

37 - MANUAL GEARBOX

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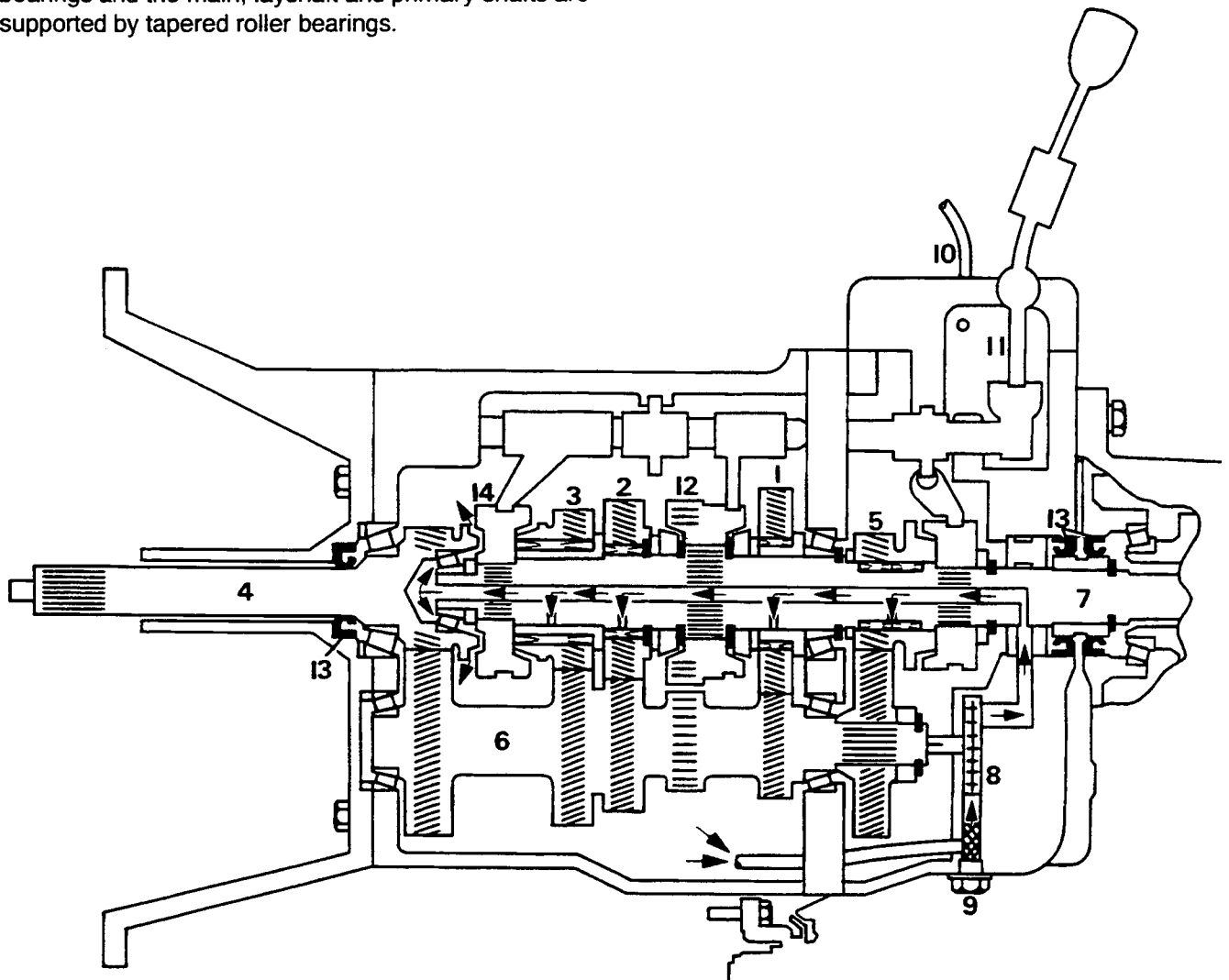
MANUAL TRANSMISSION

Description

The 77mm all synchromesh five speed manual gearbox unit, is married to a Borg Warner two speed chain drive transfer gearbox.

All the gears including reverse run on needle roller bearings and the main, layshaft and primary shafts are supported by tapered roller bearings.

The whole of the geartrain is lubricated through drillings in the shafts, supplied by a low pressure pump driven from the rear of the layshaft. The gear change has a single rail selector and spool type interlock. The main and transfer gearboxes ventilate through nylon pipes, which terminate high up in the engine compartment to prevent water entry when the vehicle is operating in adverse conditions.



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- | | |
|------------------------|------------------------------|
| 1. Mainshaft 1st gear | 9. Drain plug and oil filter |
| 2. Mainshaft 2nd gear | 10. Ventilation pipe |
| 3. Mainshaft 1st gear | 11. Single rail gear shift |
| 4. Primary input shaft | 12. 1st/2nd synchromesh |
| 5. Mainshaft 5th gear | 13. Oil seals |
| 6. Layshaft | 14. 3rd/4th synchromesh |
| 7. Mainshaft | 15. 5th gear synchromesh |
| 8. Lubrication pump | |



LT77 MANUAL GEARBOX

Symptom - Gear jumps out of engagement (any forward gear)

1. Check condition and security of transmission and engine mountings.
2. Check in situ, gear lever and selector adjustments.
3. In situ, remove gearshift and check selector rail yoke security.
Also check selector detent spring tension and both spool retainers.
Suspect internal fault
See remove and overhaul procedure.
4. Check action/operation of main selector rail and forks.
5. Check condition of synchromesh and gear dog teeth.
6. Check main and layshaft end floats bearings and adjustments.
7. Check condition of all gearbox components, ensure clearances and adjustments are correct on reassembly.

Symptom - Reverse gear only jumps out of engagement

1. Check condition and security of transmission and engine mountings.
2. Check in situ, gear lever and selector adjustments.
3. In situ, remove gearshift and check selector rail yoke security.
Also check selector detent spring tension and both spool retainers.
Suspect internal fault
See remove and overhaul procedure.
4. Check action/operation of main selector rail and reverse lever.
5. Check condition of reverse gear, angled bearings and shaft.
6. Check condition of all gearbox components, ensure clearances and adjustments are correct on reassembly.

Symptom - Excessive force required to engage or change gear, vehicle stationary or moving.

1. Check lubricant specification and level, if low do not top up at this stage.
2. In situ, lubricate gear mechanism, and check selector adjustments.
3. In situ, remove gearshift and check selector rail is free and that the yoke is secure. Also check selector detent spring tension and both spool retainers.
4. Drain lubricant and check for contamination or metal particles.
Suspect worn synchromesh unit or baulk rings on effected gears. **See remove and overhaul procedure.**

Symptom - Noisy gear engagement, vehicle stationary, See CLUTCH, Fault diagnosis, Clutch Noise - Mechanical Faults
Symptom - Noisy gear selection, vehicle moving.

1. Confirm that clutch operation is satisfactory.
2. Establish which gear/gears is causing noise.
3. Check lubricant specification and level, if low do not top up at this stage.
4. Drain lubricant and check for contamination or metal particles.
Suspect worn synchromesh. **See remove and overhaul procedure.**
5. Check condition of synchromesh unit, springs and cones for distortion and wear. Also check dog teeth for damage and cone mating surface on gear for signs of overheating.
6. Check condition of all gearbox components, ensure clearances and adjustments are correct on reassembly.

Symptom - Noise from gearbox in neutral, which changes tone or becomes worse when clutch is depressed See CLUTCH, Fault diagnosis, Clutch Noise - Mechanical Faults

Symptom - Noise from gearbox in neutral, which disappears when clutch is depressed.

1. Check lubricant specification and level, if low do not top up at this stage.
2. Drain lubricant and check for contamination or metal particles.
Suspect worn bearings on layshaft, primary shaft or front of main shaft. **See *remove and overhaul procedure.***

Symptom - Noise from gearbox in one or more gears when being driven.

1. Check lubricant specification and level, if low do not top up at this stage.
2. Drain lubricant and check for contamination or metal particles.
Suspect worn roller bearings on particular mainshaft gears. **See *remove and overhaul procedure.***



LT77 GEARBOX

Service repair no - 37. 20. 02.

Remove and refit

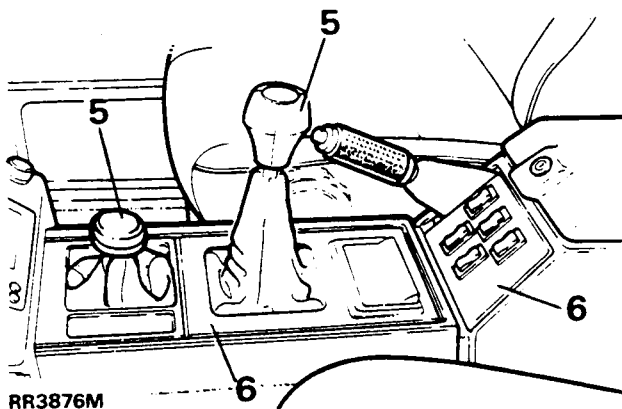
Remove

1. Site vehicle on ramp and chock wheels.
2. Disconnect the battery negative lead.
3. Remove fan blade assembly.



NOTE: The nut securing viscous unit has left hand thread.

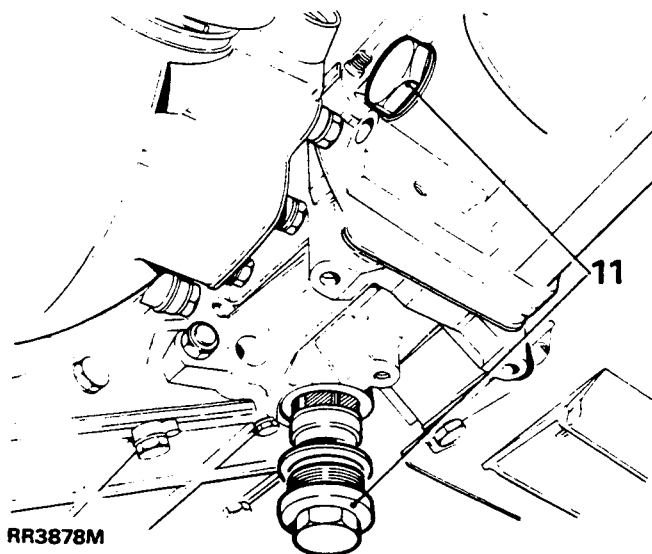
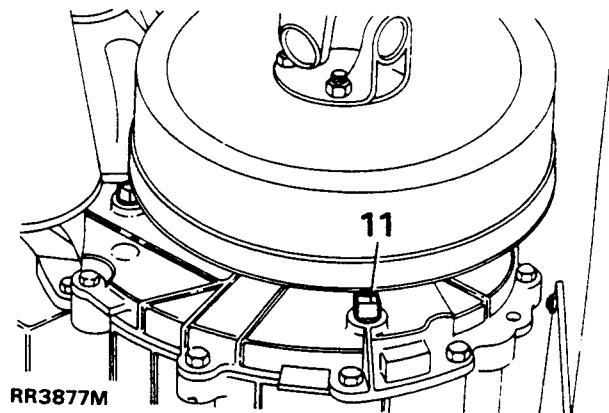
4. Disconnect airflow meter to plenum chamber hose.
5. Remove two gear lever knobs.



6. Remove floor mounted console assembly. See **CHASSIS AND BODY, Repair, Glovebox and floor mounted console assembly**
7. Remove padding from top of transmission tunnel.
8. Loosen pinch bolt and remove upper gear lever.
9. Remove screws and detach high low lever and main gearlever retaining plates.

Underneath vehicle

10. Drain oil from transfer gearbox, main gearbox and extension housing.
11. Refit plugs, cleaning filter on extension housing plug.

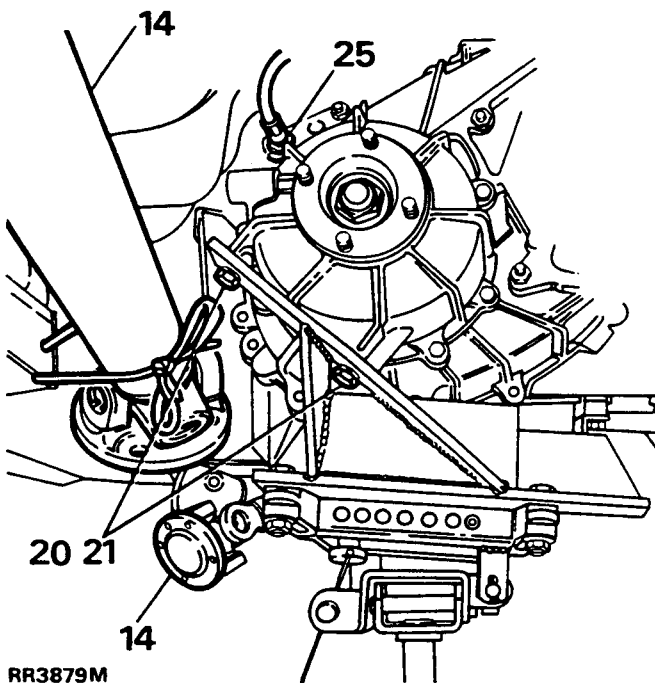


12. Disconnect Lambda sensor and remove front section of exhausts.
13. Remove chassis cross member secured by eight nuts and bolts.

14. Mark each drive flange for reassembly and disconnect front and rear propeller shafts from transfer box. Tie the shafts to one side.
15. Release clamp and disconnect speedometer cable from rear output housing.
16. Release cable from left hand side of transfer gearbox. Tie cable to one side.
17. Remove two bolts and withdraw clutch slave cylinder from bell housing.

Remove transmission assembly

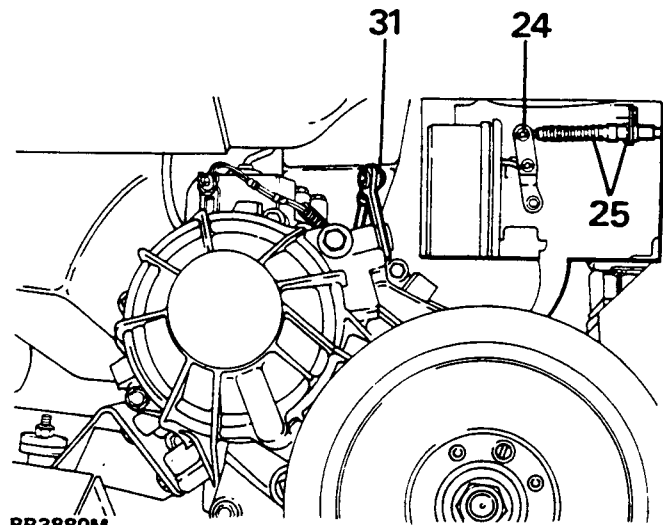
18. Position a suitable transmission hoist on rear output housing to support weight of assembly.
19. Remove fixings and withdraw transfer gearbox mountings.



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20. Fit adaptor plate to transmission hoist. Raise hoist and position under transfer box. **See TRANSFER BOX, Service tools, Adapter plate transfer box**

21. Secure fixture to transfer box mounting points.
22. Remove hoist from rear of transfer box.
23. Lower transmission until top of transfer gearbox clears rear floor.
24. Disconnect handbrake cable.
25. Remove clip securing handbrake outer cable to support bracket, feed cable through bracket, and tie to one side.
26. Position hoist under engine to support weight.
27. Remove bolts from bell housing.
28. Ensuring all fixings are released, withdraw transmission.



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Separating transfer box from gearbox

29. Remove transmission assembly from hoist and cradle.
30. Place sling round transfer box and attach to hoist.
31. Detach high low link from transfer gearbox selector lever and remove breather pipe.
32. Remove bolts and two nuts retaining transfer box to extension housing and separate.



Assembling transfer box to main gearbox

1. Stand gearbox bell housing face on two pieces of wood.
2. Lower transfer gearbox onto main gearbox. Secure with bolts and two nuts. Tighten to **40 Nm**
3. Refit breather pipe and selector link.

Transfer gearbox high/low link adjustment

4. Ensure transfer gearbox is in neutral position.
5. Set transfer gearbox lever in a vertical position. Rotate fork end of rod until holes align with hole in selector lever.
6. Fit clevis pin and retaining clip. Select high and low transfer to ensure full engagement is obtained. Repeat adjustment procedure if full engagement is not evident.

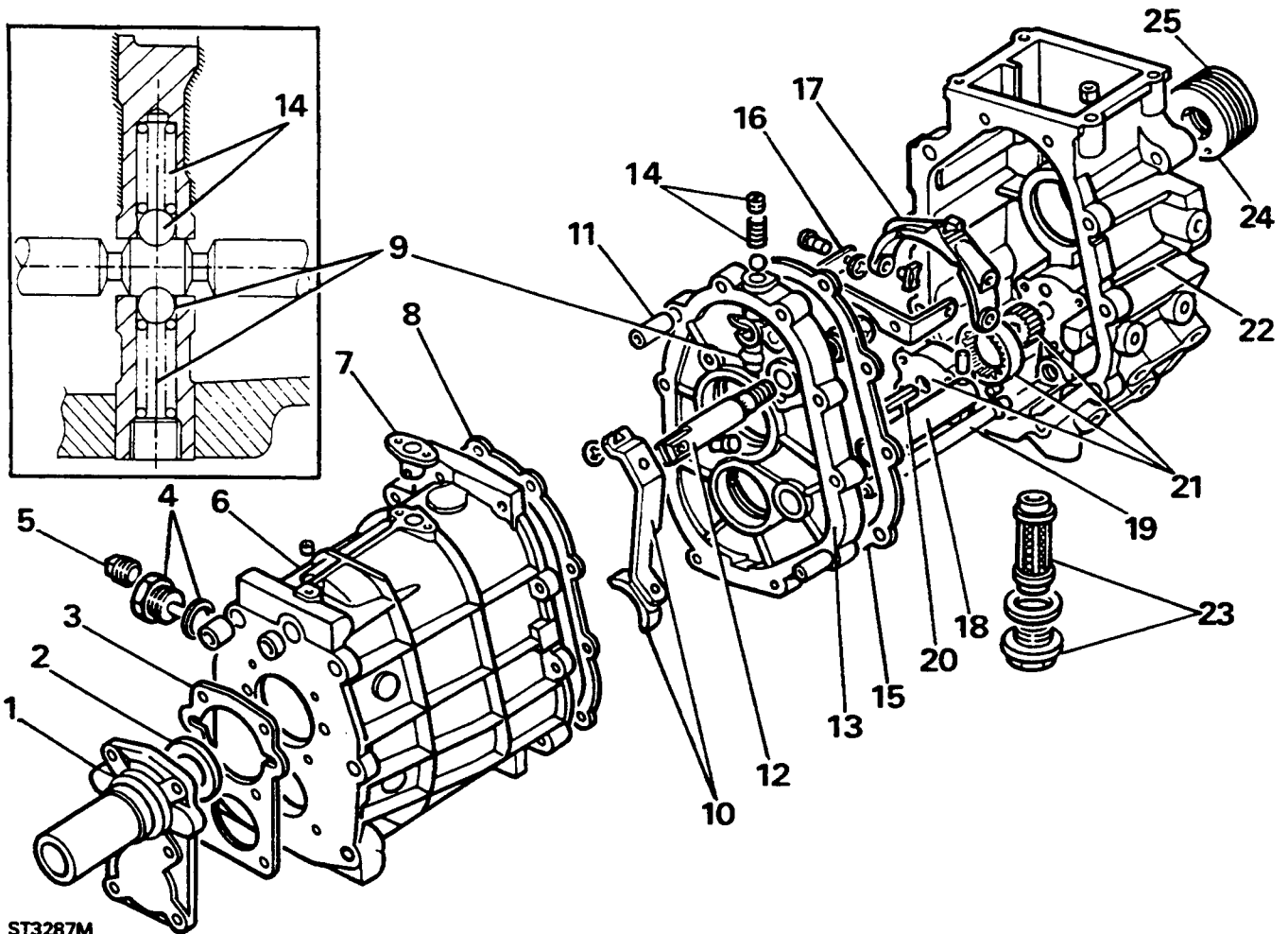
Refit

7. Fit cradle to transmission hoist and transmission to cradle. Apply Hylomar on bell housing mating face with engine.
8. Select any gear in main and transfer gearbox to facilitate entry of the input shaft. Ensure that the clutch centre plate is in alignment.
9. Position and raise hoist to line up with engine, feed handbrake cable through aperture in tunnel, ensure that any pipes or electrical leads do not become trapped.
10. Fit transmission assembly to engine. Tighten to **40 Nm**
11. Reverse removal procedure noting following points.
12. Tighten all fixings to the correct torque. **See Specifications, torque, LT77 Gearbox Data**
13. Fill both main and transfer gearboxes with recommended oil up to level of filler hole. Apply Hylomar sealant to threads and fit level plugs. **See LUBRICANTS, FLUIDS AND CAPACITIES, Information, Recommended lubricants and fluids**



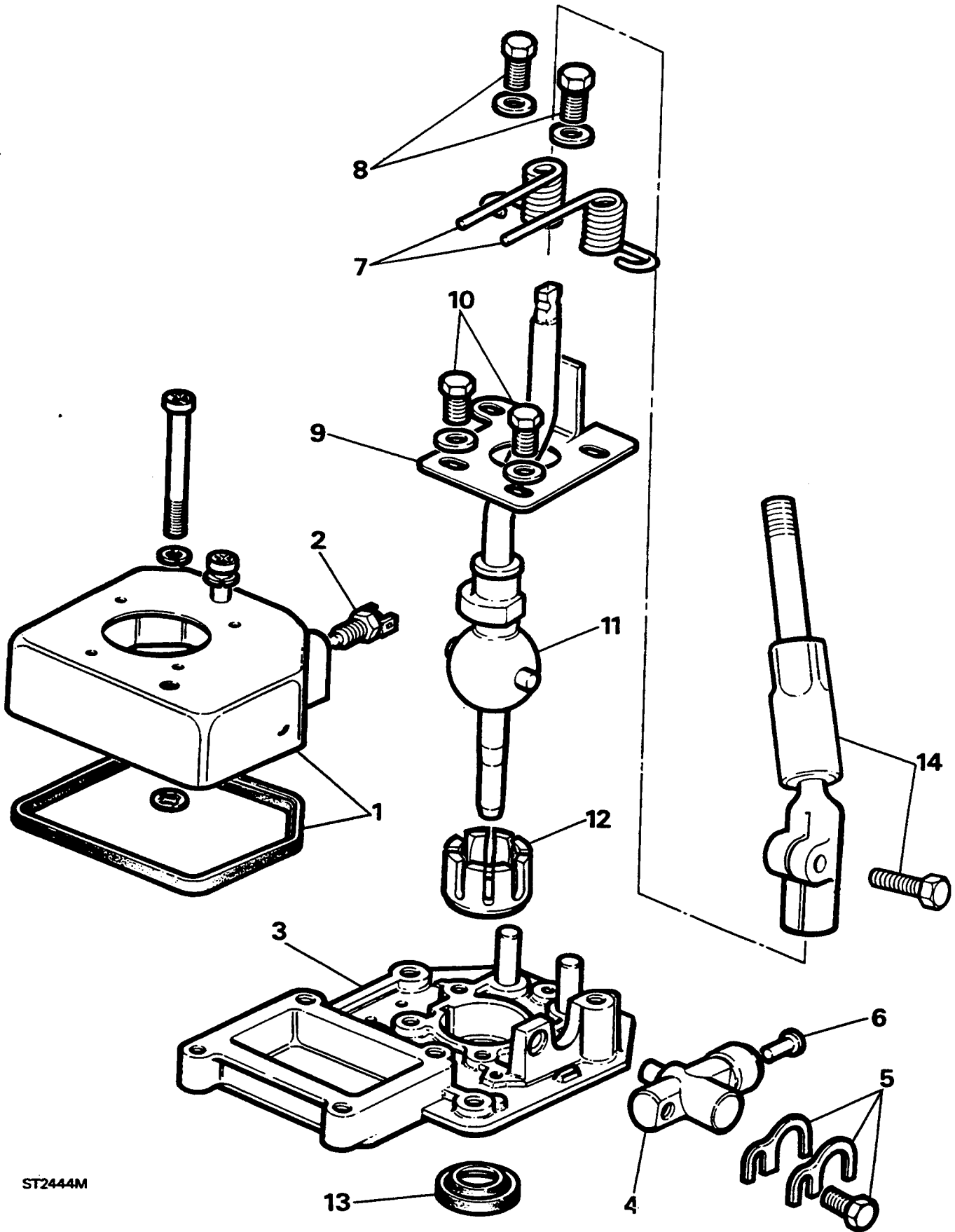
GEARBOX CASING COMPONENTS

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Front cover. 2. Front cover oil seal. 3. Front cover gasket. 4. Oil drain plug and washer. 5. Oil level plug. 6. Gearbox main casing. 7. Spool retainer. 8. Gasket. 9. Inboard detent ball and spring. 10. Reverse lever and slipper. 11. Locating dowels - centre plate to maincase. 12. Reverse lever pivot post. 13. Centre plate. 14. Selector plug, detent ball and spring. 15. Gasket. | <ol style="list-style-type: none"> 16. Fifth gear selector bracket. 17. Fifth gear selector fork. 18. Reverse gear shaft. 19. Oil pick-up pipe. 20. Oil pump drive shaft. 21. Oil pump gears and cover. 22. Fifth gear extension housing. 23. Fifth gear extension housing drain plug and filter. 24. Ferrobestos bush. 25. Oil seal. |
|---|---|



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GEAR CHANGE HOUSING COMPONENTS



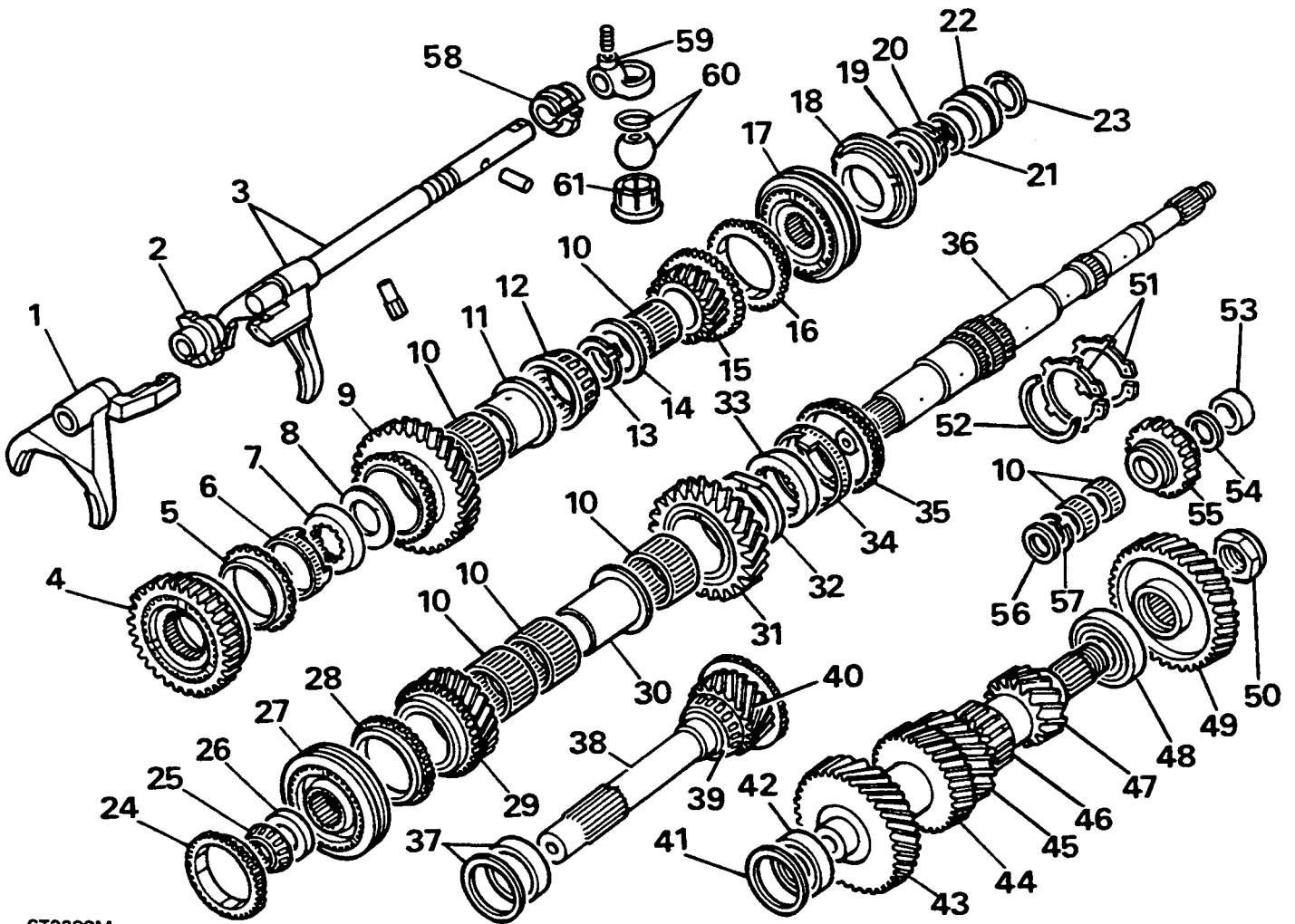
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GEAR CHANGE HOUSING COMPONENTS

1. Gear change housing cover and gasket
2. Reverse lamp switch
3. Gear change housing
4. Reverse gear plunger
5. Reverse gear plunger shims and bolt
6. Reverse lamp plunger
7. Bias springs
8. Bias spring retaining bolts
9. Bias adjustment plate
10. Bias adjustment plate bolts
11. Lower gear lever
12. Railko bush
13. Lower gear lever housing oil seal
14. Upper gear lever pinch bolt

GEARS AND SHAFTS COMPONENTS



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GEARS AND SHAFTS

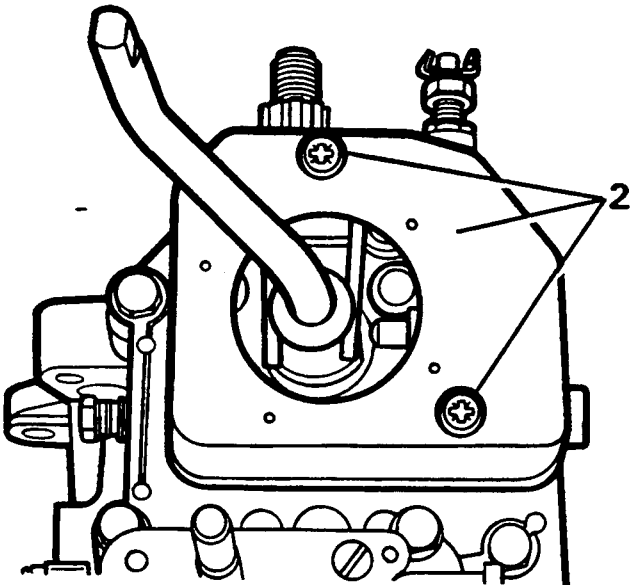
1. Third - fourth selector fork.
2. Interlock spool.
3. First - second fork and selector rail assembly.
4. First - second synchromesh.
5. First gear synchromesh outer baulk ring.
6. First gear synchromesh inner baulk ring.
7. Cone.
8. Thrust washer.
9. First gear.
10. Needle roller bearings.
11. First gear selective bush.
12. Centre taper roller bearing.
13. Circlip.
14. Thrust washer.
15. Fifth gear.
16. Fifth gear baulk ring.
17. Fifth gear synchromesh.
18. Fifth gear synchromesh back plate.
19. Fifth gear synchromesh selective washer.
20. Circlip.
21. "O" ring.
22. Oil seal collar.
23. Snap ring.
24. Fourth gear baulk ring.
25. Pilot taper bearing.
26. Spacer.
27. Third - fourth synchromesh.
28. Third gear baulk ring.
29. Third gear.
30. Third gear bush.
31. Second gear.
32. Thrust washer.
33. Cone.
34. Second gear synchromesh inner baulk ring.
35. Second gear synchromesh outer baulk ring.
36. Mainshaft.
37. Input shaft bearing track and selective washer.
38. Input shaft.
39. Input shaft taper bearing.
40. Fourth gear.
41. Selective shim.
42. Taper bearing.
43. Layshaft fourth gear.
44. Layshaft third gear.
45. Layshaft second gear.
46. Layshaft reverse gear.
47. Layshaft first gear.
48. Taper bearing.
49. Layshaft fifth gear.
50. Layshaft fifth gear retaining stake nut.
51. Circlips retaining first gear and first-second gear synchromesh.
52. Snap ring retaining second gear cone and spacer.
53. Spacer.
54. Snap ring.
55. Reverse idler gear.
56. Thrust washer.
57. Snap ring.
58. Fifth gear spool.
59. Gear change lever yoke.
60. Gear change ball and retaining ring.
61. Gear change nylon seating.

LT77S GEARBOX

1. Remove gearbox from vehicle. *See Repair, LT77 Gearbox*

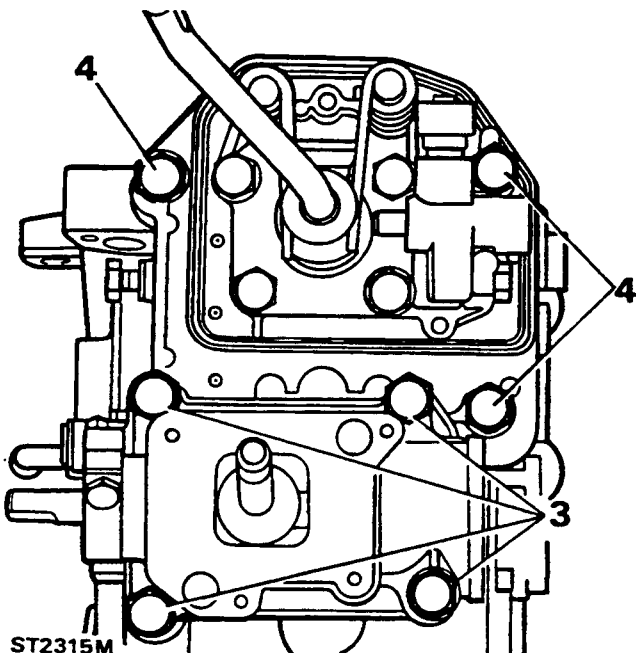
Gear change housing

1. Separate main gearbox from transfer box, remove bell housing, drain oil, and clean exterior.
2. Remove gear change housing cover.



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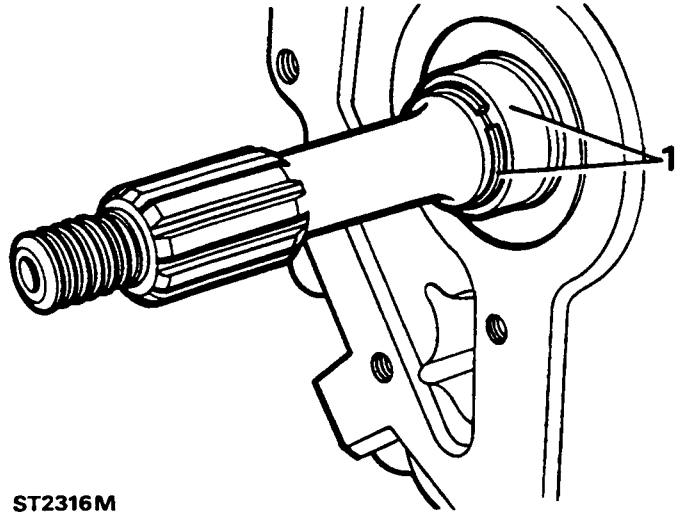
3. Remove transfer gear change housing.
4. Remove main gear change housing.



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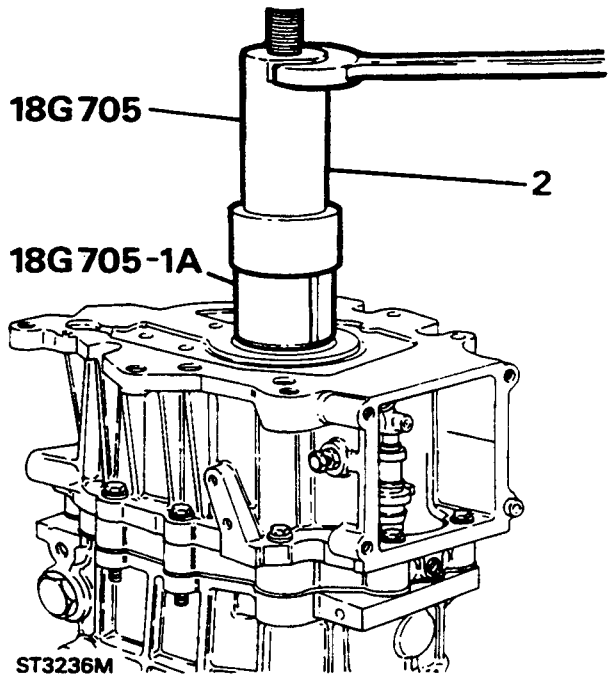
Extension housing

1. Remove snap ring retaining oil seal collar.



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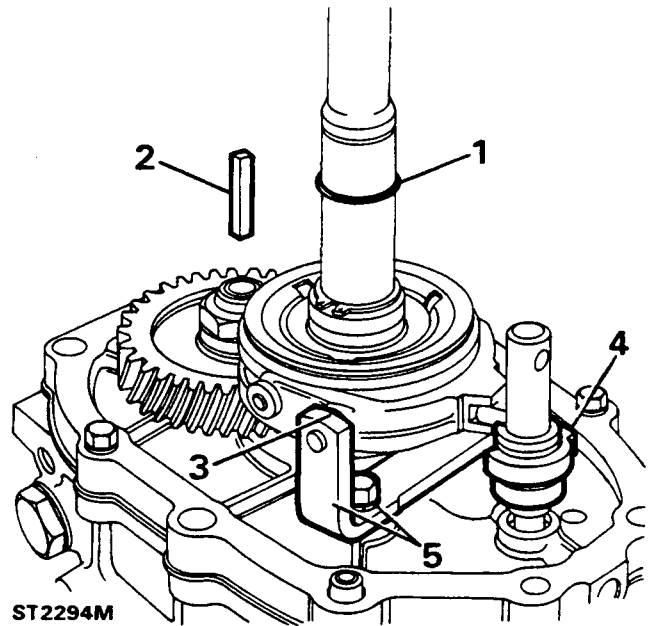
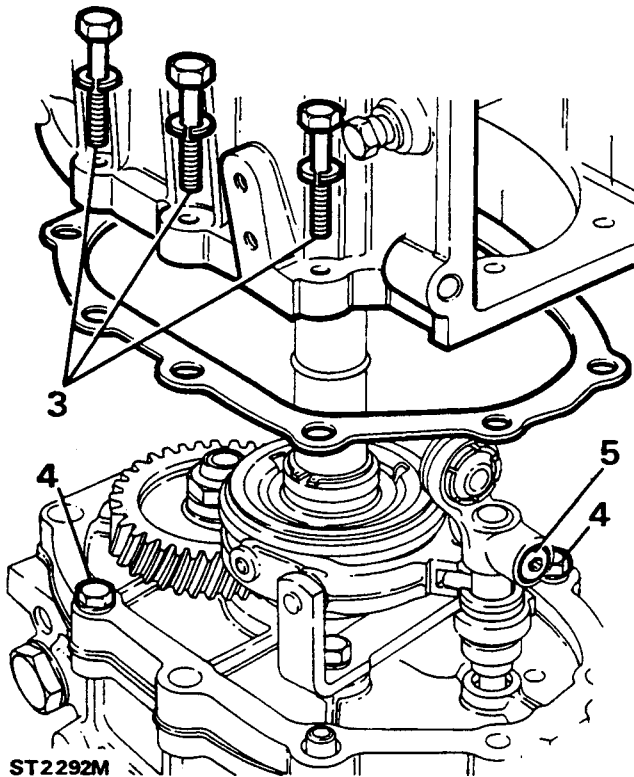
2. Using service tools LRT-37-009 (18G 705) and LRT-37-010 (18G 705-1A) withdraw oil seal collar.



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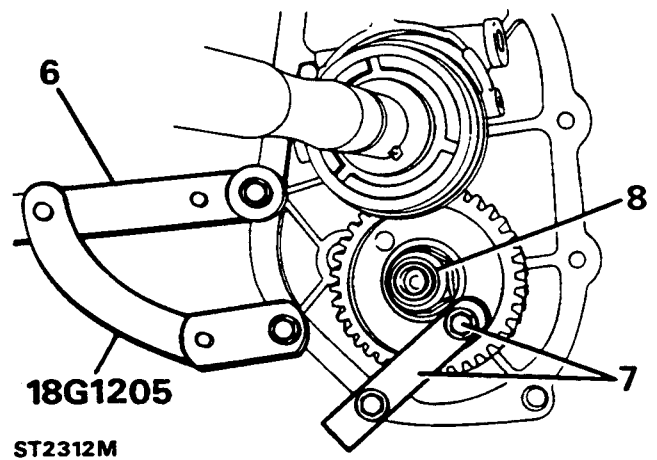
3. Remove fifth gear extension housing.
4. Secure centre plate to gearcase with two 8 x 35mm bolts.
5. Remove selector yoke from selector shaft.



6. Locate flange holder tool LRT-51-003 (18G 1205).
7. Fit manufactured tool "A" and spacer to restrain layshaft fifth gear.
8. De-stake and remove fifth gear nut.

Mainshaft and layshaft fifth gears.

1. Remove mainshaft "O" ring.
2. Remove oil pump drive shaft.
3. Remove "E" clips from selector fork.
4. Remove fifth gear selector spool.
5. Remove selector fork bracket.

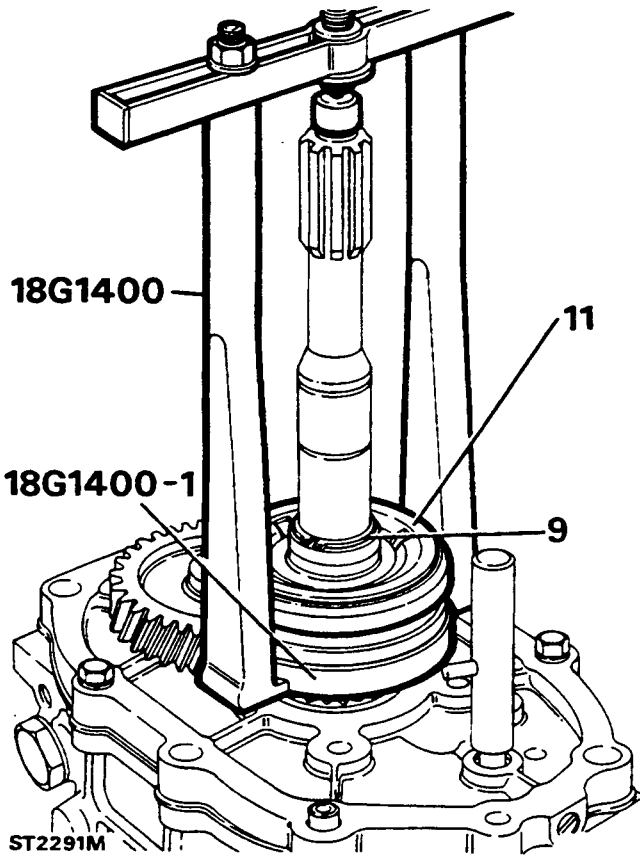


9. Remove circlip retaining mainshaft fifth gear synchromesh.

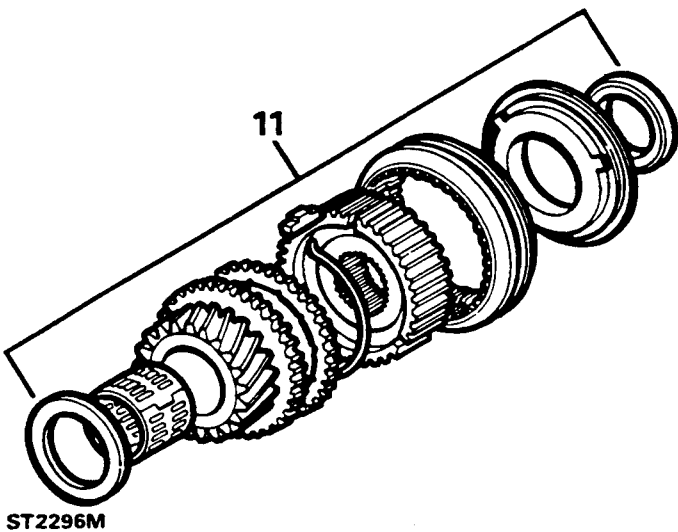
10. Fit special tool LRT-37-013 (18G 1400-1) and LRT-37-012 (18G 1400) as illustrated.



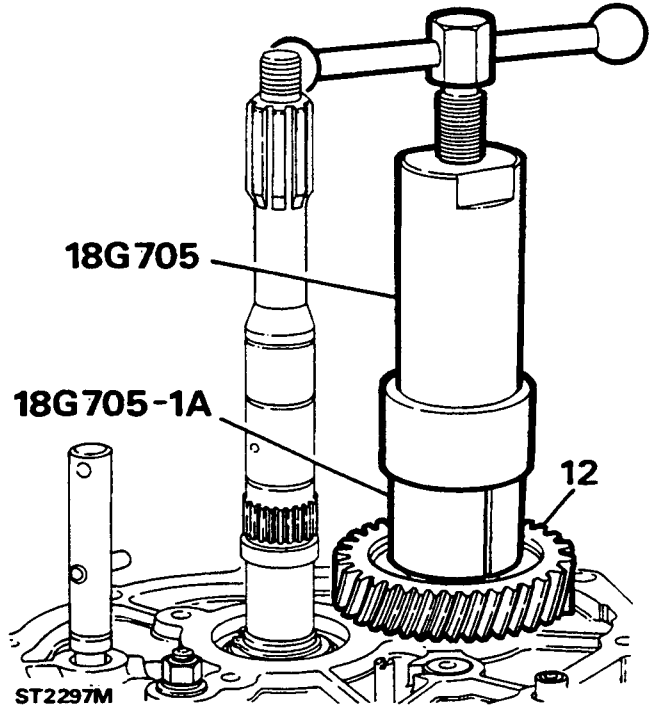
CAUTION: Ensure the puller feet locate in the two cut-outs in LRT-37-013 and between the pins.



11. Remove fifth gear synchronesh.

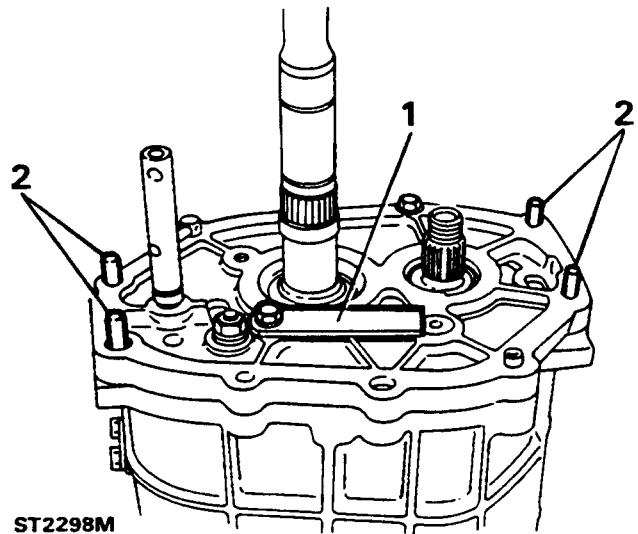


12. Remove layshaft fifth gear using special tools LRT-37-009 (18G 705) and LRT-37-010 (18G 705-1A).



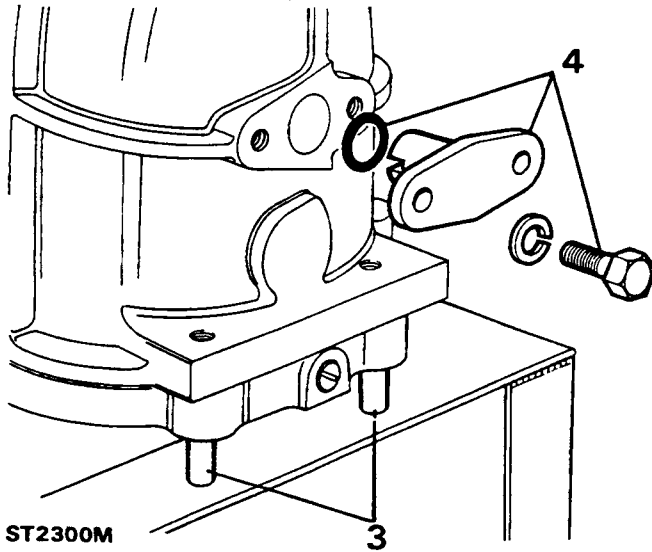
Main gear case.

1. Secure reverse shaft retainer, manufactured tool "A", to centre plate.
2. Fit studs, manufactured tool "B" to gear case.

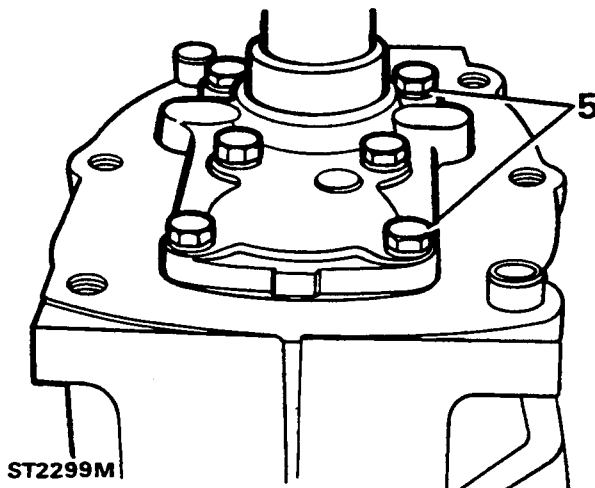




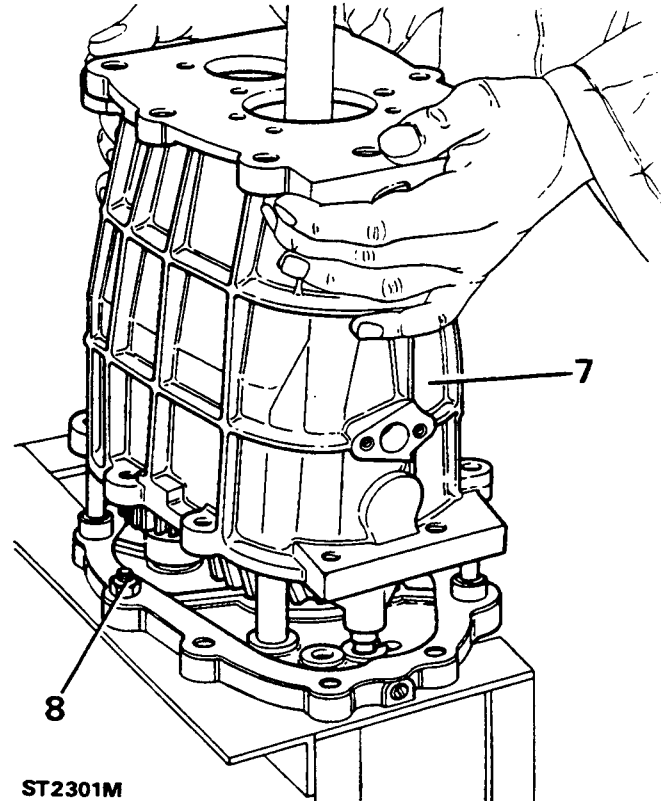
3. Invert gear case and locate studs in workstand holes.
4. Remove selector shaft spool retainer.



5. Remove front cover and gasket.
6. Retrieve selective washers.

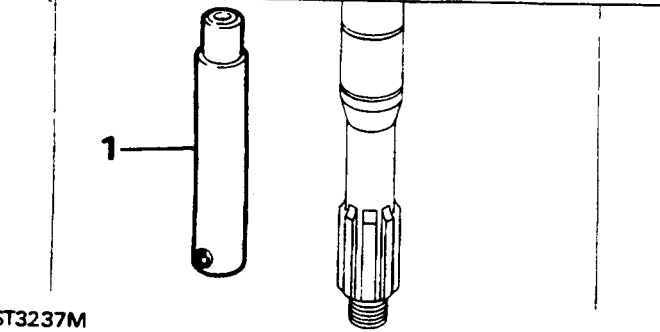
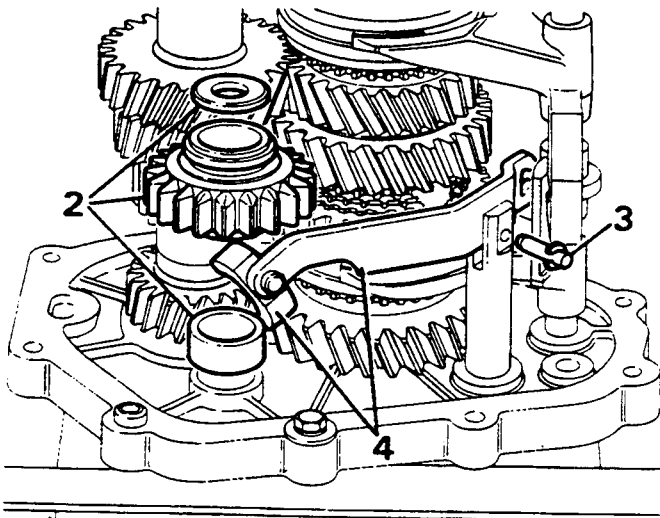


7. Remove bolts and lift-off gear case.
8. Secure centre plate with nut and bolt.



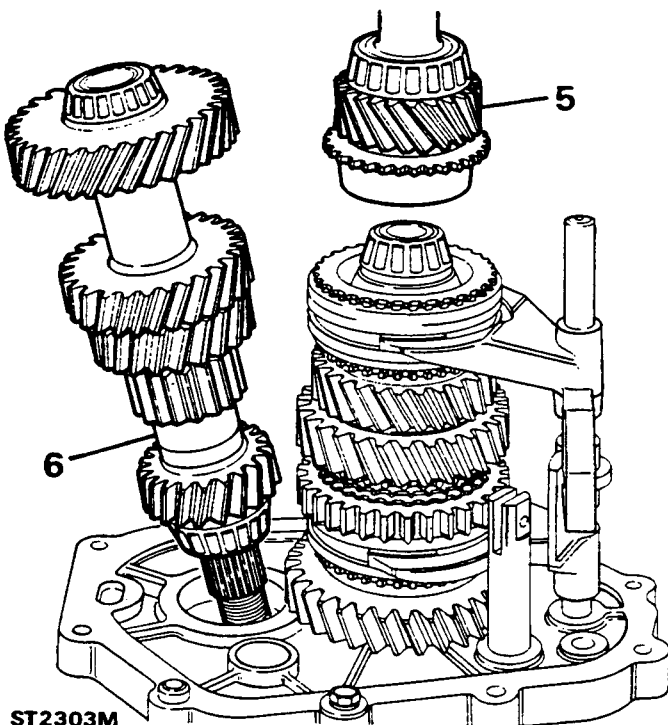
Reverse shaft, layshaft and mainshaft

1. Remove retainer (tool "A") and reverse shaft.
2. Remove thrust washer, reverse gear and spacer.
3. Remove reverse lever pin with "E" clip attached.
4. Remove lever and slipper pad.



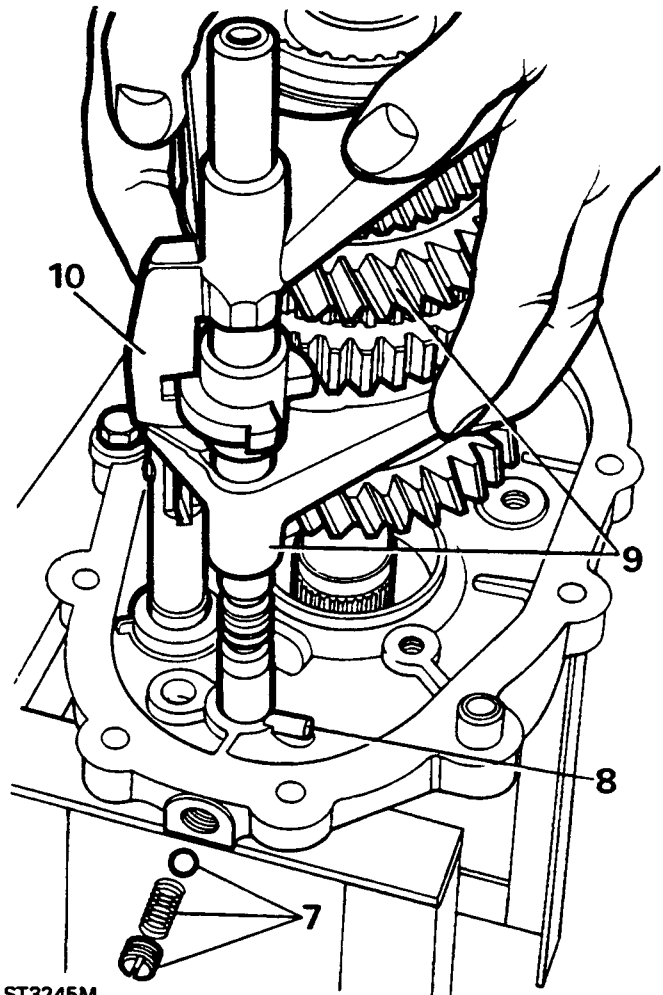
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5. Remove input shaft and fourth gear baulk ring.
6. Remove layshaft by tilting, as illustrated and lifting mainshaft.



ST2303M

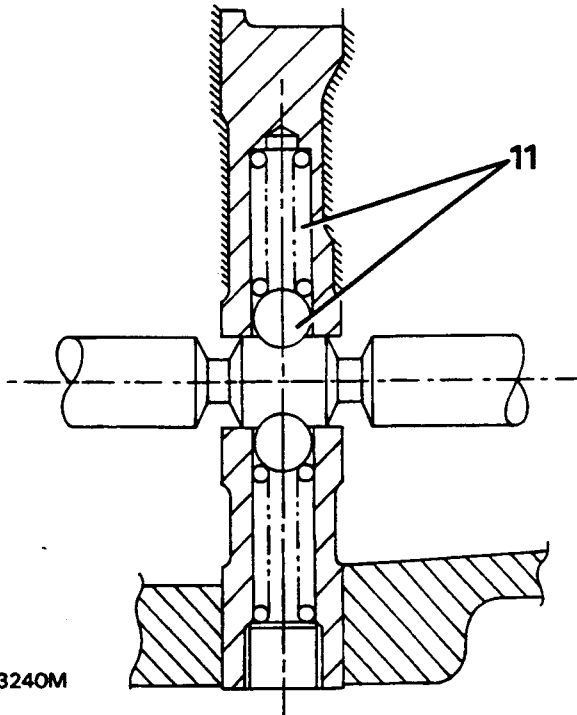
7. Unscrew plug and remove spring and outboard detent ball.
8. Align fifth gear selector pin with centre plate slot.
9. Remove mainshaft, gears, selectors and forks.
10. Remove selector fork assembly from gears.



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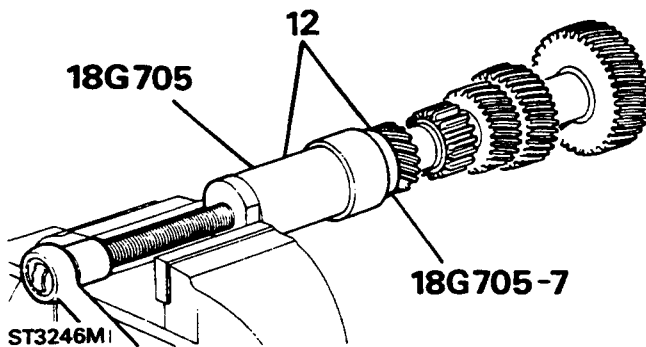


11. Collect inboard detent ball and spring from centre plate.



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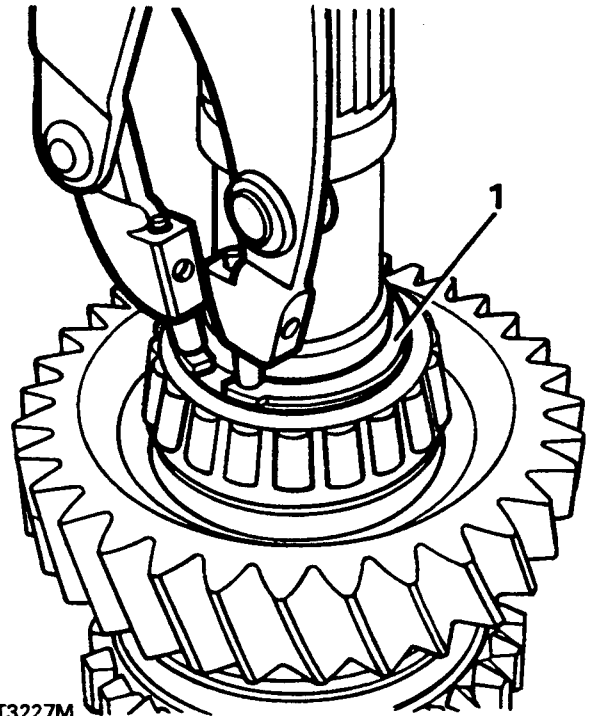
12. Using extractor tool LRT-37-009 (18G 705) and collets LRT-37-017 (18G 705-7), withdraw layshaft bearings.



ST3246M

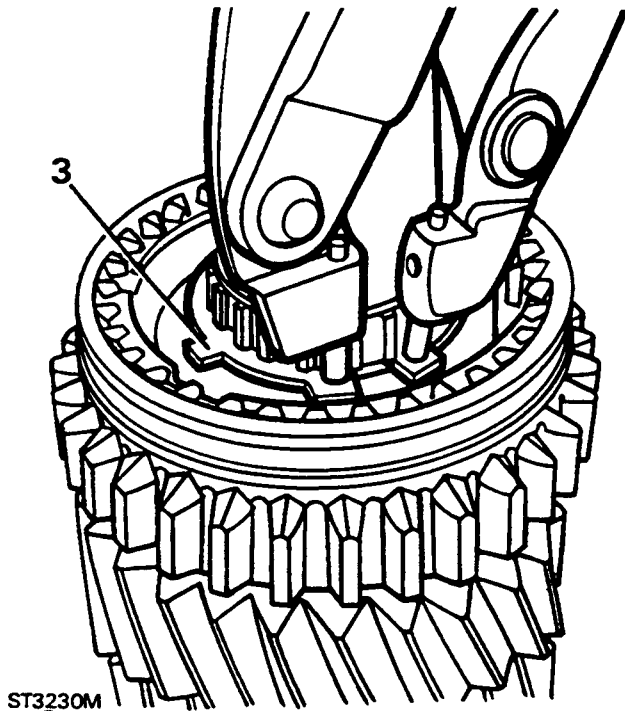
DISMANTLE MAINSHAFT

1. Remove circlip retaining first gear assembly.

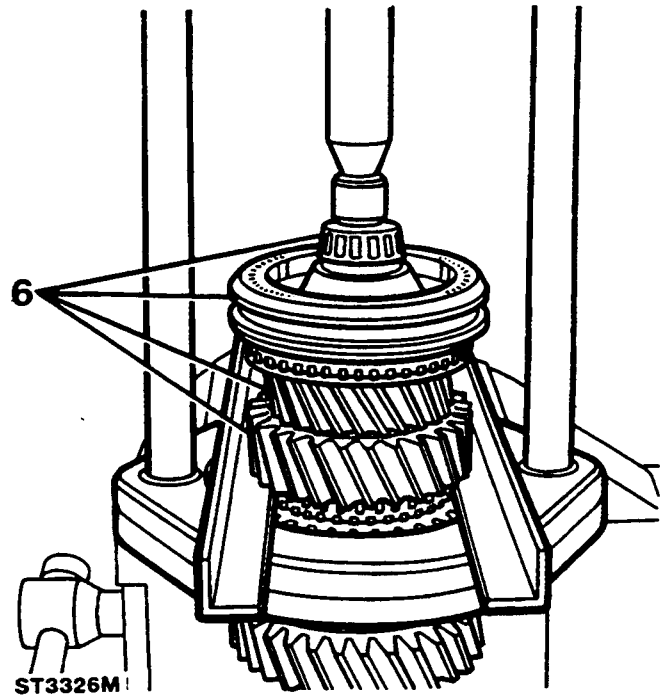


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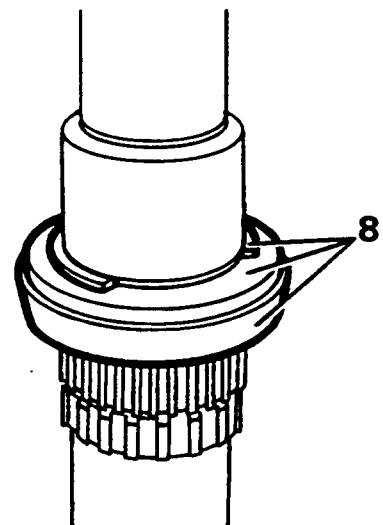
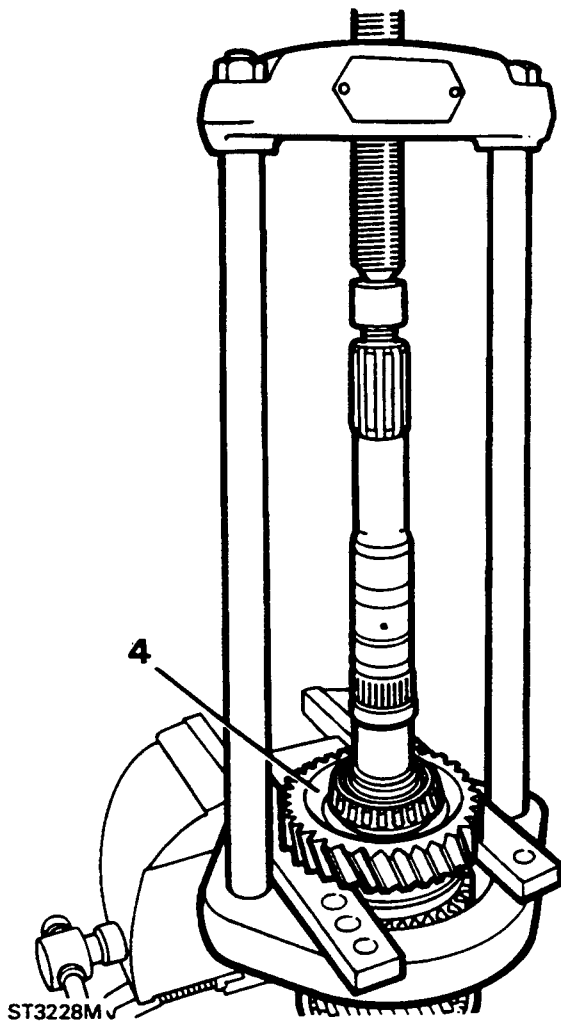
2. Remove taper bearing, bush, needle bearing, first gear spacer, cone, inner and outer baulk rings.
3. Remove circlip to release first and second gear synchromesh assembly.



4. With LRT-99-002 (MS 47) press first gear assembly from mainshaft.
5. Remove first and second synchromesh baulk rings.
6. Using LRT-99-002 and support bars under 2nd gear, press off pilot bearing, third, fourth synchromesh second and third gear assembly.



7. Remove washer, third, fourth synchromesh, third gear baulk ring, split needle rollers, bush, needle bearing and second gear.
8. Remove snap ring, spacer, second gear cone and circlip.



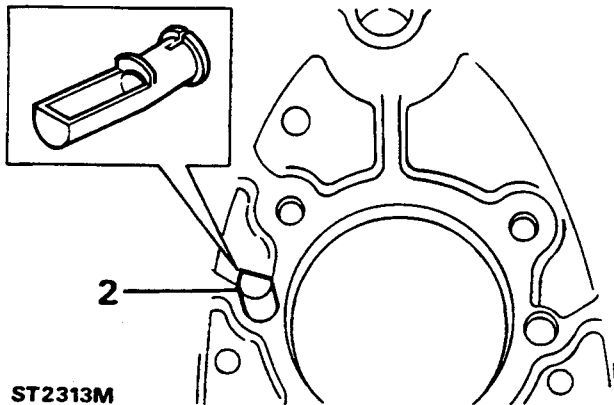


Gearbox casings and oil pump

Degrease and clean all components and discard gaskets and seals.

Gearbox casing

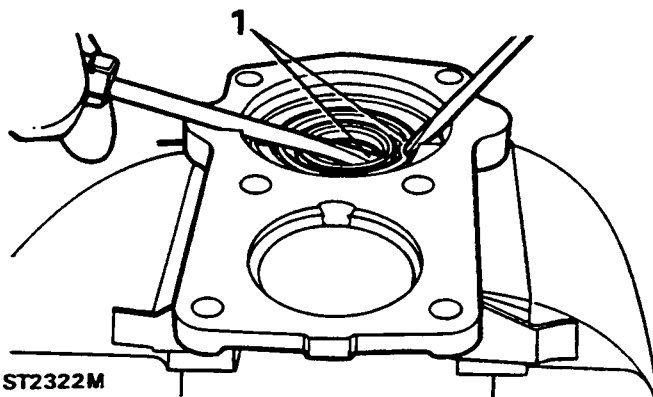
1. Remove mainshaft and layshaft bearing tracks.
2. Remove plastic scoop from inside the casing.



3. Inspect case for damage, cracks and stripped threads.
4. Fit a new scoop with scoop side towards top of casing.

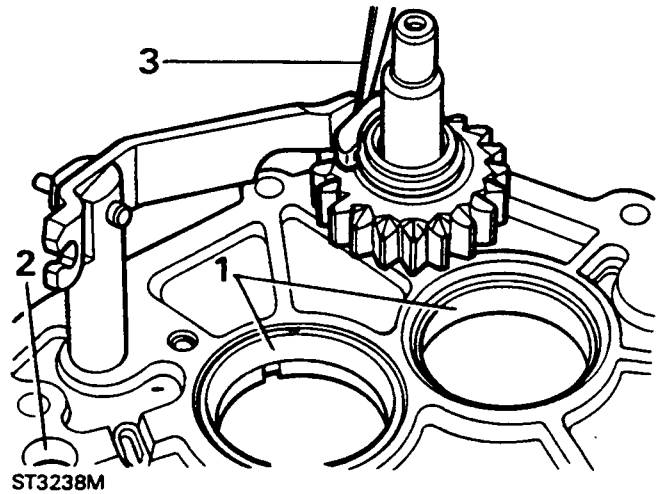
Front cover

1. Remove oil seal from cover. Do not fit a new seal at this stage



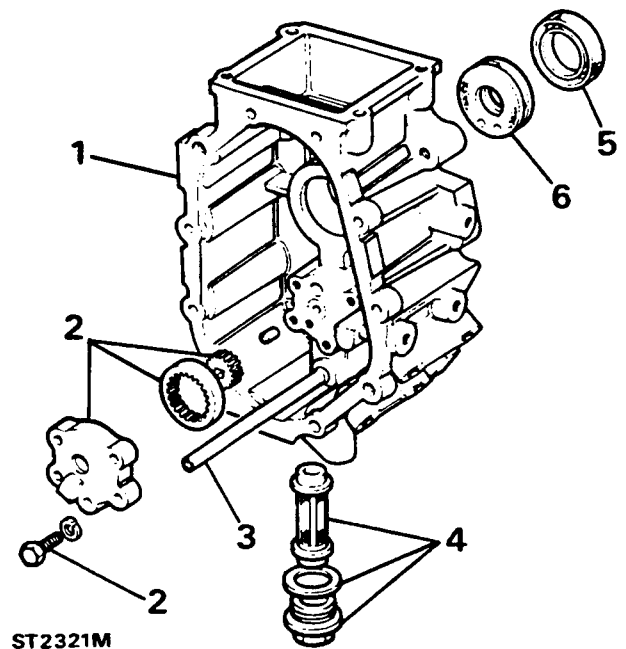
Centre plate

1. Remove bearing tracks.
2. Inspect for damage and selector rail bore for wear.
3. Temporarily fit reverse shaft gear and lever and check clearance between slipper and lever does not exceed 0,20 mm (0.008 in).



Extension case

1. Examine for damage to threads and machined faces.
2. Remove oil pump cover, inspect gears and housing and renew if required.



3. Check oil pick up pipe for obstruction but do not remove.
4. Remove drain plug assembly. Clean and renew filter and washers if necessary.
5. Renew oil seal.
6. Renew Ferrobestos bush.

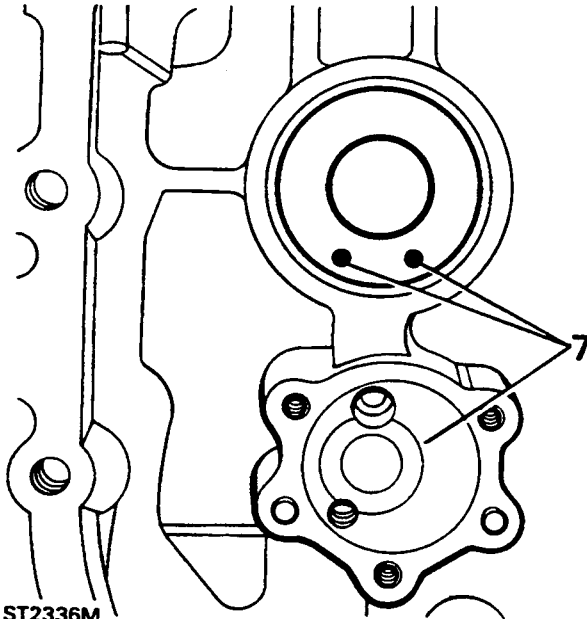


WARNING: This bush contains abestos. Do not attempt to clean it. See *INTRODUCTION, Information, Poisonous substances*

7. Fit new bush with drain holes towards bottom of casing.

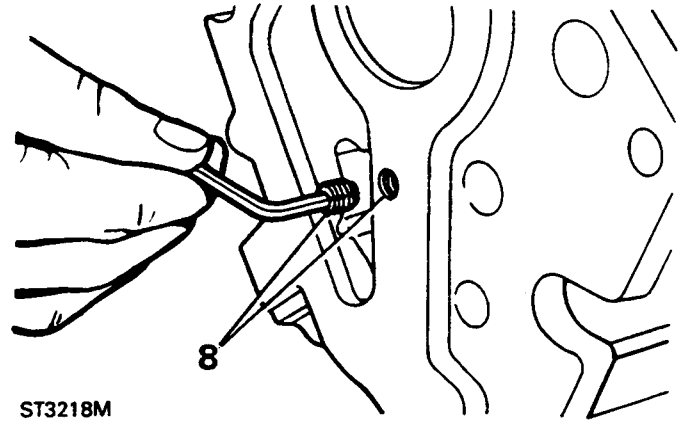


CAUTION: If drain holes are not positioned correctly oil may build up behind oil seal and cause a leak.



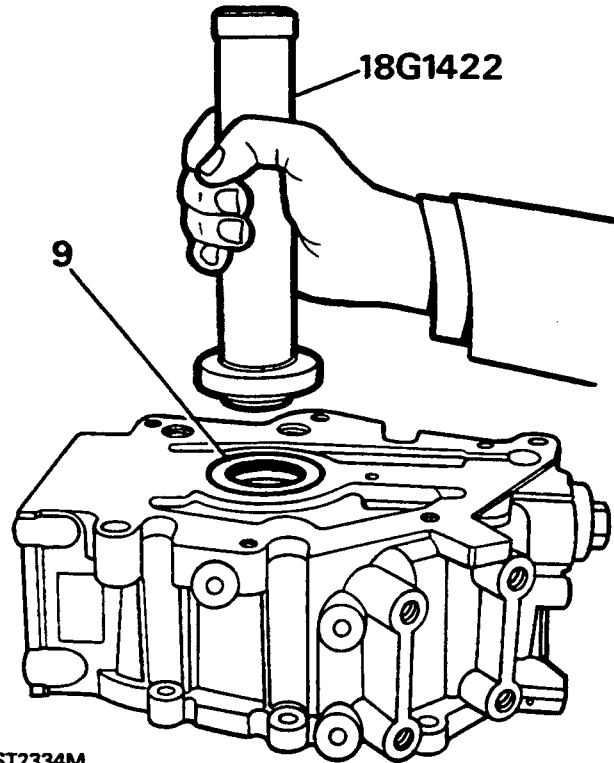
ST2336M

8. If extension housing is being renewed transfer grub screw to new housing. Apply Loctite to threads.



ST3218M

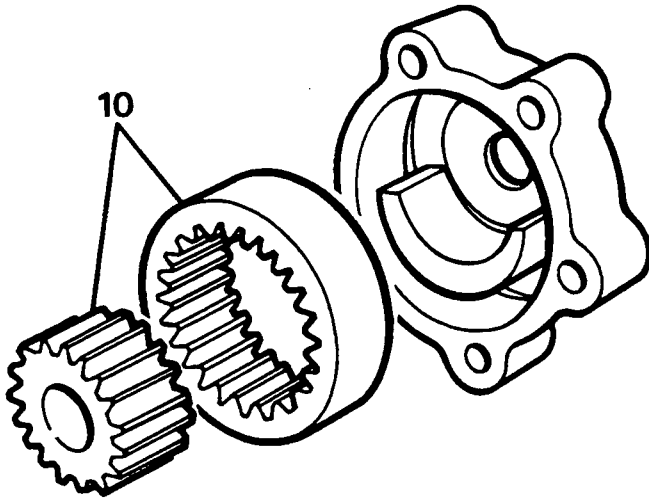
9. Fit oil seal to housing, lip side leading, using LRT-37-014 (18G 1422). Apply SAE 40 oil to lip.



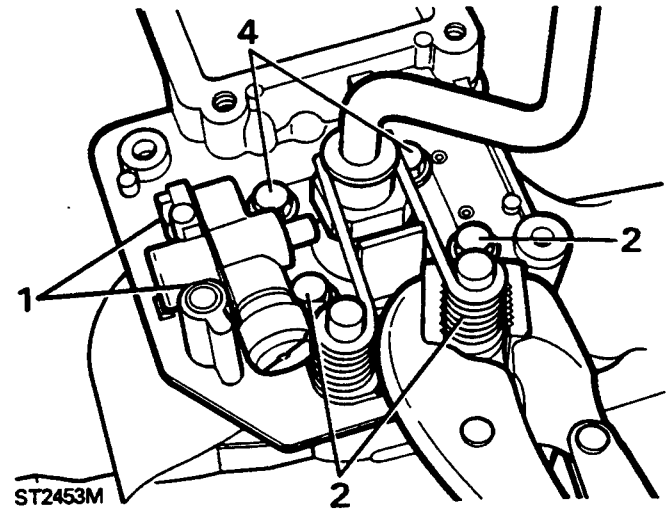
ST2334M



10. Assemble gears to oil pump and fit cover.

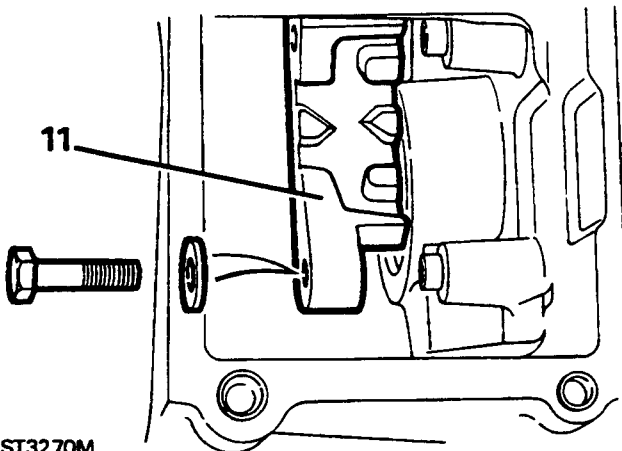


ST3254M



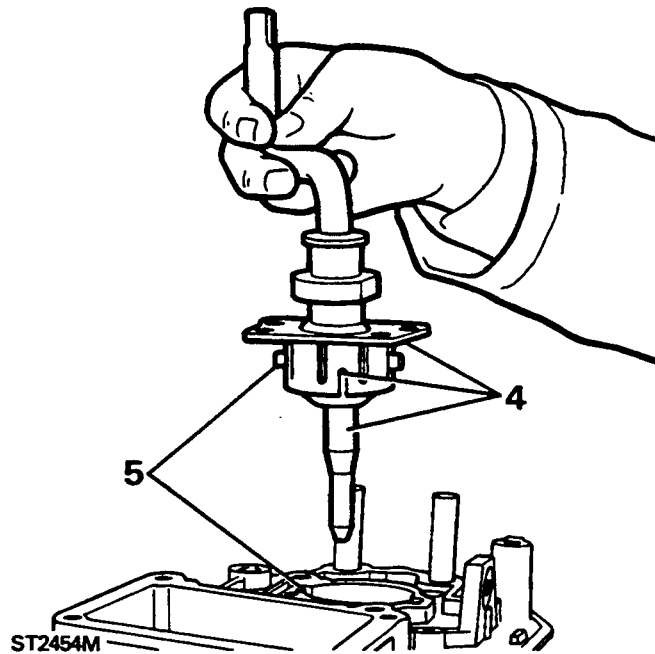
ST2453M

11. Examine gate plate and renew if worn or damaged.



ST3270M

5. Check for wear in cross pin slots in housing and wear in lower gear lever.



ST2454M

Gear change housing

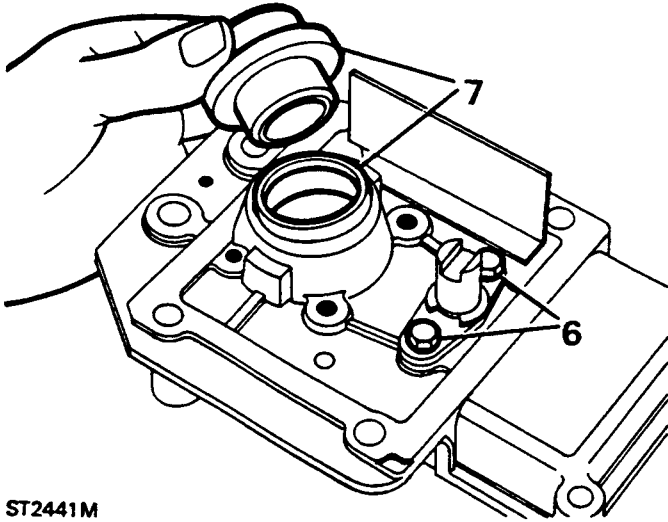
- 1. Remove reverse plunger and retain shims.
- 2. Remove bolts retaining bias springs.



WARNING: To avoid personal injury, restrain each spring in turn with a pair of grips while the bolts are being removed.


- 3. Remove the two springs.
- 4. Remove remaining bolts to release lower gear lever assembly.

- 6. Turn housing over and check security of spool guide bolts.
- 7. Remove oil seal and fit a replacement, lip side leading.




ST2441M


8. Examine bias springs and renew if weak or distorted.
9. Grease lower gear lever ball with Shell Alvina R3 and fit new Railko bush.
10. Fit gear lever to housing.
11. Fit adjustment plate.

 **NOTE:** Apply Hylomar PL 32 or Loctite 290 to threads of two short bolts and fit them forward of the gear lever. Tighten bolts to prevent plate moving while springs are being fitted.

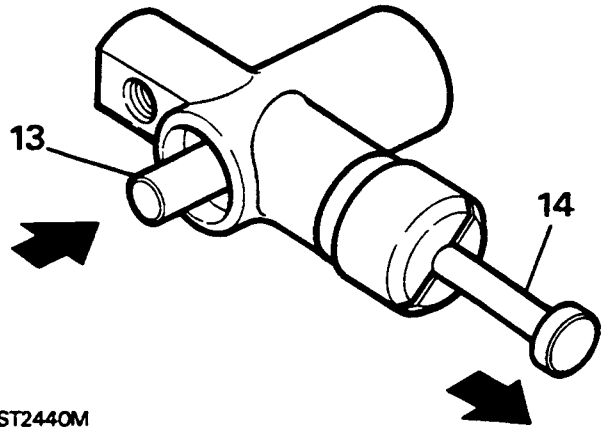
12. Fit bias springs locating long end against gear lever.

 **NOTE:** Apply above sealant to threads of spring retaining bolts. Use grips to compress springs to enable bolts to be fitted.

13. Examine and test reverse gear plunger.

 **NOTE:** Apply a load of 45 to 55 kg to plunger nose. If it functions within these limits it is satisfactory. The plunger is only available as a complete assembly.

14. Check that the reverse switch plunger operates when reverse plunger is depressed.



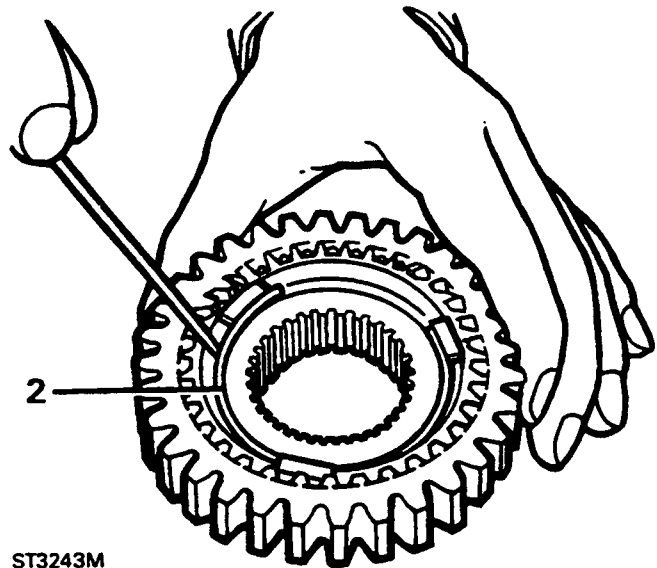
ST2440M

SYNCHROMESH ASSEMBLIES

Third-fourth and fifth gear synchromesh.

 **NOTE:** The above assemblies are the same except that fifth gear synchromesh has a retainer plate.

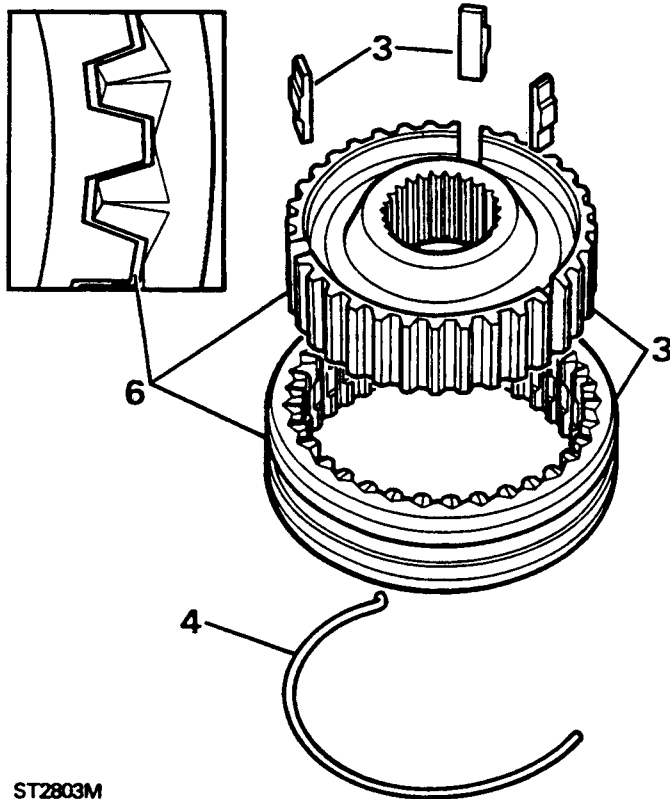
1. Mark relationship of inner and outer members.
2. Remove wire clip from both sides of assembly.



ST3243M



3. Remove slippers and separate the two members.
4. Examine all parts for damage and wear including wire clips for tension.
5. Check no radial movement exists between inner members and mainshaft splines. (except fifth gear synchromesh).
6. Examine inner and outer splines for wear.

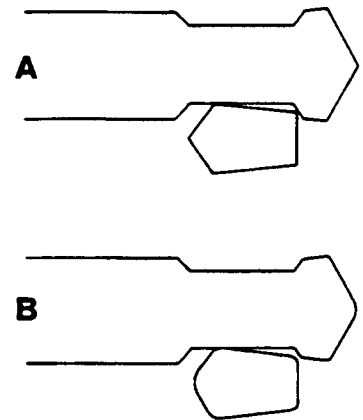


ST2803M

7. Examine the dog teeth on all gears for wear and damage.



NOTE: Example "A" shows a tooth in good condition. Example "B" shows the rounded corners of a worn tooth.



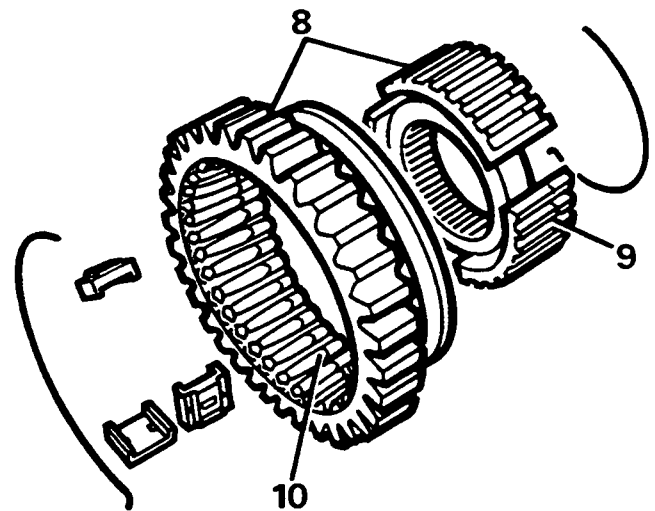
ST2449M

First-second synchromesh

8. Repeat instructions 1 to 6 for third-fourth synchromesh.
9. Examine step in each of outer splines.
10. Check that the step on both sides of the internal splines are sharp not rounded.

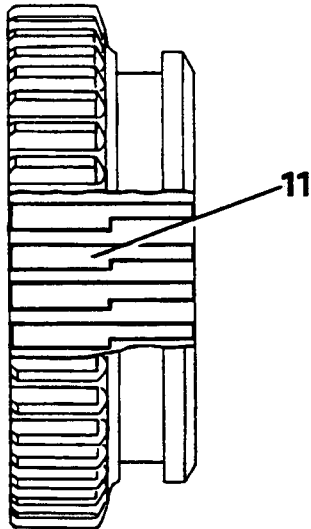


NOTE: This applies only to splines on selector groove side of member.




ST3244M

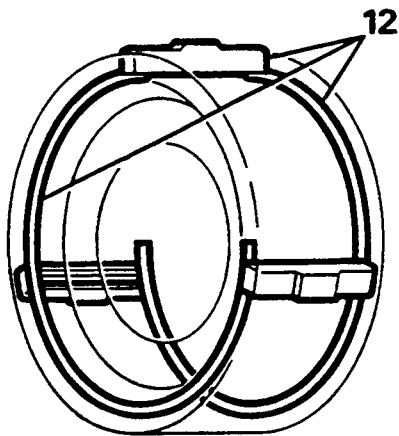
11. Fit inner member to outer so that the wide splines of inner member are under the spur gear teeth.



ST3247M


12. Fit the slippers and secure with a spring each side of the synchromesh.

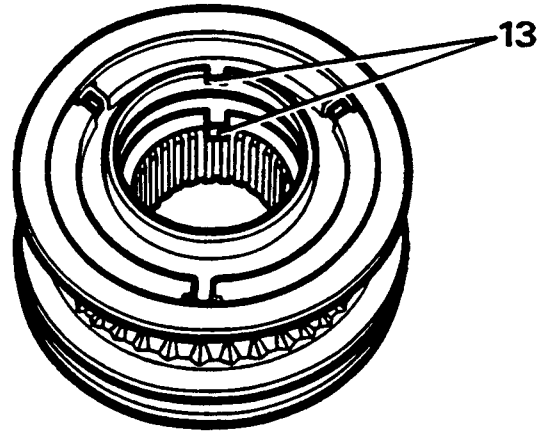
 **NOTE:** The hooked end of each spring must locate in the same slipper with the free ends running in opposite directions and resting against the remaining slippers.



ST2467M

13. Assemble third-fourth and fifth gear synchromesh components as in instruction 12.

 **NOTE:** The back plate for fifth gear is fitted to the rear of the assembly with the single tag locating in a slot in the inner member.

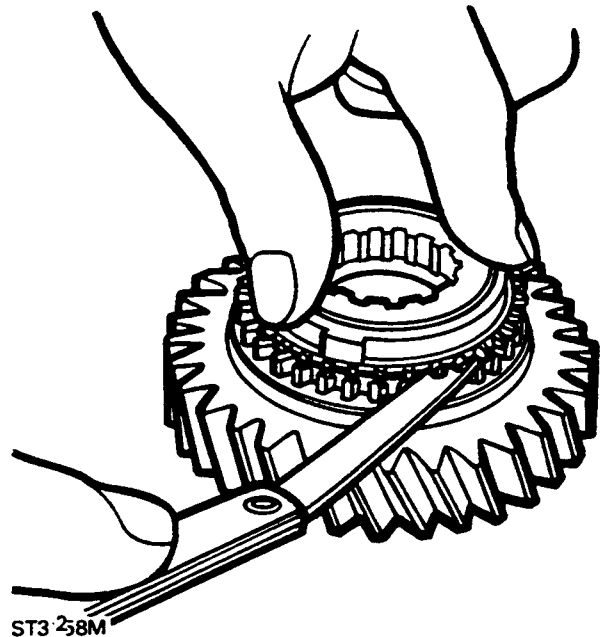


ST3276M

CHECKING BAULK RING CLEARANCES

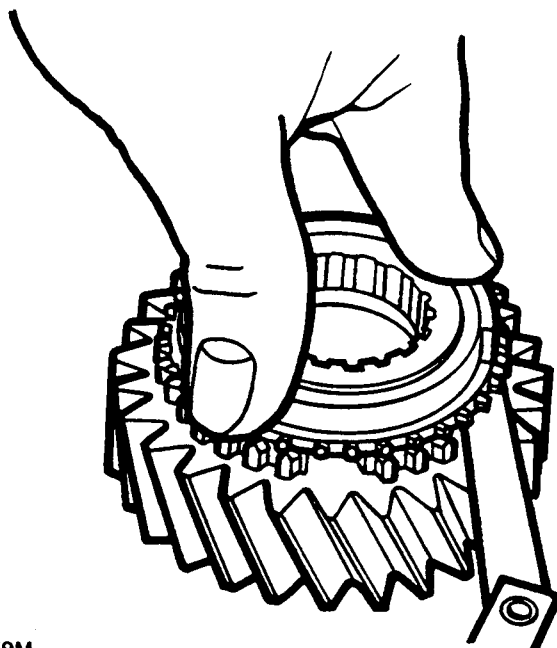
Check clearance of all baulk rings and gears by pressing the baulk ring against the gear and measuring the gap. The minimum clearance should be 0,38mm.

First gear



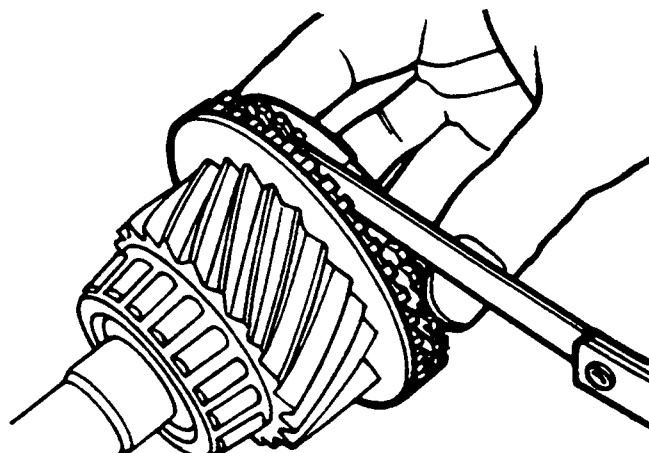


Second gear



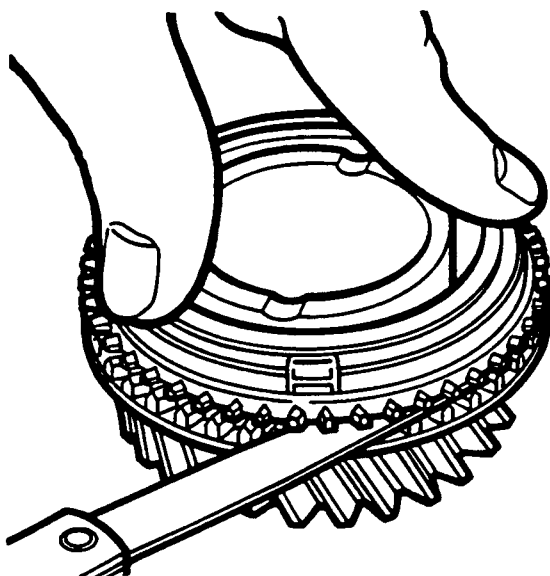
ST3259M

Fourth gear



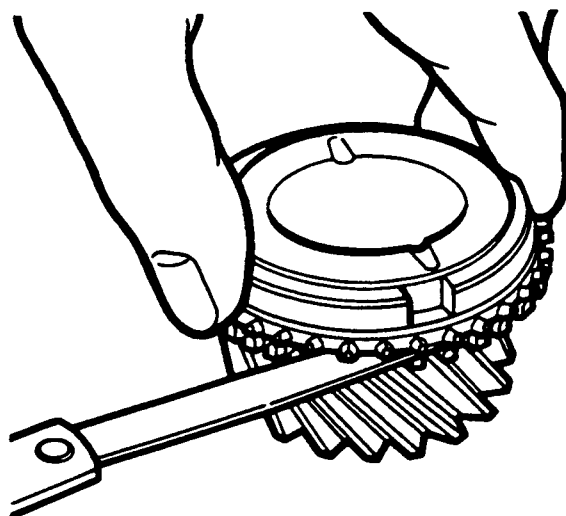
ST3226M

Third gear



ST3260M

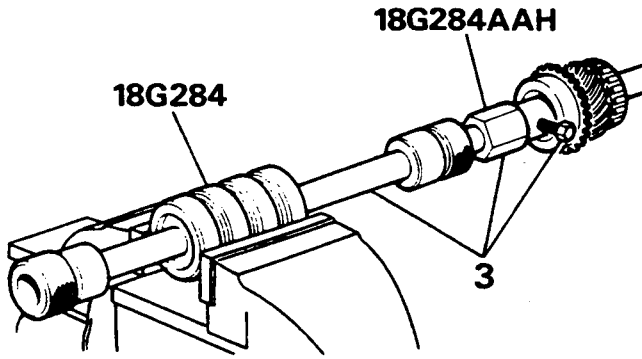
Fifth gear



ST3261M

Input shaft

1. Examine the gear and dog teeth for wear and damage.
2. Polish oil seal track if necessary.
3. Using LRT-37-004 (18G 284 AAH) and LRT-99-004 (18G 284) remove pilot bearing track.

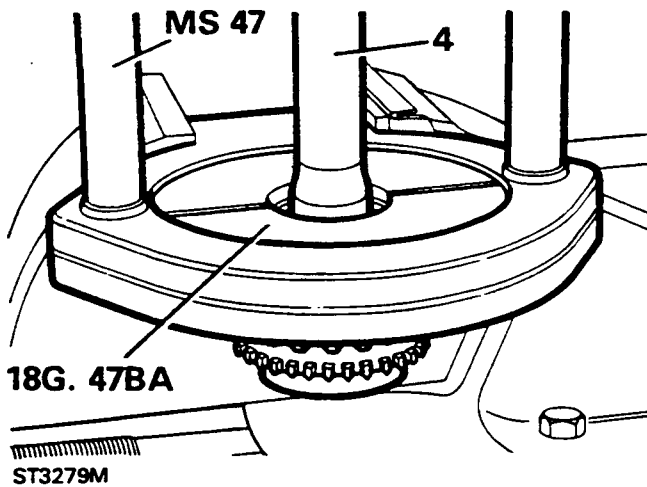


ST3278M

4. Using LRT-37-001 (18G 47BA) and LRT-99-002 (MS 47) remove taper bearing.

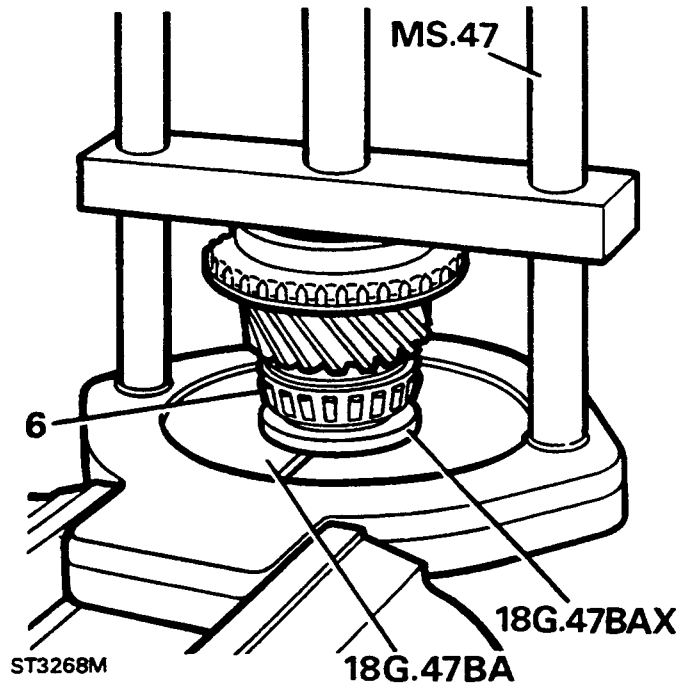


NOTE: Ensure that the bearing is supported by the lip inside LRT-37-001.



ST3279M

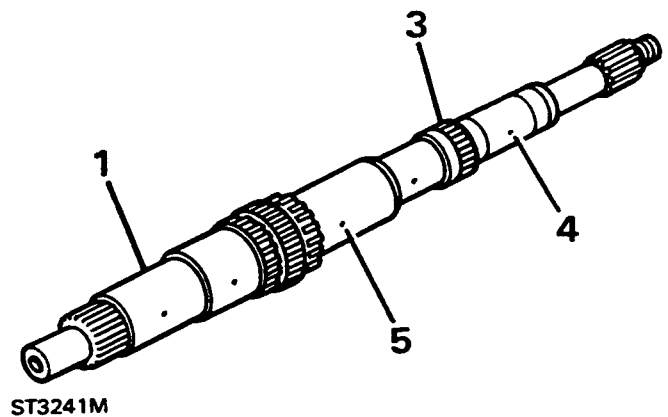
5. Support the shaft under press in a new track.
6. Using collets LRT-37-001 (18G 47BA) and adaptor LRT-37-002 (18G 47 BAX) fit a new taper bearing.



ST3268M

Mainshaft

1. Examine bearing journals for wear and scores.
2. Check condition of circlip grooves.
3. Examine splines for wear and damage.
4. Use an air line to check that the main oil feed from the pump is clear and feed to spigot bearing.
5. Check oil feed holes to roller bearings are clear.

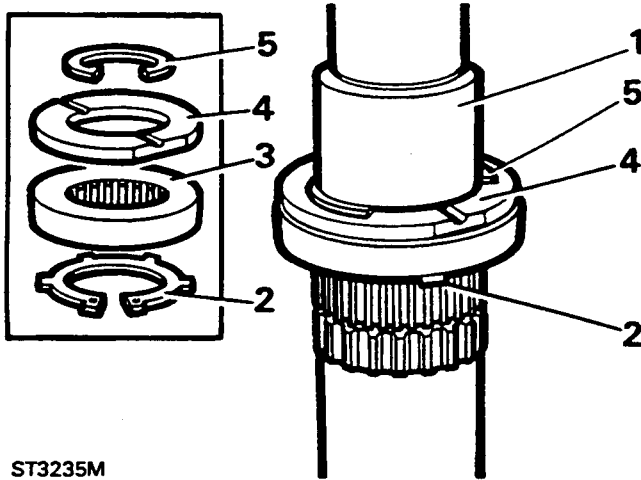


ST3241M



MAINSHAFT GEAR END FLOAT CHECKS

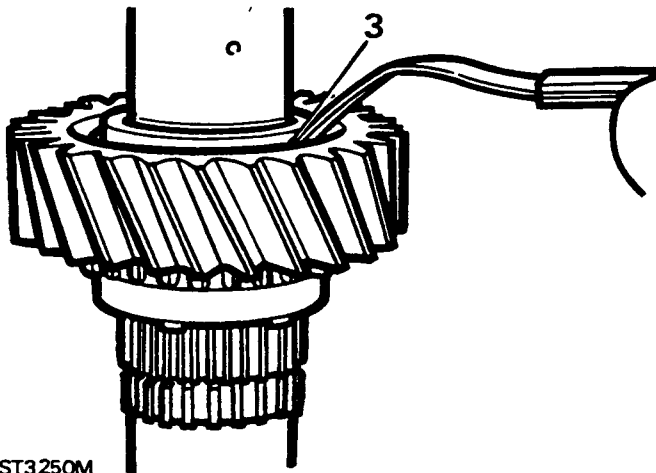
1. Hold mainshaft in vice front end downwards.
2. Fit front circlip for first-second synchromesh.
3. Fit second gear cone.
4. Fit spacer.
5. Fit snap ring.



ST3235M

Second gear end-float.

1. Fit needle roller and second gear.
2. Fit third gear bush.

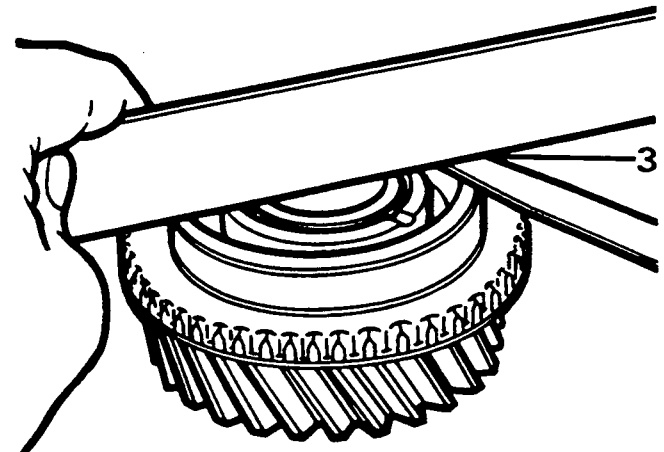


ST3250M

3. Check clearance between second gear and bush flange. Not to exceed 0,20 (0.008in).
4. Remove above components.

Third gear end-float.

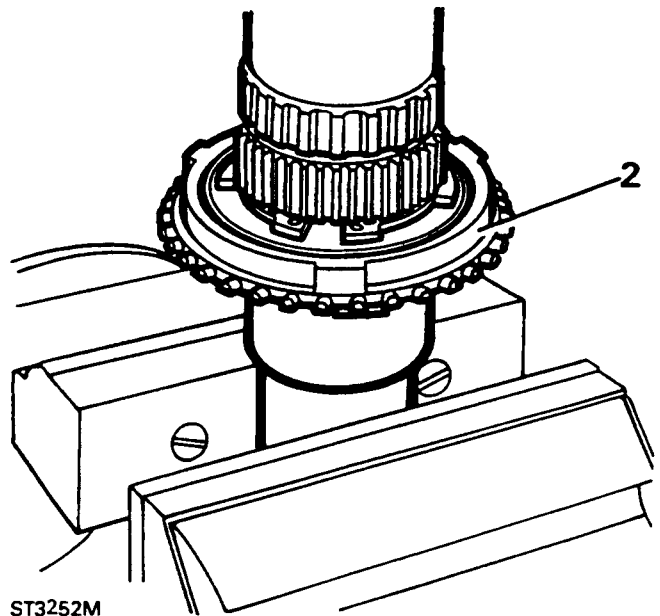
1. Fit needle roller to third gear.
2. fit third gear bush to third gear.
3. Place gear on flat surface, bush flange downwards, and with a straight edge across gear check clearance between straight edge and gear. Not to exceed 0,20mm.



ST3251M

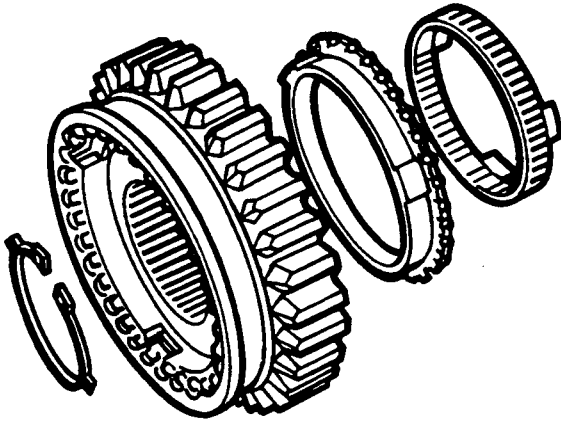
First gear bush end-float.

1. Invert mainshaft rear end uppermost.
2. Fit inner and outer second gear baulk rings.



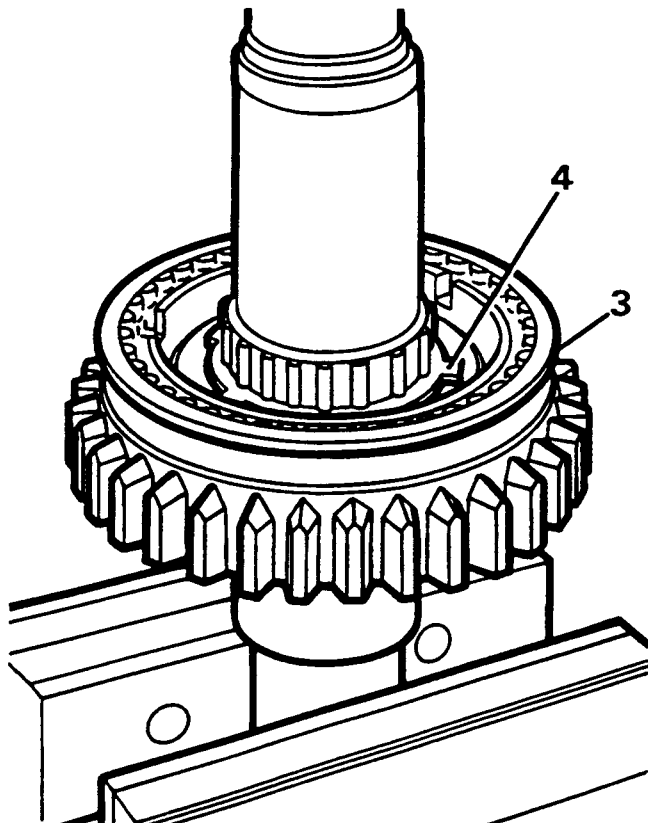
ST3252M

3. Fit first-second synchromesh hub, fork groove uppermost.
4. Fit circlip.



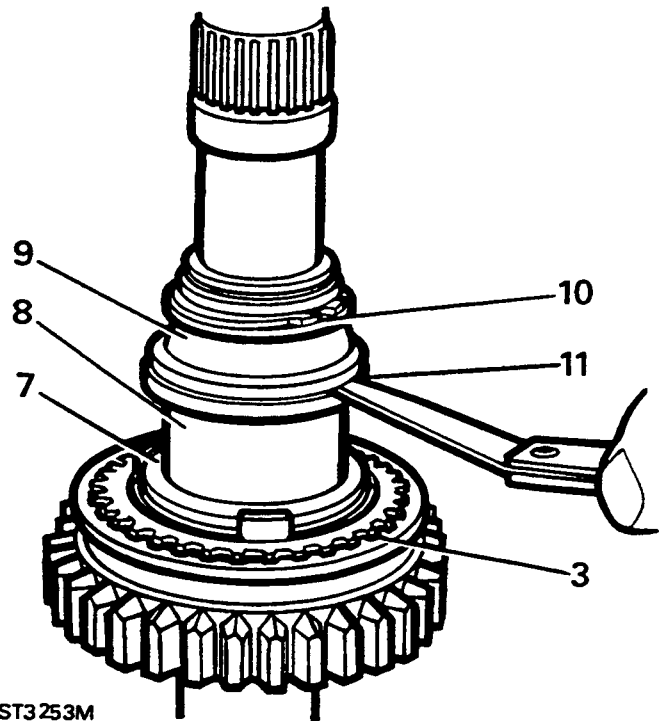
ST3231M

First-second synchromesh assembly



ST3257M

5. Fit first gear inner and outer baulk ring.
6. Fit cone.
7. Fit spacer.
8. Fit first gear bush.
9. Fit dummy bearing.
10. Fit circlip.
11. Check clearance between dummy bearing and bush. Not to exceed 0,75mm.
12. Remove circlip, dummy bearing and bush.



ST3253M

Selective first gear bush

Part Number	Thickness (mm)
FTC2005	30,905/30,955
FTC2006	30,955/31,005
FTC2007	31,005/31,055
FTC2008	31,055/31,105
FTC2009	31,105/31,155



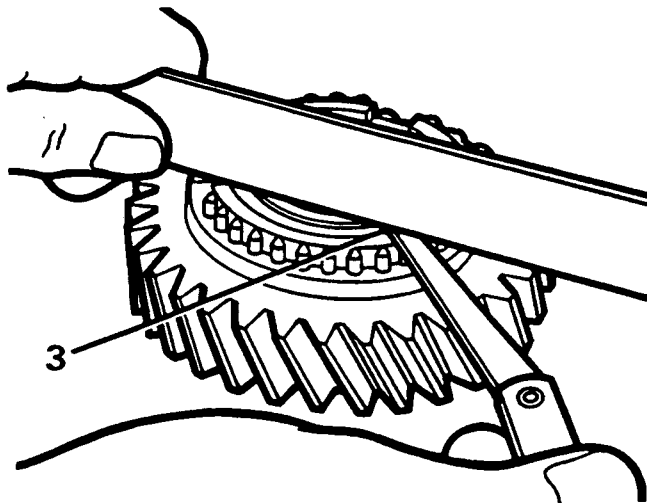
Check first gear to bush end-float.

1. Fit roller bearing and bush to first gear.
2. Place bush flange side downwards on a raised block on a flat surface.

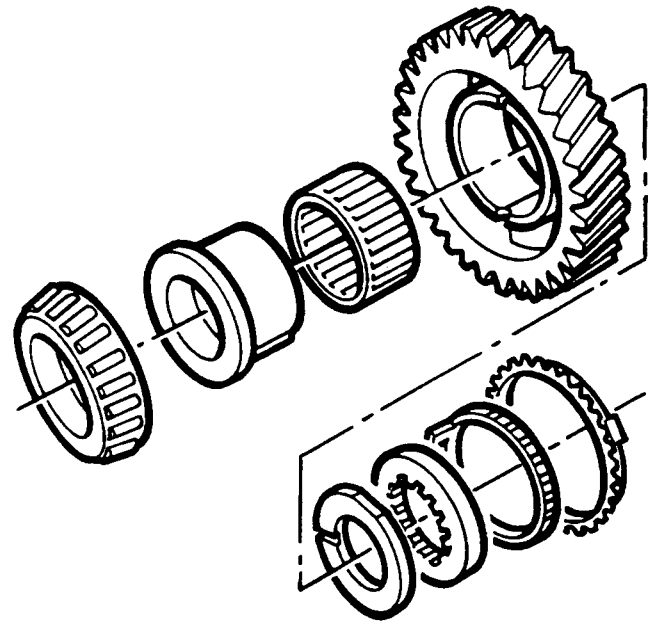


NOTE: The block should be approximately the same diameter as the bush flange so that the gear is suspended and does not rest on the flat surface.

3. Place straight edge across gear and check clearance between gear and straight edge. Not to exceed 0,20mm

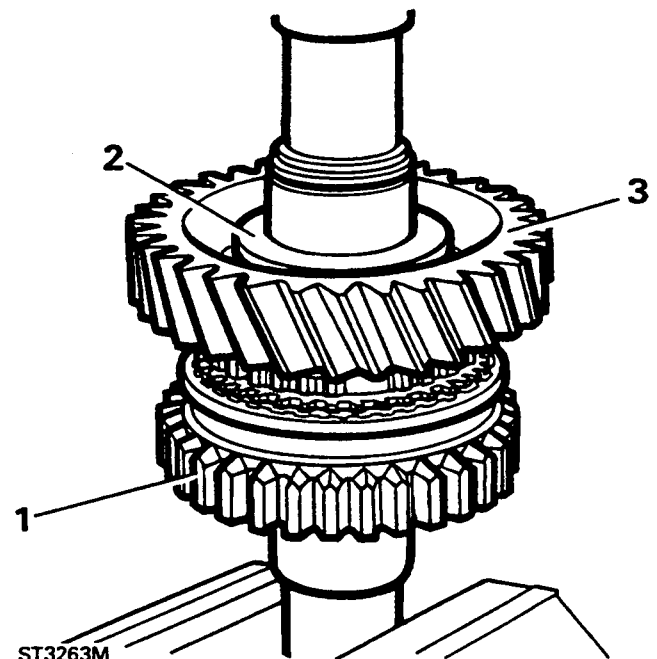


ST3255M



ST3229M

First gear assembly

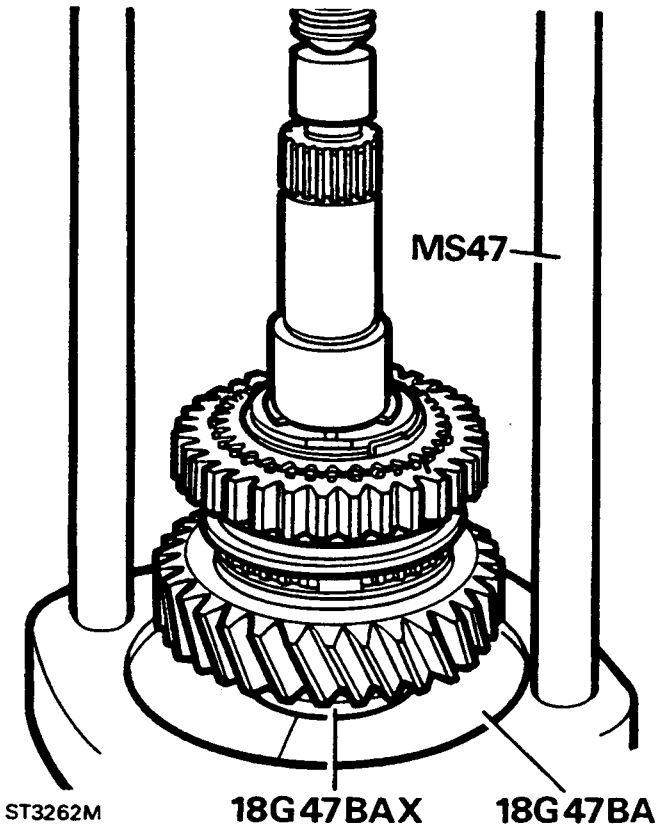


ST3263M

ASSEMBLING MAINSHAFT

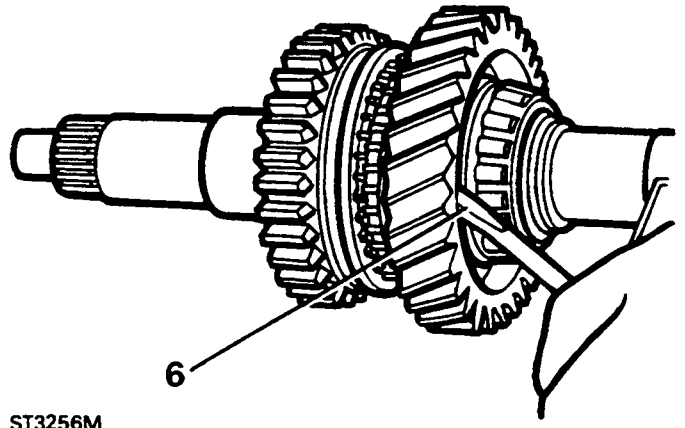
1. With the first-second synchromesh hub and spacer in position, assemble the rear end of the shaft.
2. Fit the roller bearing and bush to first gear.
3. Fit first gear to mainshaft.

4. Fit the taper bearing to mainshaft using LRT-99-002 (MS 47), collets LRT-37-001 (18G 47 BA) and adaptor LRT-37-002 (18G 47 BAX).



NOTE: Instruction 5 is necessary since it is probable that when pressing on the bearing it will have clamped the first gear bush preventing it from turning.

6. Reposition mainshaft in vice and using a screw driver blade check that the first gear bush is free to turn.



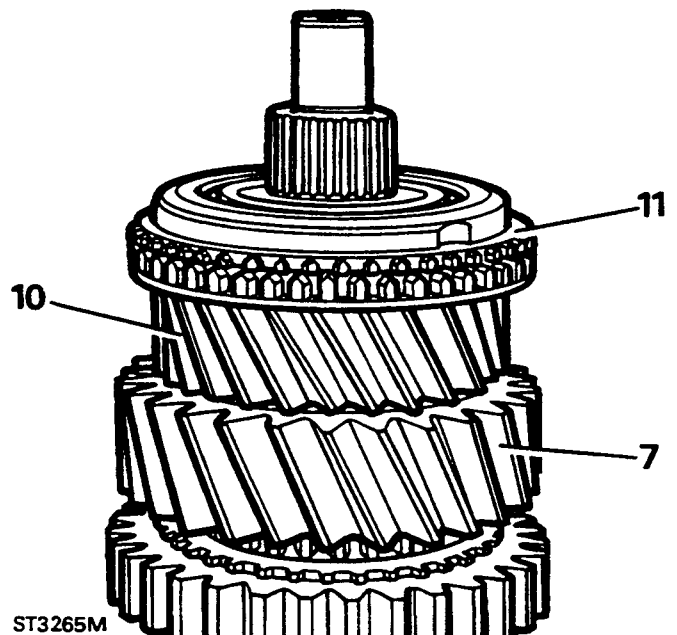
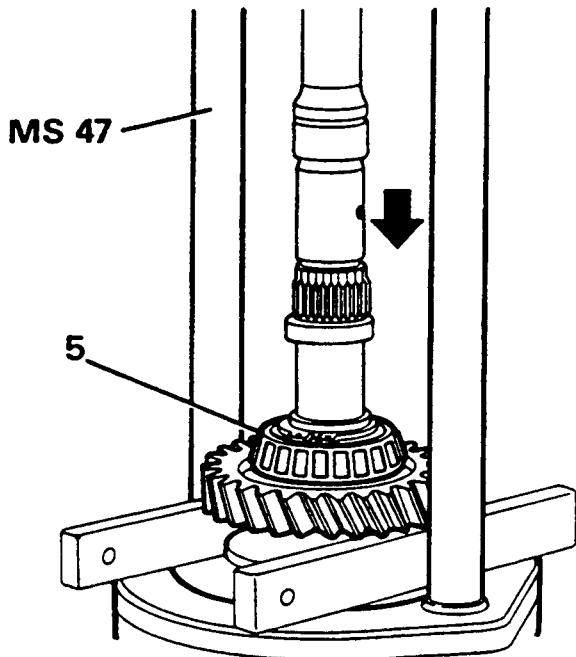
ST3256M

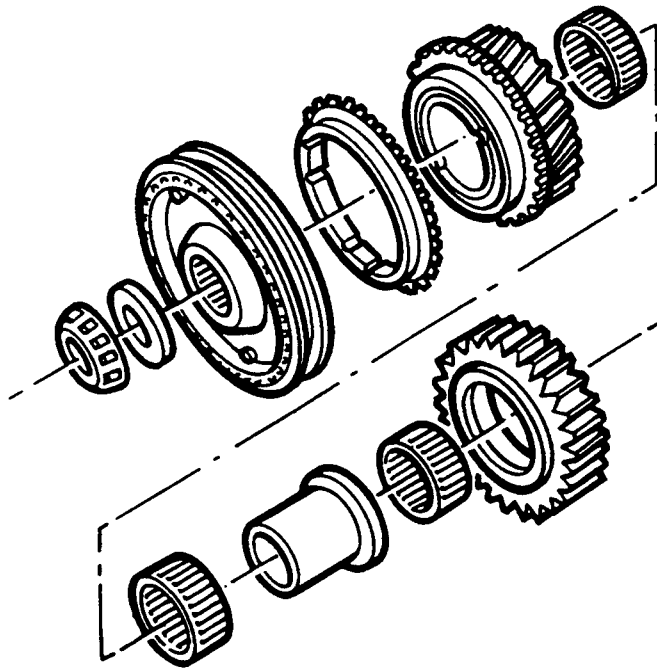


CAUTION: Ensure that the slots in the baulk ring align with the synchromesh slippers while pressing on the bearing.

5. Invert mainshaft and press assembly back against circlip.

7. Position mainshaft in vice, rear end downwards and fit second gear needle roller, and second gear.
8. Fit third gear bush.
9. Fit third gear needle rollers.
10. Fit third gear.
11. Fit third gear baulk ring.

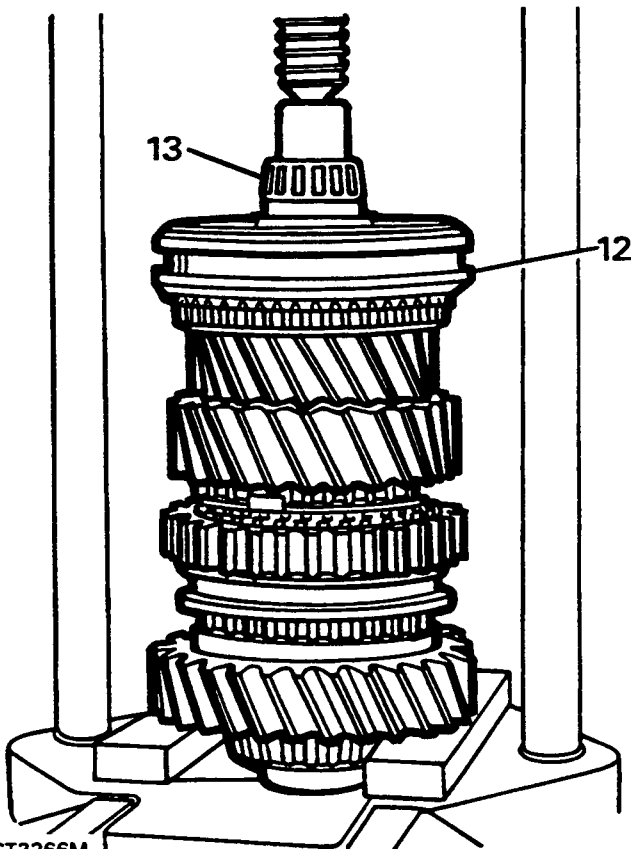




ST3233M

Third-fourth synchromesh assembly

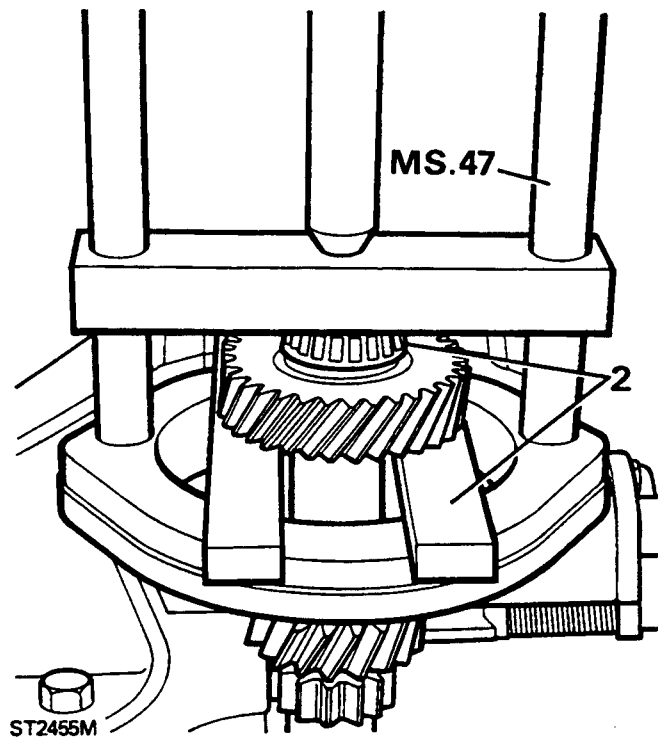
12. Fit third-fourth gear synchromesh hub.
13. Using press with supports under first gear, press the spigot bearing on to shaft.



ST3266M

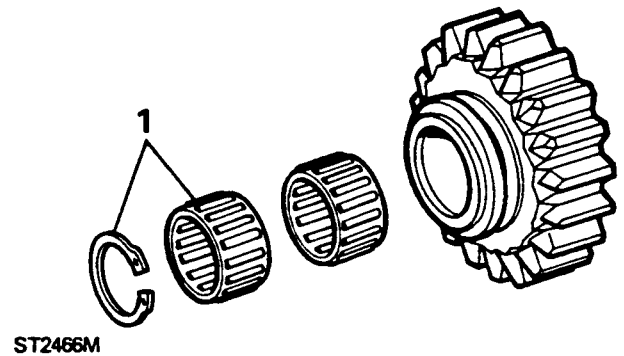
LAYSHAFT

1. Examine the layshaft for wear and damage.
2. Press bearings on to layshaft using press and supporting bars.



REVERSE GEAR AND SHAFT

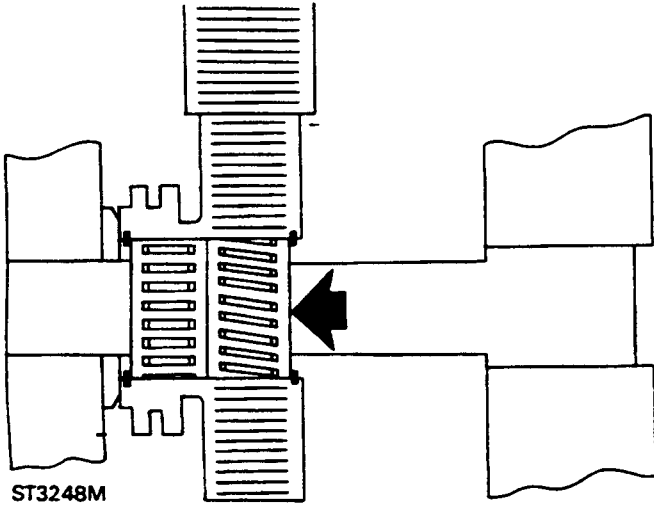
1. Remove one circlip from the idler gear and remove bearings.



ST2466M

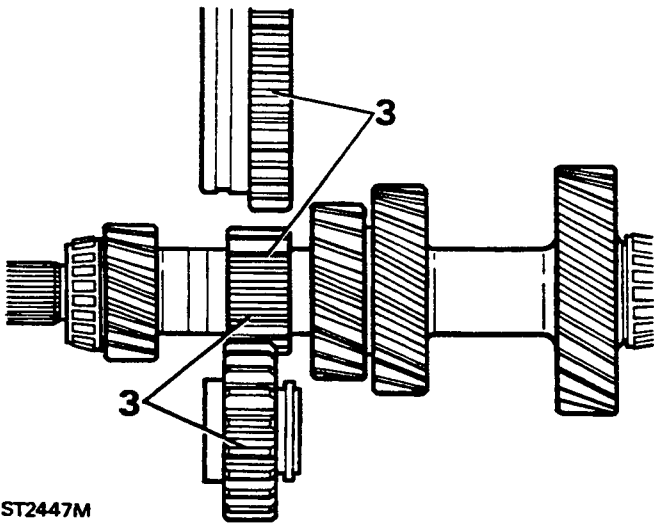


NOTE: One bearing cage is twisted in manufacture. The twist causes the gear to tilt on the shaft forcing the gear into engagement. Renew bearings if worn or if the gear jumps out of engagement.



ST3248M

2. Fit the bearings either way round and secure with the circlip.
3. Check condition of idler gear and mating teeth on layshaft and synchromesh outer member.



ST2447M

4. Examine idler shaft for wear, scores and pitting.

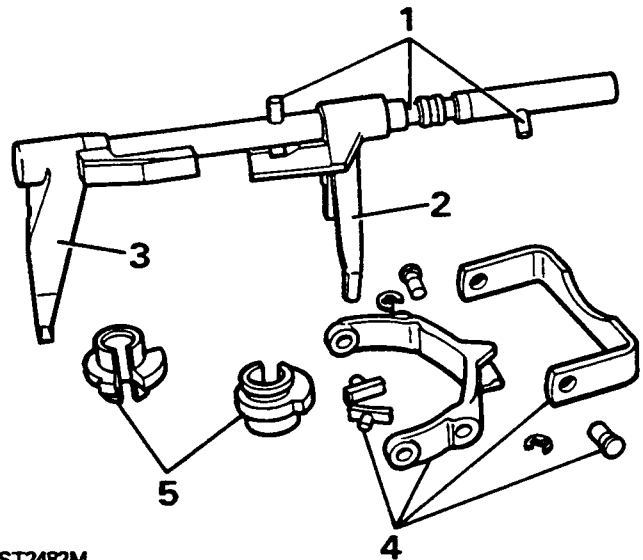
SELECTORS

1. Examine selector rail and pins for wear and damage.
2. Examine first-second selector fork for wear cracks and damage.



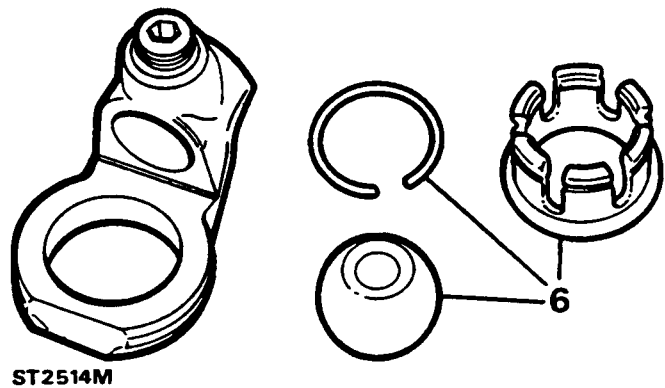
NOTE: The selector rail and fork is only supplied as a complete assembly.

3. Examine third-fourth selector fork for wear, cracks and damage.
4. Examine fifth gear selector fork, pads and pivot pins.
5. Examine interlock spools for wear and damage.



ST2482M

6. Remove snap ring and examine selector yoke assembly.

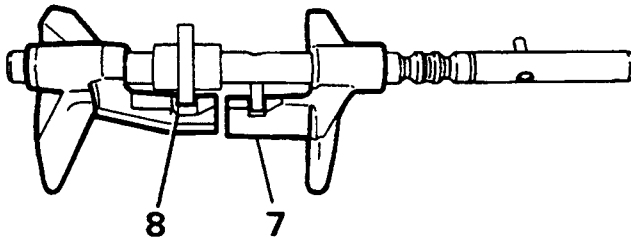


ST2514M



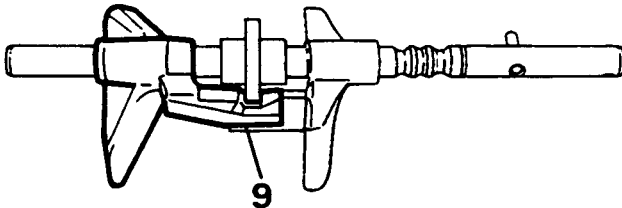
Assembling selectors.

7. Rest first-second fork and shaft assembly on bench and locate pin in jaw of fork.
8. Fit interlock spool and third-fourth fork and engage spool in jaw of fork.



ST2486M

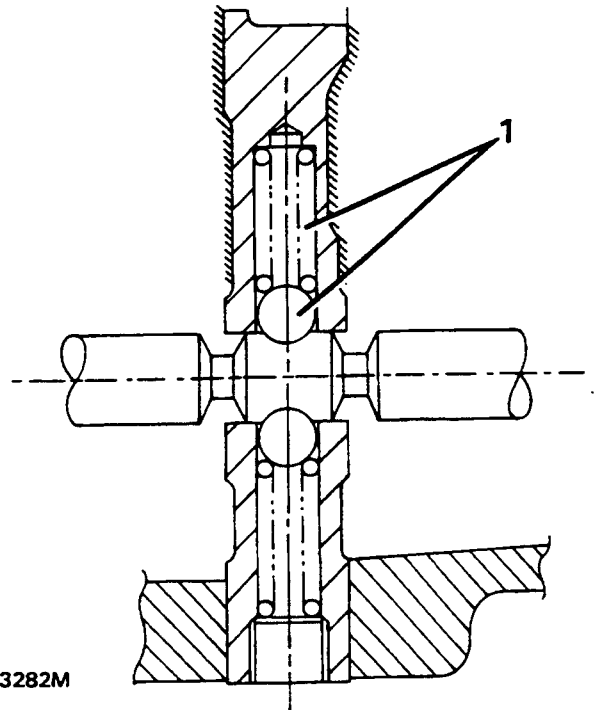
9. Slide spool and fork towards first- second selector until slot in spool locates over pin keeping the spool engaged in third-fourth fork jaw.



ST2487M

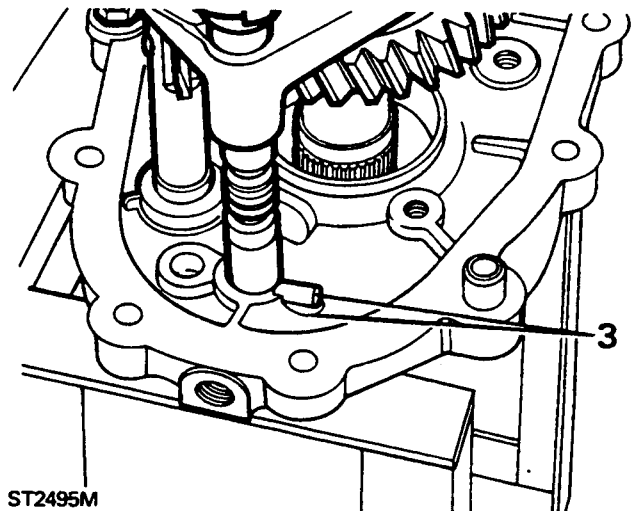
FITTING GEARS TO CENTRE PLATE

1. Secure centre plate to workstand, fit bearing tracks and inboard detent ball and spring.



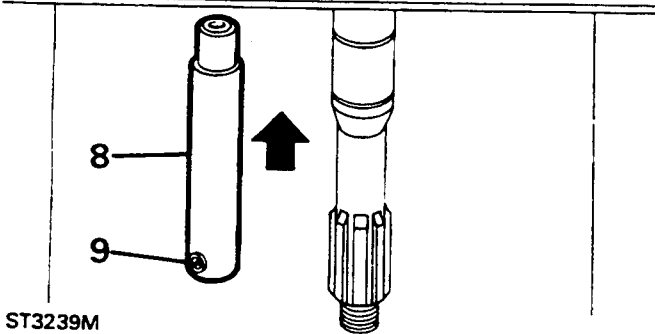
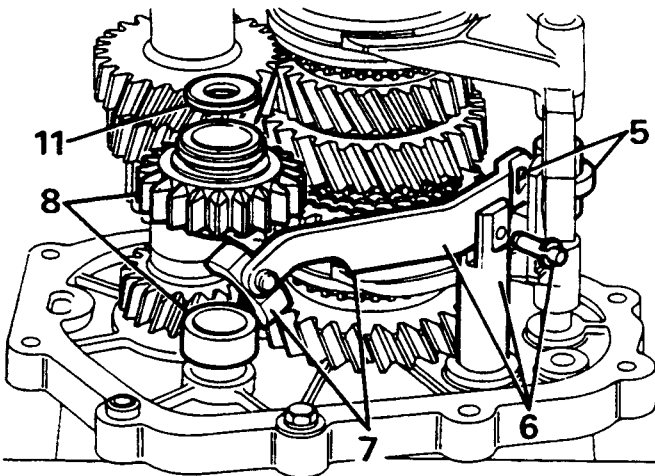
ST3282M

2. Check both synchromesh units are in neutral and fit selector shaft assembly.
3. Fit mainshaft and selectors to centre plate and align pin with slot in plate.



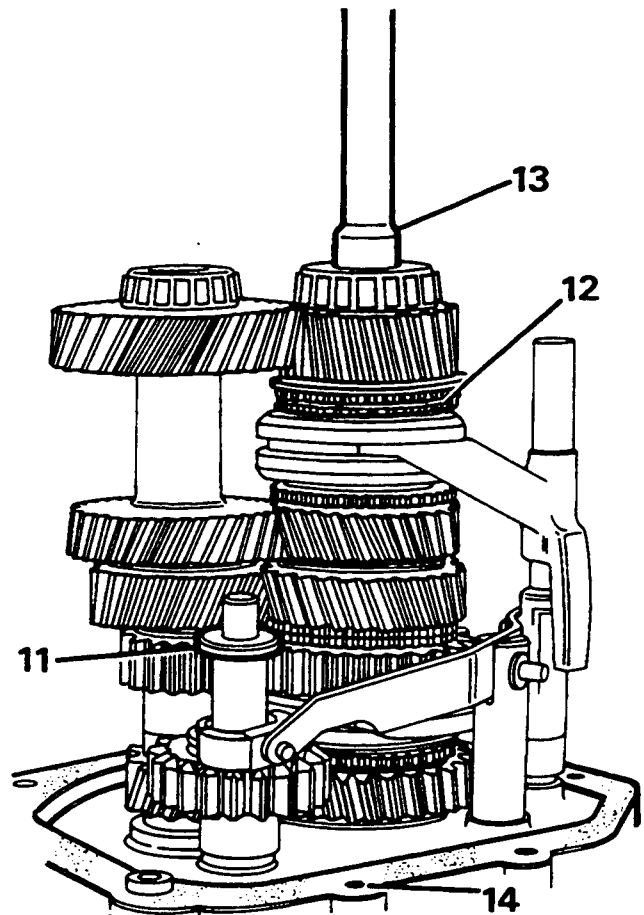
ST2495M

4. Fit layshaft while lifting mainshaft to clear layshaft rear bearing.
5. Turn selector shaft and interlock spool to allow reverse lever to engage spool flange.

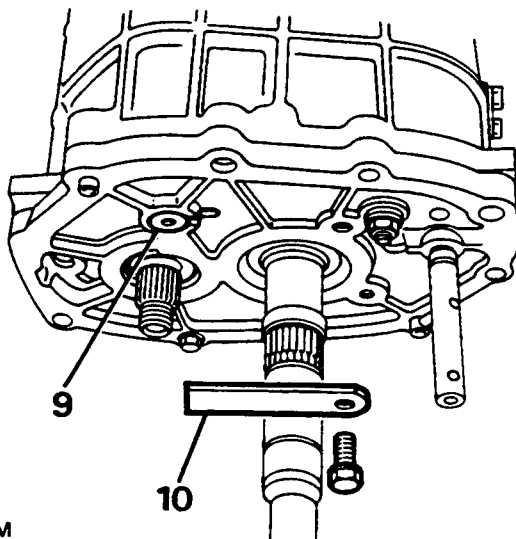


ST3239M

6. Fit reverse lever to pivot post and secure with pin and circlip.
7. Fit slipper pad to lever.
8. Fit reverse gear shaft, spacer and gear.
9. Fit slipper to reverse gear and ensure roll pin in shaft engages in slot in centre plate.
10. Secure reverse shaft with manufactured tool "A".
11. Fit reverse gear thrust washer to shaft.
12. Fit fourth gear baulk ring.
13. Lubricate spigot bearing and fit input shaft.
14. Remove centre plate workstand bolt and fit gasket.



ST3267M

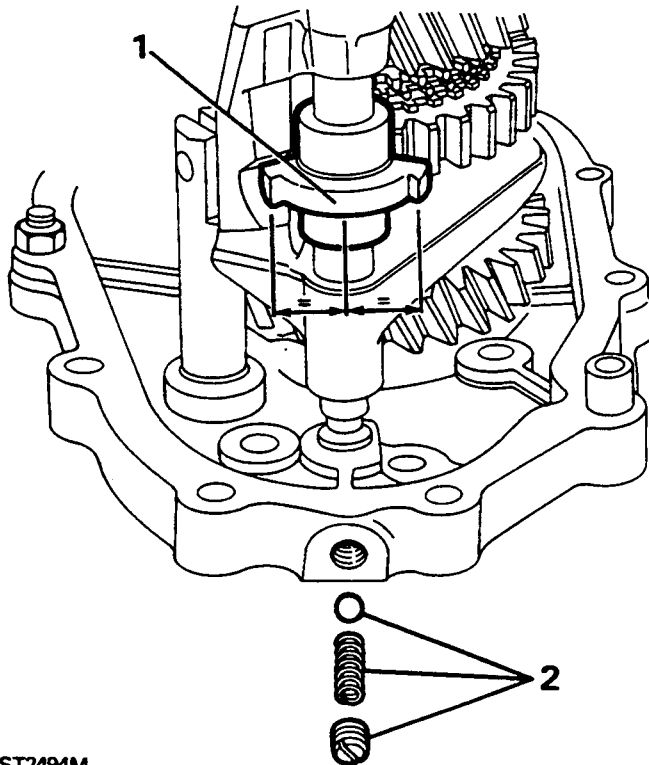


ST2492M



Fitting gearbox casing

1. Turn selector shaft and spool to neutral position.
2. Fit out-board detent ball and spring and secure with plug.



ST2494M

3. Fit guide studs to casing and check oil scoop is correctly fitted.
4. Without using force, fit gearcase.

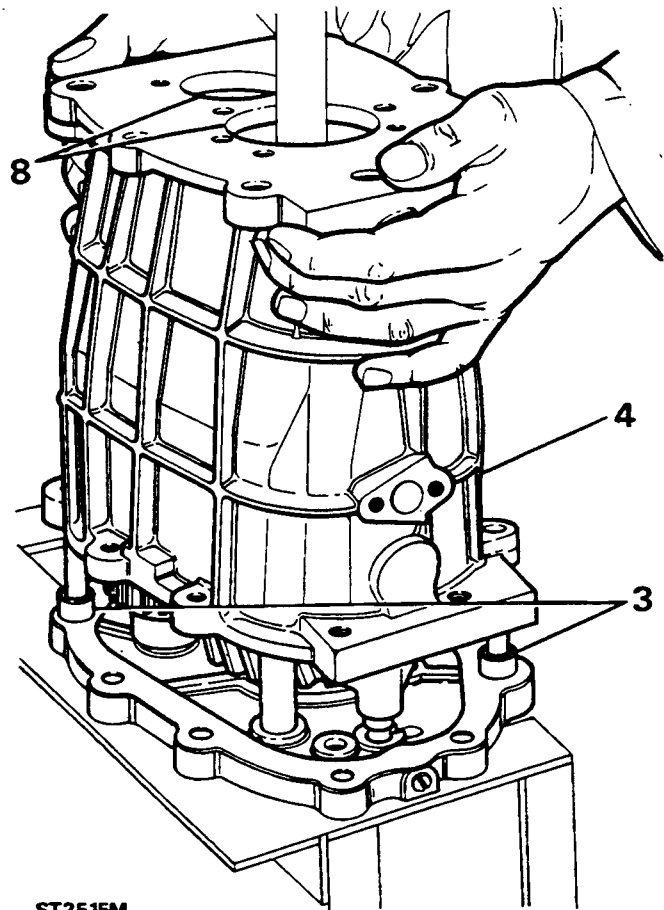


NOTE: Ensure that the centre plate dowels and selector shaft are properly located.

5. Secure centre plate and gearcase to workstand with two 8 x 35mm bolts.
6. Apply PL 32 to joint face and bolt threads and fit spool retainer.

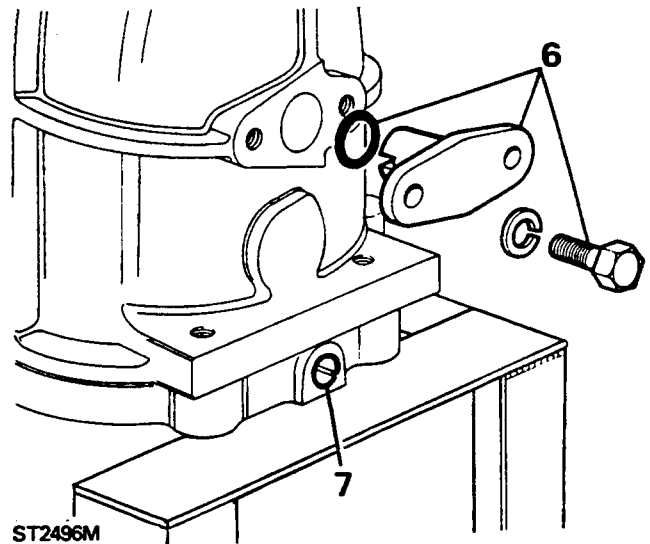


CAUTION: Do not use force to fit retainer. Provided the spool has not been disturbed the retainer will slide into position. If not, remove the gear case and reposition spool or shaft.



ST2515M

7. Remove detent plug, apply Loctite 290 or Hylomar PL 32 to thread, refit and stake.
8. Fit layshaft and input shaft bearing tracks.



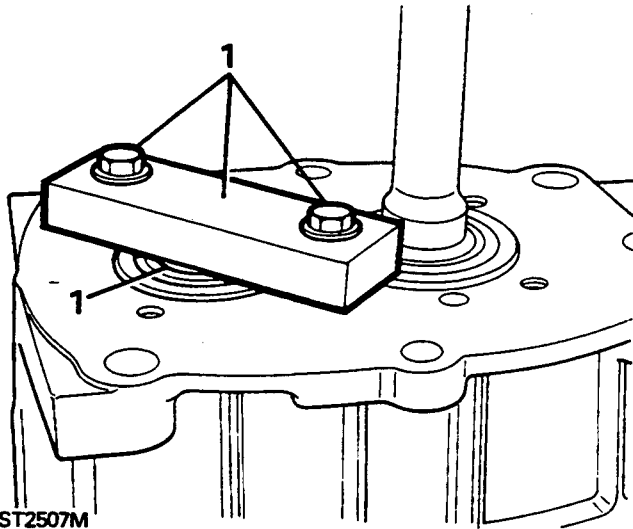
ST2496M

Fitting fifth gear

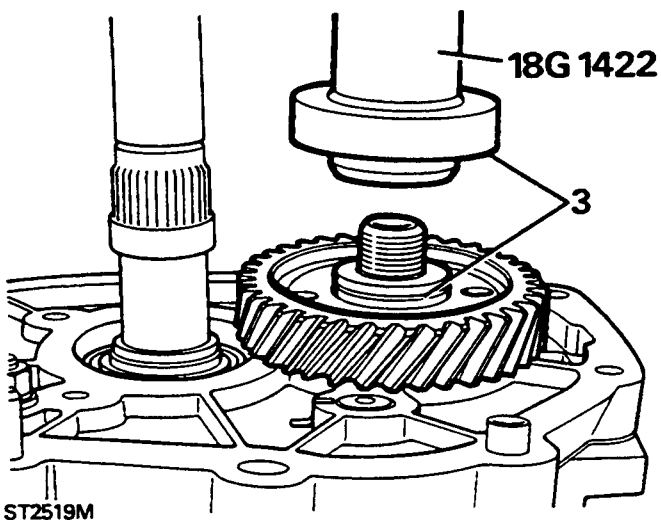


CAUTION: Since the fifth gear is a tight fit on the layshaft, the force, when pressing the gear, must not be transferred to the layshaft front bearing. Tool "D" and packing disc should be made to the dimensions given to absorb the force. The plate also retains the input shaft bearing outer track.

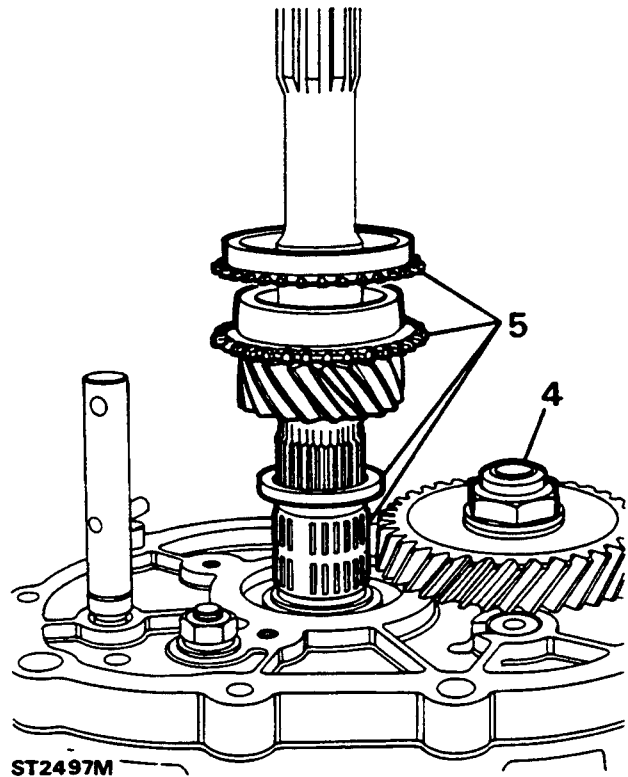
1. Secure the plate with two 8x25mm bolts. Insert disc between plate and layshaft.



2. Release and invert gearbox and remove reverse shaft retainer plate.
3. With the extraction groove uppermost, drive fifth gear on to layshaft using LRT-37-014 (18G 1422).



4. Fit a new stake nut but do not tighten.
5. Fit fifth gear assembly to mainshaft.

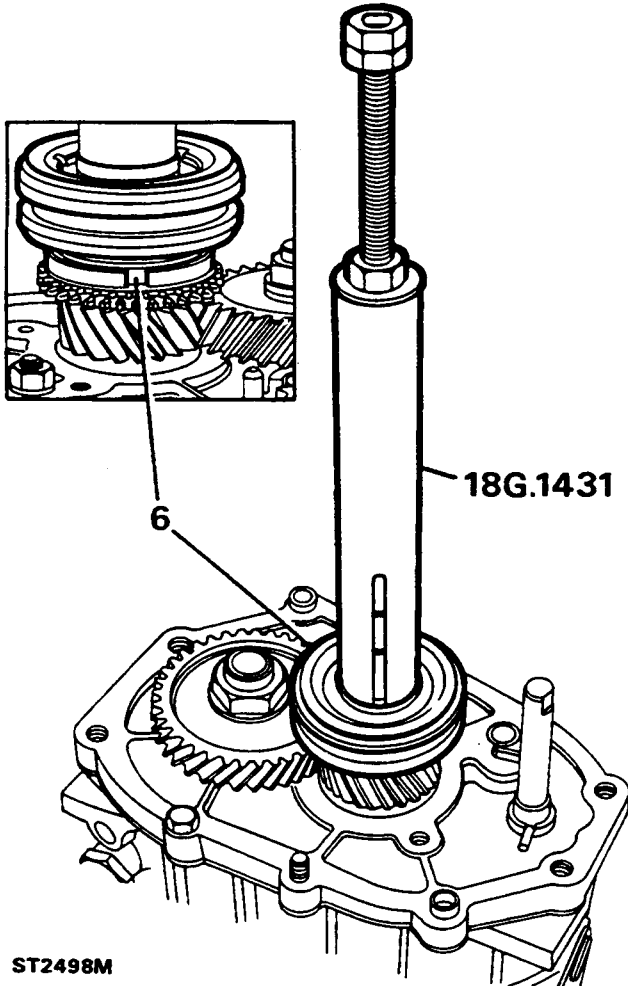




6. Press fifth gear synchromesh assembly to mainshaft using LRT-37-015 (18G 1431).



CAUTION: Before pressing the assembly fully home, ensure that the slipper pads locate in the baulk ring slots.



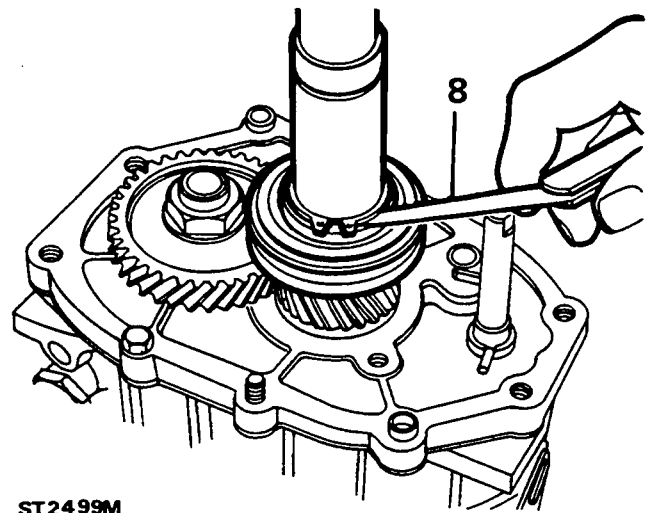
ST2498M



NOTE: Only limited movement of the synchromesh inner member on the main-shaft is permissible. The maximum clearance is 0,005mm to 0,055mm to achieve this the following selective washers are available.

Part Number	Thickness (mm)
FRC 5284	5,10
FRC 5286	5,16
FRC 5288	5,22
FRC 5290	5,58
FRC 5292	5,34
FRC 5294	5,40
FRC 5296	5,46
FRC 5298	5,52
FRC 5300	5,58
FRC 5302	5,64

- 7. Fit the thinnest washer and secure with circlip.
- 8. Measure clearance between circlip and washer.



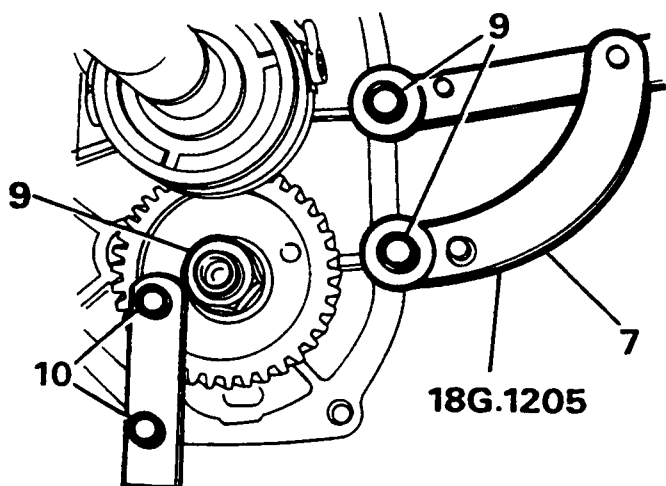
ST2499M

9. Tighten layshaft stake nut using LRT-51-003 (18G 1205).



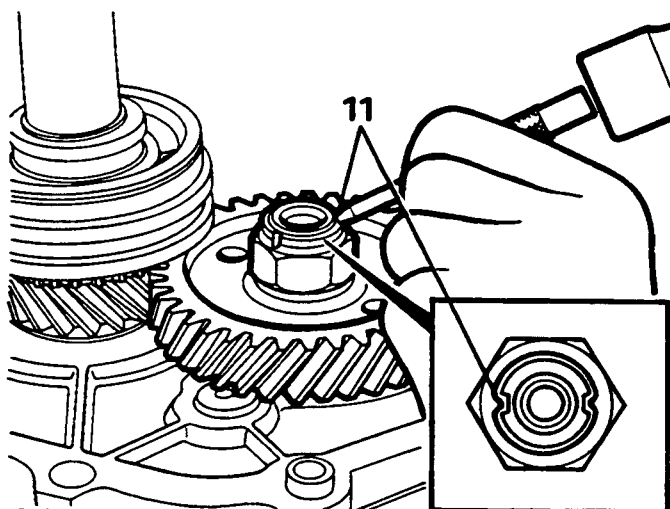
CAUTION: The practice of locking gears to provide a restraint to tighten the nut is not acceptable due to high torque figure required.

10. Secure tool "A" to gear and gear case and using a suitable torque wrench tighten the nut to the correct torque.



ST2500M

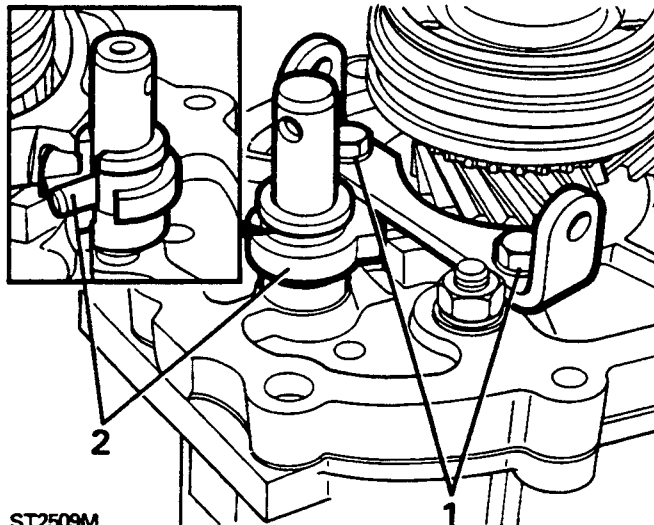
11. Using a round nose punch, form the collar into the layshaft slots.



ST2508M

FIFTH GEAR SELECTOR FORK ASSEMBLY

1. Fit fifth gear selector fork bracket.
2. Fit the fifth gear spool long end towards centre plate.



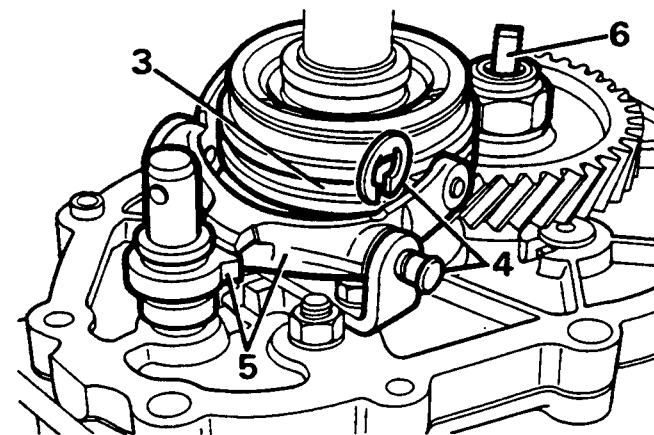
ST2509M

3. Fit slippers to selector fork.
4. Fit fork to synchromesh and secure with pins and "E" clips.



NOTE: Before fitting pins and clips cover holes in centre plate to prevent them falling into casing.

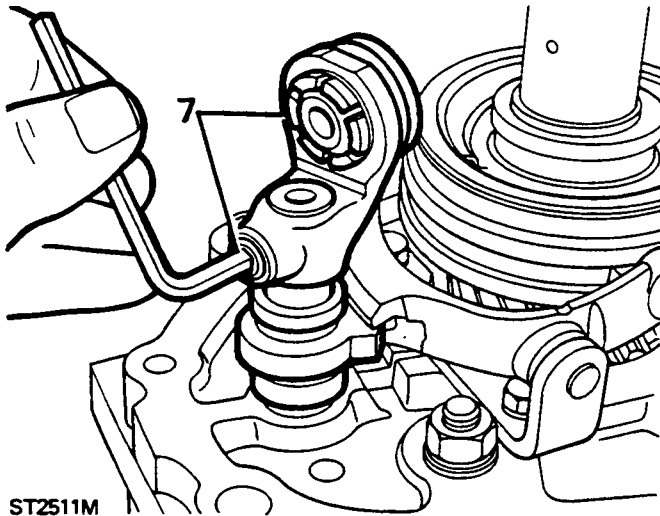
5. Engage tongue of spool in selector fork.
6. Fit oil pump drive to layshaft.



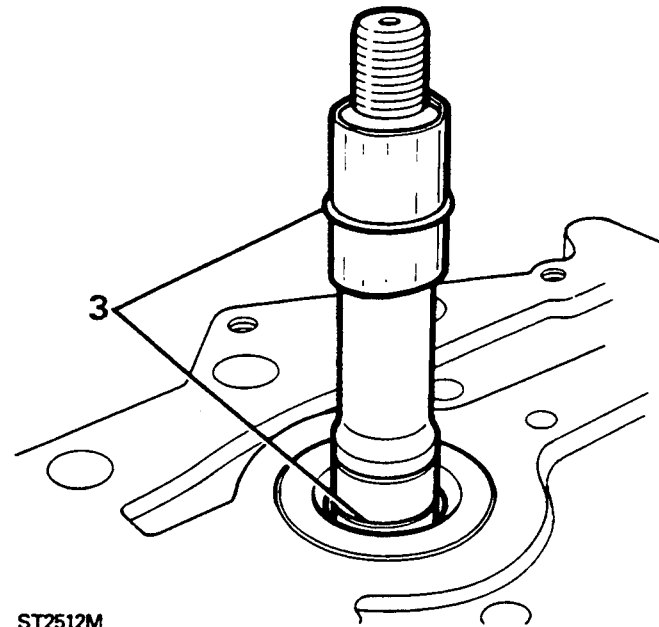
ST2510M



7. Fit yoke to selector shaft and secure with a new Loctite encapsulated grub screw.



ST2511M



ST2512M

EXTENSION CASE

1. Release centre plate from workstand and fit gasket on joint face.
2. Fit extension case while aligning oil pick-up pipe. Remove guide studs and secure to main case.

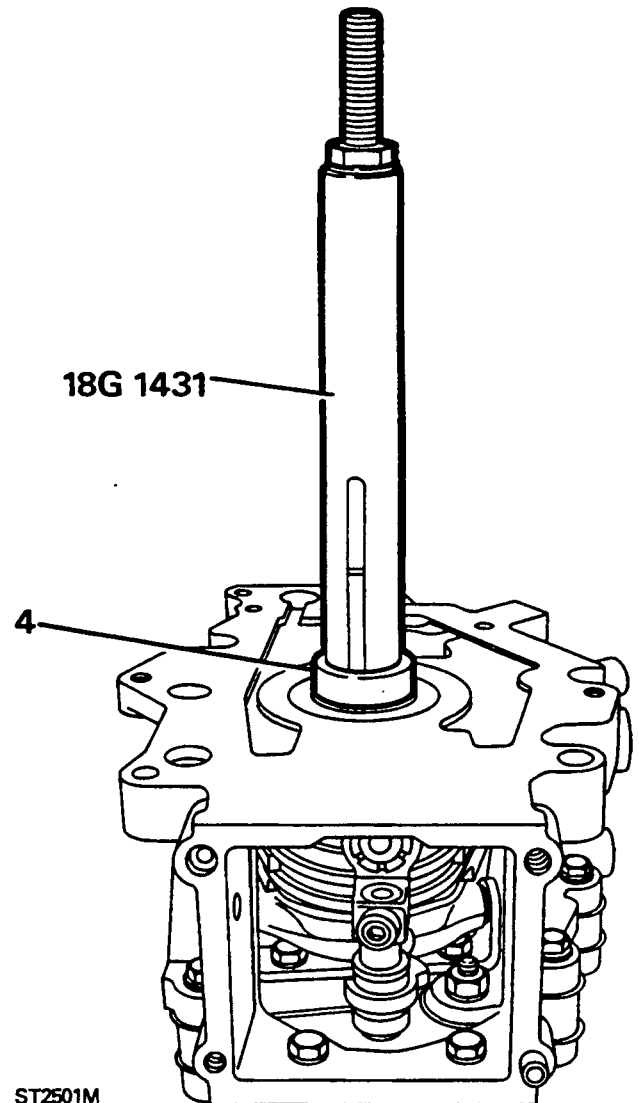


NOTE: Do not use force, if necessary remove case and re-align oil pump drive if case does not fit first time.



CAUTION: To protect "O" ring while fitting, cover mainshaft splines with smooth tape.


3. Fit "O" ring to mainshaft groove.
4. Fit "O" ring collar to mainshaft using LRT-37-015 (18G 1431).



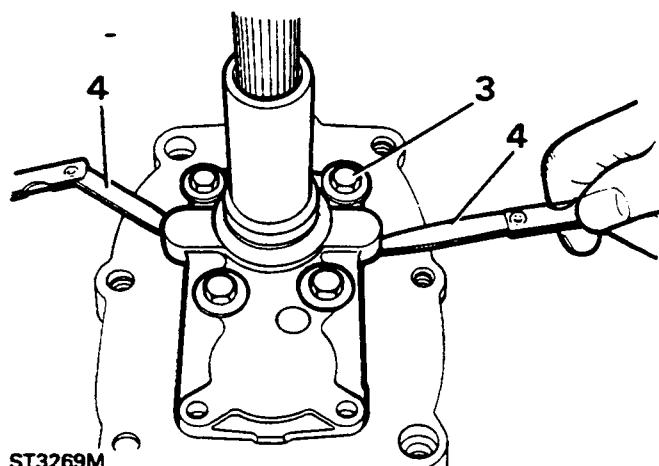
ST2501M

Input-Mainshaft bearing adjustment.

1. Turn gearbox over with input shaft uppermost.
Remove layshaft support plate.

 **NOTE: Correct shimming of the input shaft bearing is vital to ensure that the mainshaft assembly has the design intended end float, and the bearings are not pre-loaded.**


2. Measure the thickness of a new front cover gasket.
3. Place the original shim on mainshaft bearing and finger tighten the bolts.
4. Measure the clearance between front cover and gearcase with two feeler gauges.



Mainshaft selective washers

Part Number	Thickness (mm)
FRC 4327	1,51
FRC 4329	1,57
FRC 4331	1,63
FRC 4333	1,69
FRC 4335	1,75
FRC 4337	1,81
FRC 4339	1,87
FRC 4341	1,93
FRC 4343	1,99
FRC 4345	2,05
FRC 4347	2,11
FRC 4349	2,17
FRC 4351	2,23
FRC 4353	2,29
FRC 4355	2,35
FRC 4357	2,41
FRC 4359	2,47
FRC 4361	2,53
FRC 4363	2,59
FRC 4365	2,65
FRC 4367	2,67
FRC 4369	2,77

5. If required, change the selective washer to provide a clearance of 0,35mm to 0,085mm less than the gasket thickness.

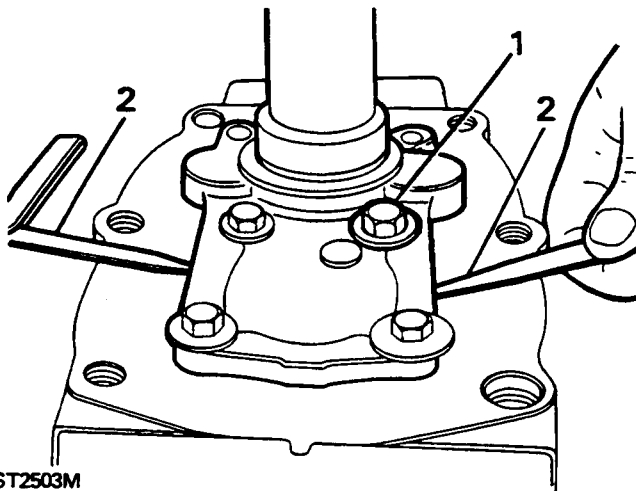
 **NOTE: This will ensure that when the gasket and cover is fitted to the correct torque, the input and mainshaft bearings will have no pre-load and not more than 0,06mm end float.**

6. Remove front cover and keep gasket and selective washer together.



LAYSHAFT BEARING ADJUSTMENT

1. Place original selective washer on layshaft bearing, fit front cover without gasket, and finger tighten bolts.
2. Measure clearance, with two feeler gauges, between cover and gearcase. Select a shim that will provide a clearance equal to the thickness of the gasket that was selected and measured when calculating the adjustment of the input and mainshaft bearing.

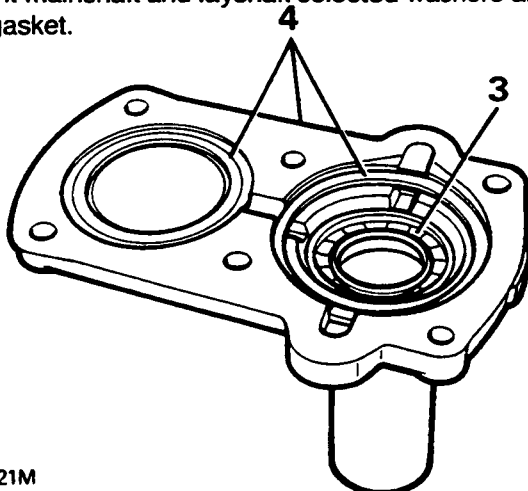


ST2503M



NOTE: This will ensure zero layshaft bearing end float and not more than 0,025mm pre-load once the cover and gasket are fitted and bolts correctly torqued.

3. Remove cover and selected washer and fit new oil seal, lip towards gearcase.
4. Fit mainshaft and layshaft selected washers and gasket.



ST2521M

5. Wrap protective tape round input shaft splines.
6. Apply Hylomar PL 32 to bolt threads and secure cover.

Layshaft selective washers.

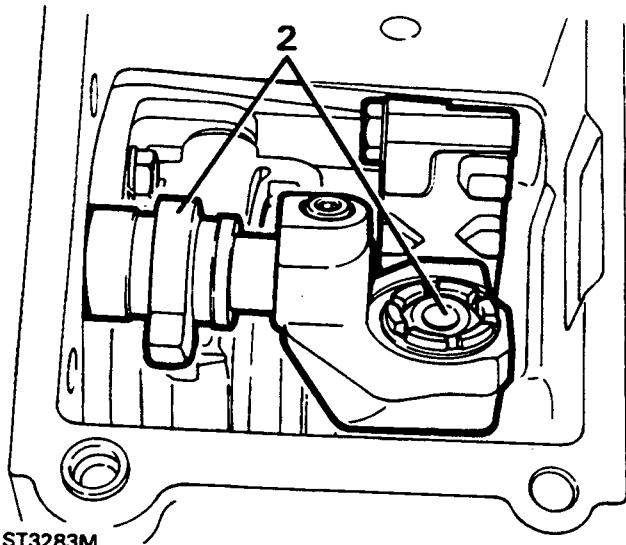
Part Number	Thickness (mm)
FTC 0262	1,36
FTC 0264	1,42
FTC 0266	1,48
FTC 0268	1,54
FTC 0270	1,60
FTC 0272	1,66
FTC 0274	1,72
FTC 0276	1,78
FTC 0278	1,84
FTC 0280	1,90
FTC 0282	1,96
FTC 0284	2,02
FTC 0286	2,08
FTC 0288	2,14
FTC 0290	2,20
FTC 0292	2,26
FTC 0294	2,32
FTC 0296	2,38

GEAR CHANGE HOUSING

1. Remove gearbox from workstand and place on bench.
2. Fit gasket and gear change assembly to extension housing.



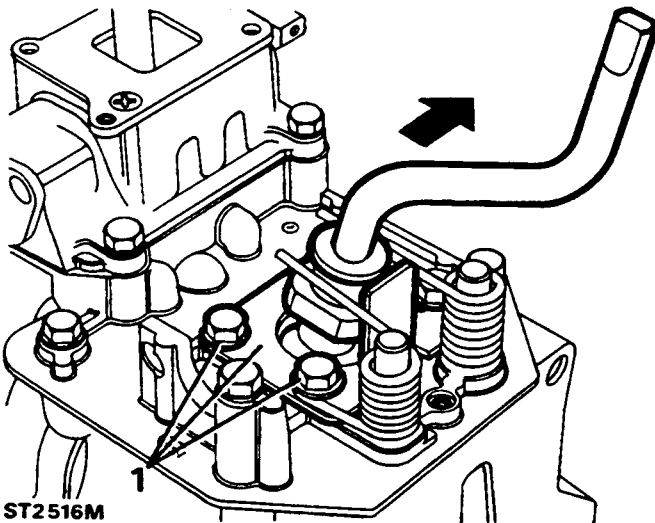
NOTE: Ensure that the gear lever pin passes through the centre of the yoke and engages in the gate plate. Also, the spool retainer must locate over the fifth gear spool.



ST3283M

Bias adjustment plate setting.

1. Slacken bias adjustment plate bolts. Select fourth gear and move lever fully to right.



ST2516M

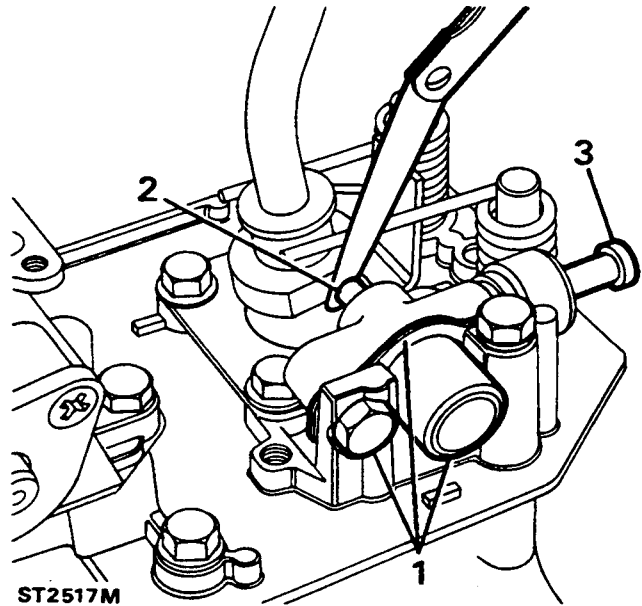
2. Tighten adjustment plate bolts.
3. Check adjustment is correct by selecting third gear then fourth.

Setting reverse gear plunger.

1. Fit plunger and original shims to gear change housing.
2. Select first gear and measure clearance between reverse plunger and flat on side of gear lever.

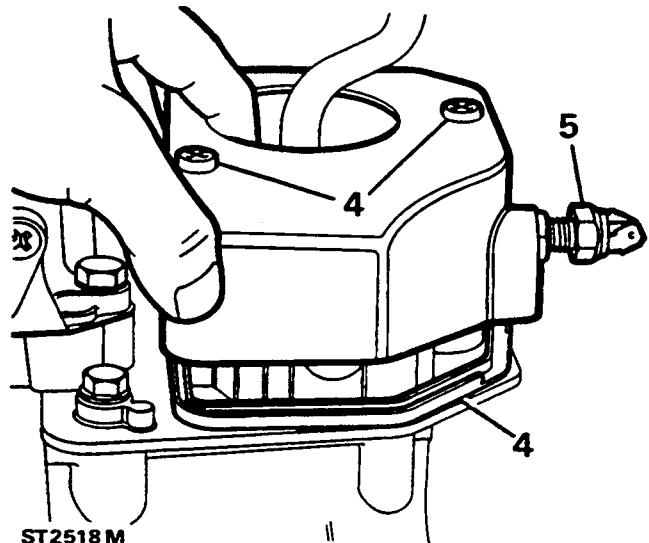
NOTE: The clearance should be 0,6mm to 0,85mm. Adjust by adding or removing shims.

3. Fit reverse lamp switch plunger.



ST2517M

4. Fit sealing rubber to gear change housing and fit cover.
5. Fit and adjust reverse lamp switch. See *ELECTRICAL, Repair, Reverse light switch*
6. Fit bell housing.



ST2518M



LT77S GEARBOX DATA

Reverse lever and slipper pad clearance.....	0,725 mm
Reverse gear plunger operating load.....	45 to 55 kg
Synchromesh assemblies push through load	8,2 to 10 kgf
Clearance between baulk rings and gears.....	0,38 mm
Fifth gear end float	0,020 mm
Third gear end float	0,020 mm
Second gear end float	0,020 mm
First gear bush end float	0,7 mm
First gear end float	0,20 mm
Fifth gear synchromesh end float.....	0,005 to 0,055 mm
Reverse gear plunger clearance	0,6 to 0.85 mm

TORQUE VALUES



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

	Nm
Bottom cover to clutch housing	8
Oil pump to extension case	8
Clip, clutch release lever	8
Spool retainer to gearcase	8
Extension case to gearcase	25
Pivot, clutch lever to bell housing	25
Guide, clutch release sleeve	25
Slave cylinder to bell housing	25
Front cover to gearcase	25
Fifth gear support bracket.....	25
Bell housing to gearbox	70
Oil drain plug	50
Oil filter plug.....	70
Breather	15
Oil level plug	30
Gear lever extension to lower lever	25
Fifth gear layshaft stake nut	218
Gear change housing to extension case	25
Reverse plunger to gear change housing.....	25
Adjustment plate to gear change housing	25
Cover to gear change housing	10
Bell housing to cylinder block	40
Yoke to selector shaft	25
Reverse lever pivot post nut	25
Plug detent ball and spring	25



NOTE: Torque values below are for all screws and bolts used except for those that are specified otherwise.

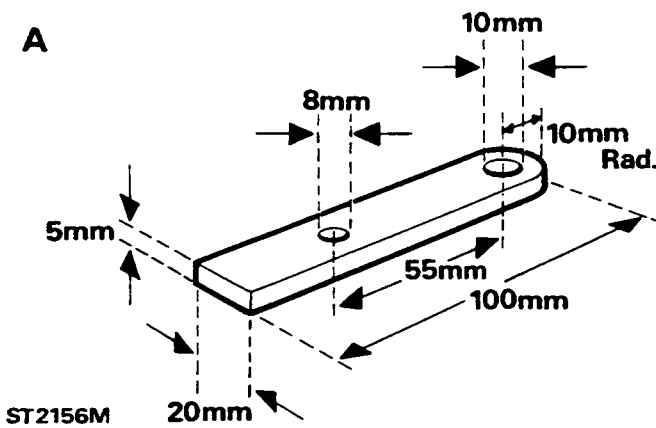
	Nm
METRIC	
M5	6
M6	9
M8	25
M10	45
M12	90
M14	105
M16	180
UNC / UNF	
1/4	9
5/16	24
3/8	39
7/16	78
1/2	90
5/8	136



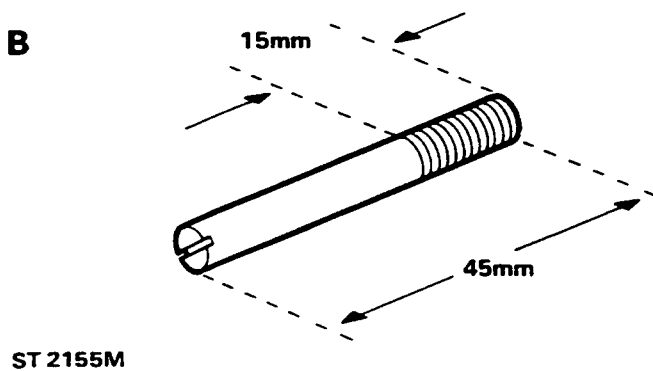
SELF MANUFACTURED TOOLS

The following tools can be self made to aid the dismantling and assembly of the gearbox.

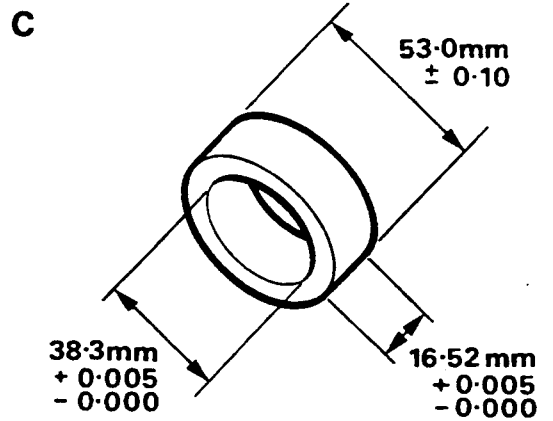
Tool 'A'. Dual purpose tool. Reverse shaft retainer to prevent the shaft falling out when the gearbox is inverted. Also, a layshaft fifth gear retainer to hold the fifth gear whilst releasing stake nut. Use 5mm mild steel to manufacture the tool. When using the tool for the layshaft nut, a suitable spacer is required 20mm diameter 23mm long, with an 8mm diameter clearance hole.



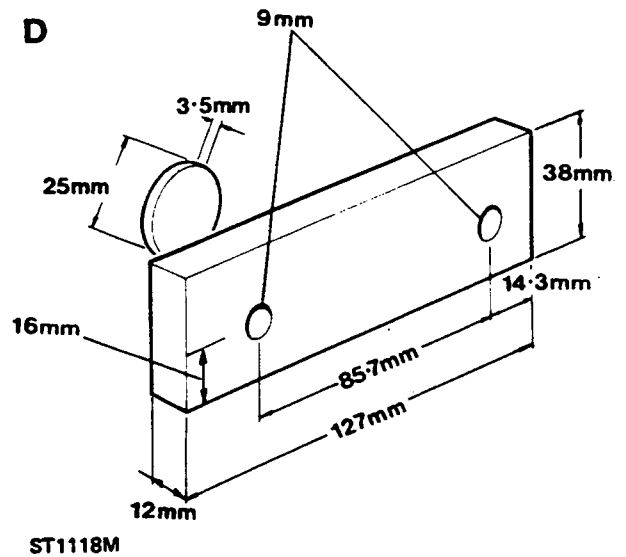
Tool 'B'. Four pilot studs with an 8mm thread for locating in the four counter sunk blind holes in the workstand.



Tool 'C'. Mild steel dummy centre bearing for the selection of first gear bush.

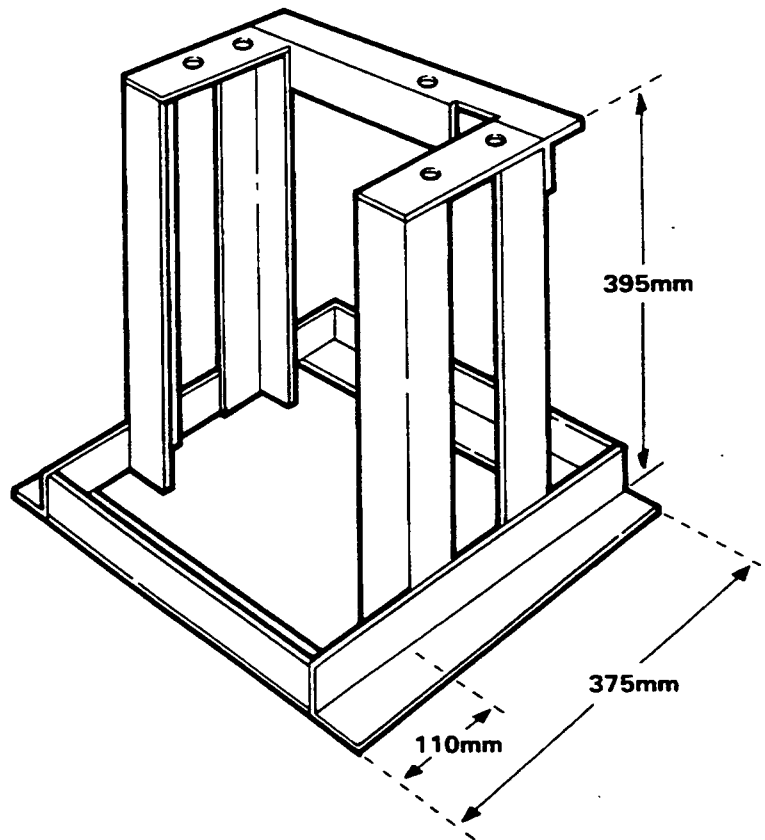
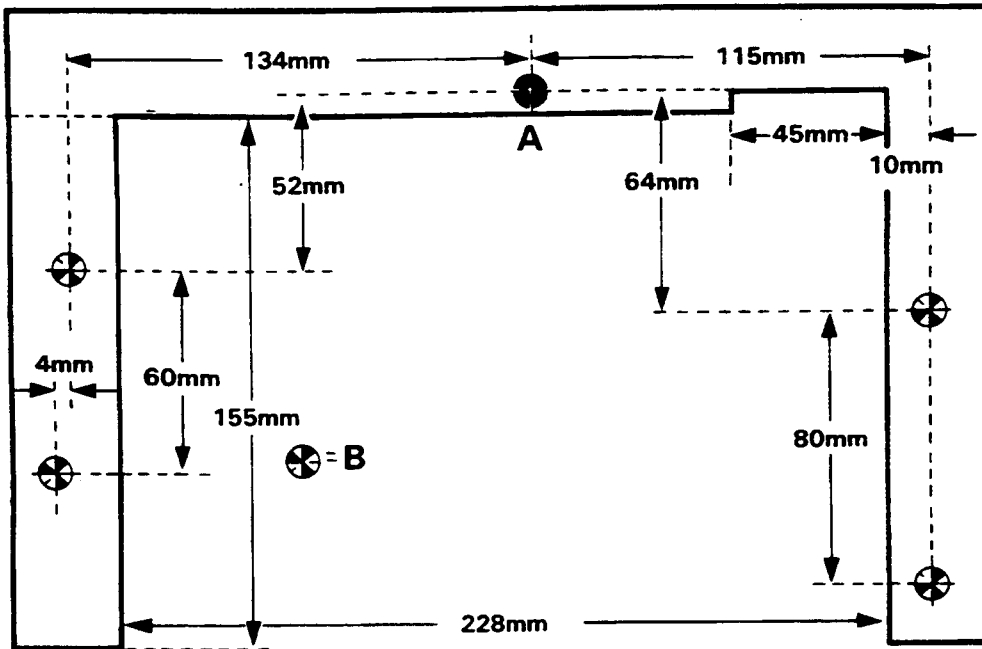


Tool 'D'. Layshaft support plate is fitted with two 8 x 25mm bolts and washers to the front of the gearbox case. It also supports the input shaft bearing outer track.

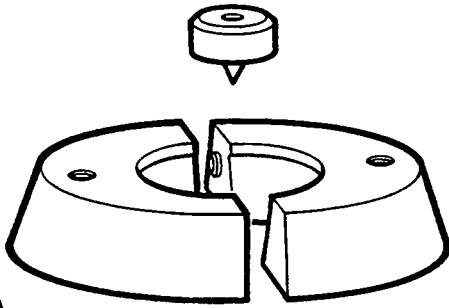


Tool 'E'. Workstand for securely locating the gearbox during overhaul. Manufacture from 30mm x 30mm angle iron. The single hole marked 'A' should be drilled through the material with a 10mm drill. The four counter sunk blind holes marked 'B' should also be made with a 10mm drill, but must not be drilled through the material.

The four counter sunk blind holes marked 'B' should also be made with a 10mm drill, but must not be drilled through the material.



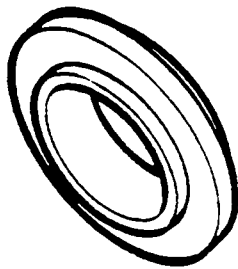
ST2153M



18G47BA

LRT-37-001
18G.47BA

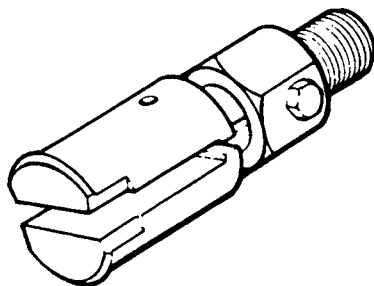
Layshaft bearing remover adaptor.



18G47BAX

LRT-37-002
18G.47BAX

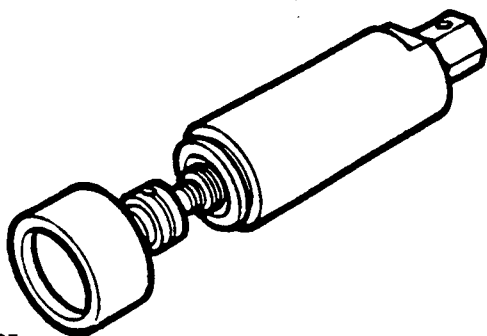
Conversion kit to primary shaft bearing remover.



8G284AAH

LRT-37-004
18G.284AAH

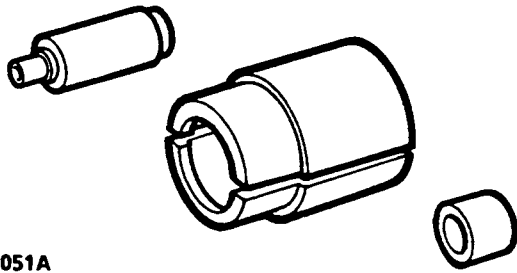
Adaptor remover input shaft pilot bearing track.



18G705

LRT-37-009
18G.705

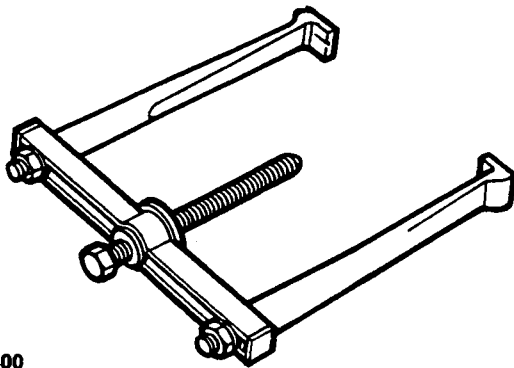
Remover bearing race centre - main tool.



18G7051A

LRT-37-010
18G.705-1A

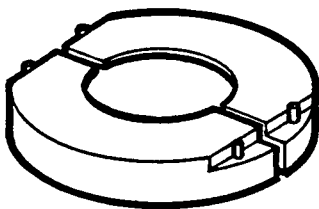
Adaptor - remover mainshaft oil seal
track layshaft 5th gear.



18G1400

LRT-37-012
18G.1400

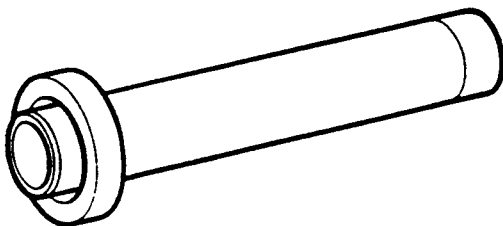
Remover 1st speed synchromesh hub
and gear cluster.



18G14001

LRT-37-013
18G.1400-1

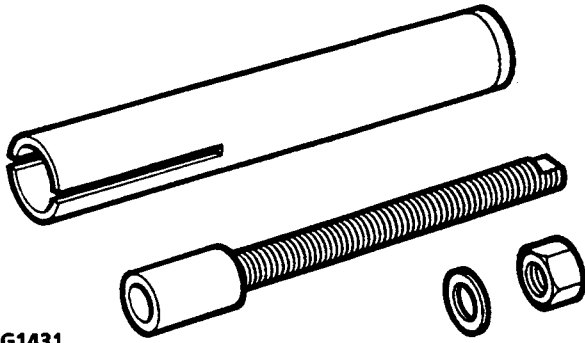
Adaptor mainshaft 5th gear remover.



18G1422

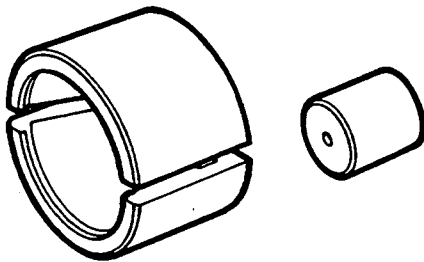
LRT-37-014
18G.1422

Mainshaft rear oil seal replacer



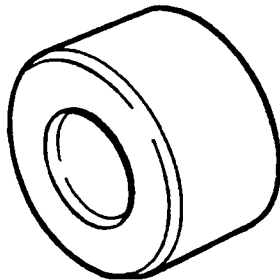
18G1431

LRT-37-015 Mainshaft 5th gear and oil seal collar
18G.1431 replacer.



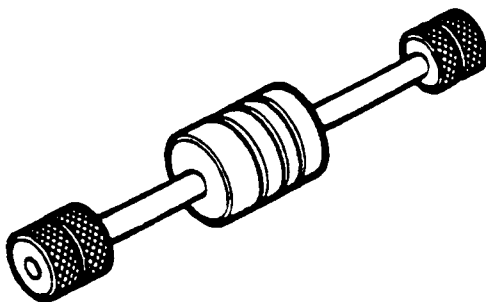
18G7057

LRT-37-017 Layshaft bearing remover.
18G.705-7



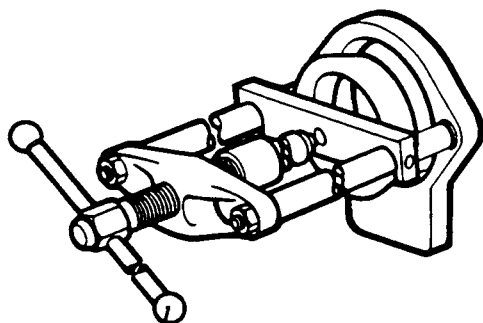
605774A

LRT-37-018 Dummy bearing.



18G284

LRT-99-004 Impulse extractor.
18G.284



LRT-99-002
MS.47

Hand press.

MS47