and tighten switch to 25 Nm (18 lbf.ft).

Differential lock warning lamp switch - adjust



NOTE: This procedure is only necessary for switches fitted with a locknut.

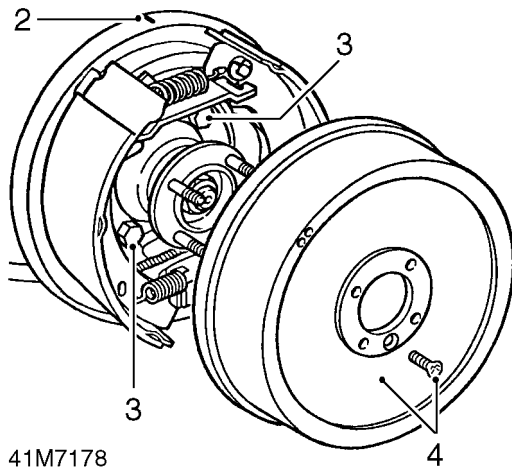


1. Move differential lock selector fork to differential locked position.
2. Connect a 12V test lamp and battery to differential lock switch.
3. Screw switch in until test lamp is illuminated then screw switch in a further 1/2 turn; tighten locknut.
4. Disengage differential lock, check that test lamp is extinguished.
5. Remove test lamp.
6. *Up to serial no. 288709E:* Apply grease to a new gasket and fit to differential lock side cover.
7. *From serial no. 288709E:* Apply sealant, Part No. STC 3254 to mating face of differential lock side cover.
8. Fit side cover.
9. Apply Loctite 290 to threads of side cover bolts, fit bolts and tighten to 25 Nm (18 lbf.ft).



Transmission brake

1. Apply sealant, Part No. STC 3254 to mating face of rear output housing.



2. Position brake backplate on rear output housing ensuring that alignment marks are together.
3. Fit 4 bolts and tighten to 72 Nm (54 lbf.ft).
4. Fit transmission brake drum, fit countersunk screw and tighten.



NOTE: Early transfer boxes - 2 screws are fitted.

5. Tighten adjusting bolt to 25 Nm (18 lbf.ft) to fully expand shoes against brake drum then slacken adjusting bolt $1\frac{1}{2}$ turns. Check that drum is free to rotate.



DATA

High/low selector finger width	15.90 to 15.95 mm	0.625 to 0.627 in
High/low selector fork finger width	7.37 to 7.47 mm	0.290 to 0.294 in
High/low selector shaft groove width	16.0 to 16.1 mm	0.63 to 0.64 in
High/low selector hub groove width	7.5 to 7.6 mm	0.295 to 0.30 in
Differential lock selector finger width	15.90 to 15.95 mm	0.625 to 0.627 in
Differential lock selector shaft groove width	16.0 to 16.1 mm	0.63 to 0.64 in
Differential lock selector fork finger width	7.92 to 7.9	0.311 to 0.313 in
Differential lock selector spring free length	84.58 mm	3.33 in
Dog clutch selector fork groove width	8.05 to 8.20 mm	0.32 to 0.33 in
Differential front and rear half carrier gears load to turn :		
Used gears	0.45 kg	1.0 lb
New gears	1.72 kg	3.8 lb
Thrust washer thicknesses available	1.05 to 1.45 mm	0.04 to 0.06 in
In increments of:	0.10 mm	0.004 in
Total load to turn - both sun gears fitted:		
Used gears	0.90 kg	2.0 lb
New gears	3.44 kg	7.6 lb
Low range gear to high range hub clearance	0.05 to 0.15 mm	0.002 to 0.006 in
High range gear to high/low hub clearance	0.05 to 0.15 m	0.002 to 0.006 in
Mainshaft input gear bearing pre-load	0.05 mm	0.002 in
Mainshaft input gear bearing shim thicknesses available	3.15 to 4.00 mm	0.12 to 0.16 in
In increments of:	0.05 mm	0.002 in
Differential bearing pre-load	0.05 mm	0.002 in
Differential shim thicknesses available	2.00 to 3.25 mm	0.08 to 0.13 in
In increments of	0.05 mm	0.002 in
Transfer box gear train torque to turn	2.2 Nm	19 lbf.in
Intermediate gear selective length		
non-collapsible spacer sizes	58.325 to 50.300 mm	2.296 to 2.235 in
In increments of	0.025 mm	0.001 in

TRANSFER BOX

TORQUE FIGURES

Drain plug	30 Nm	22 lbf.ft
Differential carrier bolts	60 Nm	44 lbf.ft
Differential bearing nut	72 Nm	53 lbf.ft
Differential lock selector lever nut	15 Nm	11 lbf.ft
* Front output housing bolts	25 Nm	18 lbf.ft
* Rear output housing bolts	45 Nm	33 lbf.ft
*** Output flange nuts	162 Nm	120 lbf.ft
* Differential lock selector housing bolts	25 Nm	18 lbf.ft
High/low selector housing bolts	25 Nm	18 lbf.ft
* Intermediate shaft retaining plate bolt	25 Nm	18 lbf.ft
*** Intermediate shaft stake nut - Selective length non-collapsible spacer	88 Nm	65 lbf.ft
* Bottom cover bolts	25 Nm	18 lbf.ft
* Bearing housing cover plate bolts and stud nut	25 Nm	18 lbf.ft
Transmission brake backplate bolts	72 Nm	54 lbf.ft
Interlock solenoid cover bolts - if fitted	10 Nm	8 lbf.ft
** Neutral warning lamp switch	25 Nm	18 lbf.ft

* Apply Loctite 290 to threads

** Apply Hylomar PL32 to threads

*** New nut must be fitted



SERVICE TOOLS

LRT-37-11/2	Thrust button
LRT-37-014	Mainshaft oil seal replacer
LRT-41-001	Collars - differential rear bearing
LRT-41-001	Thrust button
LRT-41-002	Collars - differential front bearing
LRT-41-003	Mainshaft input gear bearing remover/replacer
LRT-41-004	Intermediate gear dummy shaft
LRT-41-005	Input gear mandrel
LRT-41-006	Intermediate gear bearing track replacer
LRT-41-007	Differential bearing nut remover/replacer
LRT-41-008	Differential bearing replacer
LRT-41-011	Output shaft bearing replacer
LRT-41-012	Output shaft oil seal replacer
LRT-41-014/1	Cross-bar
LRT-41-014/2	Depth block
LRT-41-014/3	Setting block
LRT-41-014/4	Pillar
LRT-41-017	Intermediate gear bearing pre-load measuring plate
LRT-51-003	Propeller shaft flange holding tool
LRT-51-009	Differential rear bearing track replacer
LRT-54-003	Differential front bearing track replacer
LRT-99-002	Hand press
LRT-99-003	Driver handle
LRT-99-006	Dial test indicator (DTI)