DEFENDER
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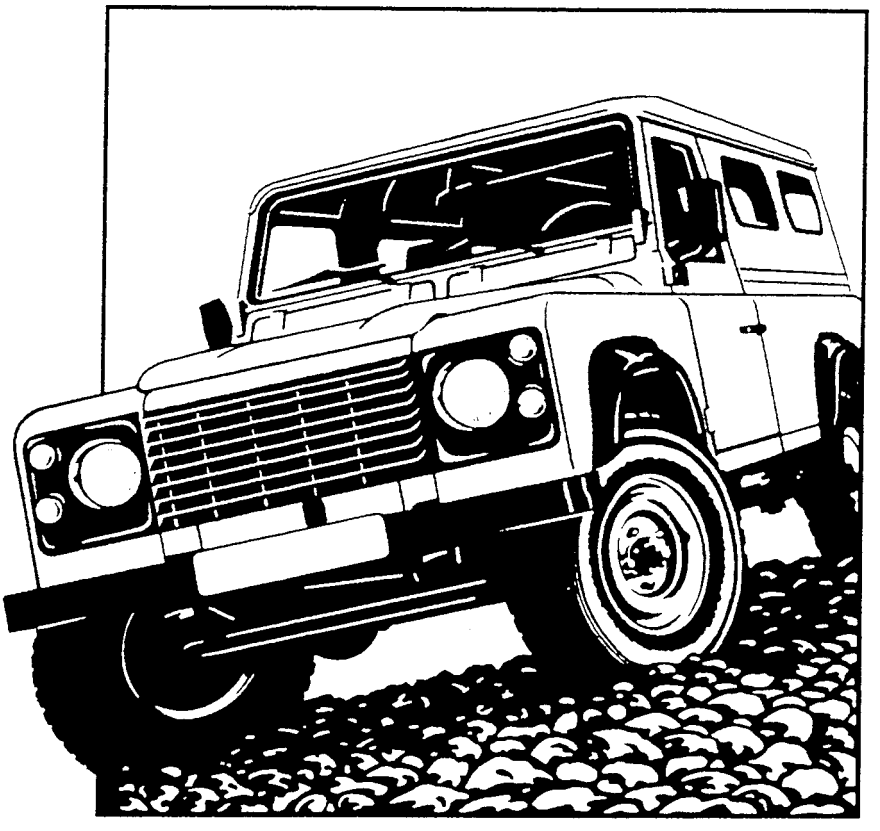

DEFENDER
LT77S GEARBOX

WORKSHOP MANUAL SUPPLEMENT

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37 - MANUAL GEARBOX

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37 - MANUAL GEARBOX

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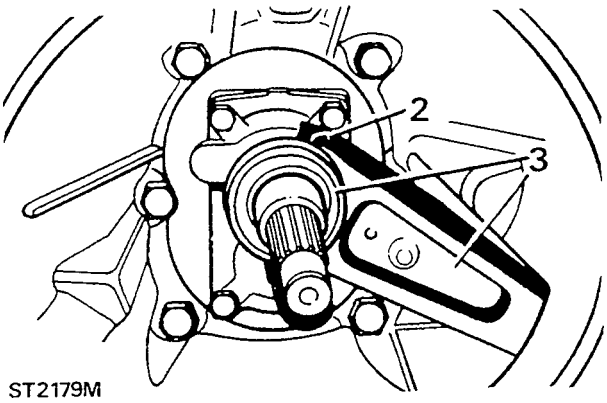
DISMANTLE

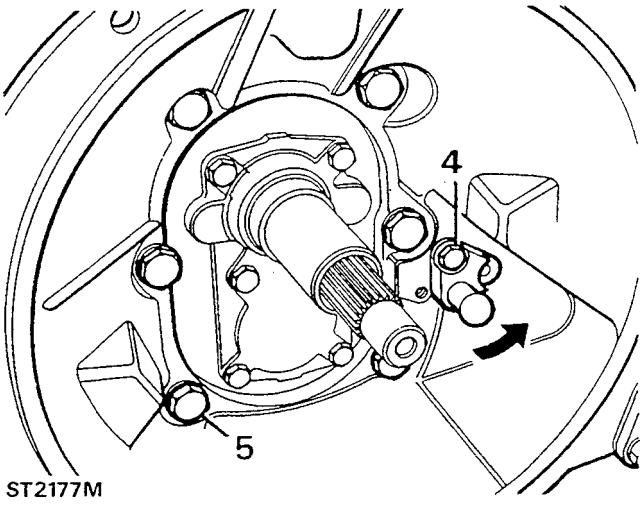
Bell housing - four cylinder engine

1. Remove transfer box, drain oil and clean exterior.
2. If fitted, clutch release bearing clip.
3. Remove clutch release assembly.



ST2179M

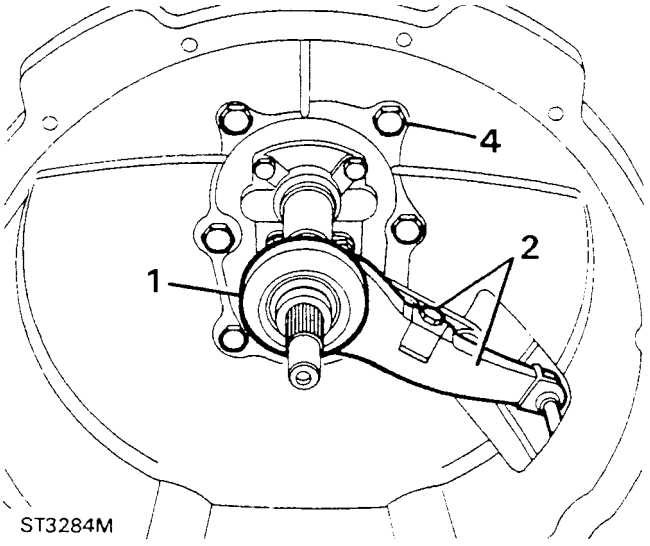
4. Remove one pivot post bolt, slacken the other and move post aside.
5. Remove six bolts and withdraw bell housing.



ST2177M

Bell housing - V8 engine

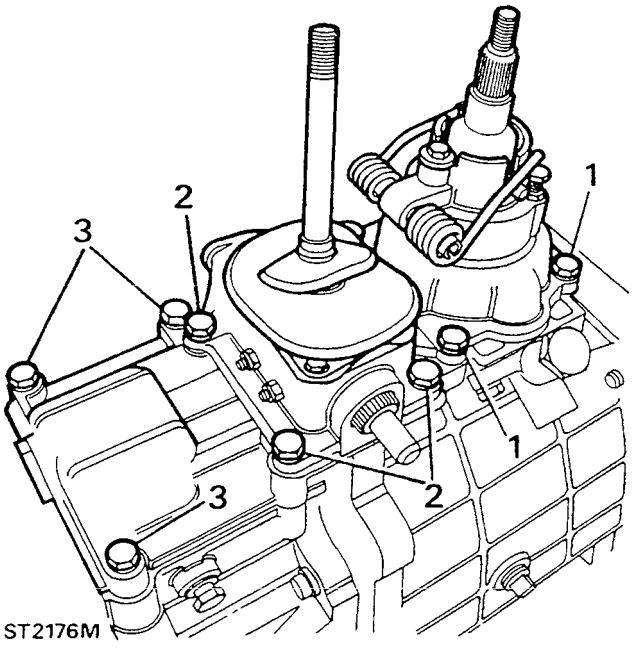
1. Remove clutch release bearing.
2. Remove screw and spring clip and remove release lever.
3. Remove "C" clip from pivot post.
4. Remove six bolts and bell housing.



ST3284M

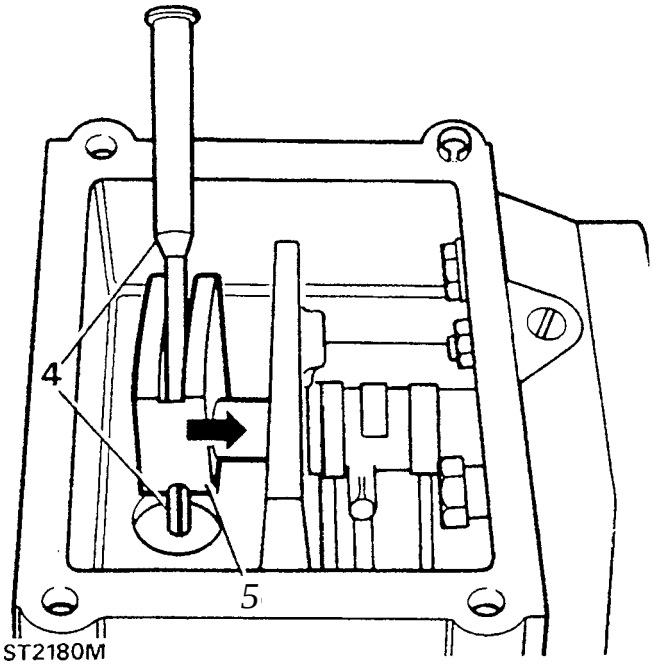
GEAR SELECTOR HOUSING

1. Remove four bolts and remove main gearbox selector housing.
2. Remove transfer box housing.
3. Remove remaining bolts and remove remote housing.



ST2176M

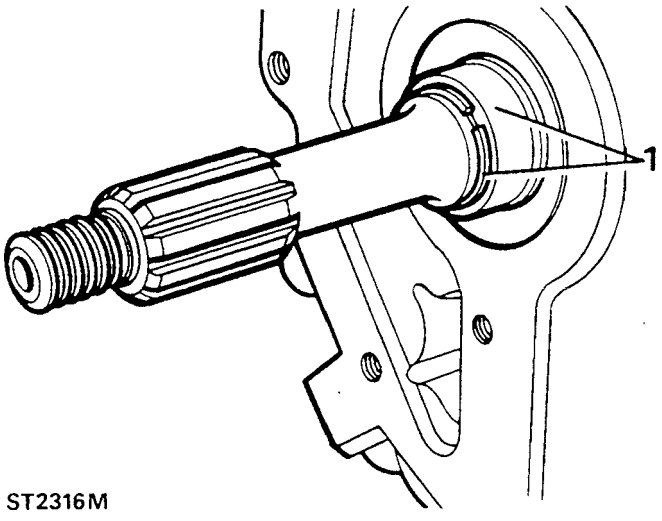
4. Drive out quadrant roll pin.
5. Move selector shaft forward to remove quadrant.



ST2180M

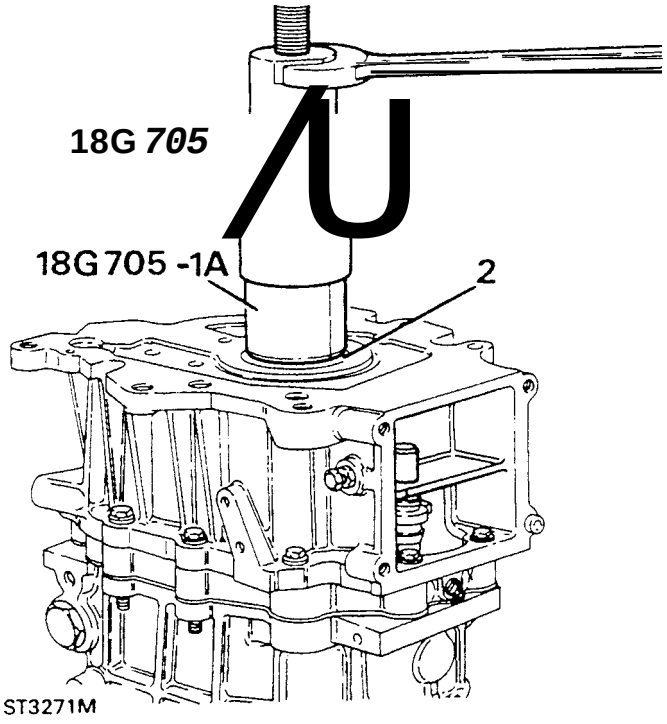
EXTENSION HOUSING

1. Remove snap ring retaining oil seal collar.



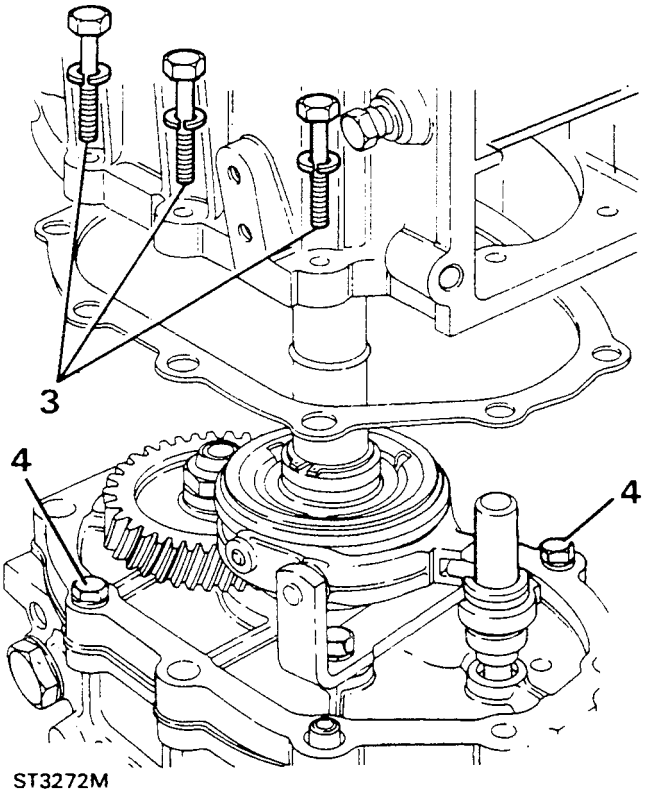
ST2316M

2. Using service tool 18G 705 and 18G 705-1A withdraw the oil seal collar.



ST3271M

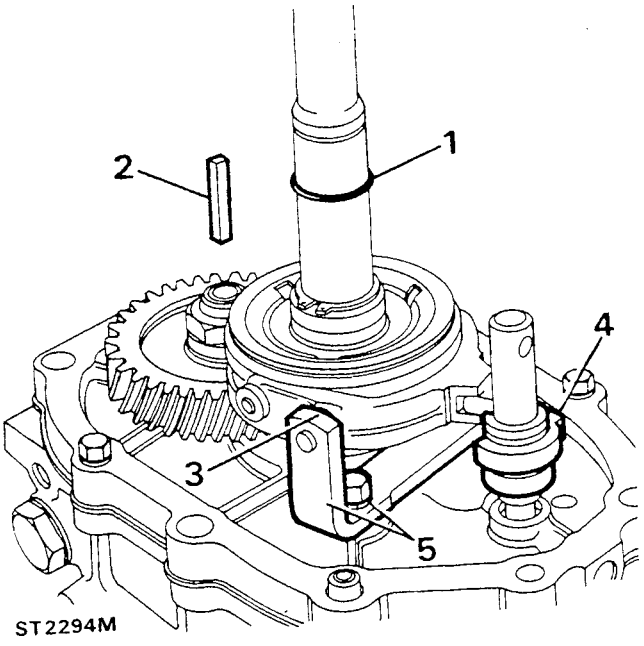
3. Remove the fifth gear extension housing.
4. Secure the centre plate to the gearcase with two 8 x 35mm bolts.



ST3272M

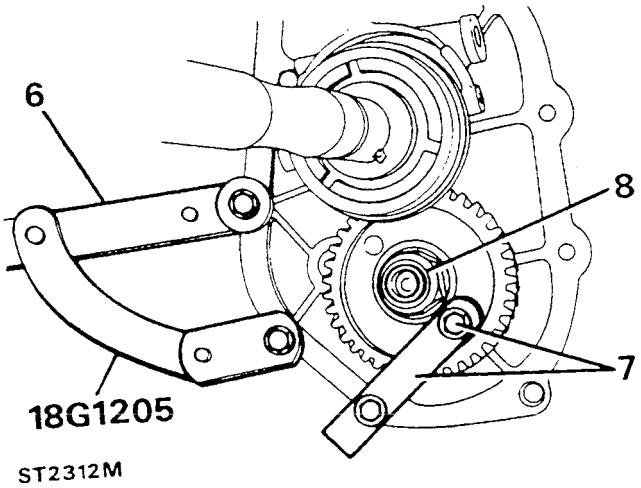
MAINSHAFT AND LAYSHAFT FIFTH GEARS

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.



ST2294M

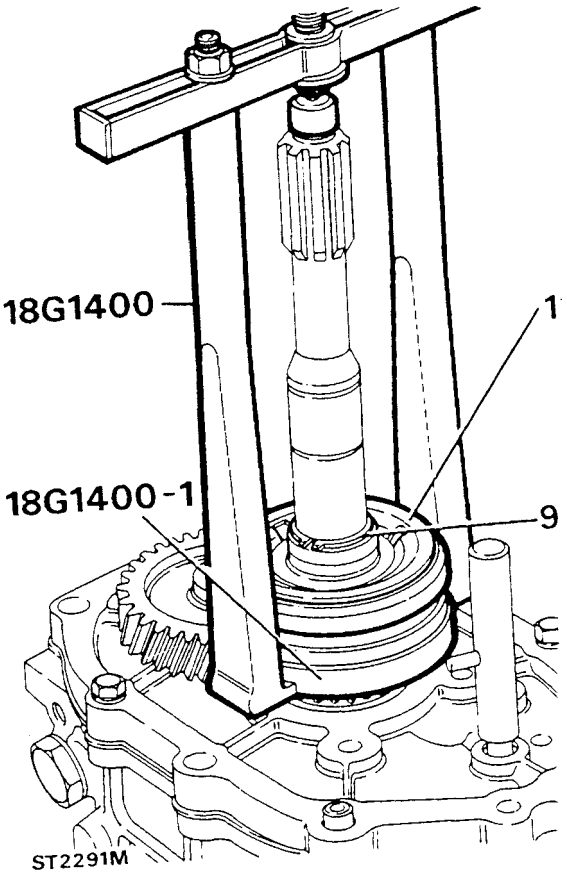
6. Locate flange holder tool 18G 1205.
7. Fit manufactured tool "A" and spacer to restrain layshaft fifth gear.
8. De-stake and remove fifth gear nut.



ST2312M

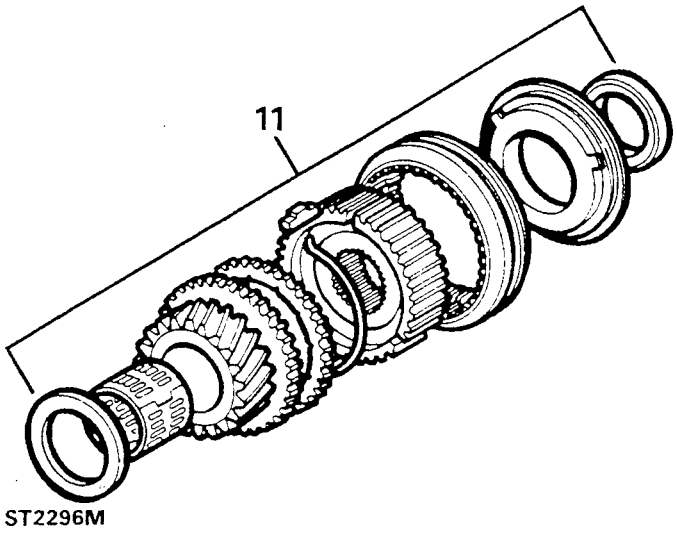
9. Remove circlip retaining mainshaft fifth gear synchromesh.
10. Fit special tool 18G 1400-1 and 18G 1400 as illustrated.

⚠ **CAUTION: ensure the puller feet locate the two cut-outs in 18G 1400-1 and between the pins.**

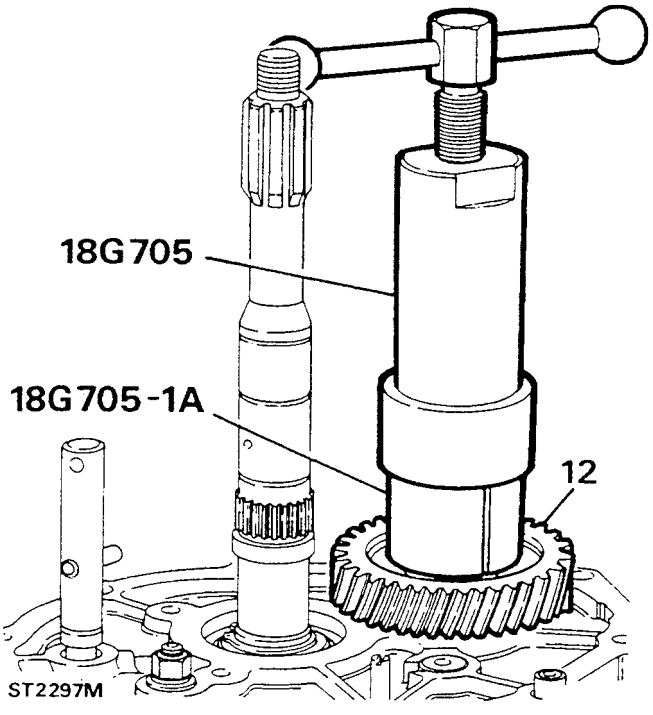


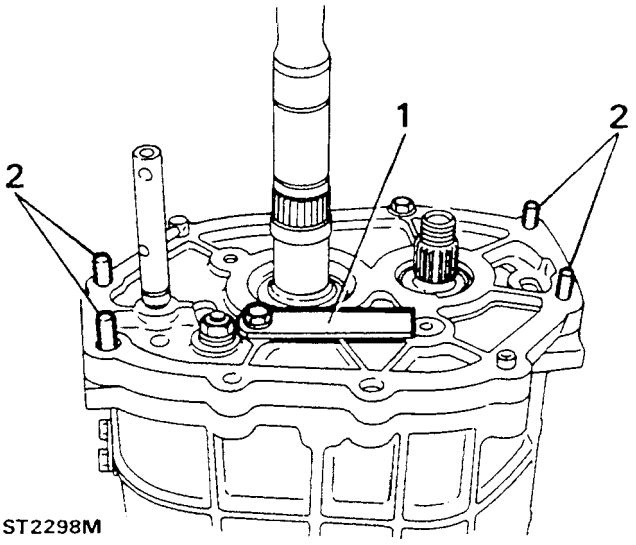
ST2291M

11. Remove fifth gear synchromesh.

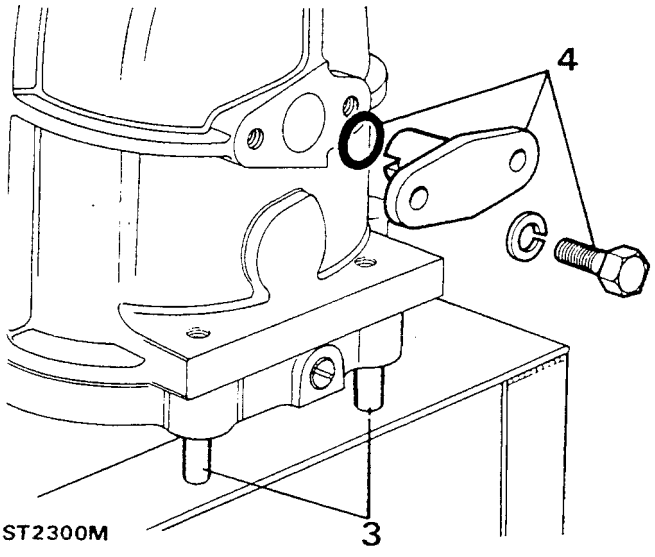


12. Remove layshaft fifth gear using special tools 18G 705 and 18G 705-1A.





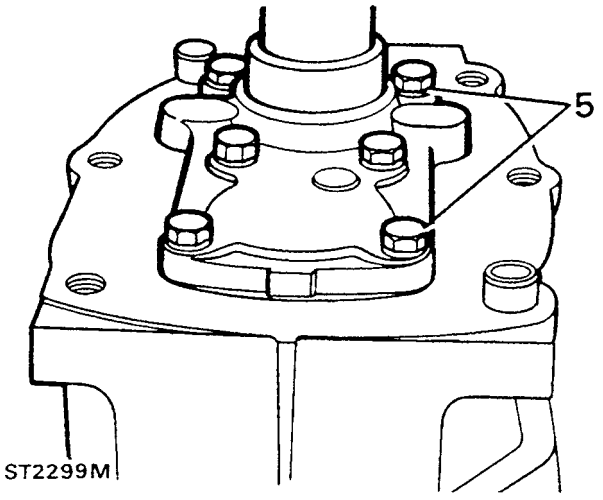
3. Invert gear case and locate studs in workstand holes.
4. Remove selector shaft spool retainer.



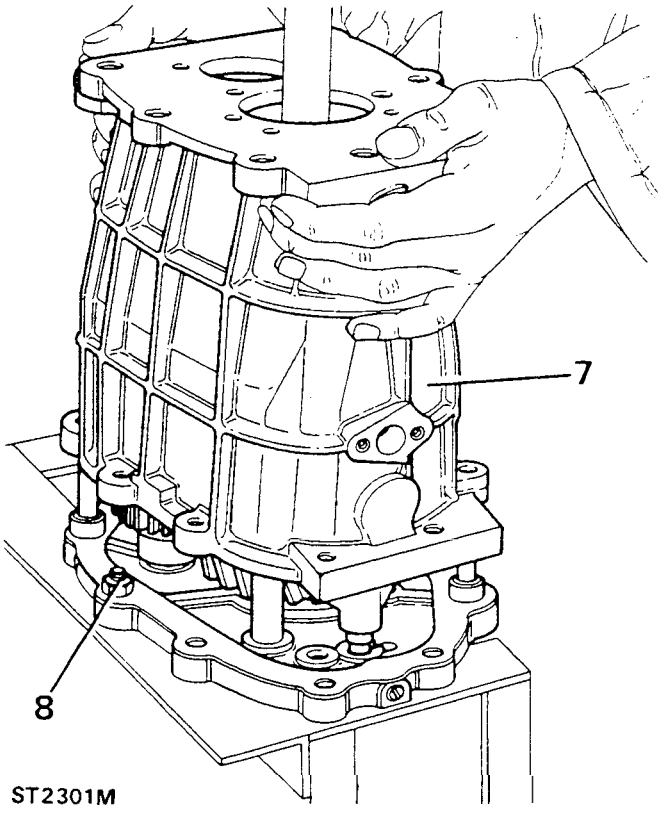
Main gear case.

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

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

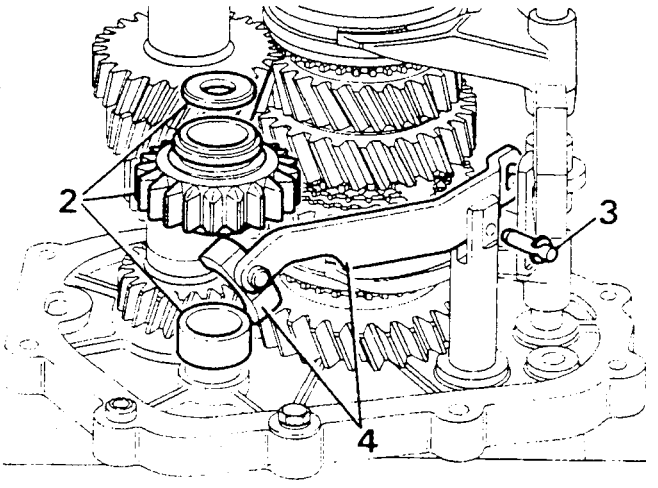


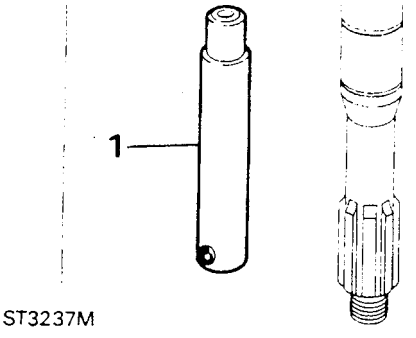
7. Remove bolts and lift-off gear case.
8. Secure centre plate with nut and **bolt.**



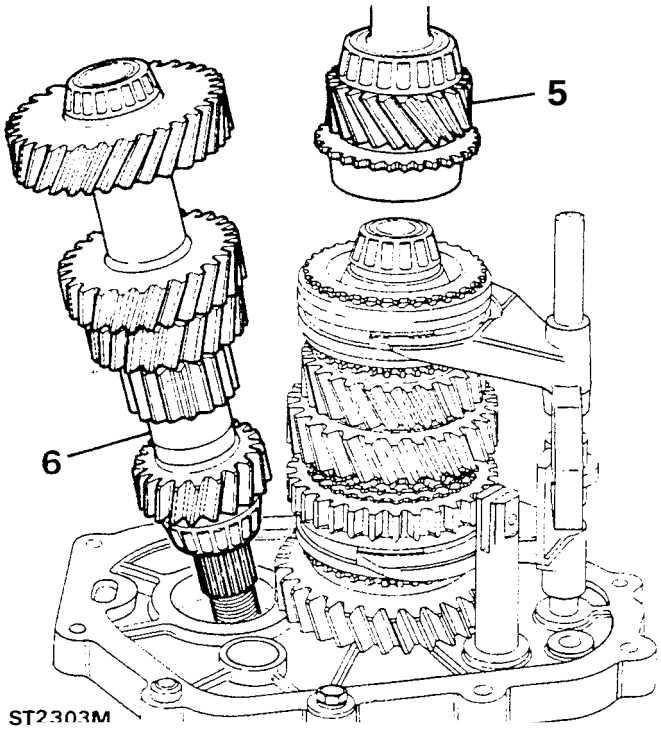
REVERSE SHAFT, LAYSHAFT AND MAINSHAFT

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.

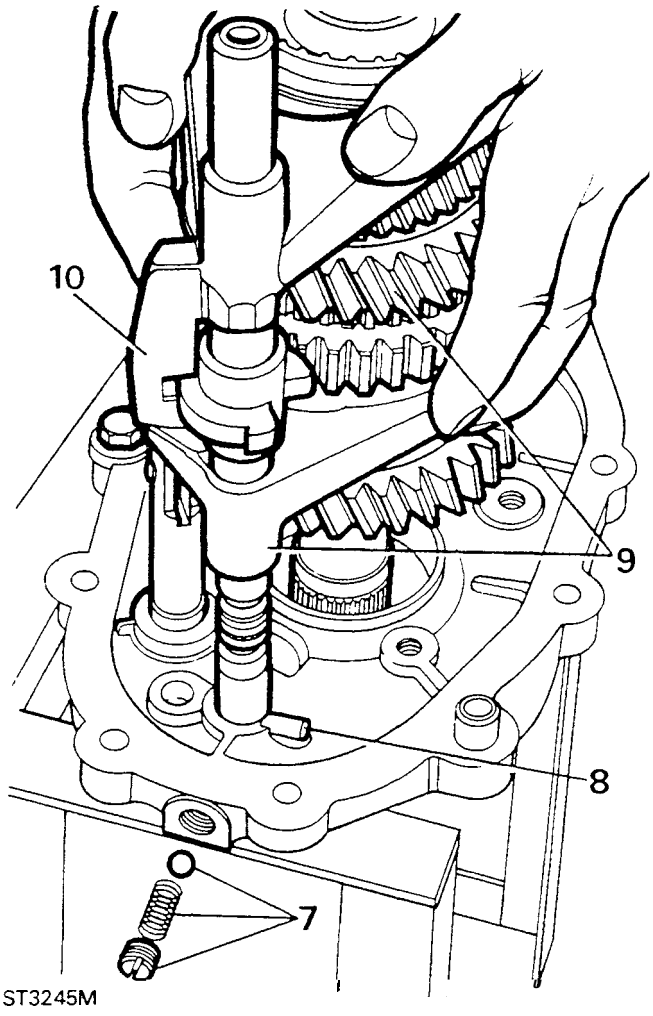




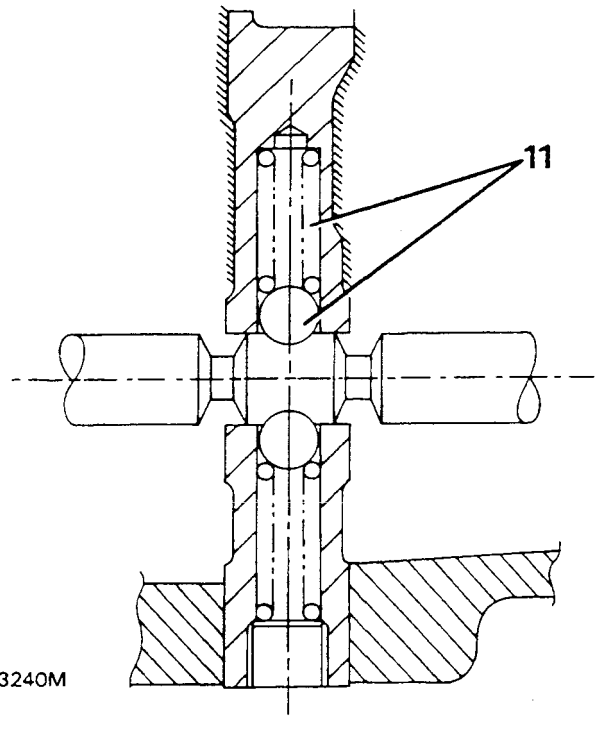
5. Remove input shaft and fourth gear baulk ring.
6. Remove layshaft by tilting, as illustrated and lifting mainshaft.



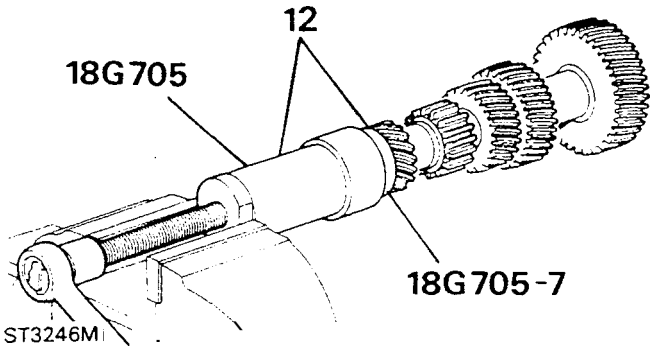
7. Unscrew plug and remove spring and outboard detent ball.
8. Align fifth gear selector pin with centre plate slot.
9. Remove mainshaft, gears, selectors and forks.
10. Remove selector fork assembly from gears.



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

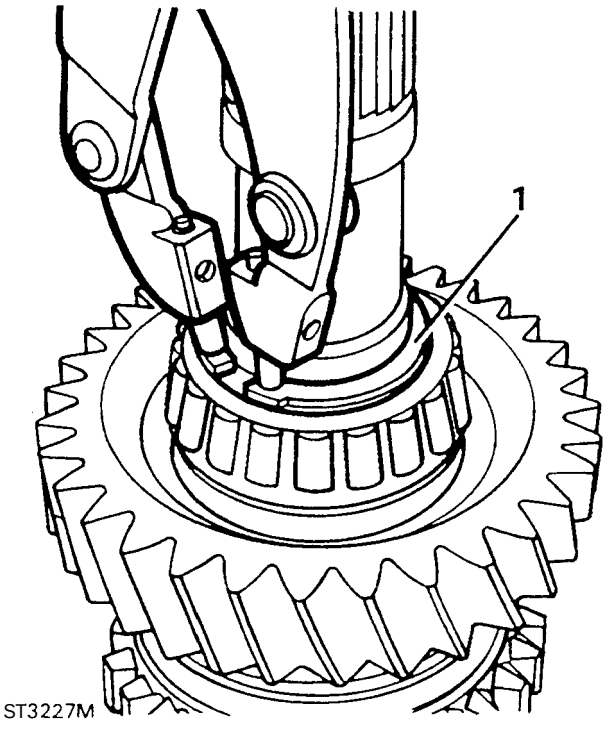


12. Using extractor tool 18G 705 and collets 18G 705-7, withdraw layshaft bearings.

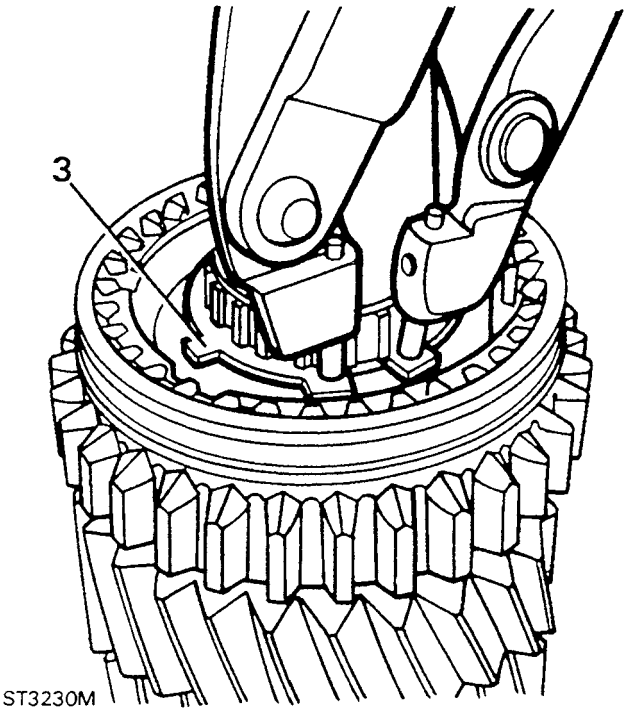


DISMANTLE MAINSHAFT

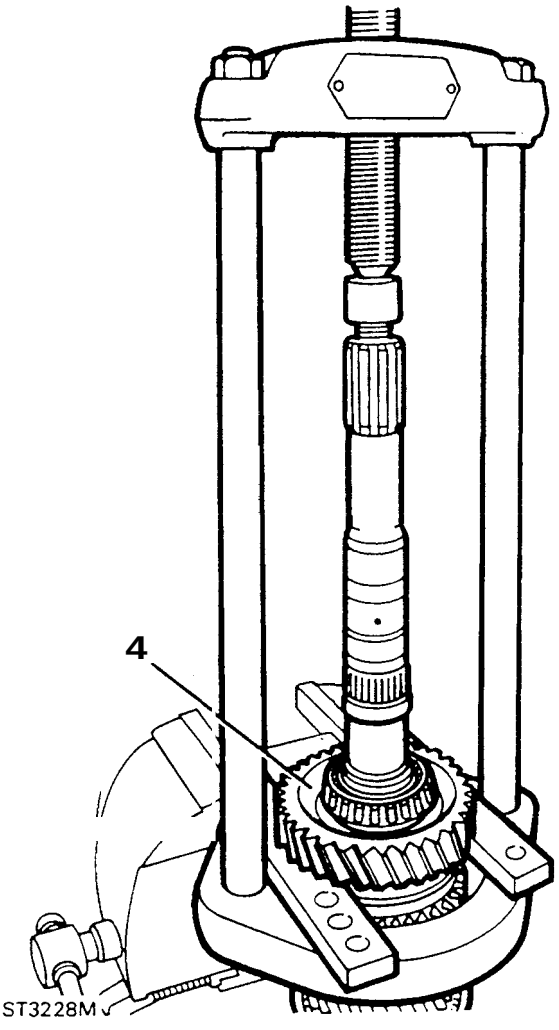
1. Remove circlip retaining first gear assembly.



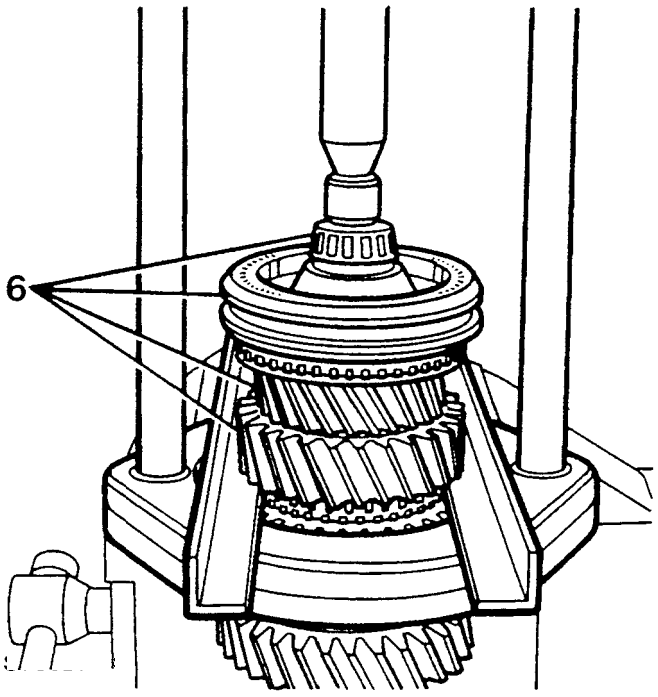
2. Remove taper bearing, bush, needle bearing, first gear spacer, cone, inner and outer baulk rings.
3. Remove circlip *to* release first and second gear synchromesh assembly.



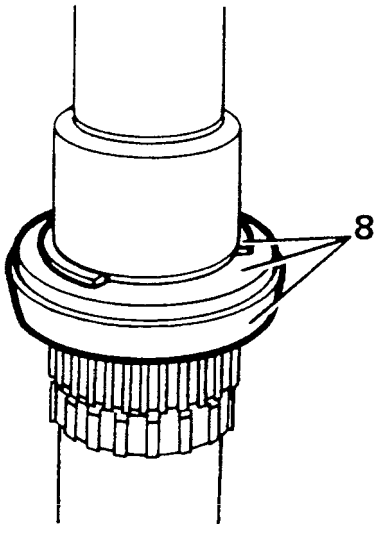
4. With MS 47 press first gear assembly from mainshaft.



5. Remove first and second synchromesh baulk rings.
6. Using MS 47 and support bars under second 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.



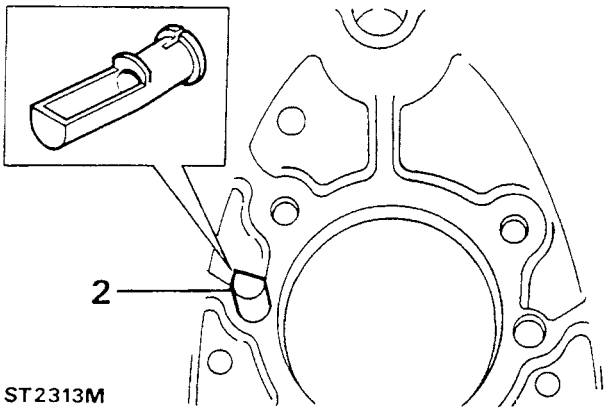
ST3234M

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.

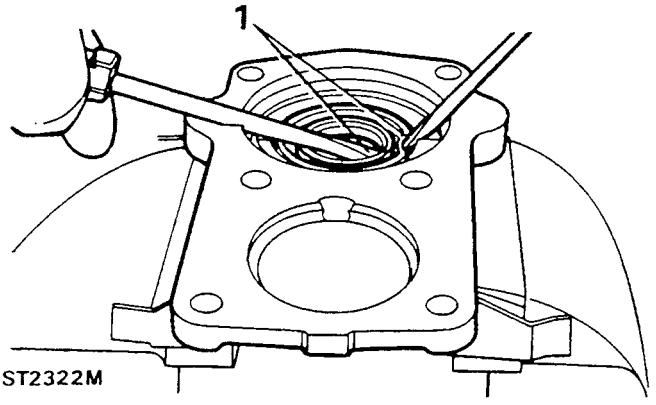


ST2313M

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

Front cover

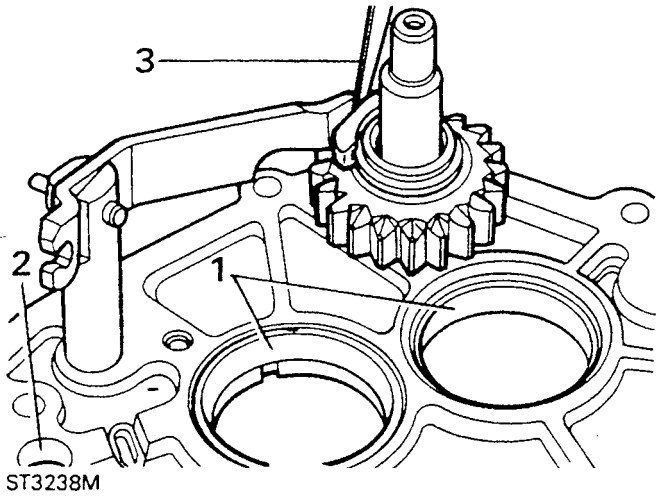
1. Remove oil seal from cover. Do not fit a new seal at this stage



ST2322M

Centre plate

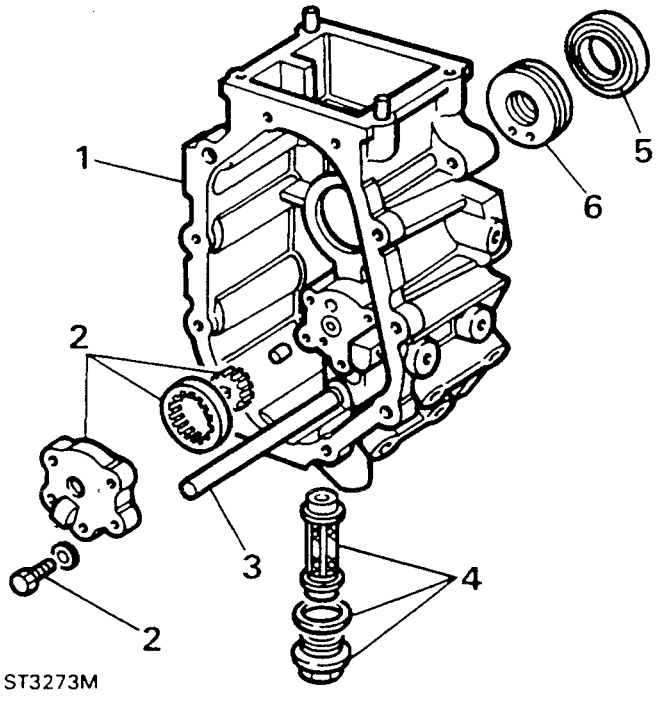
1. Remove bearing tracks.
2. Inspect for damage and selector rail bore for wear.
3. Temporally fit reverse shaft gear and lever and check clearance between slipper and lever does not exceed 0,20 mm (0.008 in).



ST3238M

Extension case

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



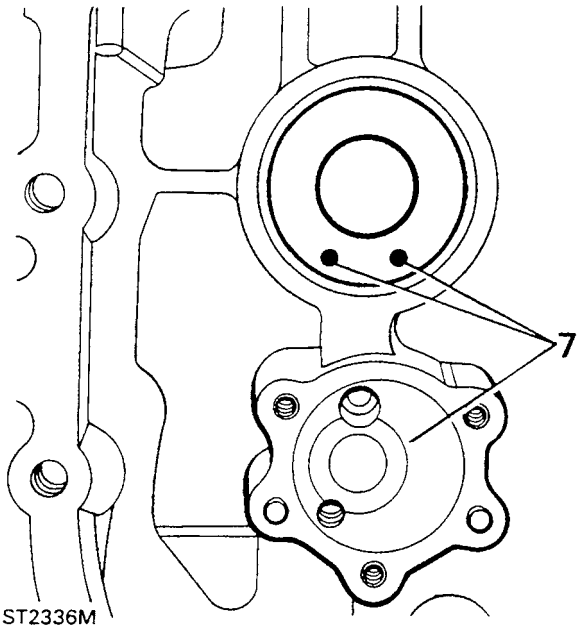
ST3273M

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.

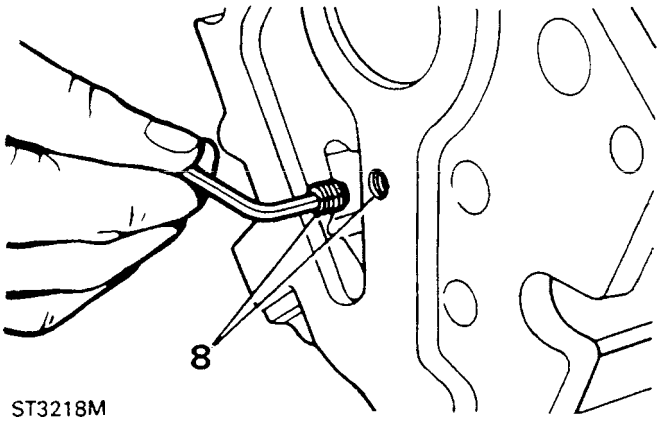
7. Fit new bush with drain holes towards bottom of casing.

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



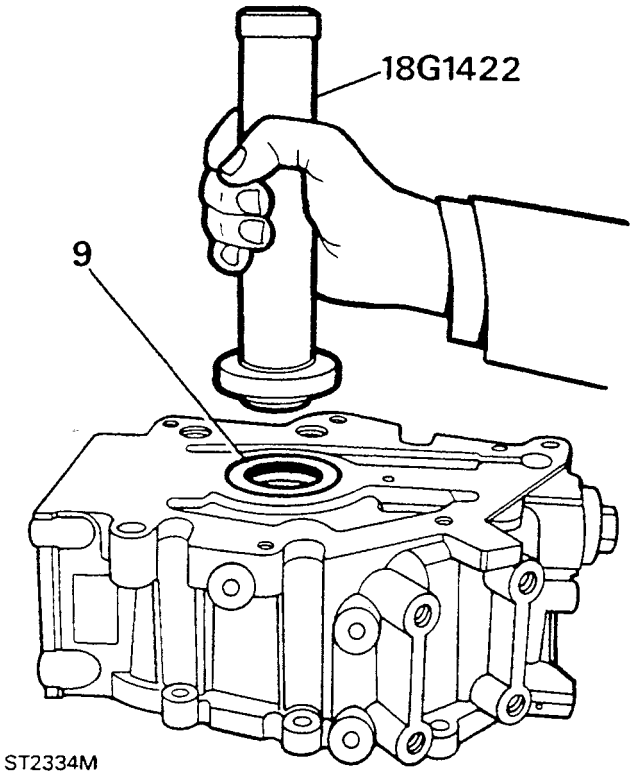
ST2336M

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



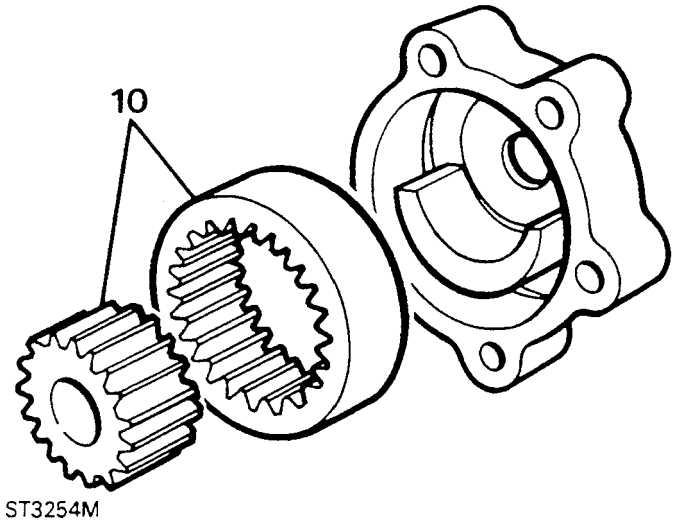
ST3218M

9. Fit oil seal to housing, lip side leading, using 18G 1422. Apply SAE 40 oil to lip.



ST2334M

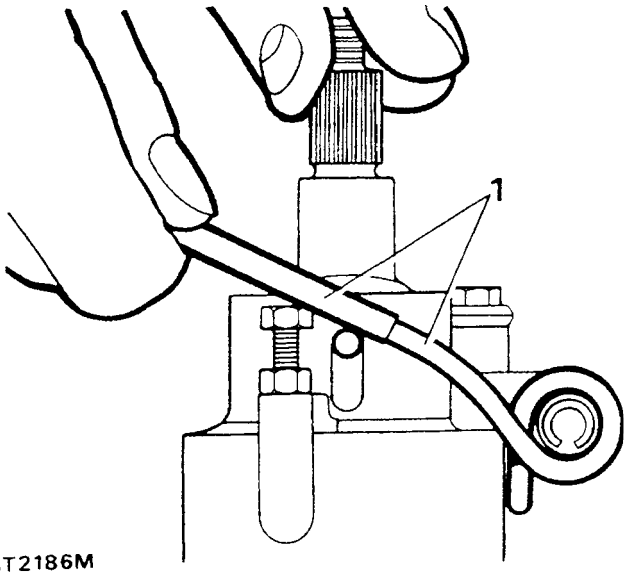
10. Assemble gears to oil pump and fit cover.



ST3254M

GEAR CHANGE HOUSING

1. With a length of tube, release the bias spring from adjusting screws.
2. Remove bias spring adjusting screws.

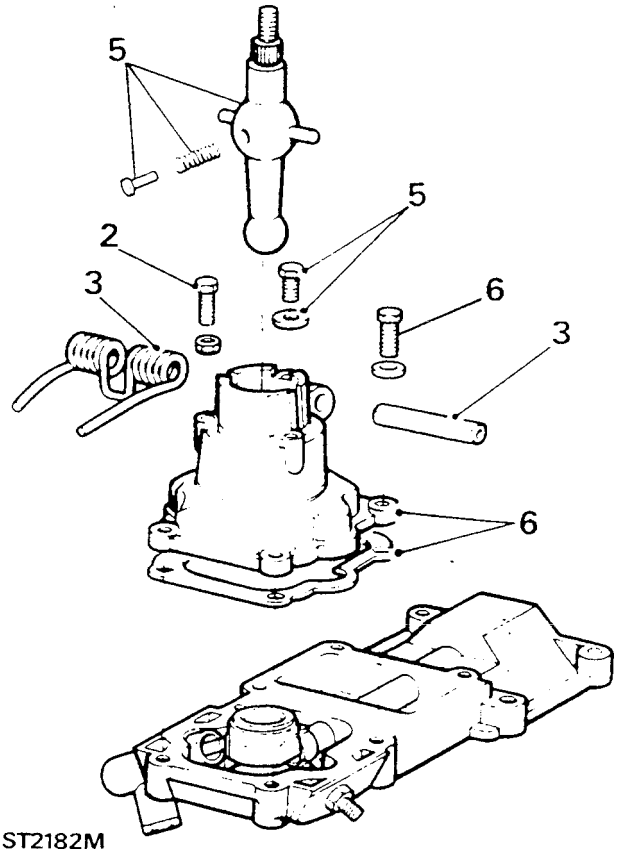


ST2186M

3. Drive-out roll pin to remove bias spring.
4. Remove gear lever extension from lower gear lever.
5. Remove bolt and special washer to remove lower gear lever.

WARNING: Hold the nylon spring loaded pad while removing the **lever** to prevent it causing personal injury.

6. Remove gear selector housing from remote housing.



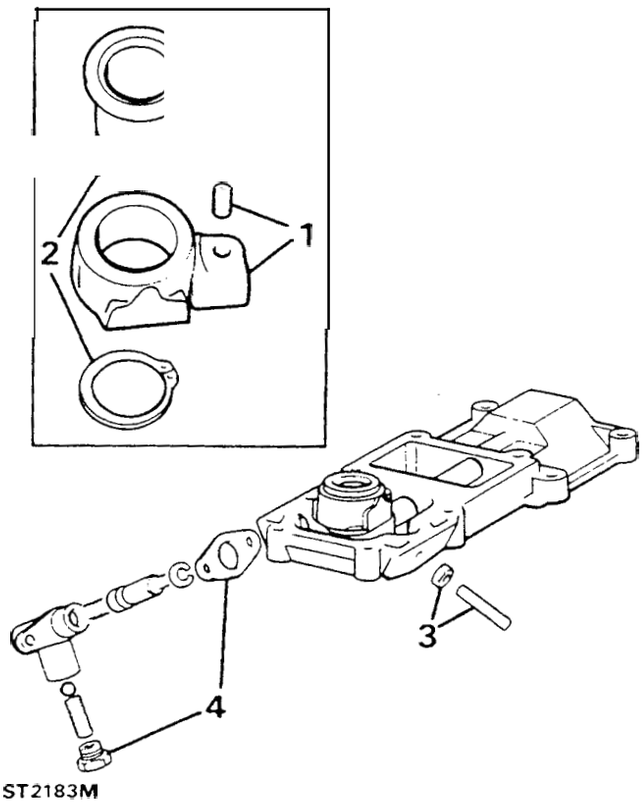
ST2182M

7. Clean and examine all components and renew where necessary.
8. Assemble above parts in reverse order using multi-purpose grease on gear lever.

NOTE: Ensure spring loaded pad is properly located and that the lever is fitted to the housing with the pad on the opposite side to the bias spring. Leave bias spring adjusting screws slack until assembly of gearbox.

Remote gear lever housing.

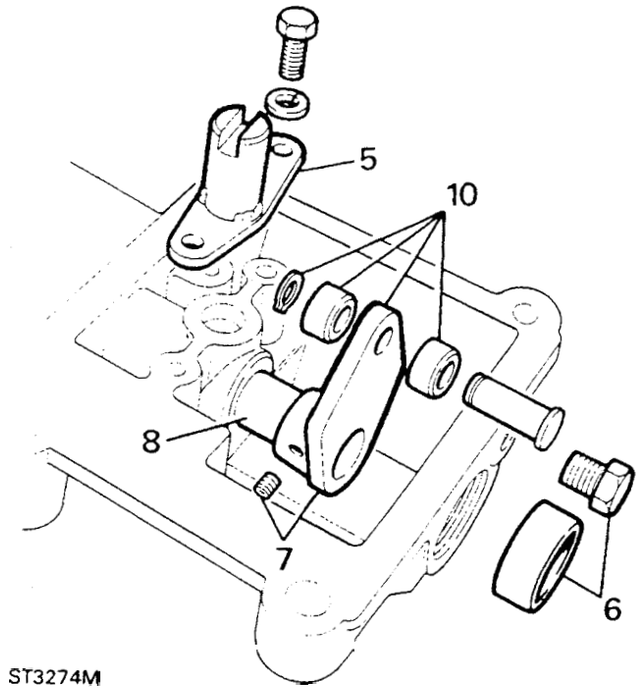
1. Release socket headed screw to remove trunnion.
2. Remove circlip to release seating from trunnion.
3. Remove fifth gear locknut and stud.
4. Remove reverse gear plunger and shim.



ST2183M

5. Remove fifth gear spool guide.
6. Remove blanking plug.
7. Drift-out roll pin securing quadrant to shaft.
8. With selector through hole.
9. Remove selector shaft "O" ring.

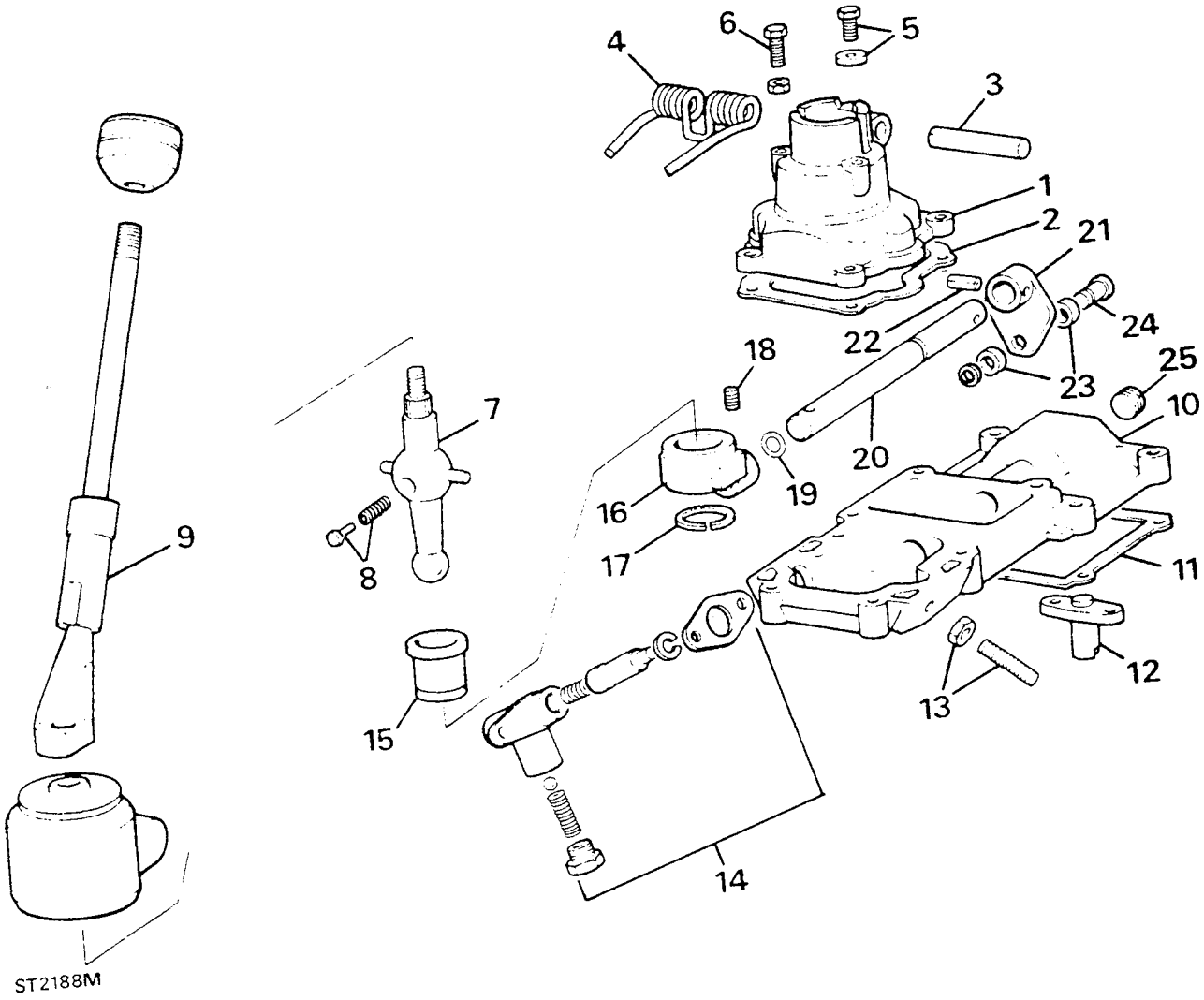
10. Remove circlip to release rollers and pin from quadrant.



ST3274M

11. Clean and examine all components and renew where necessary.
12. Assemble housing by first fitting "O" ring to shaft.
13. Fit quadrant and secure with roll pin.
14. Fit rollers and secure with circlip.
15. Fit fifth gear spool retainer and apply Loctite 290 to bolt threads.
16. Apply Loctite *290 to* reverse switch threads.
17. Fit seating to trunnion and secure with circlip.
18. Fit trunnion to shaft and apply Loctite to retaining screw threads.
19. Fit reverse gear plunger and original shims.
20. Fit fifth gear stud stop and locknut.
21. Fit new bucket plug with Hylomar PL 32.
22. Fit gear selector housing to remote housing.

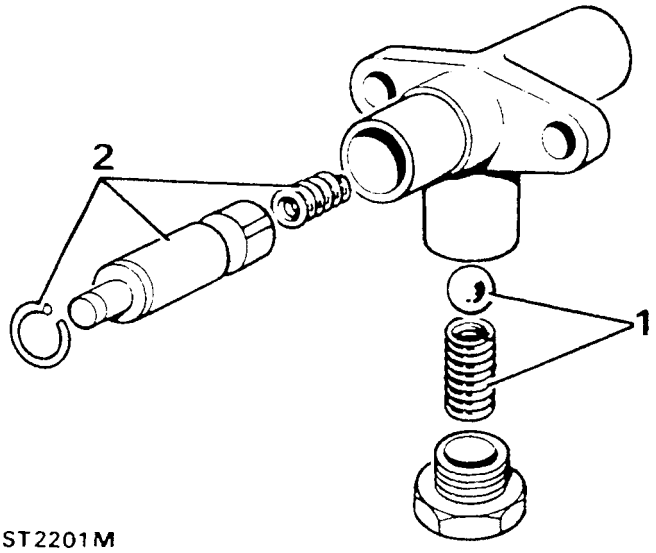
GEAR SELECTOR HOUSING



1. Gear selector housing
2. Gasket
3. Roll pin
4. Bias spring
5. Gear lever retaining screw and washer
6. Selector housing screws
7. Gear lever
8. Nylon pad and spring
9. Gear lever extension
10. Remote housing
11. Gasket
12. Fifth gear spool guide
13. Fifth gear stop screw and lock nut
14. Reverse gear plunger
15. Gear lever seating
16. Trunnion
17. Circlip
18. Trunnion retaining screw
19. 'O' ring
20. Selector shaft
21. Quadrant
22. Roll pin
23. Rollers
24. Pin
25. Blanking plug

Reverse gear plunger assembly.

1. Remove plug spring and ball.
2. Remove circlip to release plunger and spring.
3. Clean and examine components.
4. Assemble plunger and spring with multi-purpose grease and secure with circlip.
5. Lubricate and fit detent ball and spring with light oil. Apply Loctite 290 to plug threads and fit.
6. Check that plunger returns when depressed.



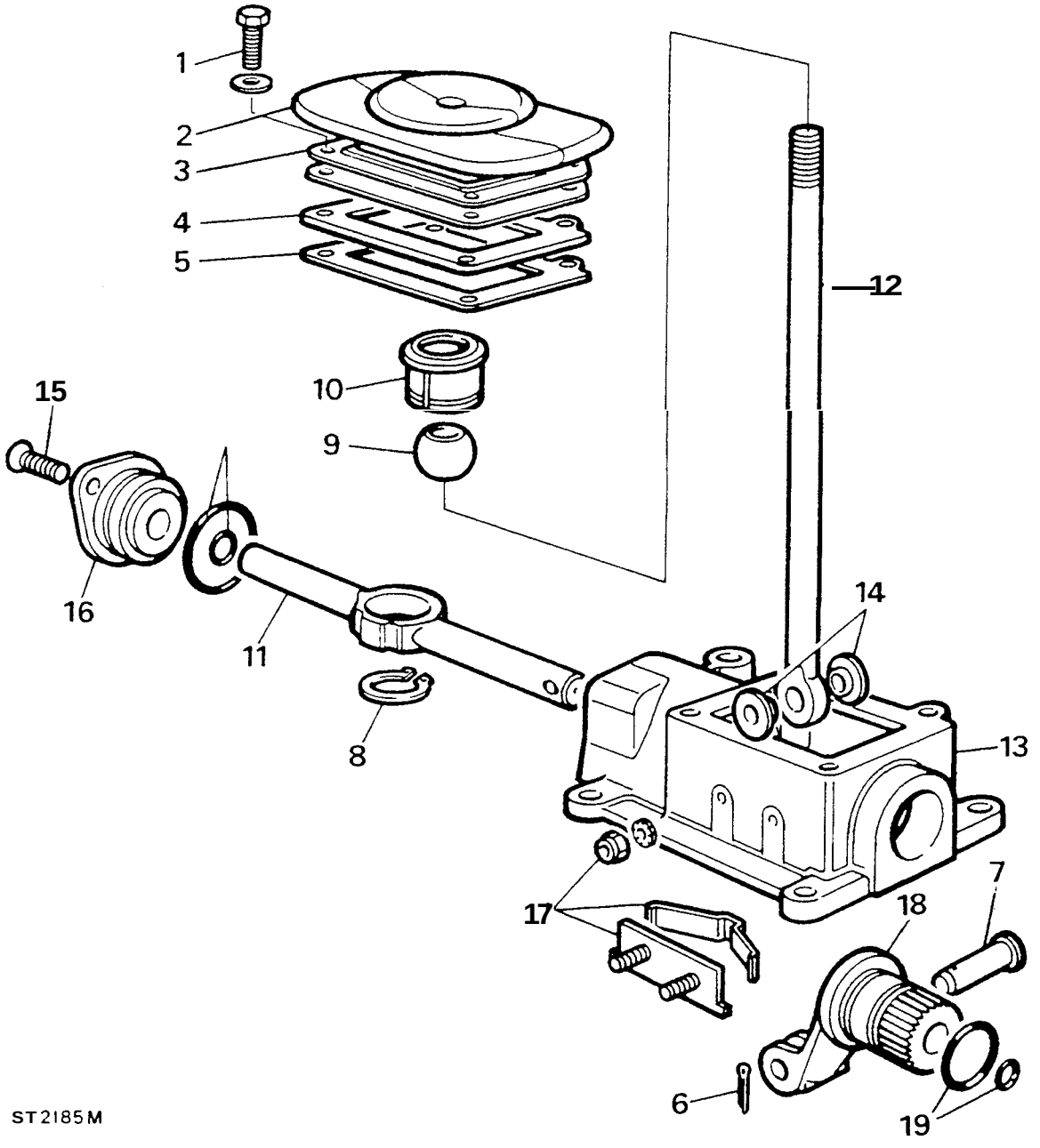
ST2201M

Transfer gear housing.

1. Remove the four screws and remove gaiter assembly.
2. Disconnect the gear lever from selector fork.
3. Retrieve the non metallic bushes.
4. Remove circlip to release ball and seat and withdraw gear lever.
5. Remove screws from end cover *to* withdraw cover and cross shaft.
6. Remove selector fork.
7. Remove detent spring and plate.
8. Clean and examine ail parts and renew where necessary.

NOTE: Assemble the housing using multi-purpose grease on all moving parts.

9. Fit internal and external "O" rings to fork assembly.
10. Fit detent spring.
11. Fit "O" rings to end cover and fit to short end of cross shaft.
12. Insert shaft into fork and secure end cover with screws.
13. Fit Nylon seat, groove downwards, to gear lever.
14. Fit gear lever and seat to cross shaft and secure with circlip.
15. Fit bushes to gear lever and secure with clevis pin and split pin.



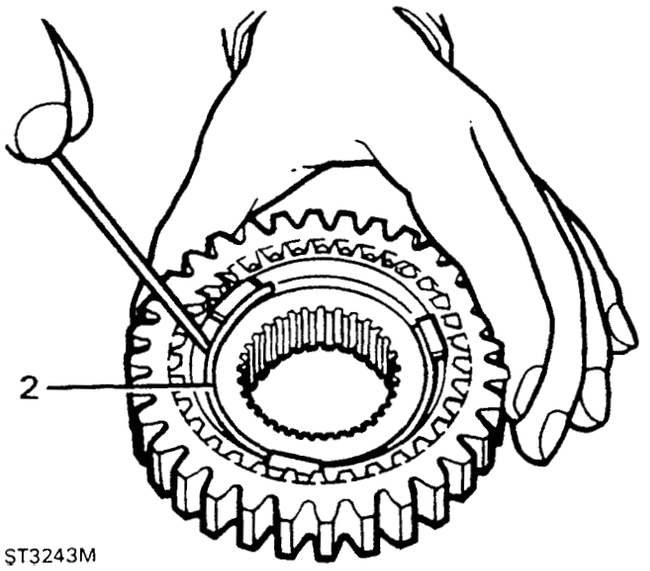
1. Gaiter retaining screw - 4 *off,*
2. Gaiter.
3. Gaiter support plate.
4. Gate plate.
5. Gasket.
6. Split pin.
7. Clivis pin.
8. Circlip retaining Nylon seat.
9. Gear lever ball.
10. Nylon seat.
11. Cross shaft.
12. Gear lever.
13. Gear change housing.
14. Non-mettalic bushes.
15. Counter sunk screws.
16. End cover.
17. Detent spring and plate.
18. Selector fork.
19. "O" rings.

SYNCHROMESH ASSEMBLIES

Third-fourth and fifth gear synchromesh.

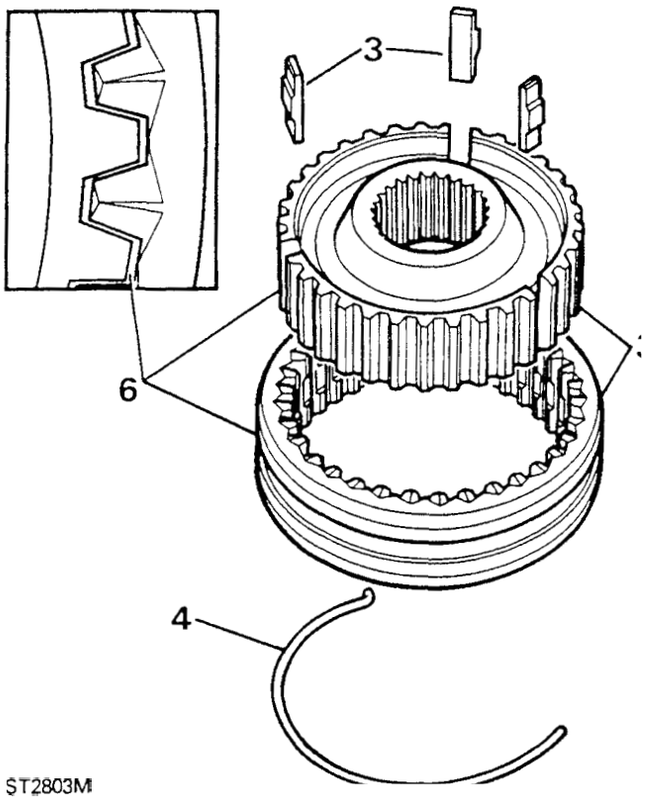
NOTE: the above assemblies are the same except that fifth gear synchromesh has a retainer plate.

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



ST3243M

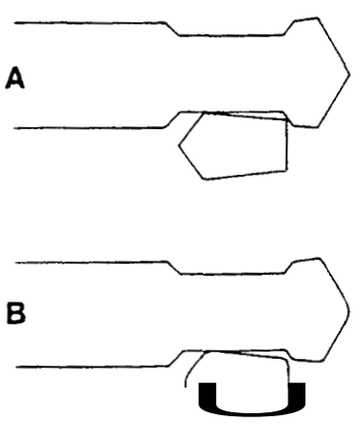
3. Remove slippers and separate the two members.
4. Examine all parts for damage and wear including wire clips for tension.
5. Check no radial movement exists between inner members and mainshaft splines. (except fifth gear synchromesh).
6. Examine inner and outer splines for wear.



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.

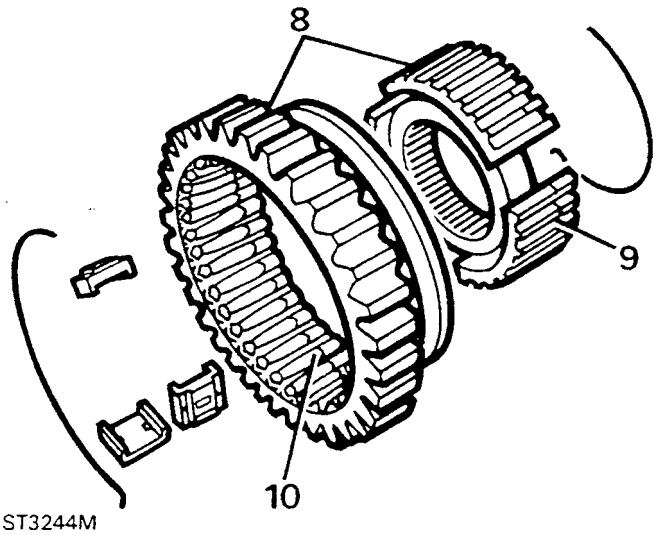


ST2449M

First-second synchromesh

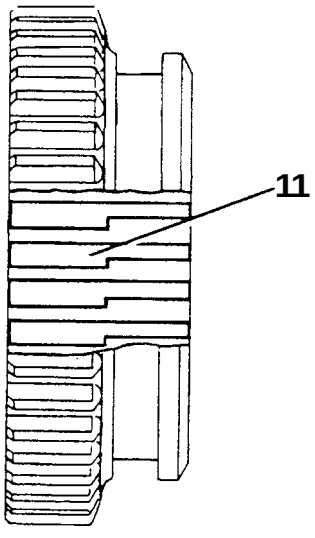
8. Repeat instructions 1 to 6 for third-fourth synchromesh.
9. Examine step in each *of* outer splines.
10. Check that the step on both sides of the internal splines are sharp not rounded.

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



ST3244M

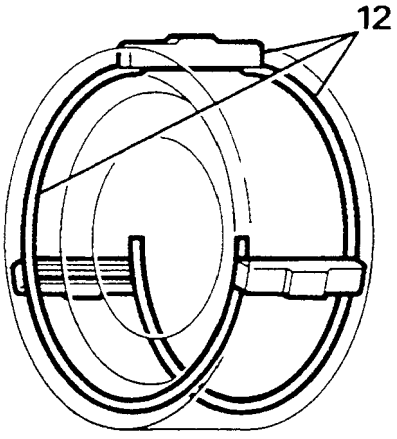
11. Fit inner member to outer so that the wide splines of inner member are under the spur gear teeth.



ST3247M

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

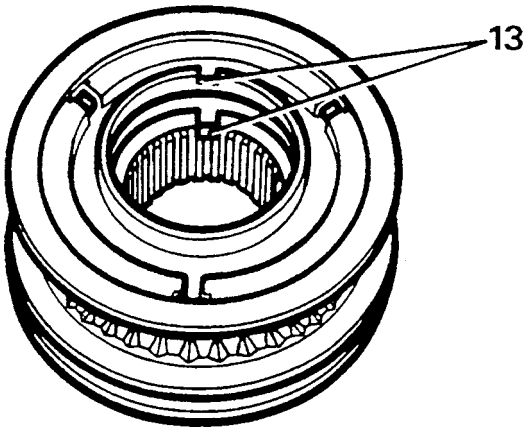
△ NOTE: The hooked end of each spring must locate in the same slipper with the free ends running in opposite directions and resting against the remaining slippers.



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.

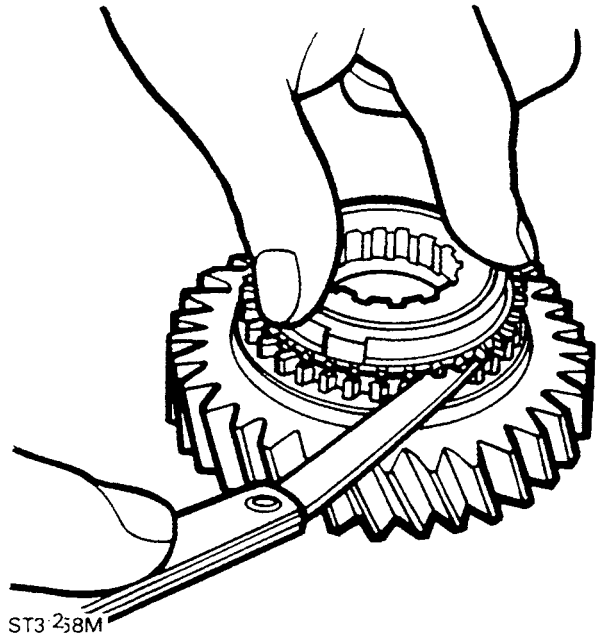


ST3276M

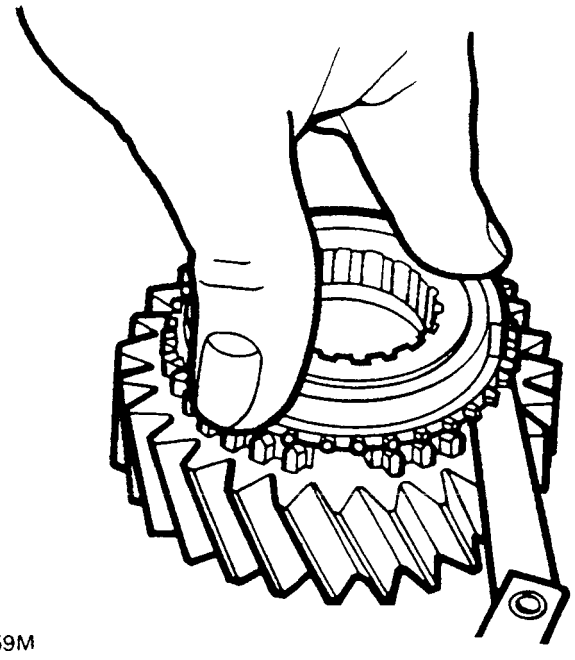
CHECKING BAULK RING CLEARANCES

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 (0.015in).

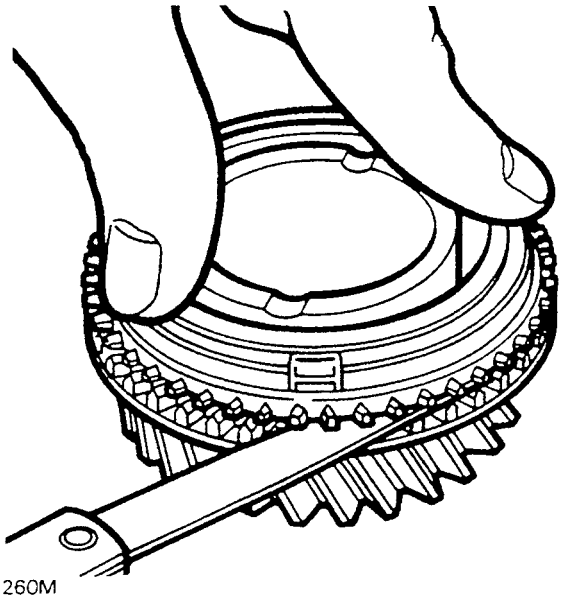
First gear



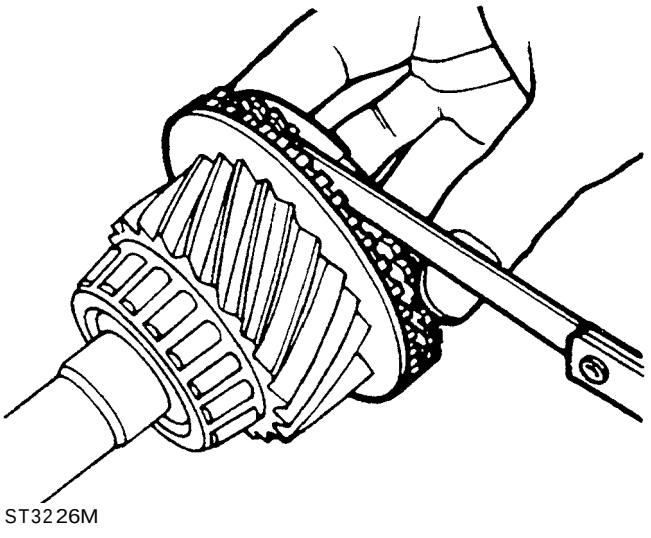
second gear



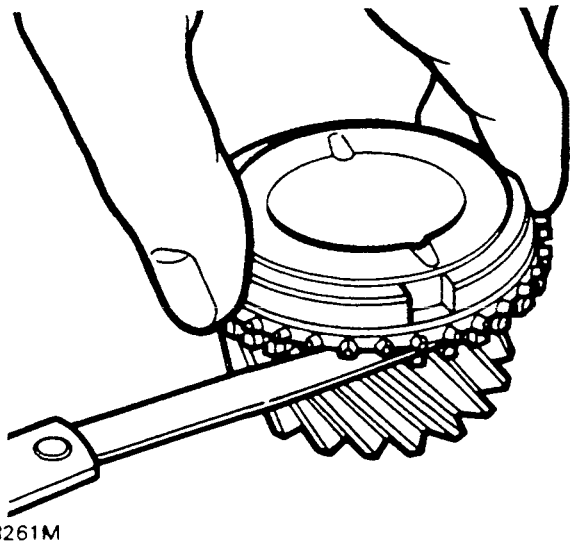
Third gear



Fourth gear

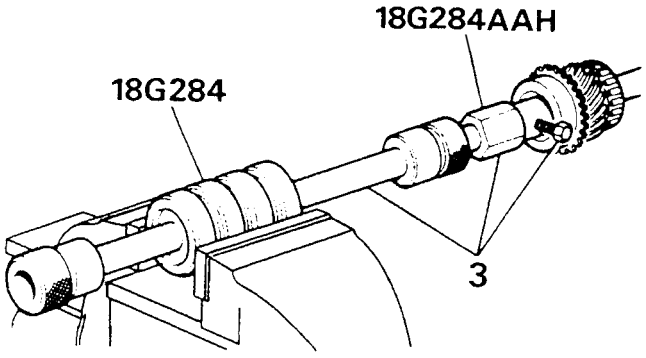


Fifth gear



INPUT SHAFT

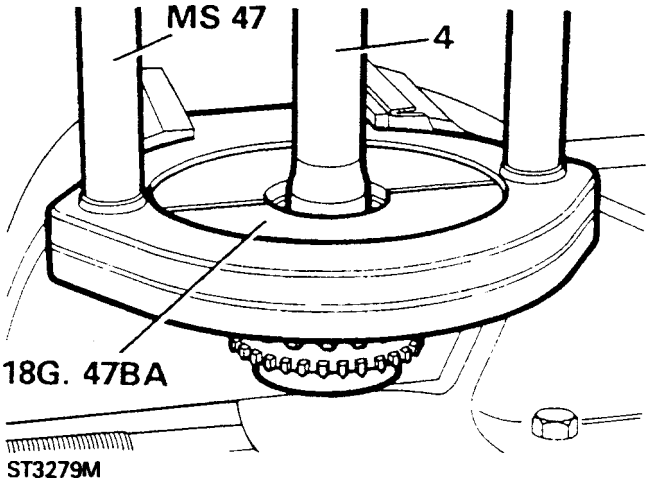
1. Examine the gear and dog teeth for wear and damage.
2. Polish oil seal track if necessary.
3. Using **18G 284** AAH and **18G 284** remove pilot bearing track.



ST3278M

4. Using **18G 47BA** and MS **47** remove taper bearing.

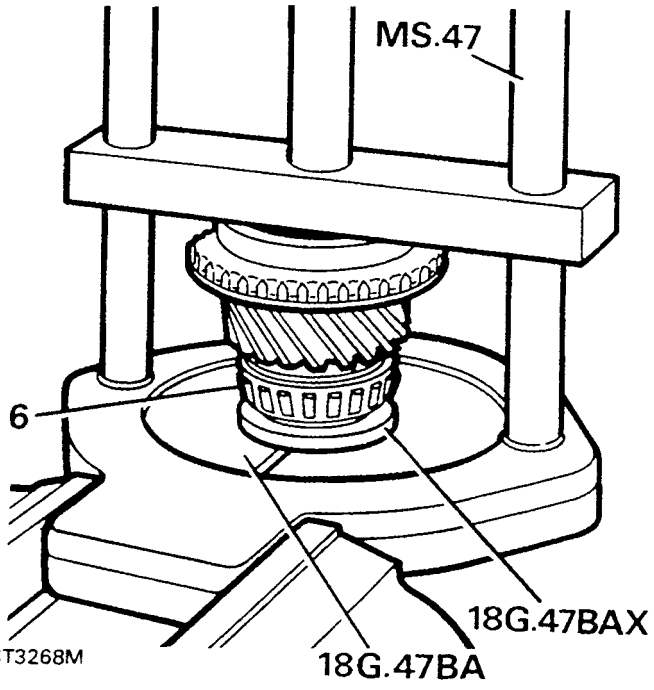
△ **NOTE: ensure that the bearing is supported by the lip inside 18G 47 BA.**



ST3279M

5. Support the shaft under MS **47** and press in a new track.

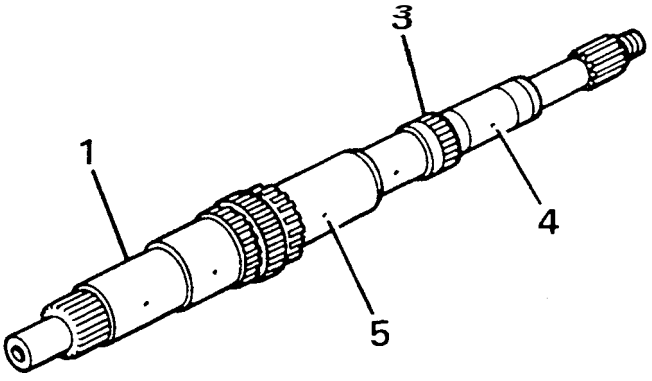
6. Using Press **MS 47,** Collets **18G 478** and adaptor **18G 47** BAX fit a new taper bearing.



ST3268M

MAINSHAFT

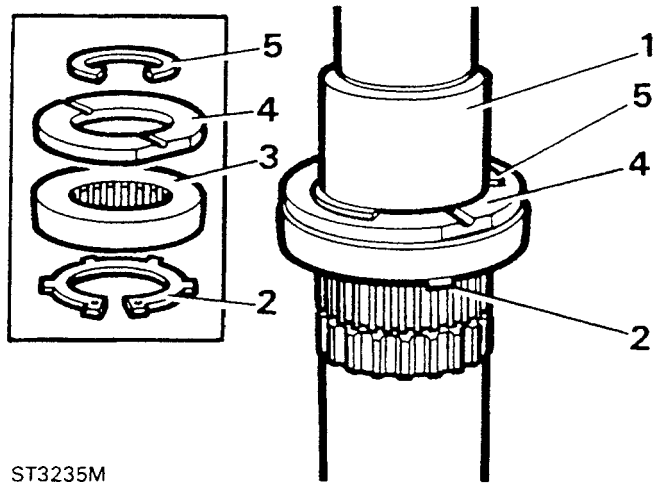
1. Examine bearing journals for wear and scores.
2. Check condition of circlip grooves.
3. Examine splines for wear and damage.
4. Use an air line to check that the main oil feed from the pump is clear and feed *to* spigot bearing.
5. Check oil feed holes to roller bearings are clear.



ST3241M

MAINSHAFT GEAR END FLOAT CHECKS

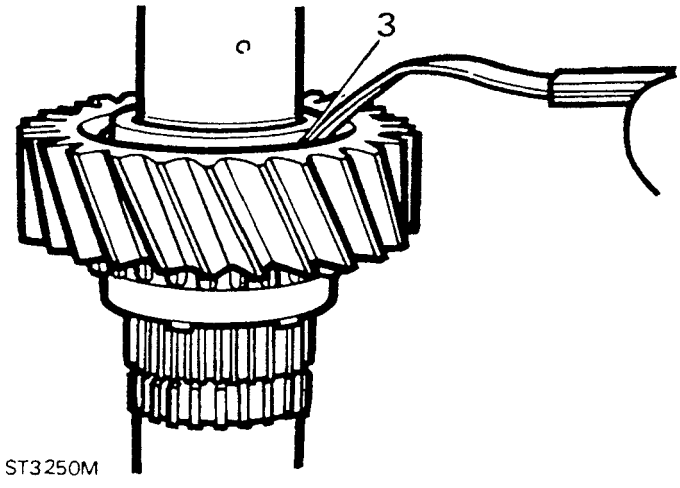
1. Hold mainshaft in vice front end downwards.
2. Fit front circlip for first-second synchromesh.
3. Fit second gear cone.
4. Fit spacer.
5. Fit snap ring.



ST3235M

Second gear end-float.

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

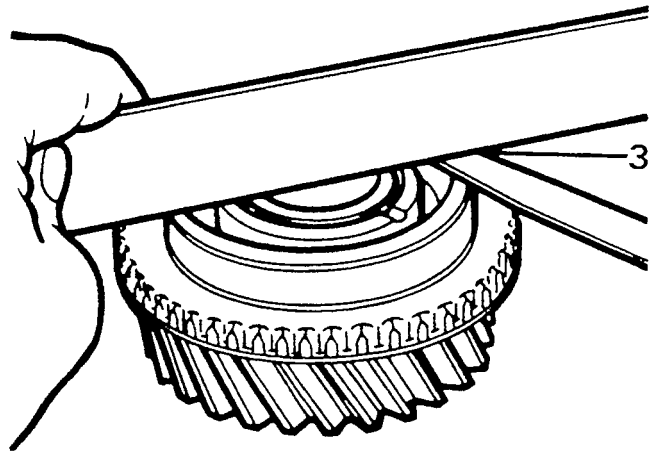


ST3250M

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

Third gear end-float.

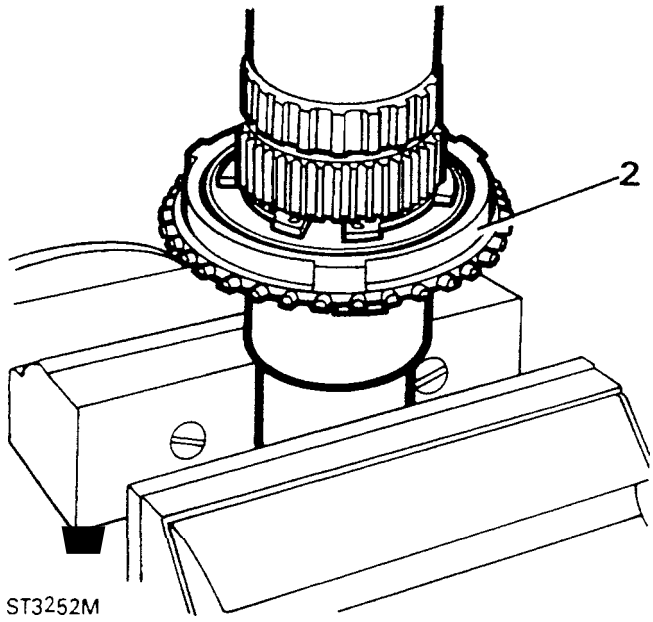
1. Fit needle roller *to* third gear.
2. fit third gear bush *to* third gear.
3. Place gear on flat surface, bush flange downwards, and with a straight edge across gear check clearance between straight edge and gear. Not to exceed 0,20 (0.008in).



ST3251M

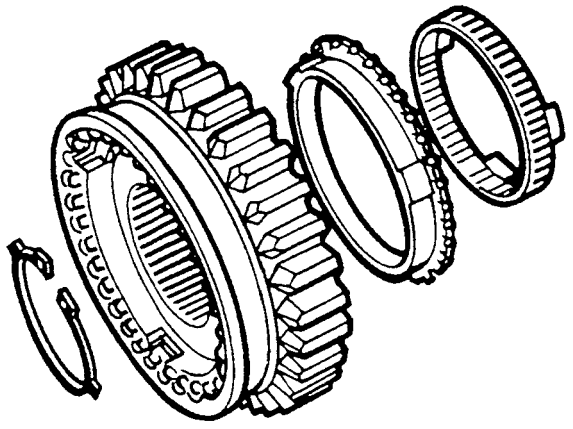
First gear bush end-float.

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



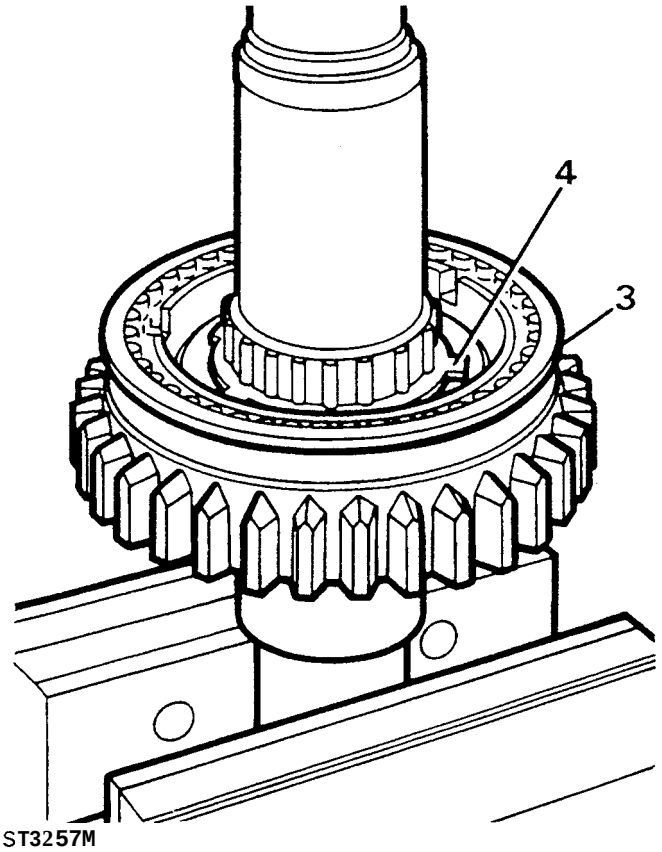
ST3252M

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



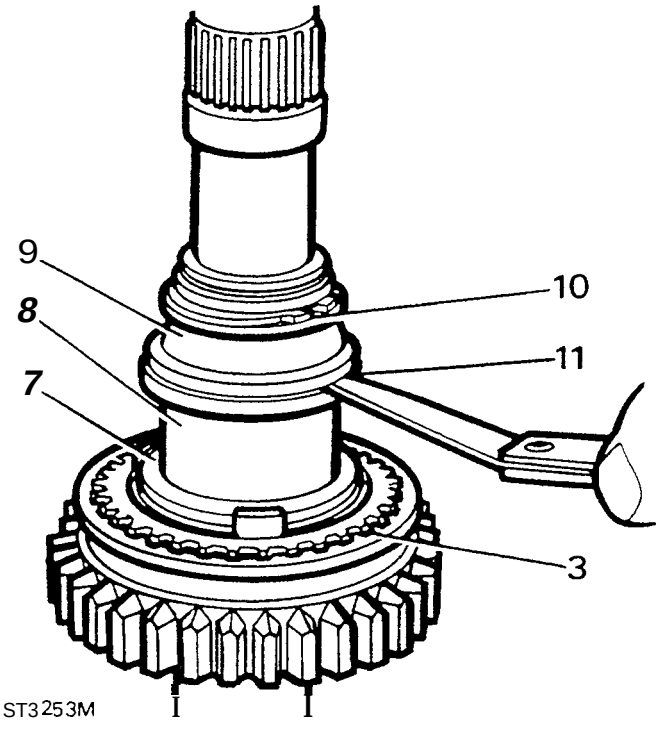
ST3231M

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 (0.003in).
12. Remove circlip, dummy bearing and bush.



ST3253M

Selective first gear bush

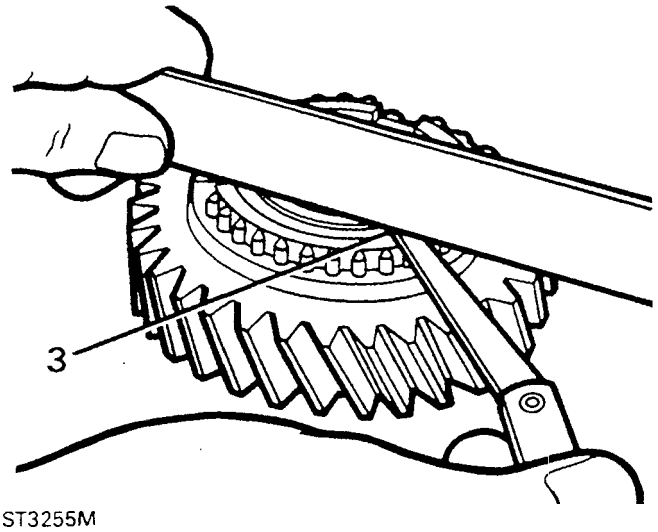
Part number	Thickness
FTC2005	30,905/30,955
FTC2006	30,955131,005
FTC2007	31,005131,055
FTC2008	31,055/31,105
FTC2009	31,105/31,155

Check first gear to bush end-float.

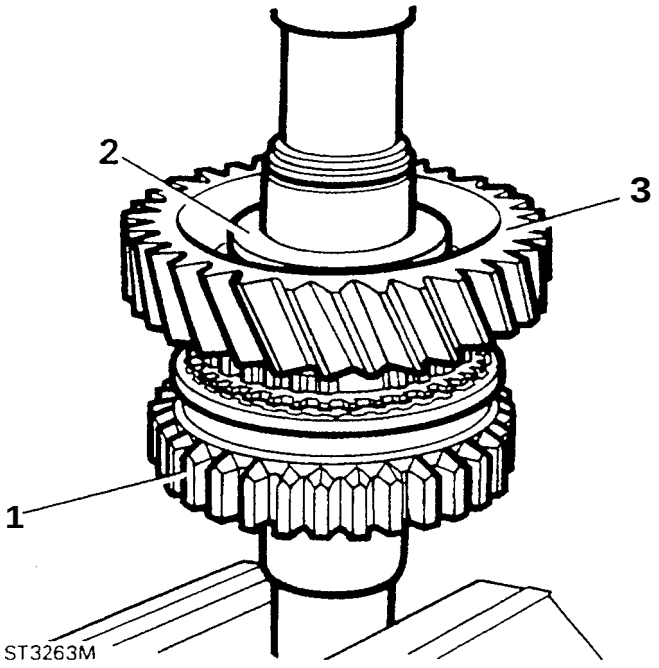
1. Fit roller bearing and bush to first gear.
2. Place bush flange side downwards on a raised block on a flat surface.

△ **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 (0.008in).



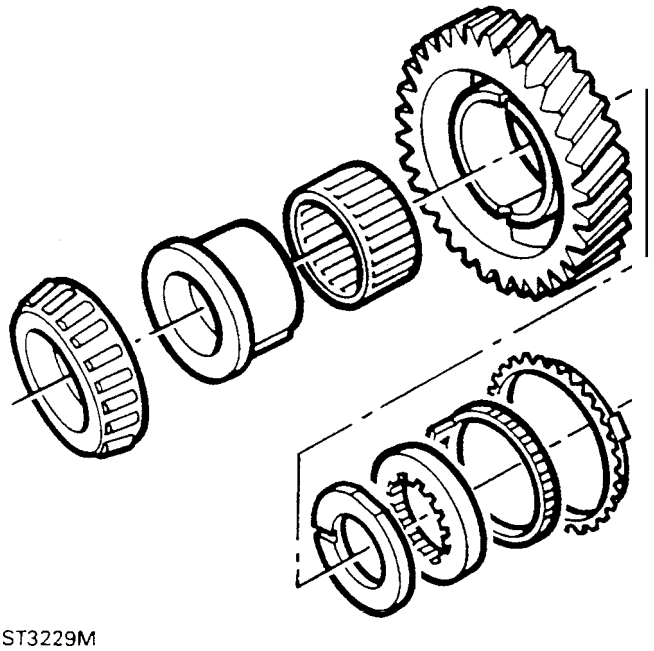
ST3255M



ST3263M

ASSEMBLING MAINSHAFT

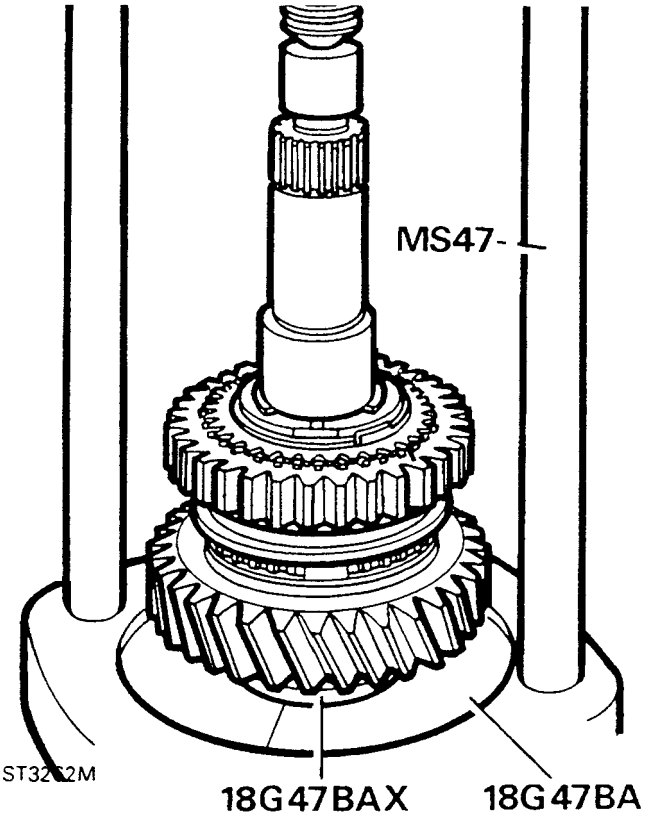
1. With the first-second synchromesh hub and spacer in position, assemble the rear end of the shaft.
2. Fit the roller bearing and bush to first gear.
3. Fit first gear to mainshaft.



ST3229M

First gear assembly

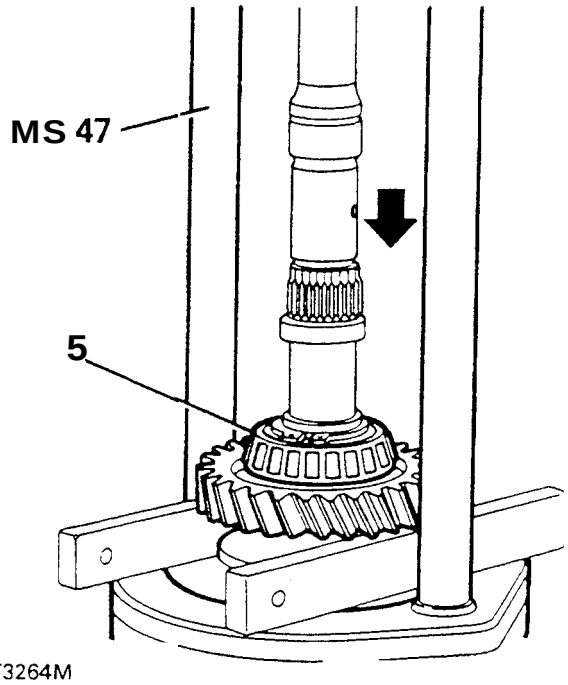
4. Fit the taper bearing to mainshaft using MS 47, collets 18G 47 BA and adaptor 18G 47 BAX.



ST3262M

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

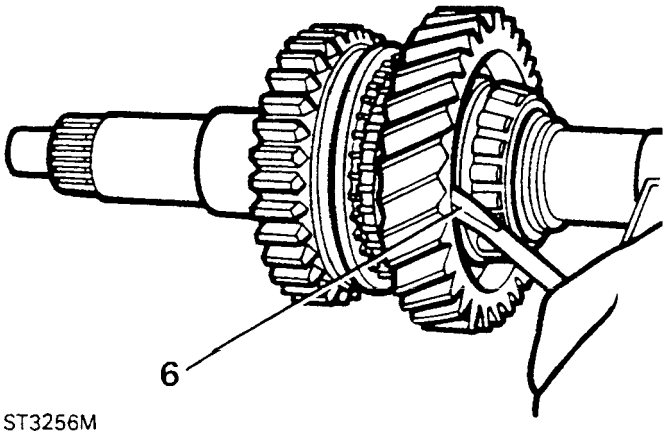
5. Invert mainshaft and press assembly back against circlip.



ST3264M

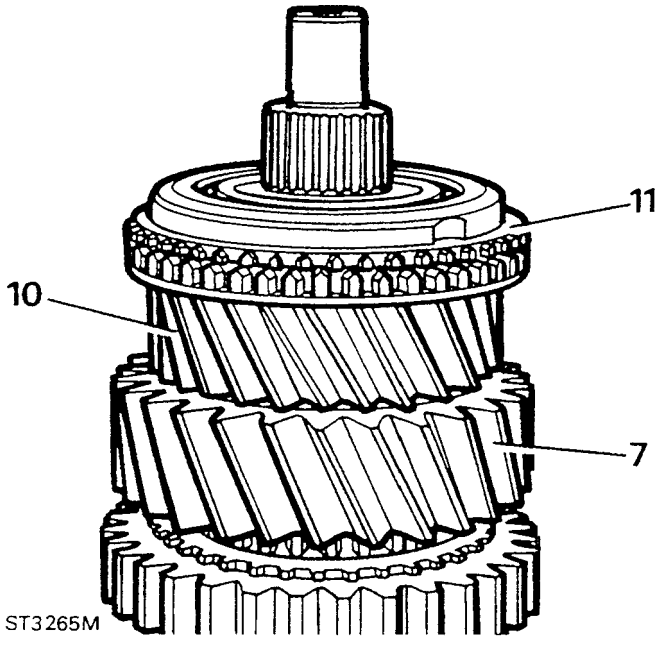
NOTE: Instruction *5* is necessary since it is probable that when pressing on the bearing it will have clamped the first gear bush preventing it from turning.

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

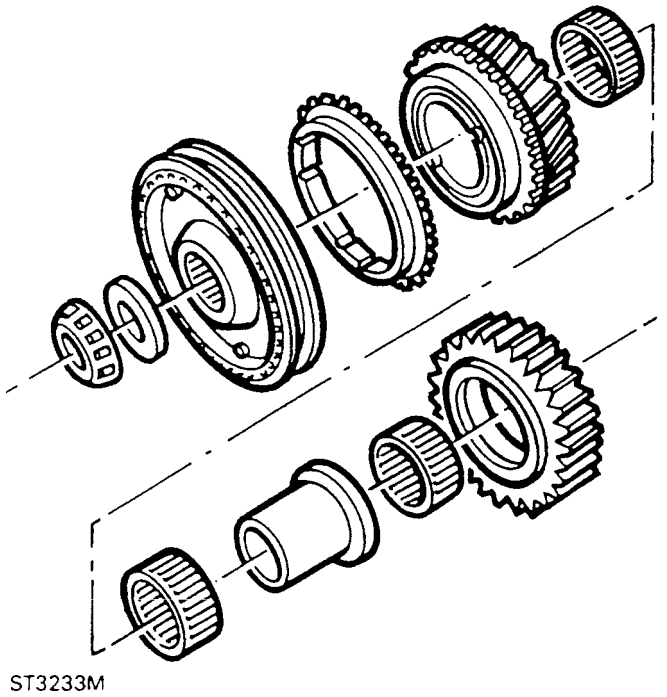


ST3256M

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.

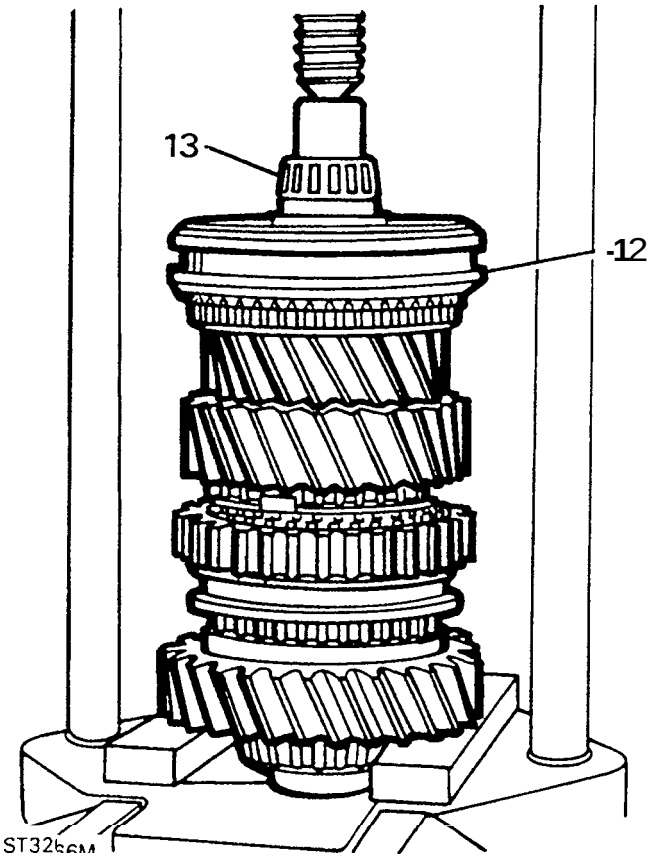


ST3265M



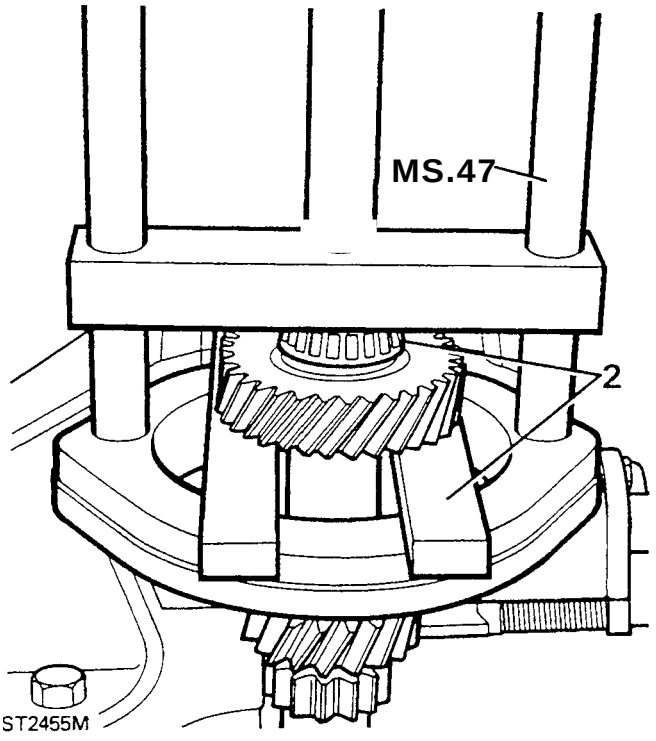
Third-fourth synchomesh assembly

12. Fit third-fourth gear synchromesh hub.
13. Using MS 47 with supports under first gear, press the spigot bearing on to shaft.



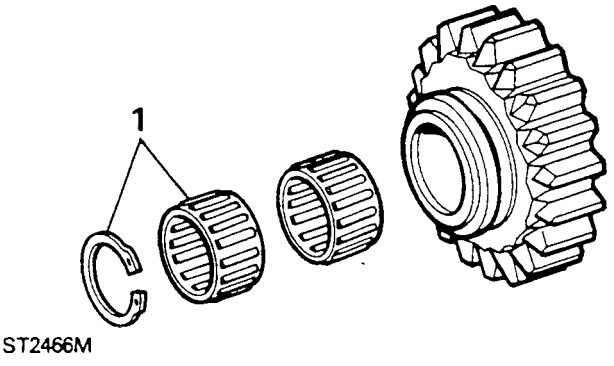
LAYSHAFT

1. Examine the layshaft for wear and damage.
2. Press bearings on to layshaft using MS 47 and supporting bars.

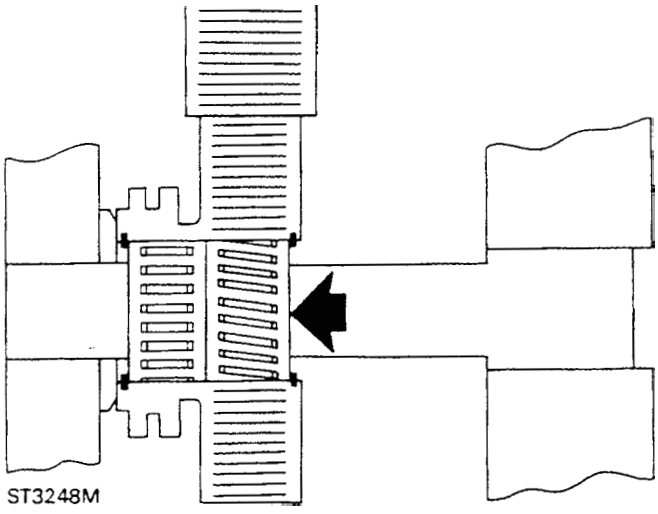


REVERSE GEAR AND SHAFT

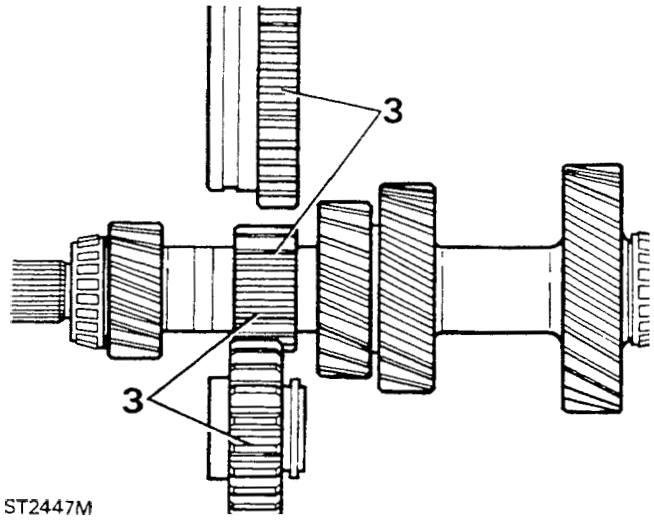
1. Remove one circlip from the idler gear and remove bearings.



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.



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.



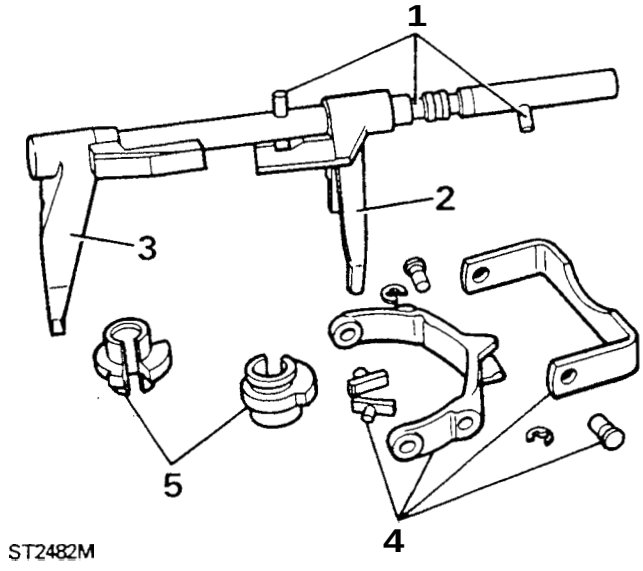
4. Examine idler shaft for wear, scores and pitting.

SELECTORS

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

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

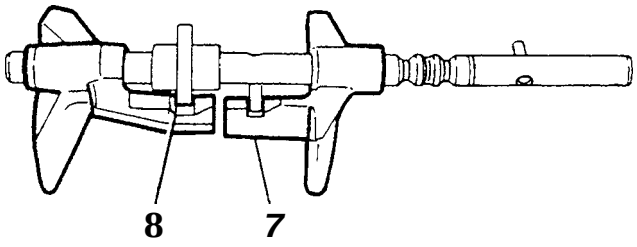
3. Examine third-fourth selector fork for wear, cracks and damage.
4. Examine fifth gear selector fork, pads and pivot pins.
5. Examine interlock spools for wear and damage.



6. Renew retaining circlips if distorted.

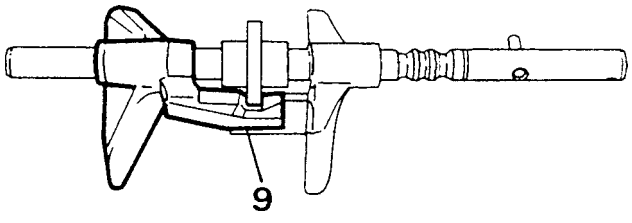
Assembling selectors.

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.



ST2488M

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.

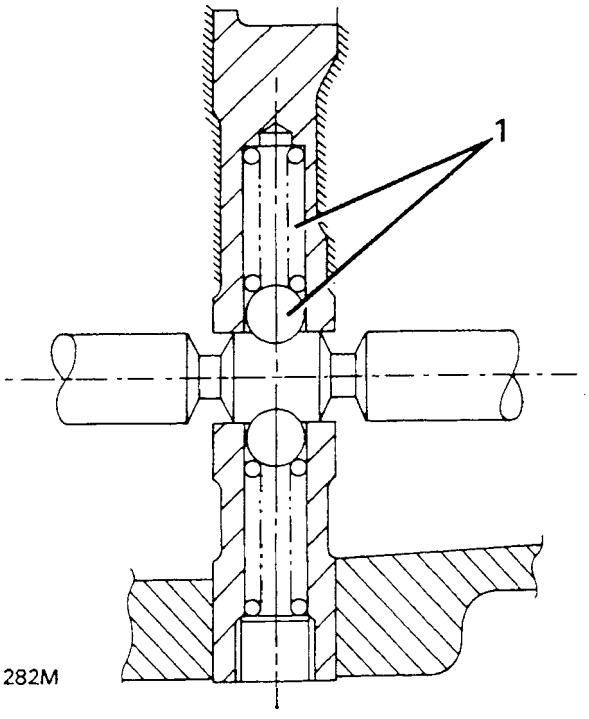


ST2487M

ASSEMBLING GEARBOX SHAFTS TO CENTRE PLATE

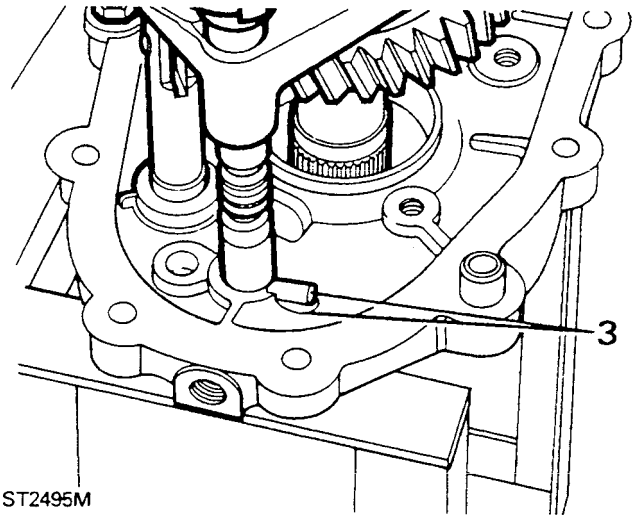
Fitting gears to centre plate

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



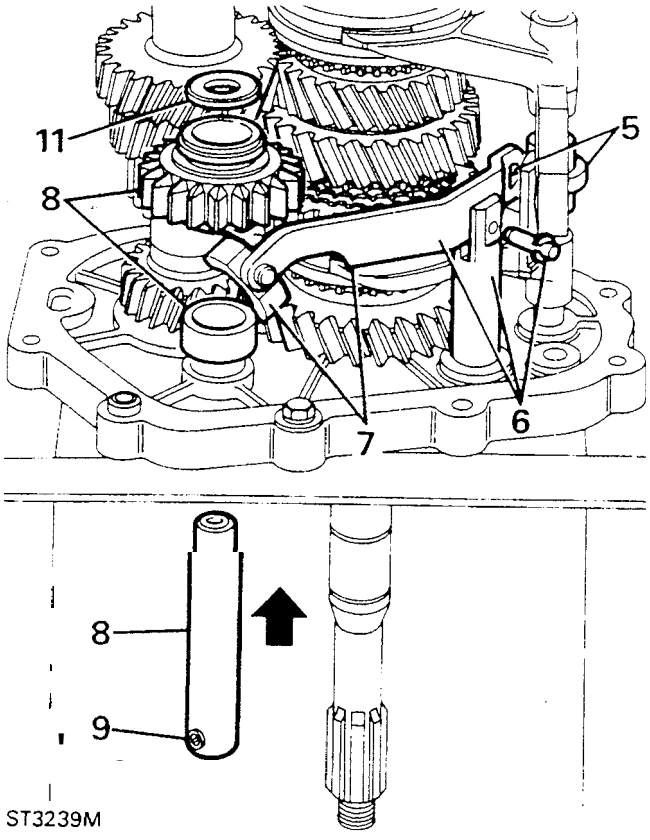
ST3282M

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.



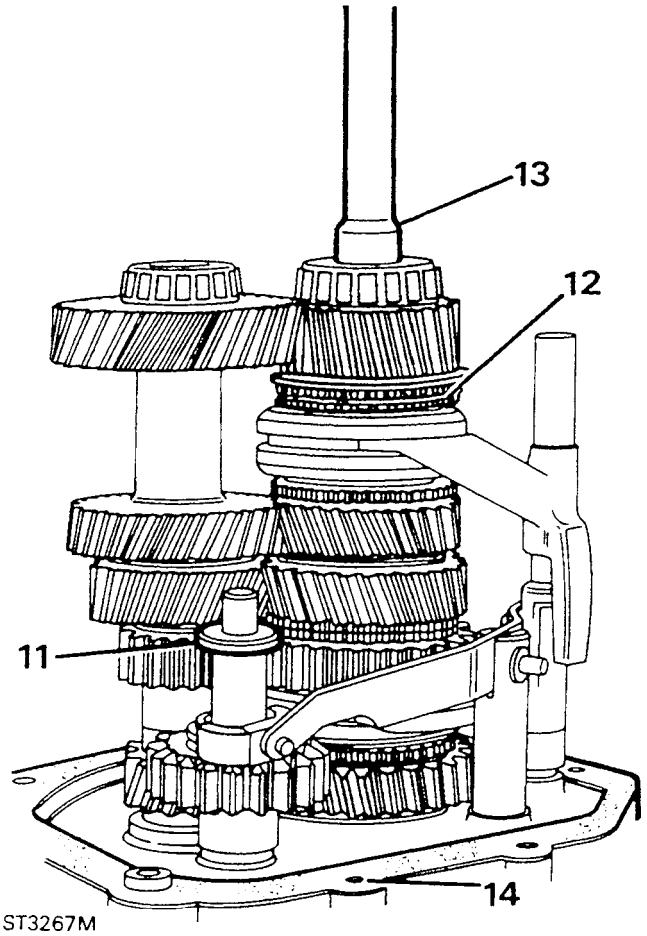
ST2495M

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.
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.

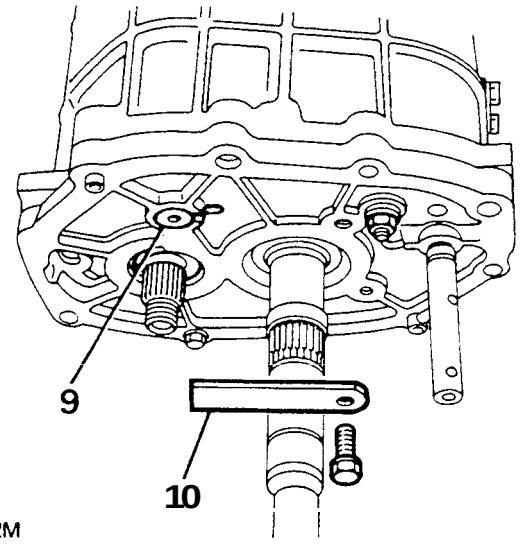


ST3239M

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.



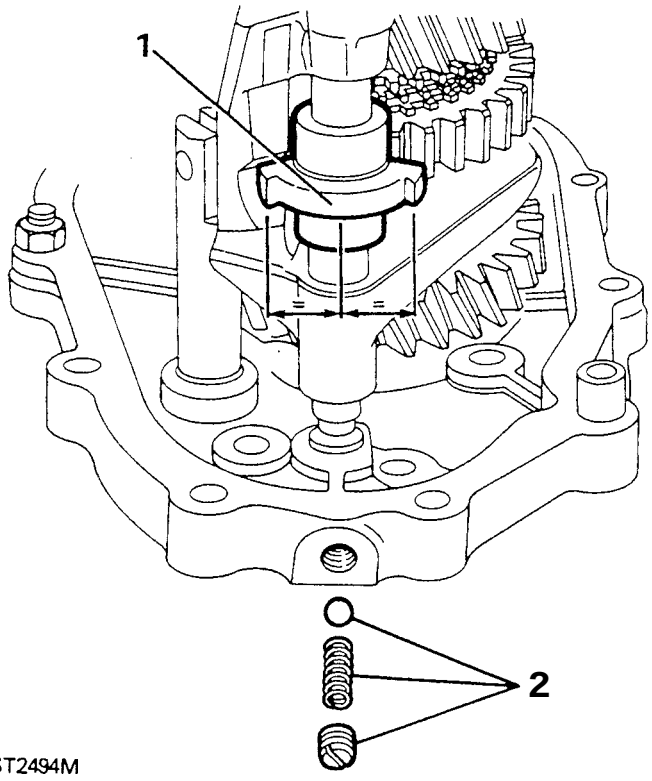
ST3267M



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.

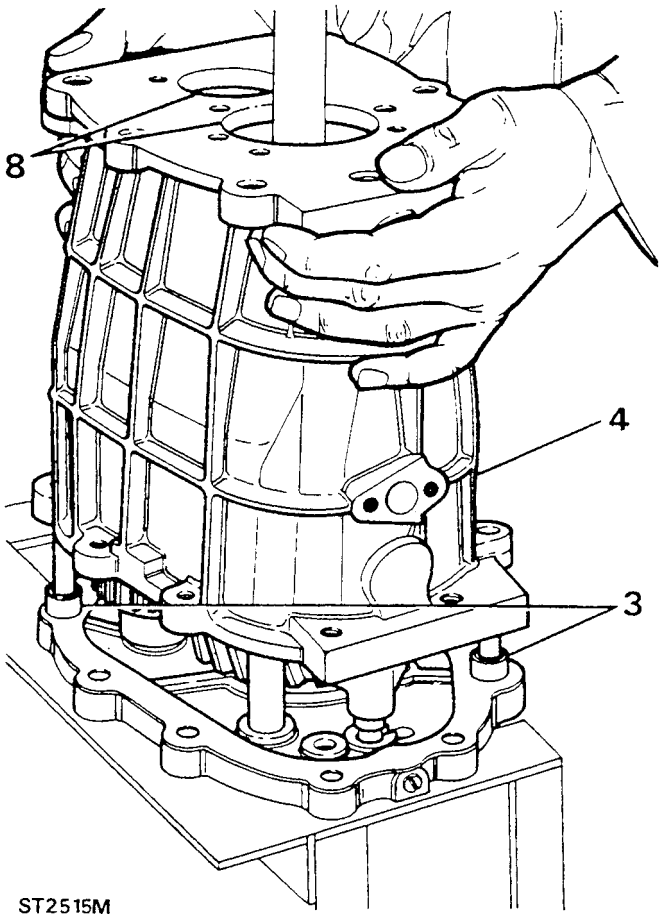


ST2494M

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.

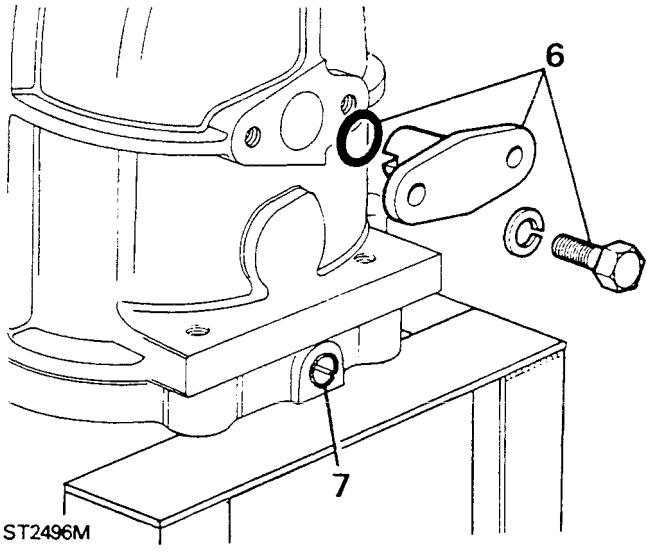
5. Secure centre plate and gearcase to workstand with two 8 x 35mm bolts.
6. Apply PL *32* to joint face and bolt threads and fit spool retainer.



ST2515M

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.

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

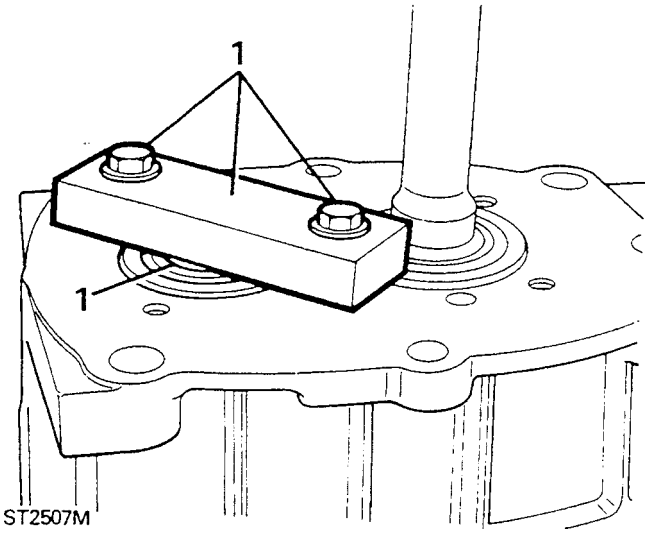


ST2496M

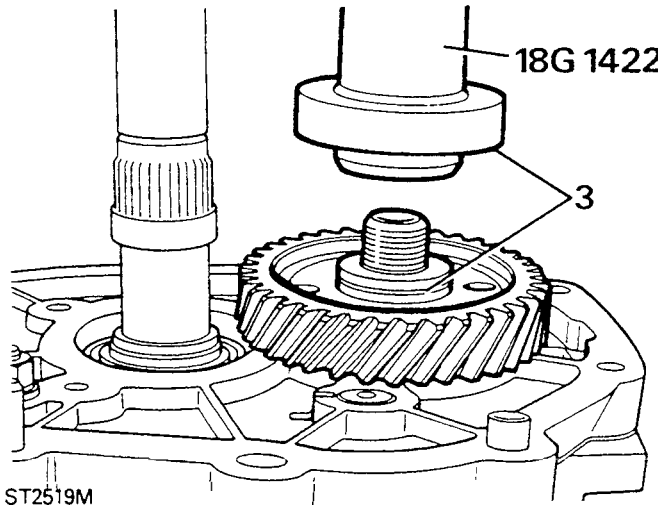
FITTING FIFTH GEAR

CAUTION: Since the fifth gear is a tight fit on the layshaft, the force, when pressing the gear, must not be transfered 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.

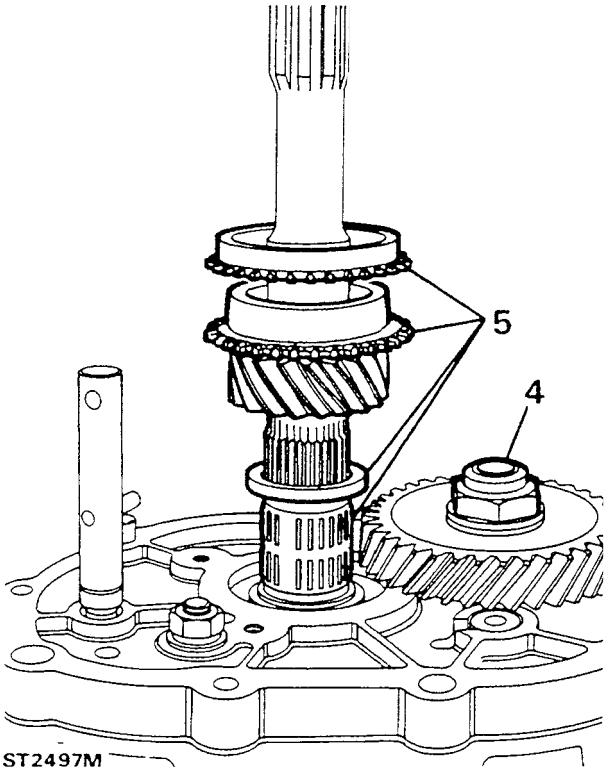
1. Secure the plate with two 8x25mm bolts. Insert disc between plate and layshaft.



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

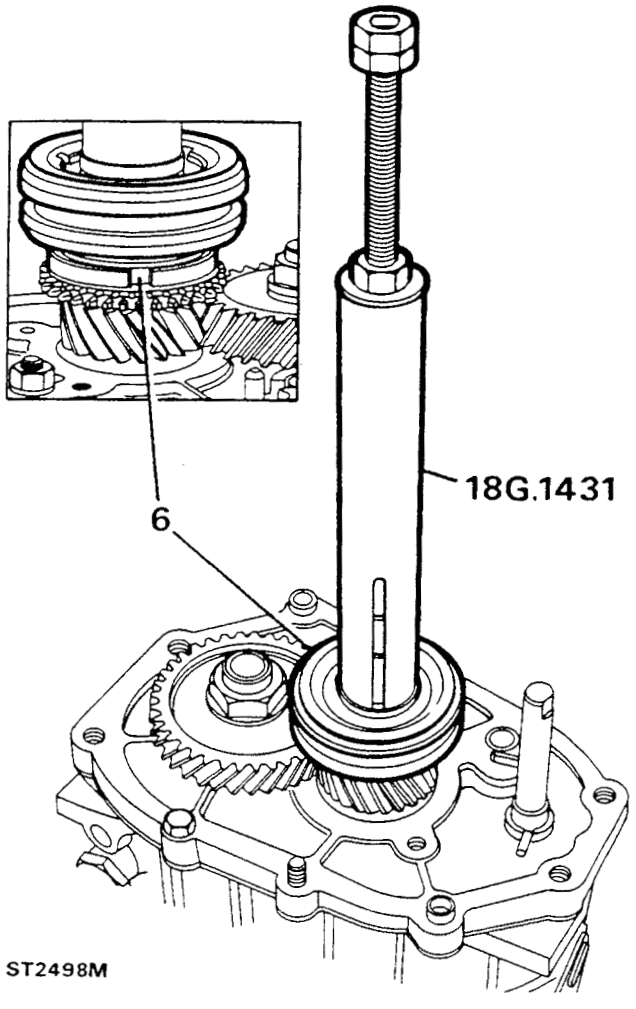


4. Fit a new stake nut but do not tighten.
5. Fit fifth gear assembly to mainshaft.



6. Press fifth gear synchromesh assembly to mainshaft using 18G 1431.

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

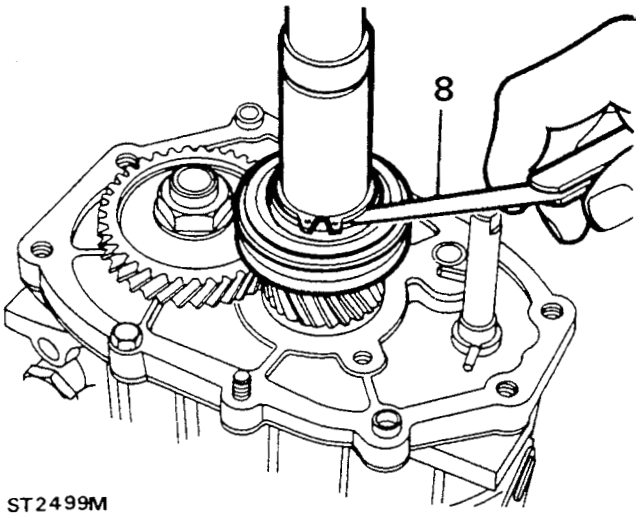


ST2498M

NOTE: Only limited movement of the synchromesh inner member on the main-shaft is permissable. The maximum clearance is 0,005mm to 0,055mm (0.0002in) to (0.002in and to achieve this the following selective washers are available.

Part number	Thickness
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,

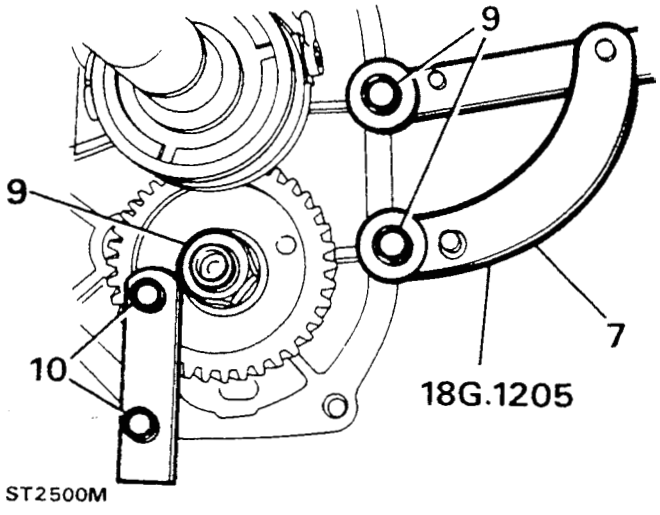


ST2499M

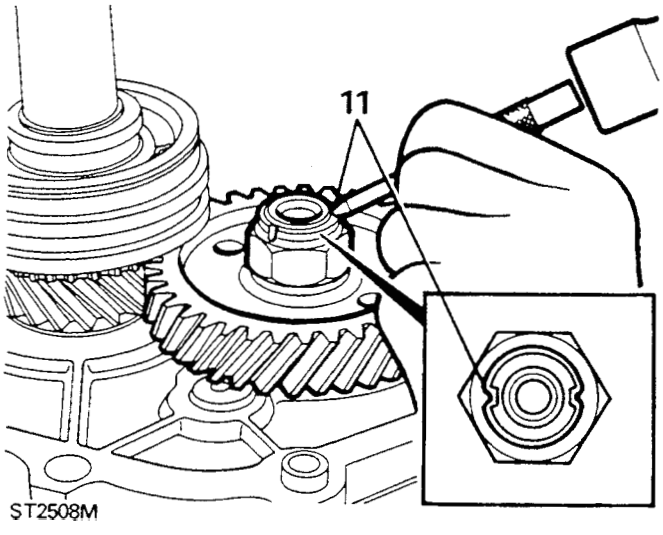
9. Tighten layshaft stake nut using 18G 1205.

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.

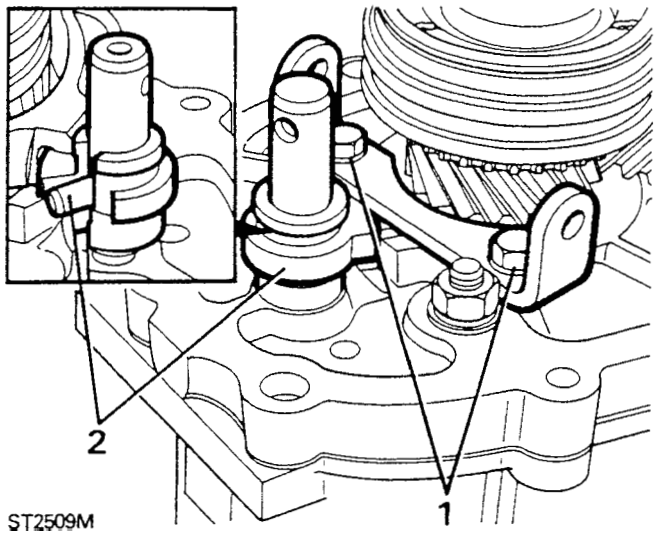


11. Using a round nose punch, form the collar into the layshaft slots.



FIFTH GEAR SELECTOR FORK ASSEMBLY

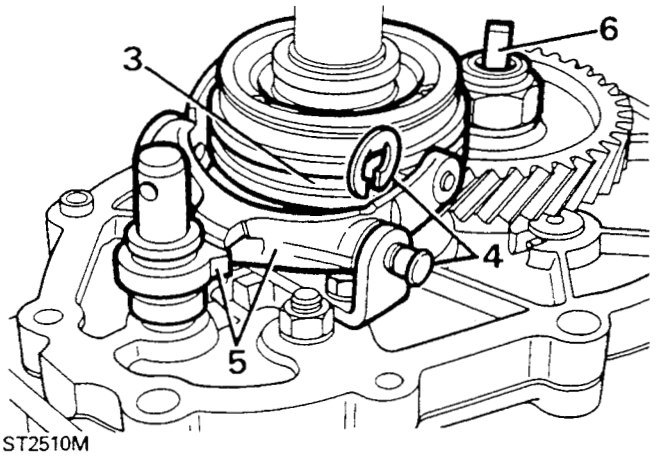
1. Fit fifth gear selector fork bracket.
2. Fit the fifth gear spool long end towards centre plate.



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.



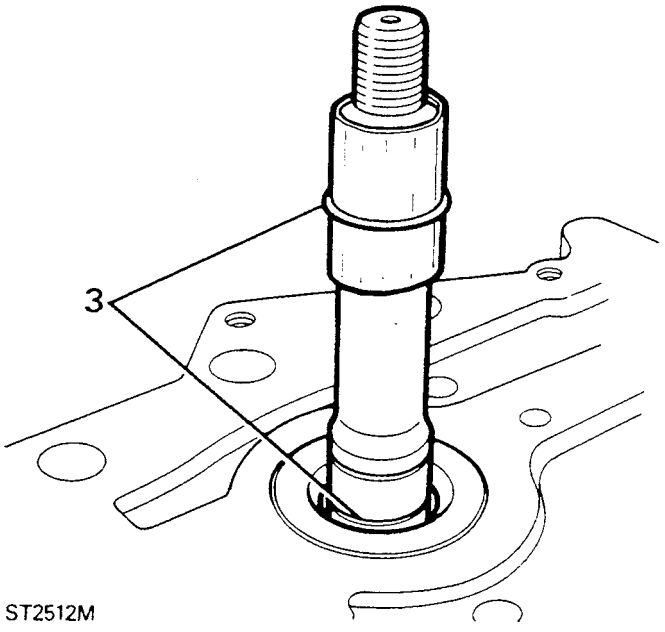
EXTENSION CASE

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.

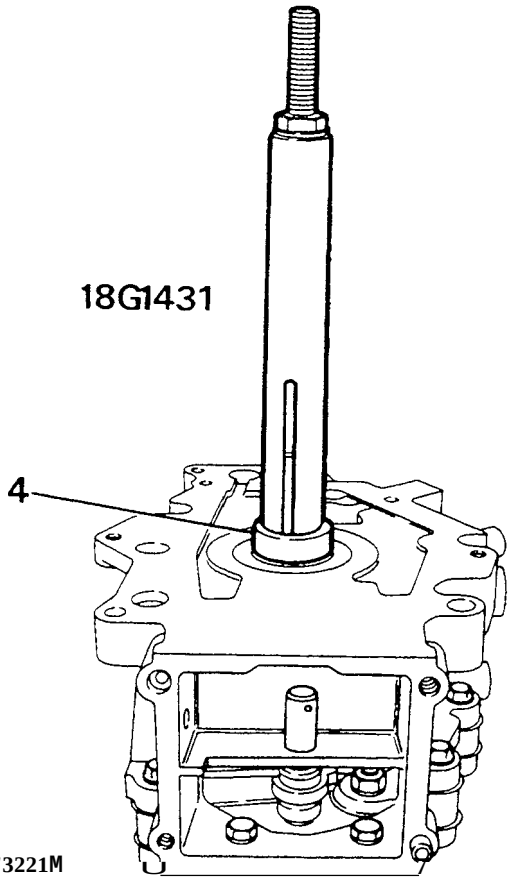
CAUTION: To protect "O" ring while fitting, cover mainshaft splines with smooth tape.

3. Fit "O" ring to mainshaft groove.



ST2512M

4. Fit "O" ring collar to mainshaft using 18G 1431



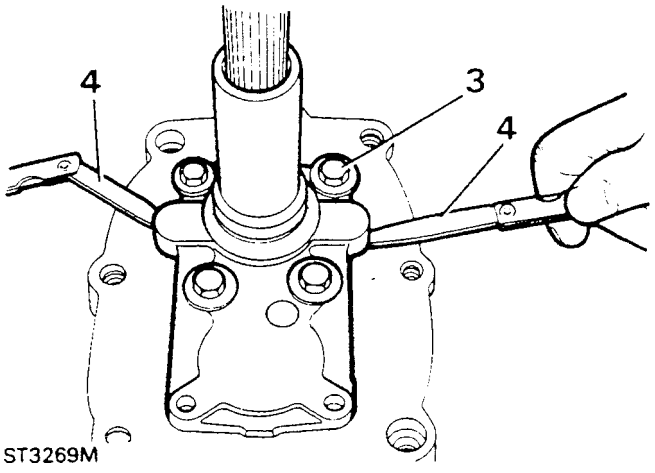
ST'3221M

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.



ST3269M

5. If required, change the selective washer to provide a clearance of 0,35mm to 0,085mm (0.001 to 0.003ins) 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 (0.0025in) end float.

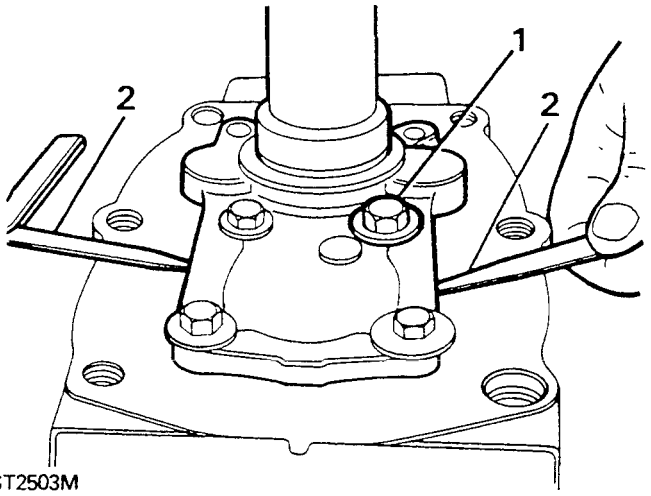
6. Remove front cover and keep gasket and selective washer together.

Mainshaft selective washers

Part number	Thickness(mm)
FRC 4327	1,51
FRC 4329	1,57
FRC 4331	!,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

LAYSHAFT BEARING ADJUSTMENT

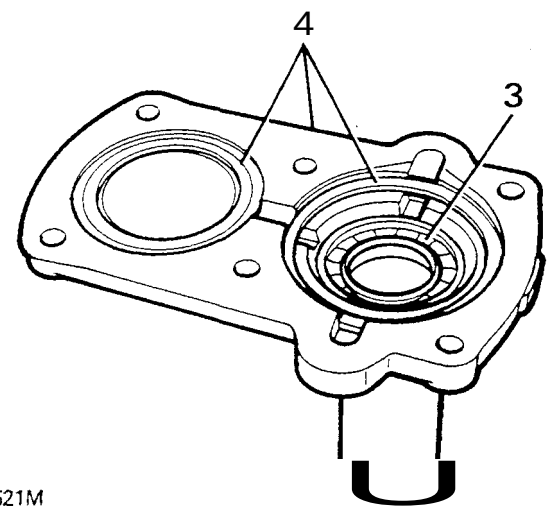
1. Place original selective washer on layshaft bearing, fit front cover without gasket, and finger tighten bolts.
2. Measure clearance, with two feeler gauges, between cover and gearcase. Select a shim that will provide a clearance equal to the thickness of the gasket that was selected and measured when 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 (0.001in) 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.

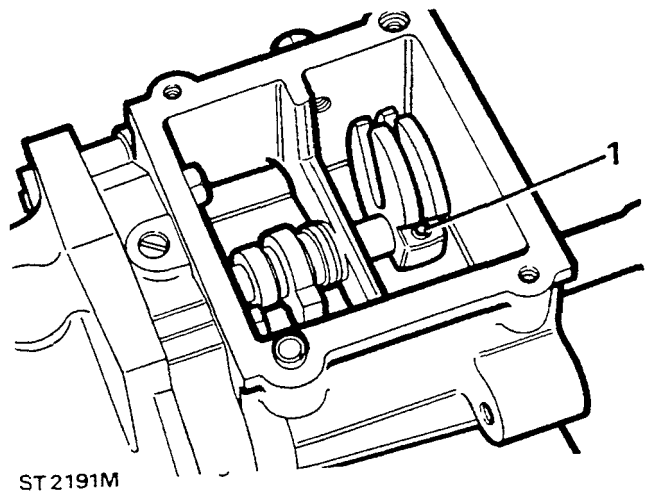
Layshaft selective washers.

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 LEVER AND REMOTE HOUSING ASSEMBLY

1. Fit quadrant to selector shaft with new roll pin.

NOTE: Push shaft forward, fit quadrant so ledge is to the left viewing box from rear. Return shaft to neutral position.



ST2191M

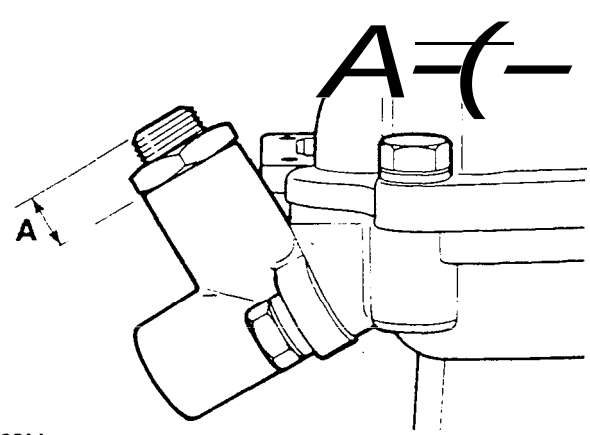
2. With a new gasket, fit remote housing locating over dowels.

NOTE: Ensure rollers locate in quadrant fork.

3. Fit transfer gear change housing.

Reverse gear plunger adjustment.

1. Fit plunger with original shims and tighten bolts.
2. Slacken locknut, turn adjuster screw so that dimension "A" is approximately 12 mm (0.50 in). Tighten locknut.



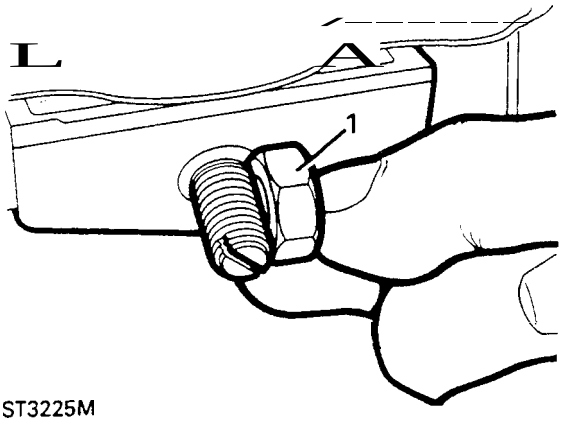
ST3223M

NOTE: If necessary, final adjustment can be made in vehicle. To increase pull-over load turn screw clockwise or anti-clockwise to reduce load.

Fifth gear stop screw adjustment.

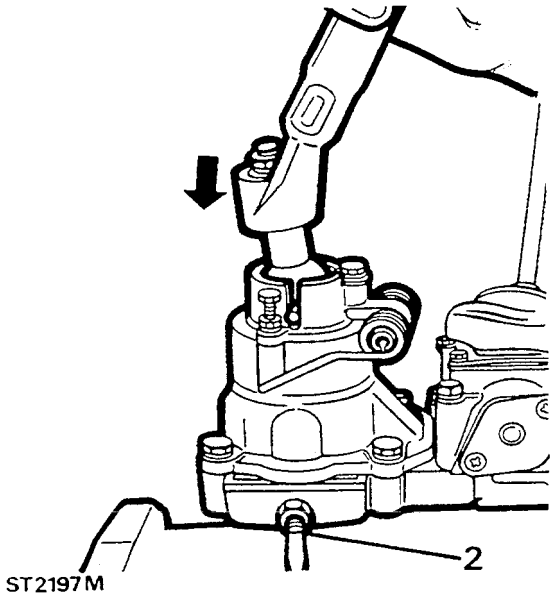
1. Adjust screw to protrude from housing the distance across corners of locknut.

NOTE: This is only an approximate setting which will limit travel of selector yoke but will allow fifth gear to be selected.



ST3225M

2. Select fifth gear. While applying light pressure to gear lever towards right, turn screw clockwise until it contacts yoke. Turn screw half a turn anti- clockwise and tighten nut.



ST2197M

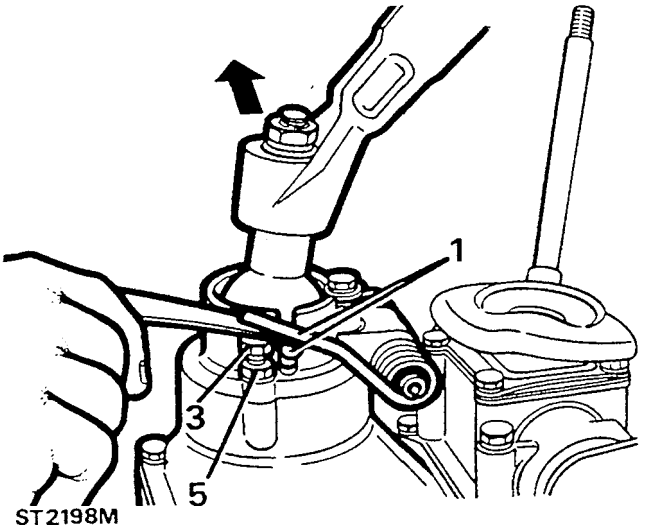
Bias spring adjustment

NOTE: The purpose of this adjustment is to set both bolts so that the bias spring legs apply equal pressure on both ends of the gear lever cross pin when third or fourth gear is engaged. This will ensure that when the lever is in neutral, the gear change mechanism is automatically aligned for third or fourth gear selection.

1. Select fourth gear and lift both spring legs over the cross pins.
2. Turn adjustment bolts until heads touch spring legs.
3. Apply light pressure to gear lever to the right and adjust left hand bolt.

NOTE: Clearance between spring leg and bolt 0,05 mm (0.002 in.) using feeler gauge.

4. Move lever to left and adjust right hand bolt to clearance.
5. Tighten locknuts.



ST2198M

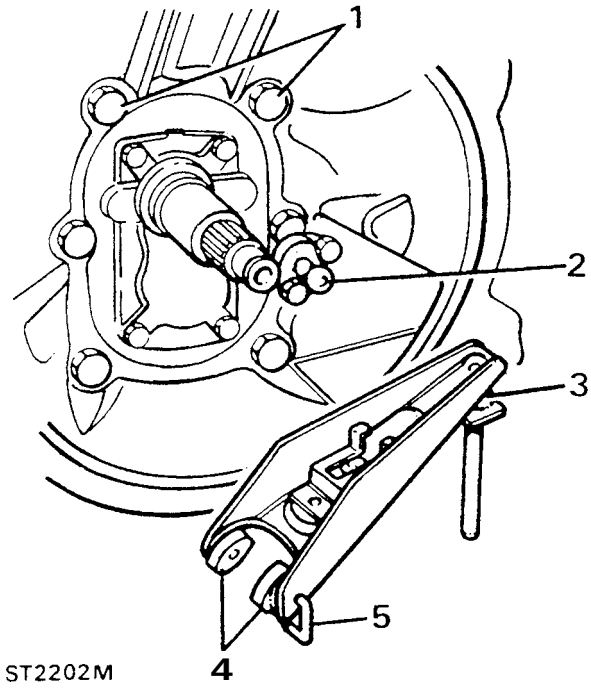
BELL HOUSING - FOUR CYLINDER ENGINE

1. Fit bellhousing locating over hollow dowels and secure with bolts.

NOTE: Fit the 12 x 45 mm bolts through dowels and 12 x 30 mm bolts in remaining positions.

2. Secure pivot post.
3. Apply molybdenum disulphide grease to pivot post, lever pads and pins.
4. Assemble pads to lever and lever to bearing and fit assembly to pivot post.
5. Fit staple to release assembly, short leg to lever.

NOTE: The staple is an aid to assembly only which may become dislodged or lost in service without detriment.



ST2202M

BELL HOUSING - V8 ENGINE

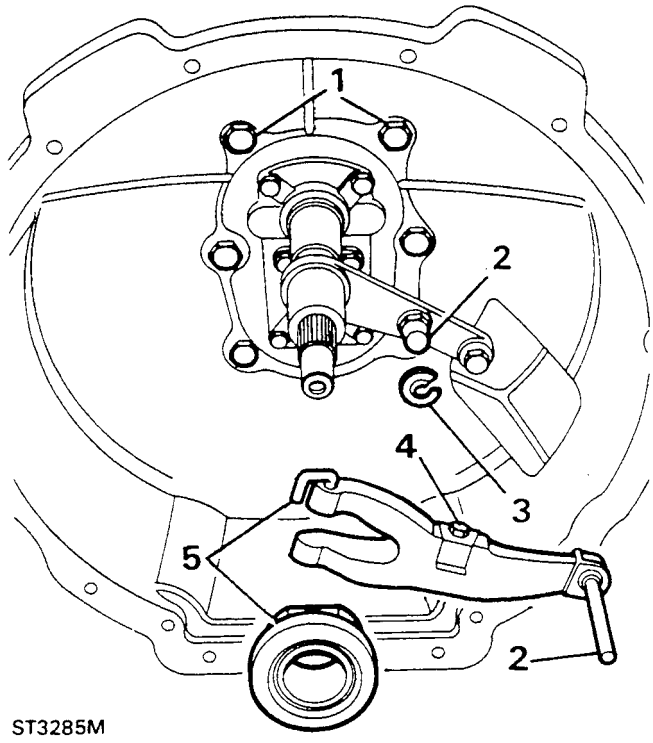
1. Fit bell housing locating on hollow dowels.

NOTE: Fit the 12 x 45mm bolts through dowels and 12 x 30mm bolts in remaining positions.

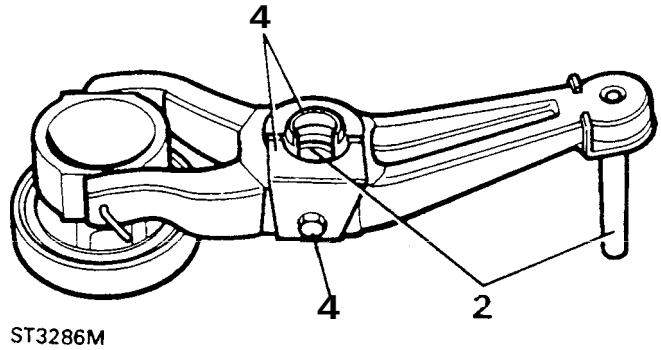
2. Apply molybdenum disulphide grease to pivot post, release lever, socket and push rod. Not the bearing guide.
3. Fit 'C' washer to pivot post.
4. Fit spring clip to lever and fit lever to pivot post.

NOTE: Position spring clip behind 'C' washer and tighten screw.

5. Fit bearing and retain with plastic staple.



ST3285M



ST3286M

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	0,075 mm
First gear end float	0,20 mm
Fifth gear synchromesh end float	0,005 to 0,055 mm

TORQUE VALUES

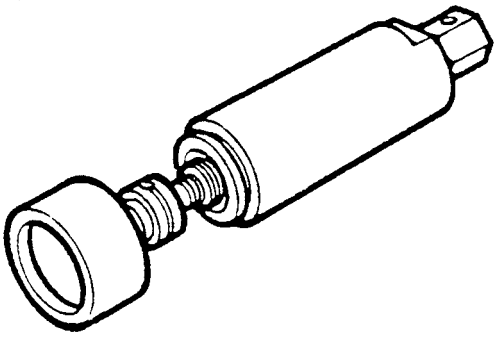
NOTE: Torque wrenches should be regularly checked for accuracy to ensure that all fixings are tightened to the correct torque.

	Nm
Oil pump to extension case	7 - 10
Clip clutch release lever	7 - 10
Spool retainer to gearcase	7 - 10
Spool guide to remote housing	7 - 10
Extension case to gearcase	7 - 10
Pivot plate, clutch release	22 - 28
Remote housing to gearcase	22 - 28
Gear lever housing to remote housing	22 - 28
Guide, clutch release sleeve	22 - 28
Slave cylinder to bell housing	22 - 28
Front cover to gearcase	22 - 28
Fifth gear support bracket bolts	22 - 28
Plunger housing to remote housing	22 - 28
Gear lever retainer	7 - 10
Lower gear lever to extension nut	40 - 47
Reverse lever pivot post nut	22 - 28
Clutch housing to gearbox bolts	65 - 80
Plug, detent spring and ball	22 - 28
Oil drain plug	47 - 54
Oil filter plug	65 - 80
Oil filler - level plug	25 - 35
Breather	14 - 16
Fifth gear layshaft stake nut	204 - 231
Bottom cover *to* clutch housing	7 - 10

SERVICE TOOLS

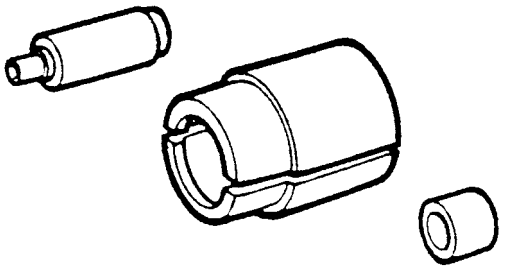
NOTE: Where the use of special tools is specified, only these tools should be used to avoid the possibility of personal injury and or damage to components.

18G.705



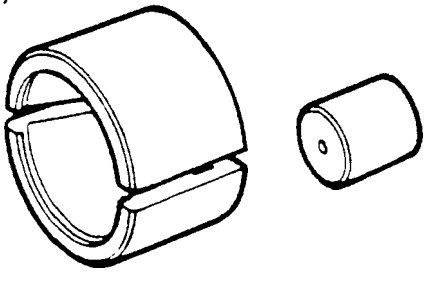
18G 705 Puller, bearing remover

18G.705-1A



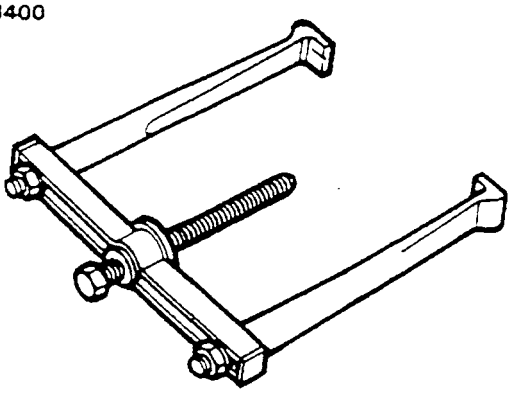
8G 705-1A Adaptor for mainshaft oil seal track and layshaft fifth gear

18G.705-7



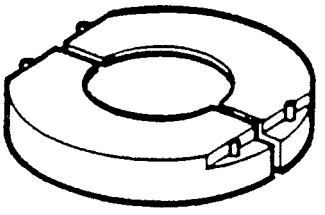
8G 705-7 Adaptor for layshaft bearings

18G.1400

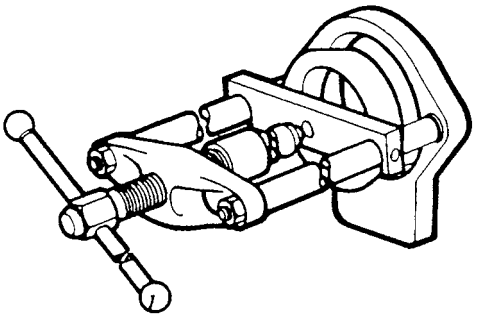


18G 1400 Remover synchromesh hub and gear cluster

18G.7400-1



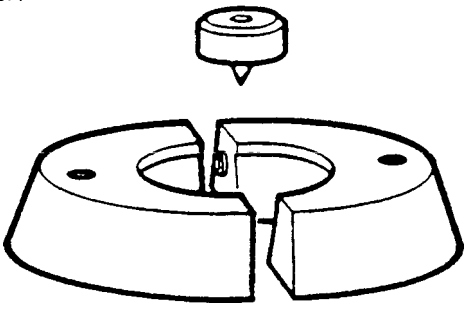
8G 1400-1 Adaptor mainshaft fifth gear



MS47

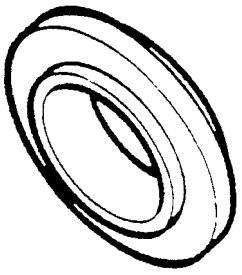
MS 47 Hand press

18G.47BA



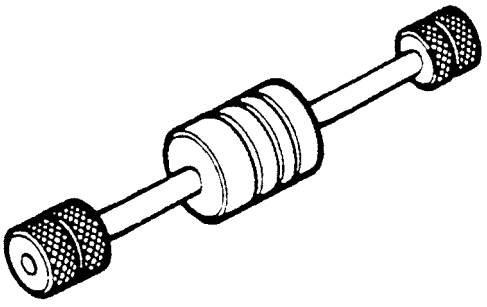
8G 47BA Adaptor input shaft bearing

18G.47BAX

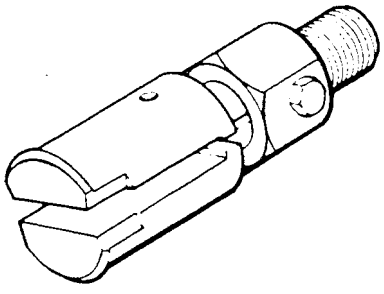


18G 47BAX Conversion kit

18G.284 (MS.284)



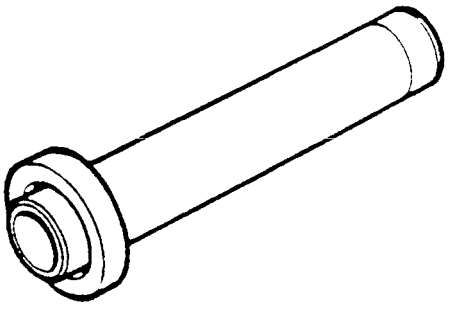
18G 284 Impulse extractor



18G284AAH

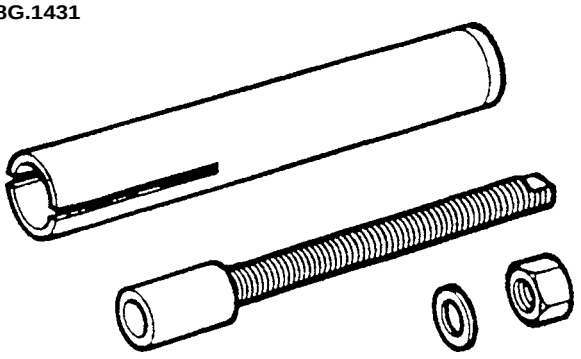
8G 284AAH Adaptor for input shaft pilot bearing track

18G.1422

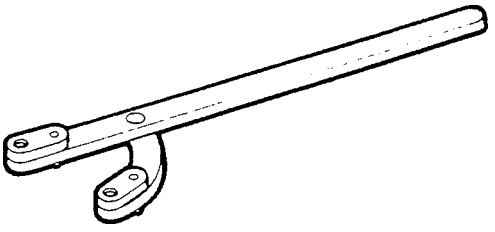


8G 1422 Mainshaft rear oil seal replacer

18G.1431



18G 1431 Mainshaft rear oil seal replacer



18G1205

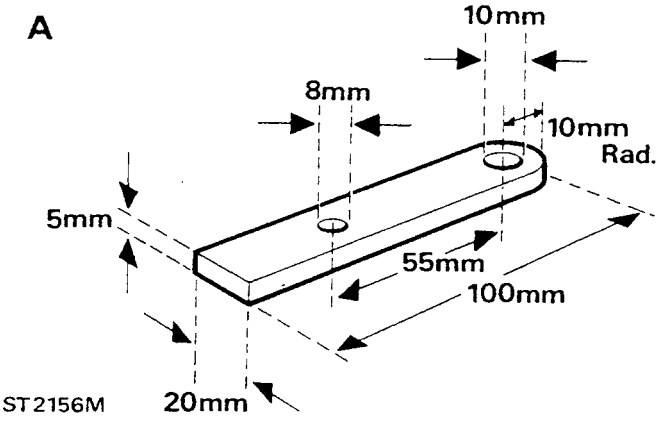
18G 1205 Flange holder

LOCALLY MANUFACTURED TOOLS

In addition to the special service tools, the following tools can be locally made to assist the dismantling and assembly of the gearbox. The following overhaul procedure is based upon the assumption that these tools are available.

Tool 'A'. Dual purpose tool. Reverse shaft retainer to prevent the shaft falling out when the gearbox in 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.

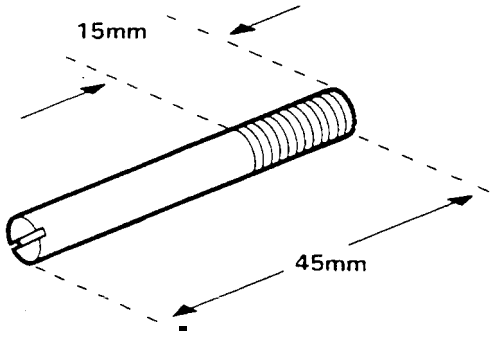
A



ST2156M

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

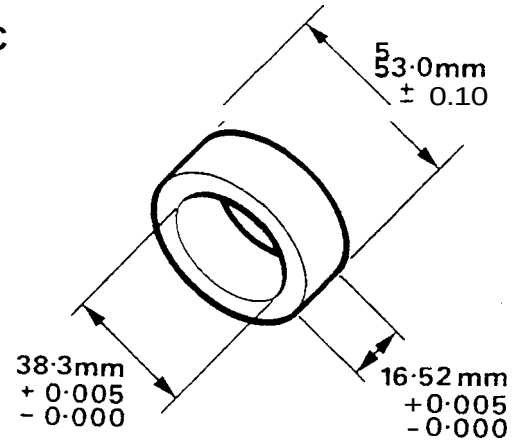
B



ST2155M

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

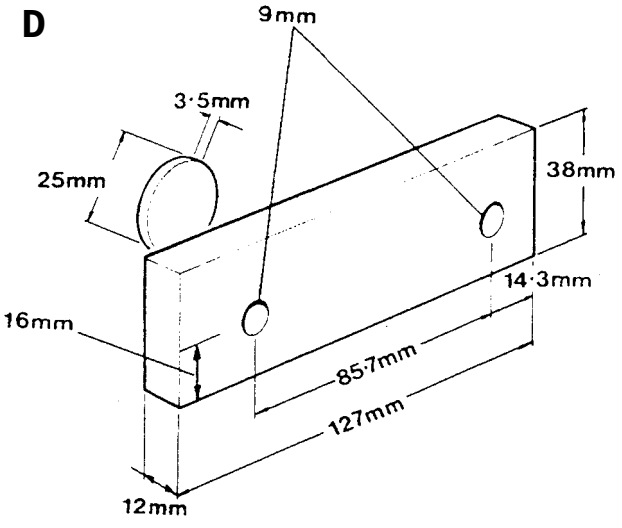
C



ST2154M

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.

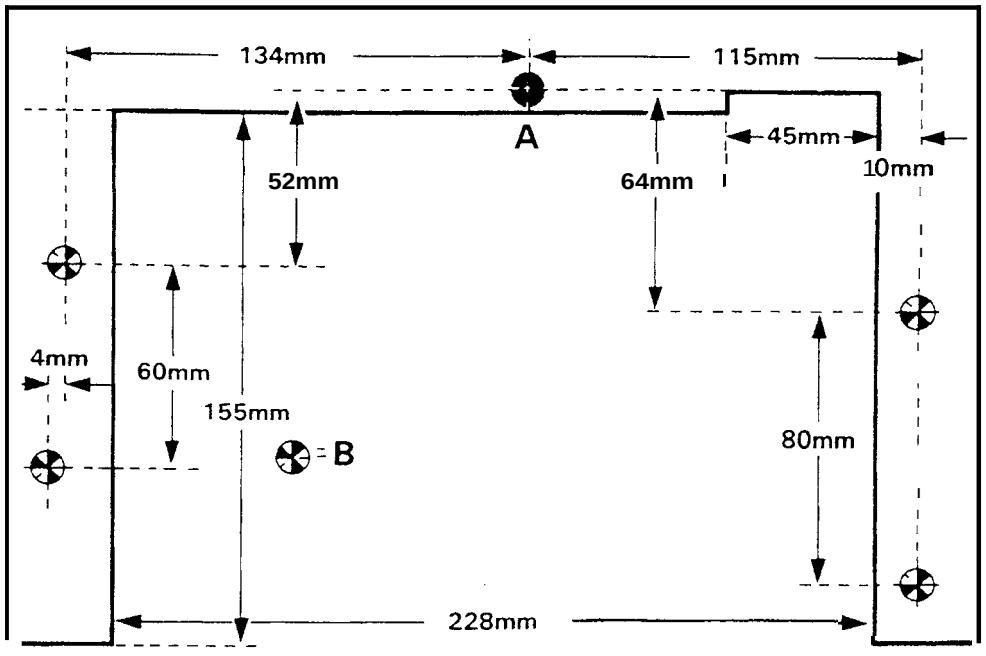
D

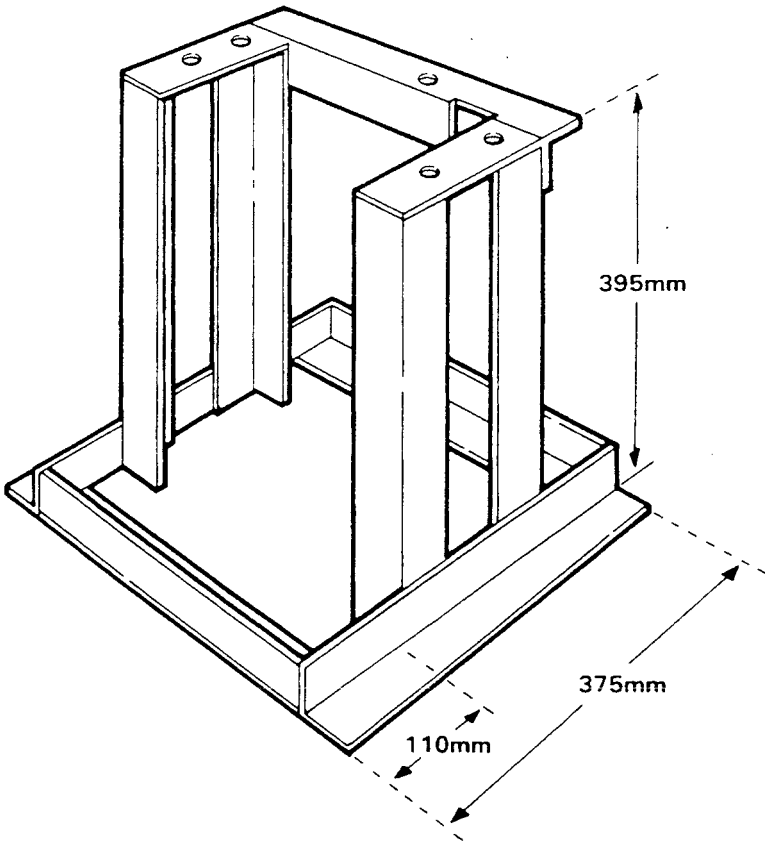


ST1118M

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.

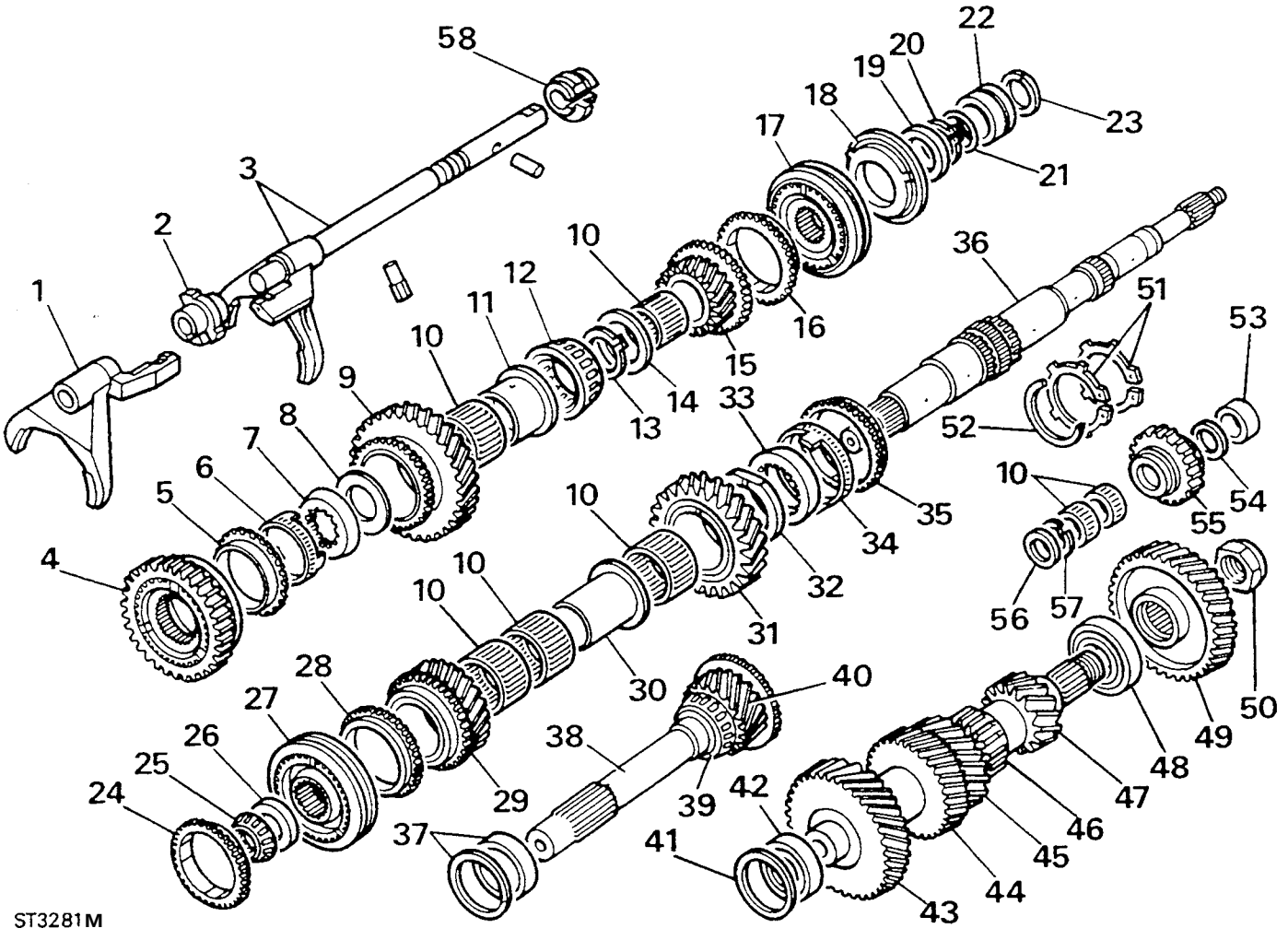




ST2153M

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.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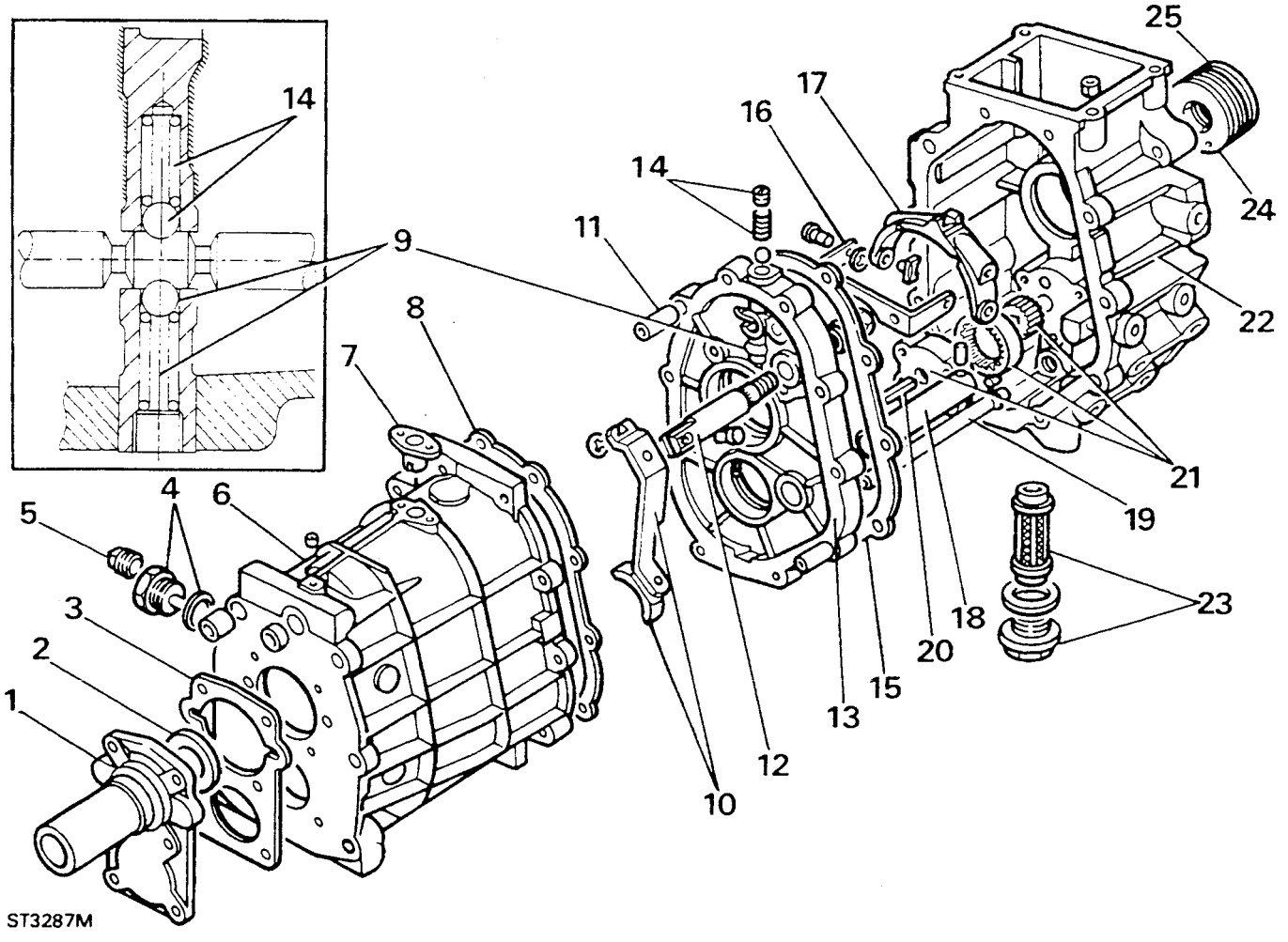
ST3281M

GEARBOX CASING

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.
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.



R380
MANUAL GEARBOX

Overhaul Manual

R380 Handgeschakelde versnellingsbak revisiehandboek

R380 Boîte de vitesses manuelle Manuel de révision

R380 Schaltgetriebe Überholungsanleitung

R380 Cambio meccanico Manuale di revisione

R380 Caja de cambios manual Manual de revisión

R380 Caixa de velocidades manual Manual de revisão

R380 GEARBOX

OVERHAUL MANUAL

This Overhaul Manual contains information applicable to the following models:

New Range Rover
Range Rover Classic 1995 Models on
Discovery 1995 Models on
Defender 1995 Models on

Publication Part No.LRL 0003ENG - 2nd Edition
Published by Rover Technical Communication

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 of each page.

This manual contains procedures for overhaul of the R380 gearbox on the bench with the clutch and, if applicable, the transfer box removed. For all other information regarding Adjustments, Removal of oil seals, clutch, transfer box and gearbox unit, consult the appropriate Repair Manual for the model concerned.

This manual is divided into 5 sections, Data, Torque Settings, Service Tools, Description and finally, Overhaul.To assist filing of revised information each sub - section is numbered from page 1.

The individual overhaul items are to be followed in the sequence in which they appear. 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 in use. Operations also include reference to wear limits, relevant data, torque figures, and 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.

REPAIRS AND REPLACEMENTS

When replacement parts are required it is essential that only Rover/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 embodied in the car may be impaired if other than Rover/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 Rover/Land Rover recommended parts. All Rover/Land Rover recommended parts have the full backing of the vehicle Warranty.

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

INTRODUCTION

SPECIFICATION

Rover/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. Rover/Land Rover Dealers are not agents of Rover/Land Rover and have no authority to bind the manufacturer by any expressed or implied undertaking or representation.

GEARBOX IDENTIFICATION

The procedures given in this manual cover overhaul of the R380 gearbox fitted to a range of vehicles and as such, certain differences exist between gearboxes, particularly in respect of the extension housings, gear change housings and transfer box selector housings. It is important therefore that before starting work, the gearbox to be overhauled is correctly identified. Identification can be made by noting the gearbox serial number prefix stamped on the RH side of the gearbox casing and referring to the following table which lists four types of gearbox, A, B, C and D together with their appropriate serial number prefixes.

NOTE: The gearbox types listed are only intended as an aid to identification and do not relate to gearbox part numbers or a particular vehicle.

Overhaul operations in this manual list the applicable gearbox type referred to and it is important that the relevant operation is followed.

Type A gearbox prefixes: - 50A; 51A; 56A; 58A; 60A; 61A;

Type B gearbox prefixes: - 53A; 55A; 63A

Type C gearbox prefix: - 18A

Type D gearbox prefixes: - 64A; 65A

GENERAL DATA

	NEW	SERVICE LIMIT
Baulk ring clearances	0.5 mm (0.02 in)	
1st gear end float	0.05 - 0.20 mm (0.002 - 0.008 in)	0.327 mm (0.013 in)
2nd gear end float	0.04 - 0.21 mm (0.0016 - 0.0083 in)	0.337 mm (0.13 in)
3rd gear end float	0.11 - 0.21 mm (0.004 - 0.0083 in)	0.337 mm (0.13 in)
Adjust 5th - reverse hub - shim to -	0.005 - 0.055 mm (0.002 - 0.022 in)	0.055 mm (0.022 in)
Reverse gear idler shaft clearance	0.04 - 0.38 mm (0.0016 - 0.015 in)	0.38 mm (0.015 in)
Mainshaft end float	0.01 - 0.06 mm (0.0004 - 0.0024in)	0.06 mm (0.0024 in)
Layshaft end float	0.01 - 0.06 mm (0.0004 to 0.0024 in)	0.06 mm (0.0024 in)
Lubricants	ATF M2C33 F or G	
Capacities	Oil cooler fitted = 3.4 litres Non oil cooler type = 2.9 litres	
Sealants	Joint faces - Hylosil RTV 102 Available through Unipart Bolts and filler plug - Loctite 270 or Marston Bentley Hylogrip 640 (studlock)	

TORQUE WRENCH SETTINGS

Oil pump to extension case	6 Nm
Attachment plate to gearcase	8 Nm
Attachment plate to remote housing	8 Nm
Bottom cover to clutch housing	8 Nm
Breather baffle	8 Nm
Clip to clutch release lever	8 Nm
Cover to gear change housing	8 Nm
Spool retainer to gear case	8 Nm
Torsion spring locknut - adjusting screw	8 Nm
Screw - gear lever retention	8 Nm
Breather	15 Nm
Gear lever retainer bolt	15 Nm
Reverse inhibitor shaft	16 Nm
Reverse light switch	24 Nm
Transfer box to remote housing bolts	25 Nm
Bias adjustment plate bolts	25 Nm
Selector quadrant setscrew	25 Nm
Gear change lever yoke setscrew	25 Nm
Adjustment plate to gear change housing	25 Nm
Extension case to gear case	25 Nm
Front cover to gear case	25 Nm
Gear change housing to extension case	25 Nm
Gear lever housing to remote housing	25 Nm
Guide - clutch release sleeve to bell housing	25 Nm
Mounting bracket	25 Nm
Pivot clutch lever to bell housing	25 Nm
Pivot plate to bell housing	25 Nm
Plug - detent ball and spring	25 Nm
Plunger housing to gear change housing	25 Nm
Remote selector housing to extension case	25 Nm
Slave cylinder to clutch housing	25 Nm
Upper gear lever assembly to lower gear lever	25 Nm
Yoke to selector shaft	25 Nm
Filler plug	30 Nm
Oil level plug	30 Nm
Oil drain plug	50 Nm
Clutch housing to gearbox	72 Nm
Output flange bolt	90 Nm
5th gear layshaft stake nut	220 Nm

SERVICE TOOLS

NOTE: Where the use of special tools is specified, only these tools should be used to avoid the possibility of personal injury and or damage to components.

Land Rover Number	Rover Number	Description
LRT-37-001	18G47BA	Adaptor input shaft bearing
LRT-37-002	18G47BAX	Conversion kit
LRT-37-004	18G284AAH	Adaptor for input shaft pilot bearing track
LRT-37-009	18G705	Puller, bearing and oil seal collar remover
LRT-37-010	18G705-1A	Adaptor for mainshaft oil seal collar
LRT-37-014	18G1422	Mainshaft rear oil seal replacer
LRT-37-015	18G1431	Mainshaft rear support bearing track and oil seal collar replacer.
LRT-37-021	-	Adaptor for mainshaft rear support bearing track and oil seal collar replacer.
LRT-37-022	-	Adaptor for layshaft bearings
LRT-37-023	-	Layshaft holding tool
LRT-37-024	-	Rear mainshaft bearing track remover
LRT-51-003	18G1205	Flange holder
LRT-99-002	M547	Hand press
LRT-99-004	18G284	Impulse extractor

Service tools must be obtained direct from the manufacturers:
V.L.Churchill,
P.O. Box No. 3,
London Road,
Daventry,
Northants, NN11.4NF
England

DESCRIPTION

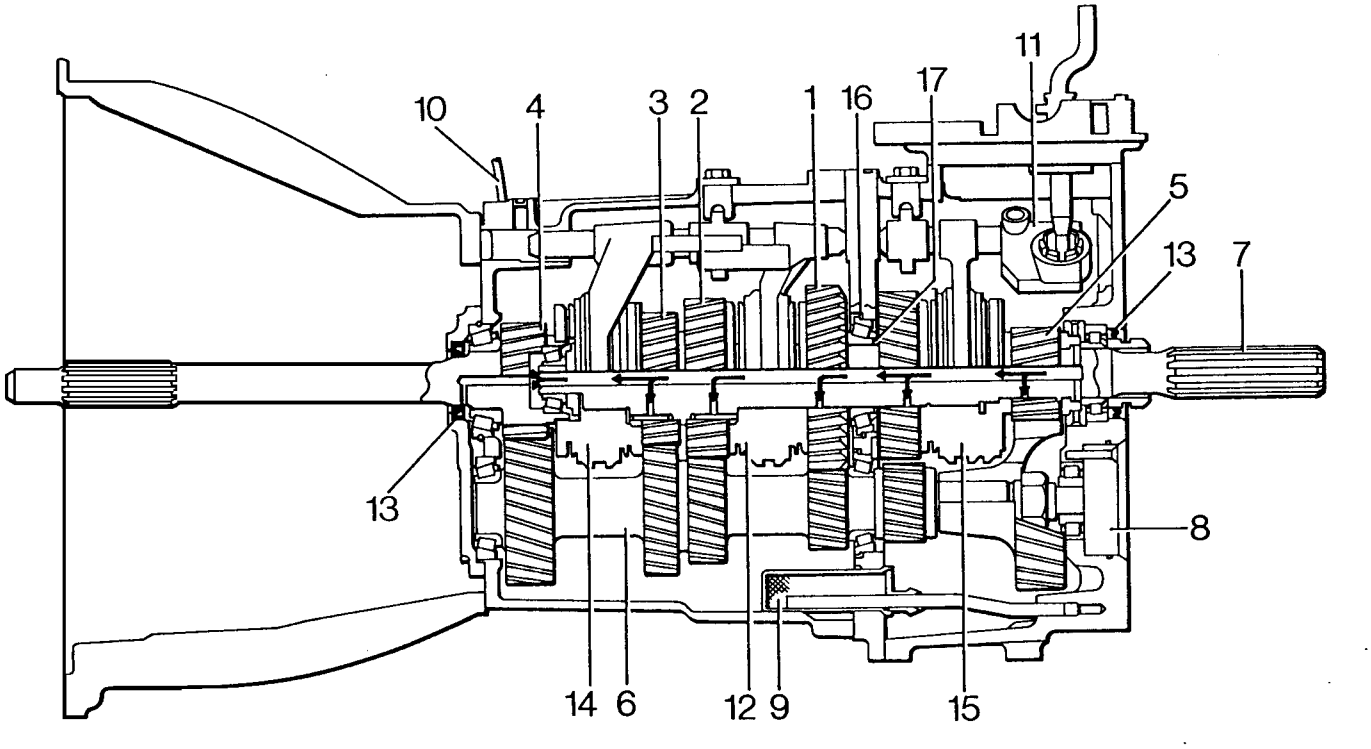
The R380 5 speed all synchromesh gearbox comprises an input shaft, output shaft, layshaft and reverse idler shaft .

Gearbox casings consist of a front cover, gearcase, centre plate and extension housing, all casings are located by dowels and sealed.

Selector forks for 1st/2nd and 3rd/4th gears are located on a single selector shaft inside the main gearcase whilst the selector fork for fifth and reverse gear is located on the same selector shaft inside the extension housing.

The input shaft, output shaft and layshaft are supported by taper roller bearings with all gears running on caged needle roller bearings. Output shaft and layshaft bearings end float is controlled by selective thrust washers located in the centre plate.

Lubrication is by an oil pump located in the extension housing which directs oil via internal drillings in the output shaft to lubricate the components.



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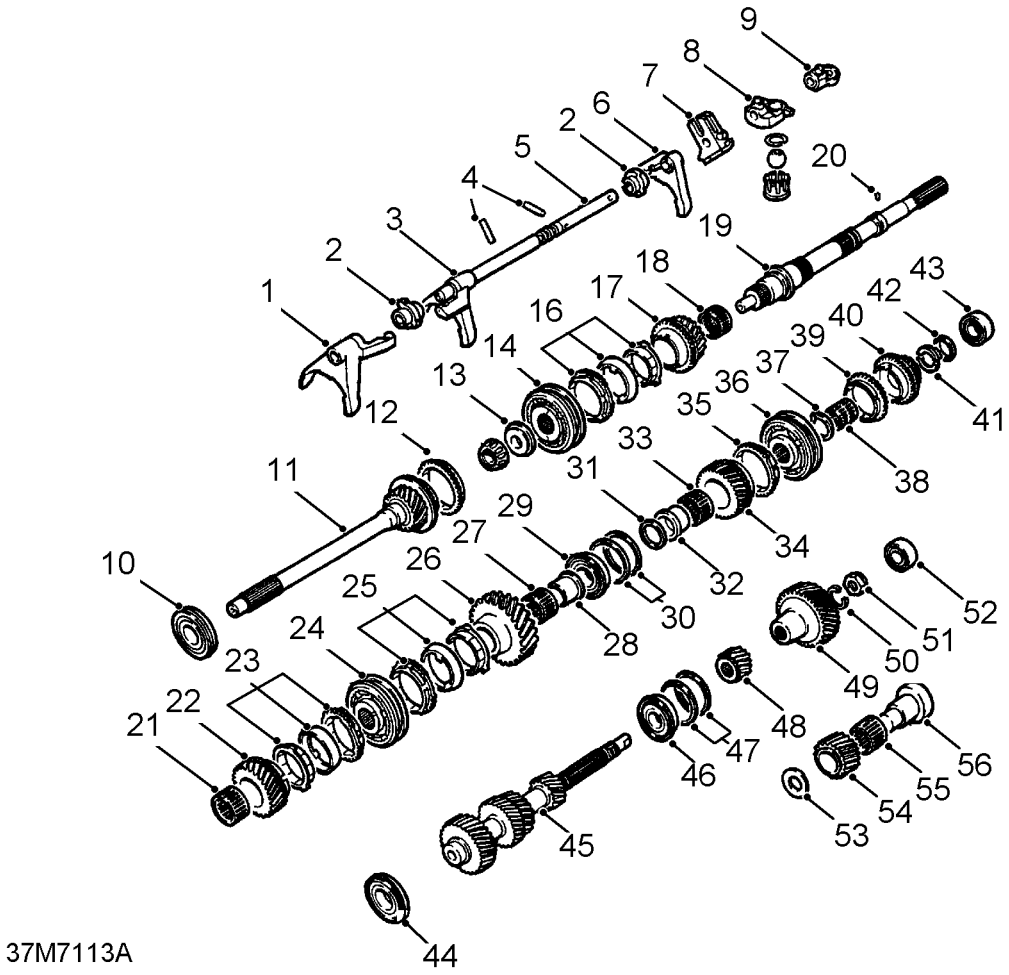
1. Mainshaft 1st gear
2. Mainshaft 2nd gear
3. Mainshaft 3rd gear
4. Primary input shaft/4th gear
5. Mainshaft 5th gear
6. Layshaft
7. Mainshaft
8. Lubrication pump
9. Oil filter
10. Breather
11. Single rail gear shift
12. 1st/2nd synchromesh
13. Oil seals
14. 3rd/4th gear synchromesh
15. 5th/reverse gear synchromesh
16. Selective spacers (mainshaft & layshaft end float)
17. Selective spacer (5th gear/reverse hub) 12/96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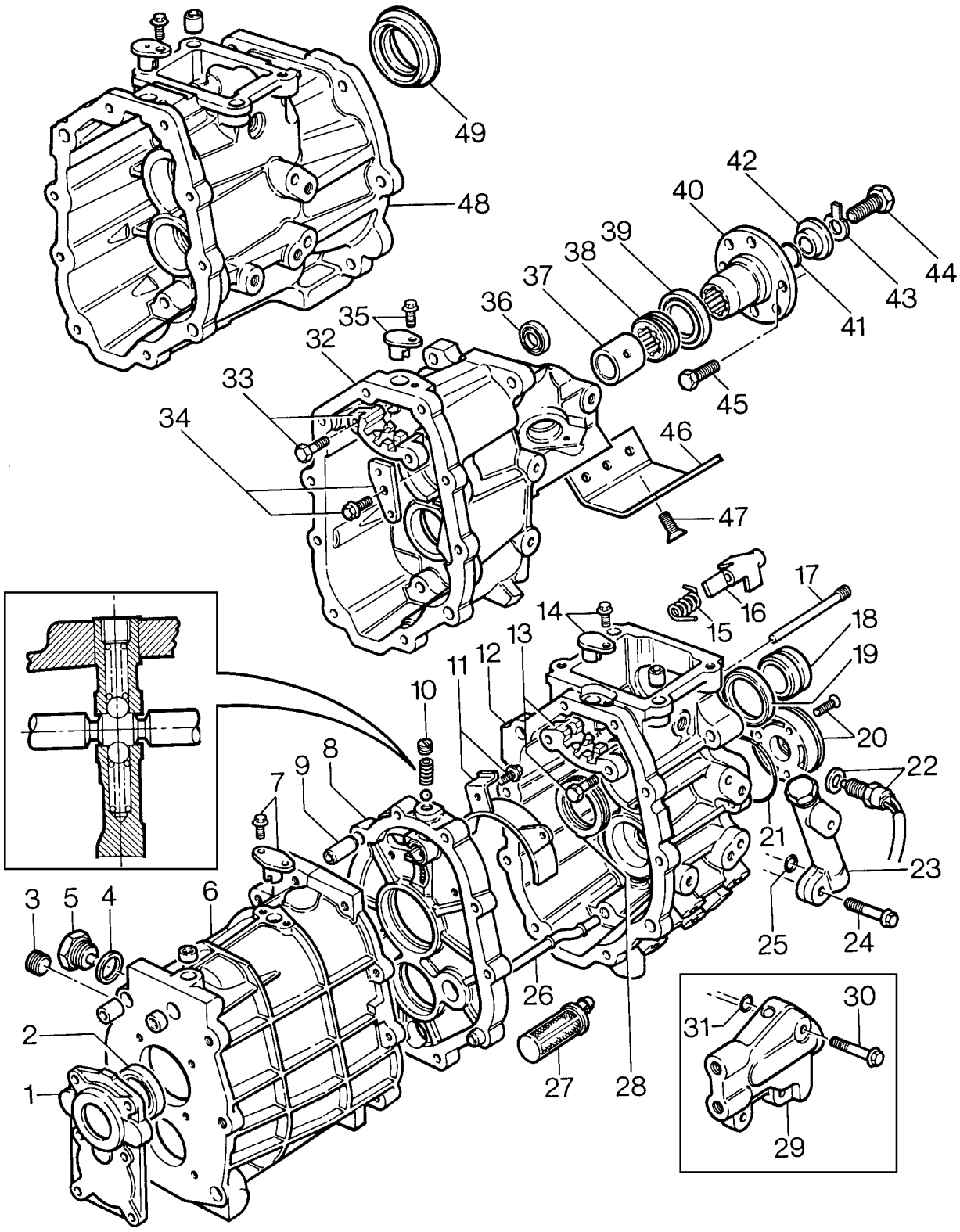
GEARBOX COMPONENTS - GEARS AND SHAFTS

1. 3rd/4th gear selector fork
2. Interlock spool
3. 1st/2nd gear selector fork
4. Selector shaft yoke pins
5. Selector shaft
6. Reverse/5th gear selector fork
7. Selector quadrant - Type A gearbox
8. Selector yoke - Type B/D gearbox
9. Selector yoke - Type C gearbox
10. Input shaft front taper bearing
11. Input shaft
12. 4th gear synchro ring
13. Pilot taper bearing
14. Spacer
15. 3rd/4th gear synchro hub and sleeve
16. 3rd gear synchro rings
17. 3rd gear
18. Needle roller bearings
19. Mainshaft (output shaft)
20. Roll pin
21. Needle bearing
22. 2nd gear
23. 2nd gear synchro rings
24. 2nd/1st gear synchro hub and sleeve
25. 1st gear synchro rings
26. 1st gear
27. Needle roller bearing
28. Bush
29. Mainshaft taper bearing
30. Selectable shims
31. Selectable washer
32. Bush
33. Needle roller bearing
34. Reverse gear
35. Reverse gear synchro ring
36. Reverse/5th gear synchro hub and sleeve
37. Circlip
38. Needle roller bearings
39. 5th gear synchro ring
40. 5th gear
41. 5th gear segments
42. 5th gear segment retaining ring
43. Mainshaft rear support bearing
44. Layshaft support bearing
45. Layshaft
46. Layshaft support bearing
47. Selectable shims
48. Layshaft reverse gear
49. Layshaft 5th gear
50. Split washer - later gearboxes
51. 5th gear nut
52. Layshaft rear support bearing
53. Spacer
54. Reverse idler gear
55. Needle roller bearing
56. Reverse idler shaft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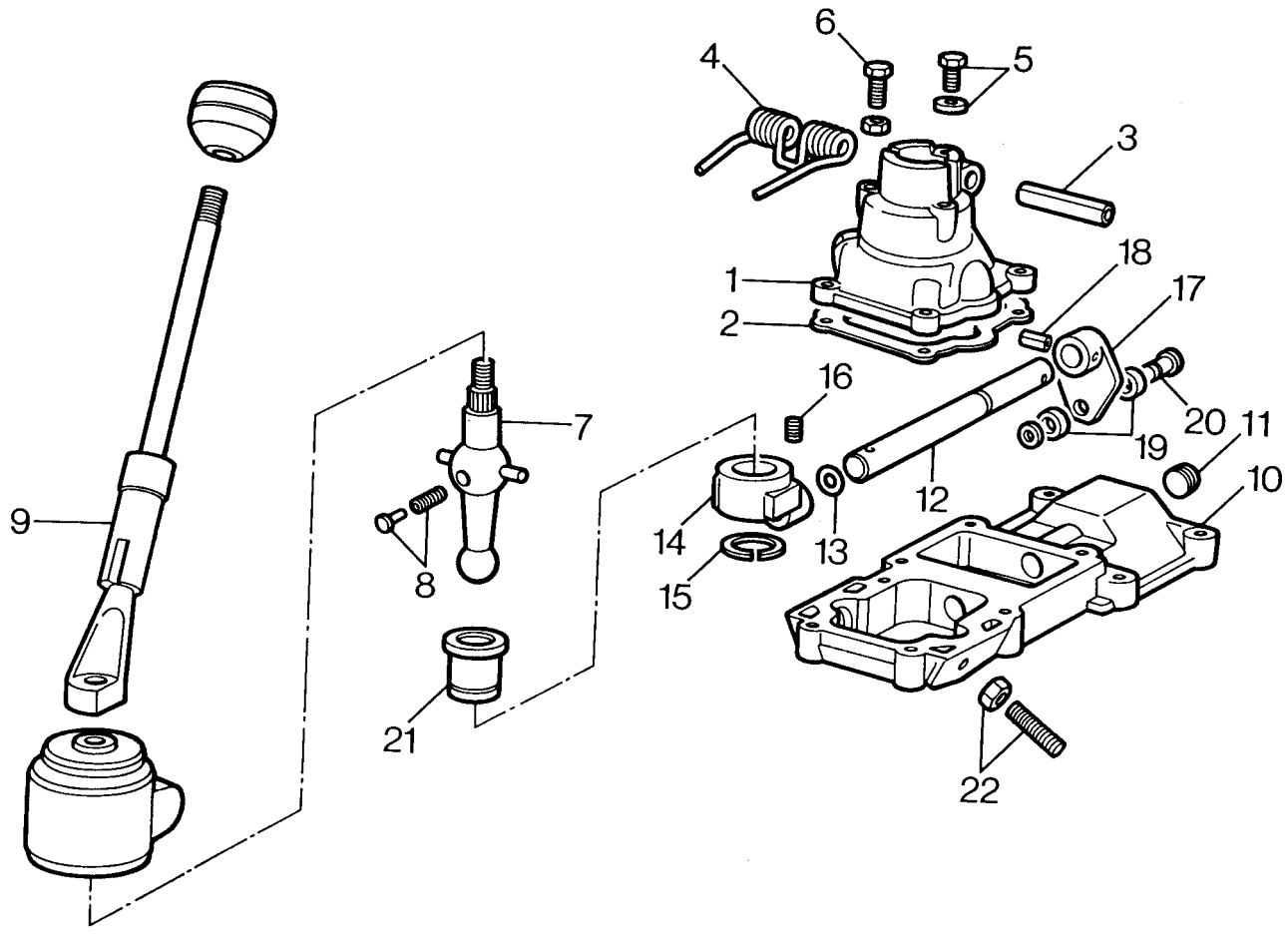
GEARBOX CASINGS

1. Front cover
2. Input shaft oil seal
3. Oil level plug
4. Washer
5. Oil drain plug
6. Gearcase
7. Spool retainer
8. Centre plate
9. Locating dowels
10. Selector plug - outer detent ball and spring
11. Splash shield
12. Extension housing - Types A and B gearbox
13. Gate plate
14. Spool retainer - Extension housing
15. Inhibitor cam spring
16. Inhibitor cam
17. Inhibitor cam shaft
18. Oil selector collar
19. Oil seal
20. Oil pump
21. 'O' ring
22. Reverse light switch
23. Oil cooler by-pass
24. Bolt
25. 'O' ring
26. Oil pick-up pipe
27. Oil filter
28. Oil pick-up ring
29. Oil cooler adaptor
30. Bolt
31. 'O' ring
32. Extension housing - Type C gearbox
33. Gate plate - Type C gearbox
34. Inhibitor cam end plate - Type C gearbox
35. Spool retainer - Type C gearbox
36. Selector shaft oil seal - Type C gearbox
37. Spacer - Type C gearbox
38. Speedometer pinion - Type C gearbox
39. Oil seal - Type C gearbox
40. Output shaft drive flange - Type C gearbox
41. 'O' ring - Type C gearbox
42. Spacer - Type C gearbox
43. Tab washer - Type C gearbox
44. Drive flange bolt - Type C gearbox
45. Drive flange propeller shaft bolt - Type C gearbox
46. Support bracket - Type C gearbox
47. Support bracket bolt - Type C gearbox
48. Extension housing - Type D gearbox
49. Oil seal - Type D gearbox



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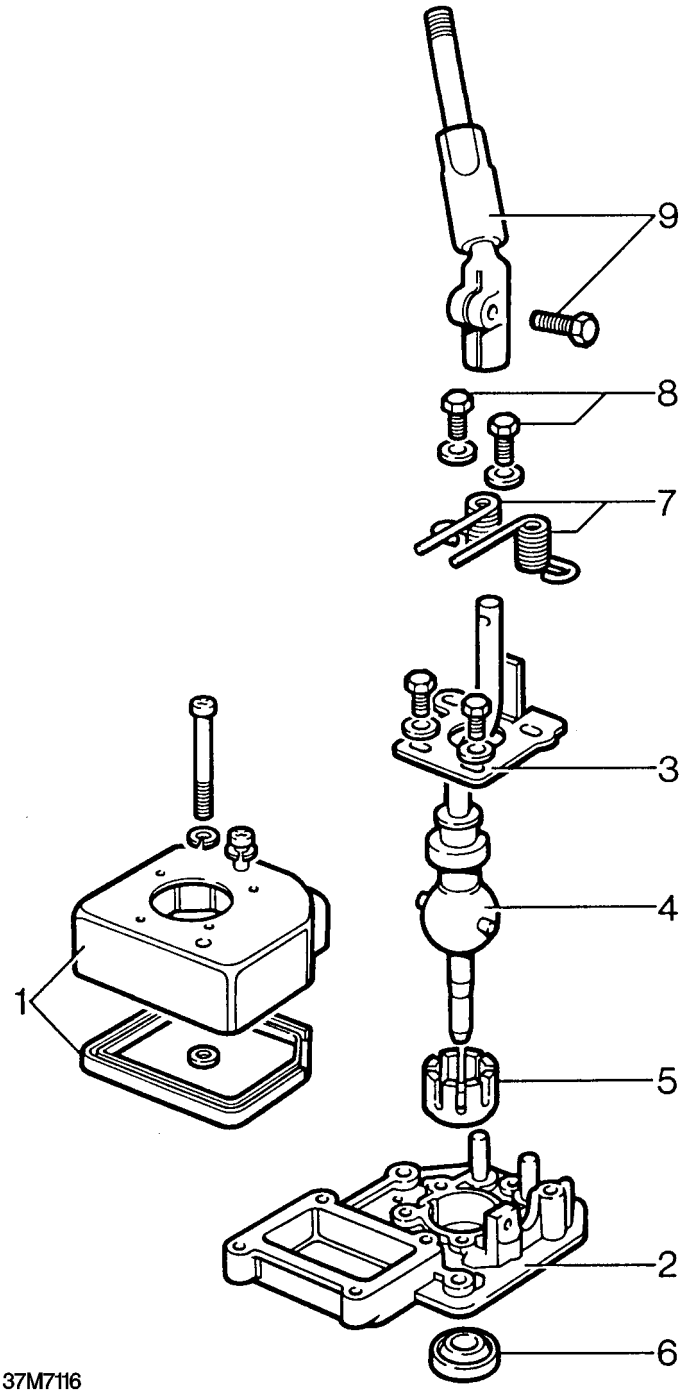
GEAR CHANGE HOUSING - TYPE A GEARBOX

1. Gear change housing
2. Gasket
3. Roll pin
4. Bias spring
5. Gear lever retaining bolt and washer
6. Gear change housing bolts
7. Gear lever
8. Nylon pad and spring
9. Gear lever extension
10. Remote housing
11. Blanking plug
12. Selector shaft
13. 'O' ring
14. Trunnion
15. Circlip
16. Trunnion retaining screw
17. Selector quadrant
18. Roll pin
19. Shim
20. Pin
21. Ball pin seating
22. 5th gear stop screw and locknut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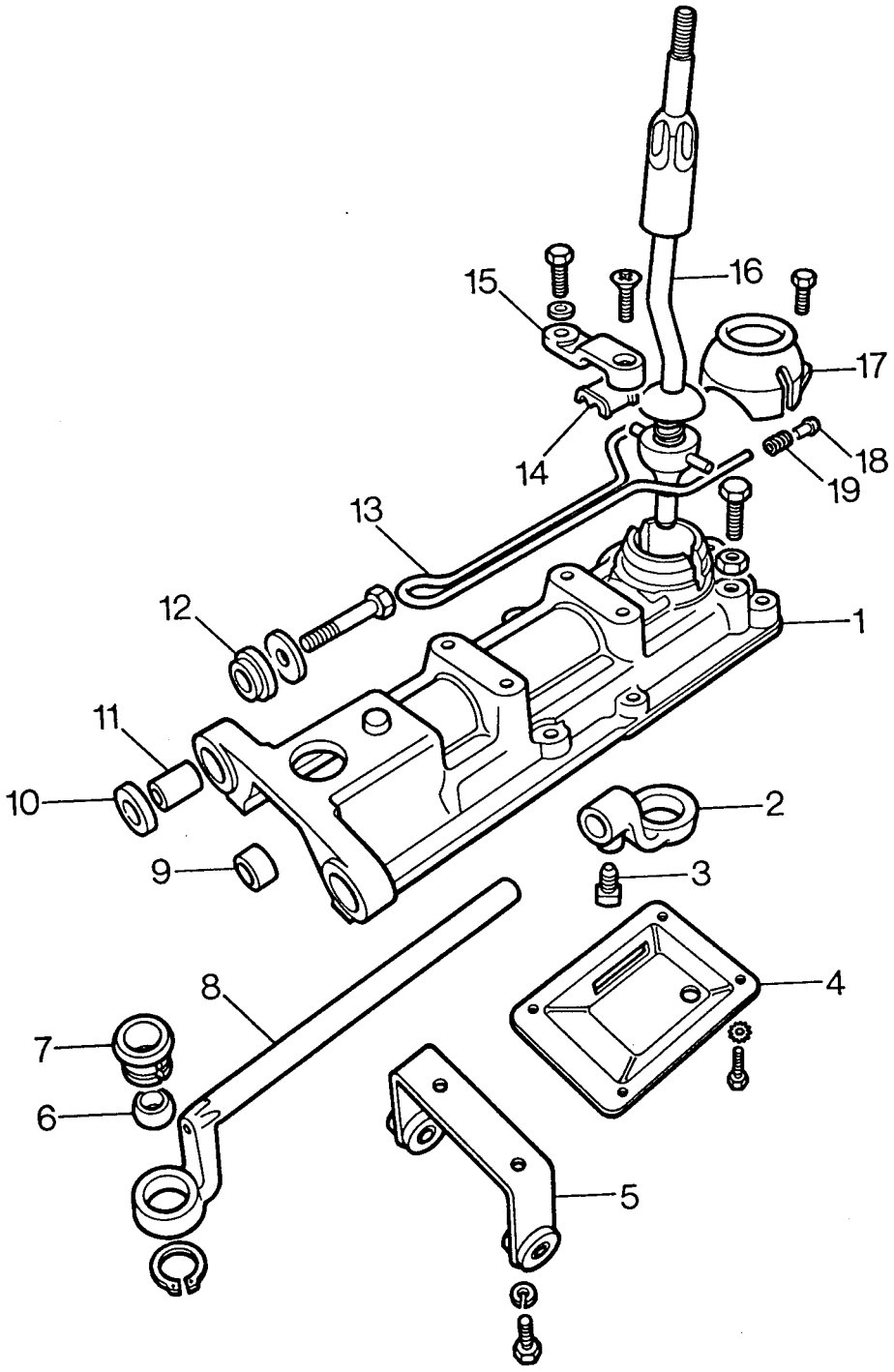
GEAR CHANGE HOUSING - TYPE B GEARBOX

1. Gear change housing cover and gasket
2. Gear change housing
3. Bias adjustment plate
4. Lower gear lever
5. Railko bush
6. Lower gear lever housing oil seal
7. Bias springs
8. Bias spring retaining bolts
9. Upper gear lever and bolt



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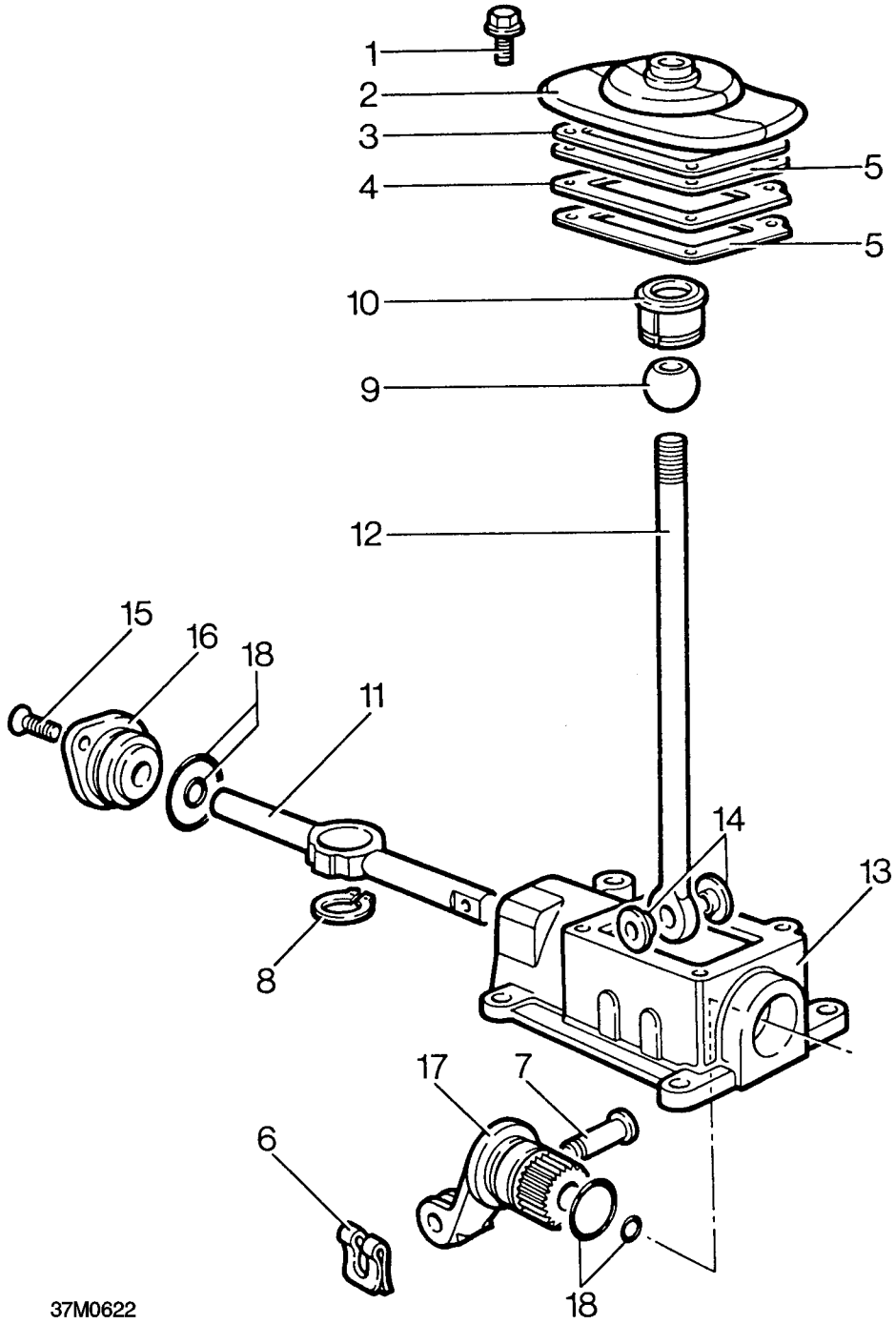
REMOTE GEAR CHANGE HOUSING - TYPE C GEARBOX

1. Remote gear change housing
2. Selector rod yoke
3. Pinch bolt
4. Bottom cover plate
5. Remote gear change bracket
6. Ball pin
7. Ball pin seating
8. Selector rod
9. Selector rod bush
10. Spacer
11. Mounting rubbers
12. Flexible mounting
13. Bias spring
14. Bridge plate liner
15. Bias spring bridge plate
16. Gear lever
17. Gear lever cap
18. Plunger
19. Anti-rattle spring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37M0622

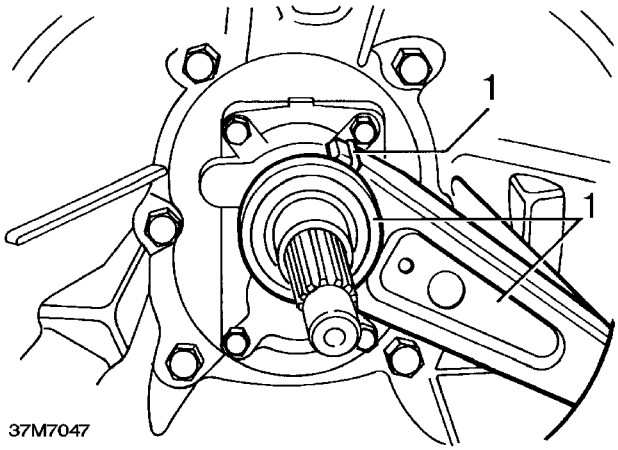
TRANSFER BOX SELECTOR HOUSING - TYPE A GEARBOX

1. Gaiter retaining bolt
2. Gaiter
3. Gaiter support plate
4. Gasket plate
5. Gaskets
6. Spring clip
7. Clevis pin
8. Circlip retaining nylon seat
9. Gear lever ball
10. Nylon seat
11. Cross shaft
12. Gear lever
13. Selector housing
14. Bushes
15. Countersunk screws
16. End cover
17. Selector fork
18. 'O' rings

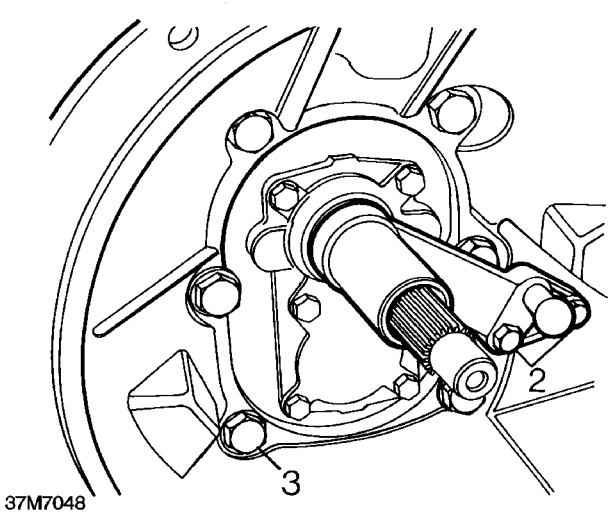
GEAR BOX DISMANTLE

Service repair no - 37.20.04

Clutch housing - Type A gearbox - Remove



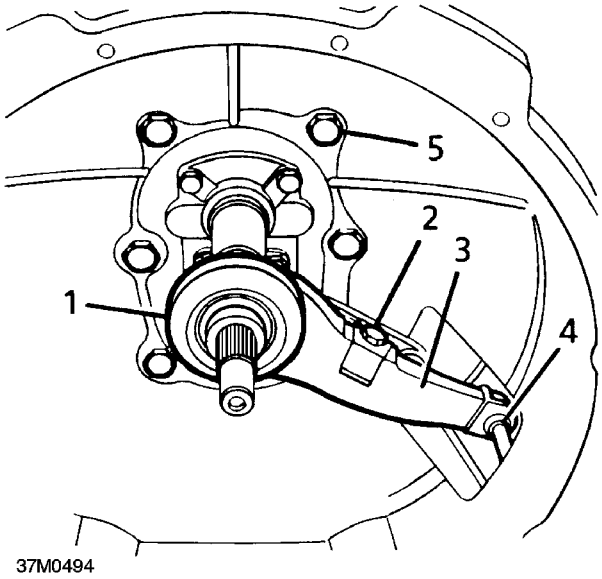
1. *If fitted:* remove and discard clips retaining clutch release bearing pads, remove bearing and clutch release lever, recover pads.



2. Remove 2 bolts securing release lever pivot post, remove post.
3. Remove 6 bolts securing clutch housing to gearbox, remove housing.

NOTE: Dowel located.

Clutch housing - Type B gearbox - Remove

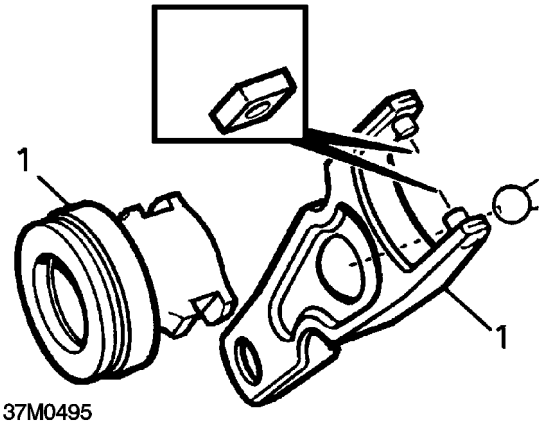


37M0494

1. Remove clutch release bearing.
2. Remove bolt securing spring clip to clutch release lever, remove clip.
3. Remove clutch release lever.
4. Remove 'C' clip from release lever pivot post, discard clip.
5. Remove 6 bolts securing clutch housing to gearbox, remove housing.

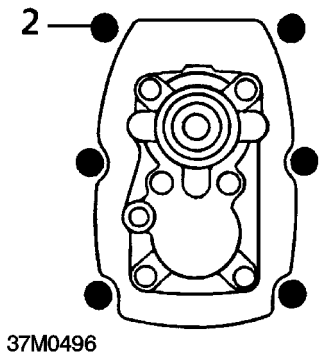
△ **NOTE: Dowel located.**

Clutch housing - Type C gearbox - Remove



37M0495

1. Pull clutch release lever off pivot post, remove lever and clutch release bearing.

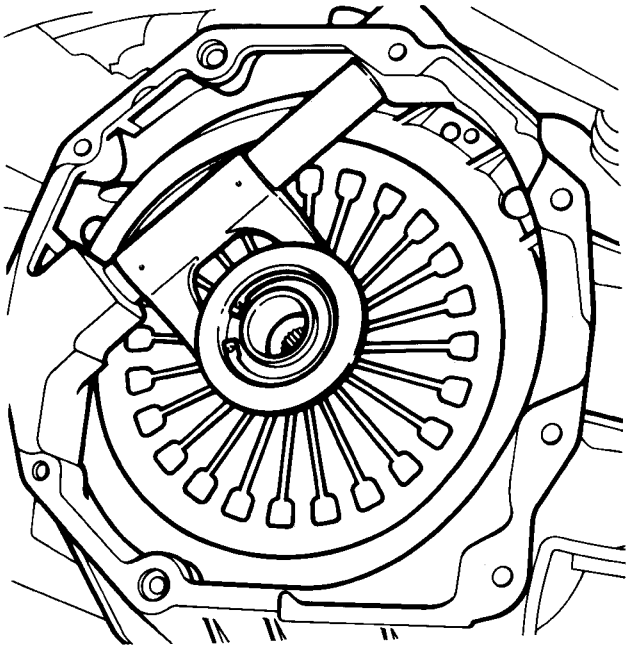


37M0496

2. Remove 6 bolts securing clutch housing to gearbox, remove clutch housing.

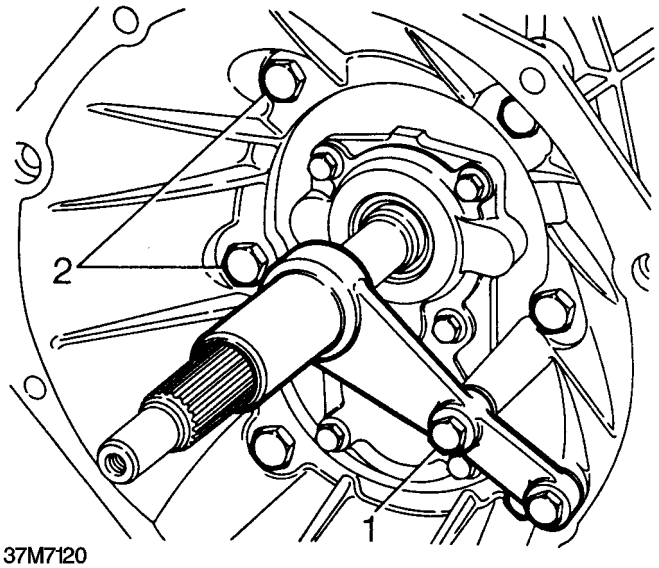
△ **NOTE: 2 longest bolts are fitted at dowel locations and have plain washers under their heads.**

Clutch housing - Type D gearbox - Remove



37M7119

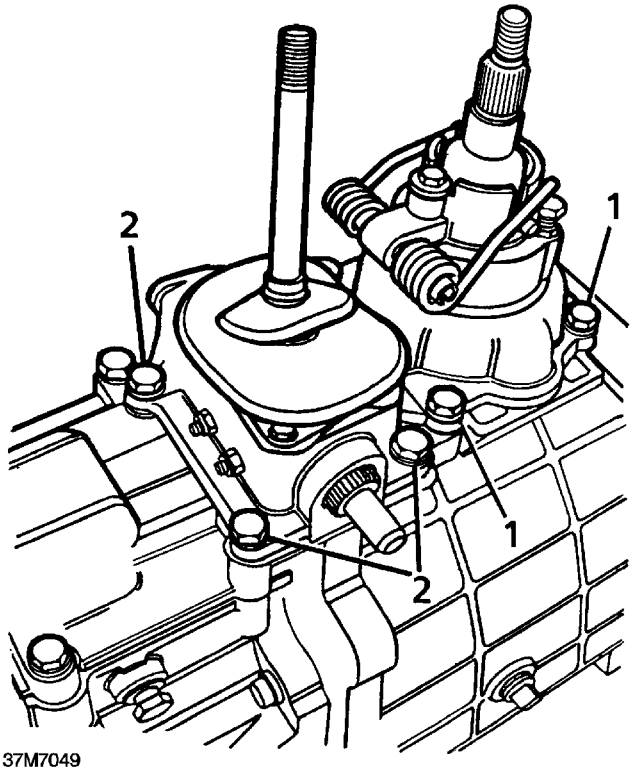
NOTE: Type D gearboxes have a standard clutch housing adaptor which mates with both V8 and diesel engine clutch housings.The above illustration shows the gearbox removed at the clutch housing adaptor with the clutch housing adaptor (containing the clutch mechanism) still fitted to the engine.



37M7120

1. Remove 2 bolts securing release lever pivot post. Remove post.
2. Remove 6 bolts securing adaptor housing to gearbox. Remove adaptor housing.

Gear change/selector housings - Type A gearbox - Remove



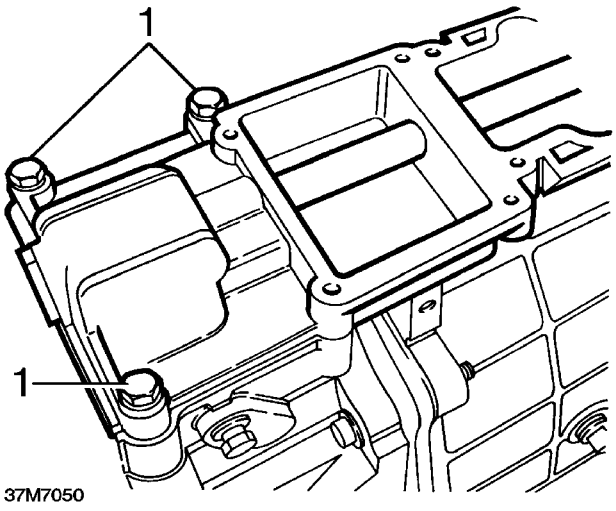
37M7049

1. Remove 4 bolts securing gear change housing, remove housing.

NOTE: Dowel located.

2. Remove 4 bolts securing transfer box selector housing, remove housing.

Remote housing - Type A gearbox - Remove

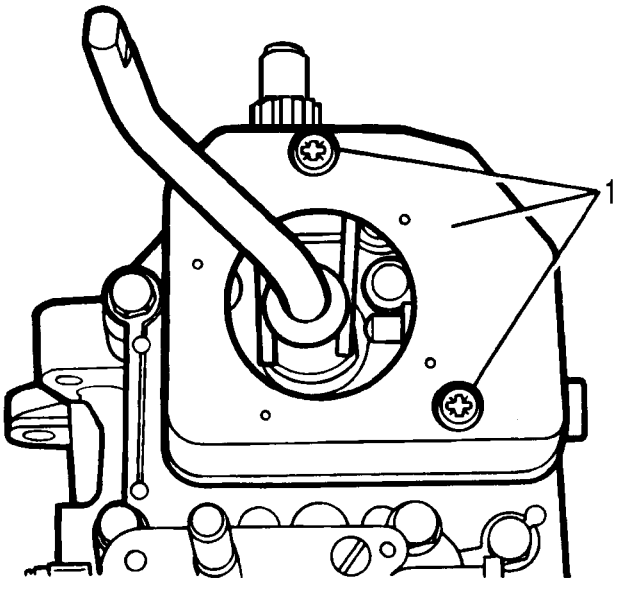


37M7050

1. Noting their fitted position, remove 3 bolts securing remote housing, remove housing.

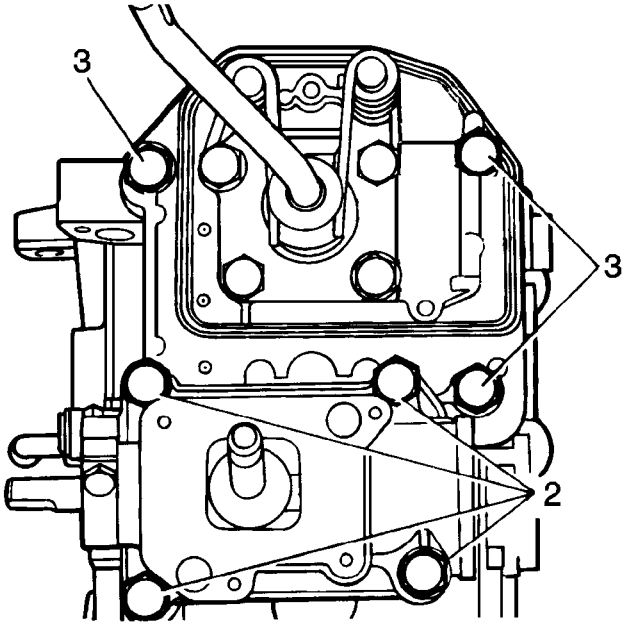
△ **NOTE: Dowel located.**

Gear change/selector housings - Type B gearbox - Remove



37M7051

1. Remove 2 Torx screws securing gear change housing cover, remove cover; recover sealing rubber.

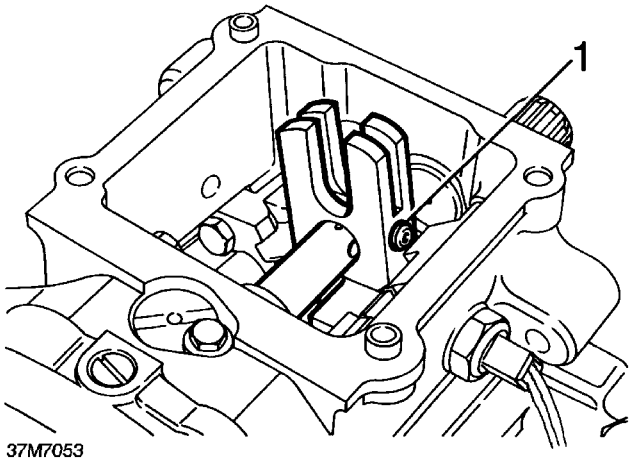


37M7052

2. Remove 4 bolts securing transfer box selector housing, remove housing.
3. Noting their fitted position, remove 3 bolts securing gear change housing, remove housing.

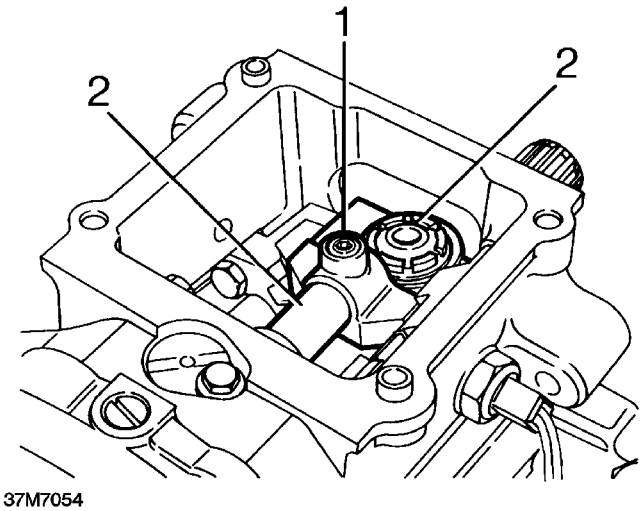
△ **NOTE: Dowel located.**

Selector quadrant - Type A gearbox - Remove



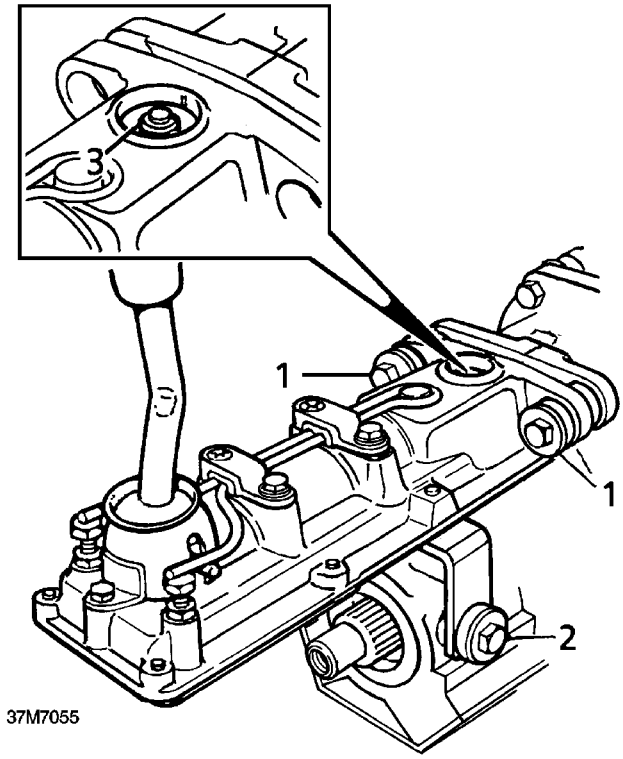
1. Remove and discard set screw securing selector quadrant.
2. Move selector shaft forwards, remove quadrant.

Gear change lever yoke - Type B gearbox - Remove



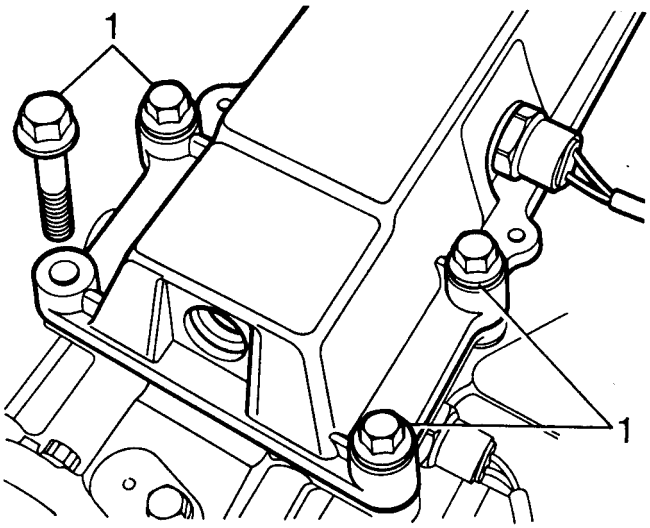
1. Remove and discard set screw securing yoke.
2. Move selector shaft forwards, remove yoke.

Remote gear change - Type C gearbox - Remove



1. Noting fitted positions of mounting rubbers and washers, Rremove 2 bolts securing remote gear change to extension housing, recover washers and mounting rubbers.
2. Remove 2 bolts securing remote gear change bracket to extension housing , recover washers and mounting rubbers.
3. Release remote gear change from extension housing, disconnect selector rod from selector shaft pin.

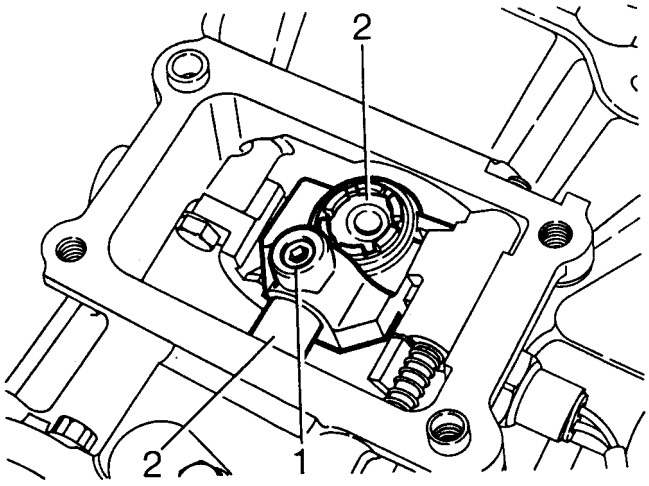
Remote gear change - Type D gearbox - Remove



37M7121

1. Remove 4 bolts securing remote gear change to extension housing.
2. Release remote gear change from extension housing.

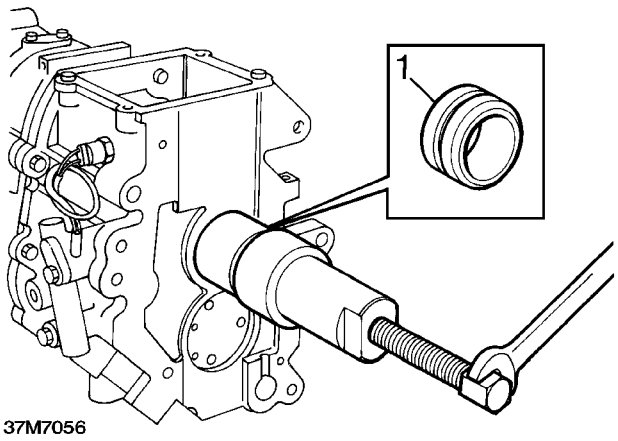
Gear change lever yoke - Type D gearbox - Remove



37M7122

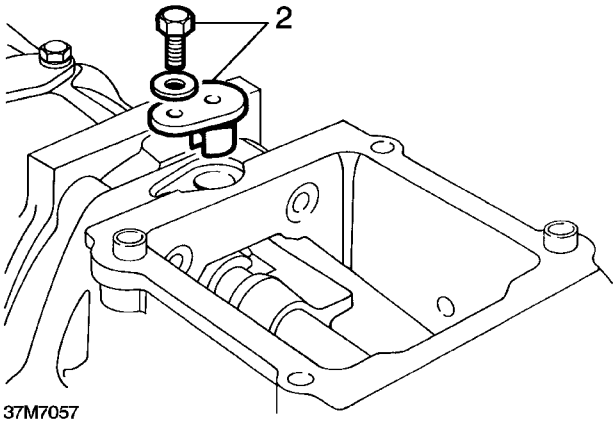
1. Remove and discard set screw securing yoke.
2. Move selector shaft forwards. Remove yoke.

Extension housing - Types A and B gearbox - Remove



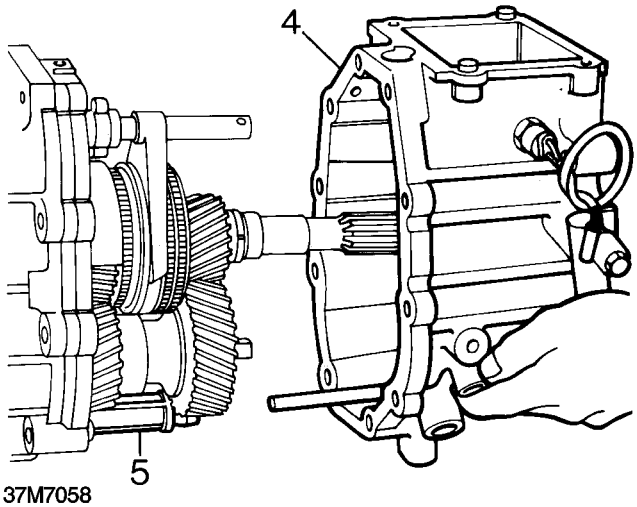
37M7056

1. Thread a 12mm bolt into the end of the output shaft and using tool **LRT-37-009** and **LRT-37-010** withdraw oil seal collar.



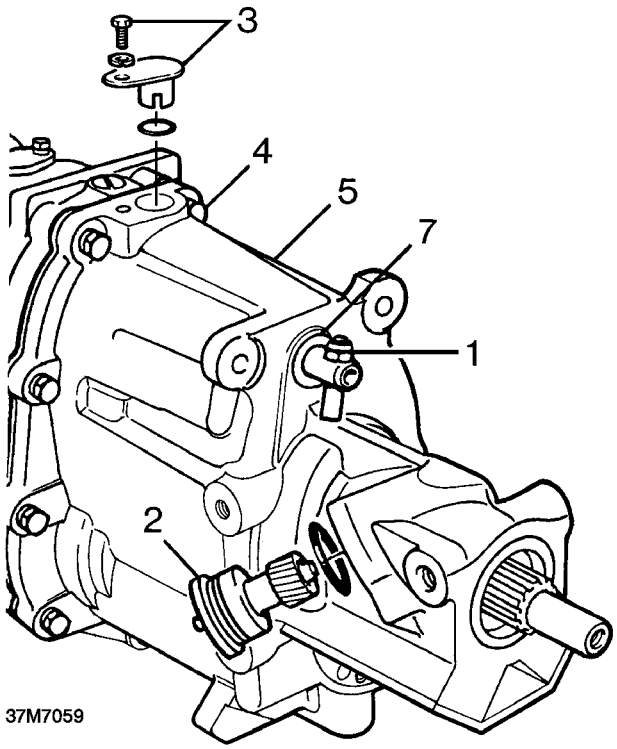
37M7057

2. Remove reverse/5th gear selector spool retainer.
3. Remove 10 bolts securing extension casing noting position of longer bolts.



4. Place a suitable container underneath the box to catch any oil spillage and remove the extension housing.
5. Remove oil filter.
6. Secure centre plate to gear casing with 2 bolts 8 x 35mm.

Extension housing - Type C gearbox - Remove

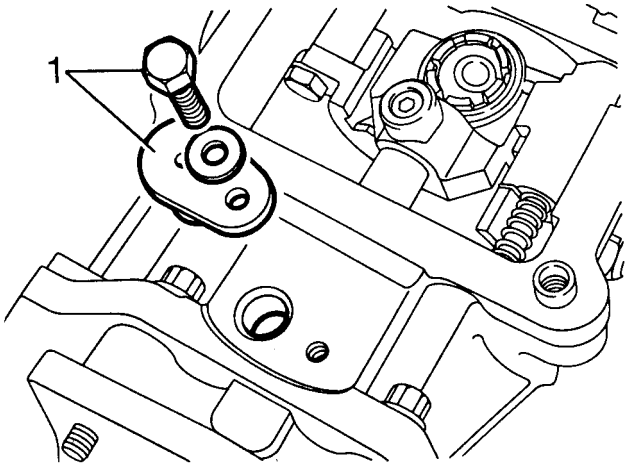


1. Remove and discard self-locking nut securing selector shaft pin to selector shaft; remove pin.
2. Carefully prise speedometer pinion housing and gear out of extension housing, remove and discard 'O' ring.
3. Remove 5th gear spool retainer, remove and discard 'O' ring.
4. Noting their fitted position, remove 10 bolts securing extension housing to gearcase.
5. Using a soft faced mallet, tap extension housing to free it from locating dowels.
6. Remove extension housing.

NOTE: Speedometer drive gear may be a tight fit on output shaft and this can prevent removal of extension housing. Insert suitable blocks of wood between extension housing and centre plate and carefully lever extension housing away until drive gear is released.

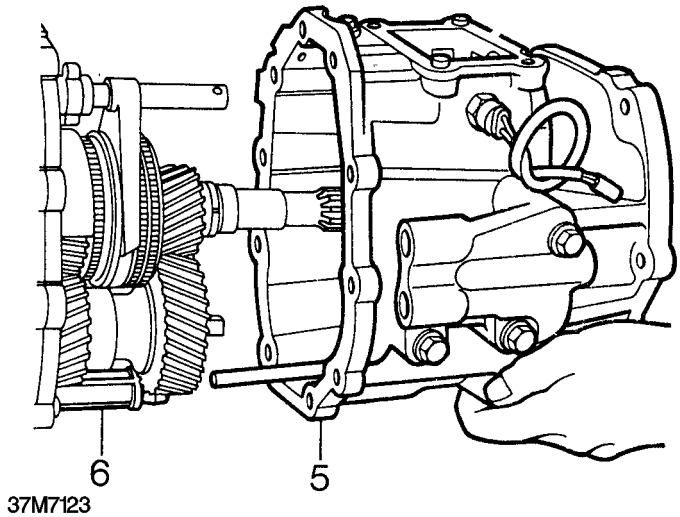
7. Remove and discard selector shaft oil seal.
8. Secure centre plate to gearcase with 2 bolts 8 x 35mm.

Extension housing - Type D gearbox - Remove



37M7125

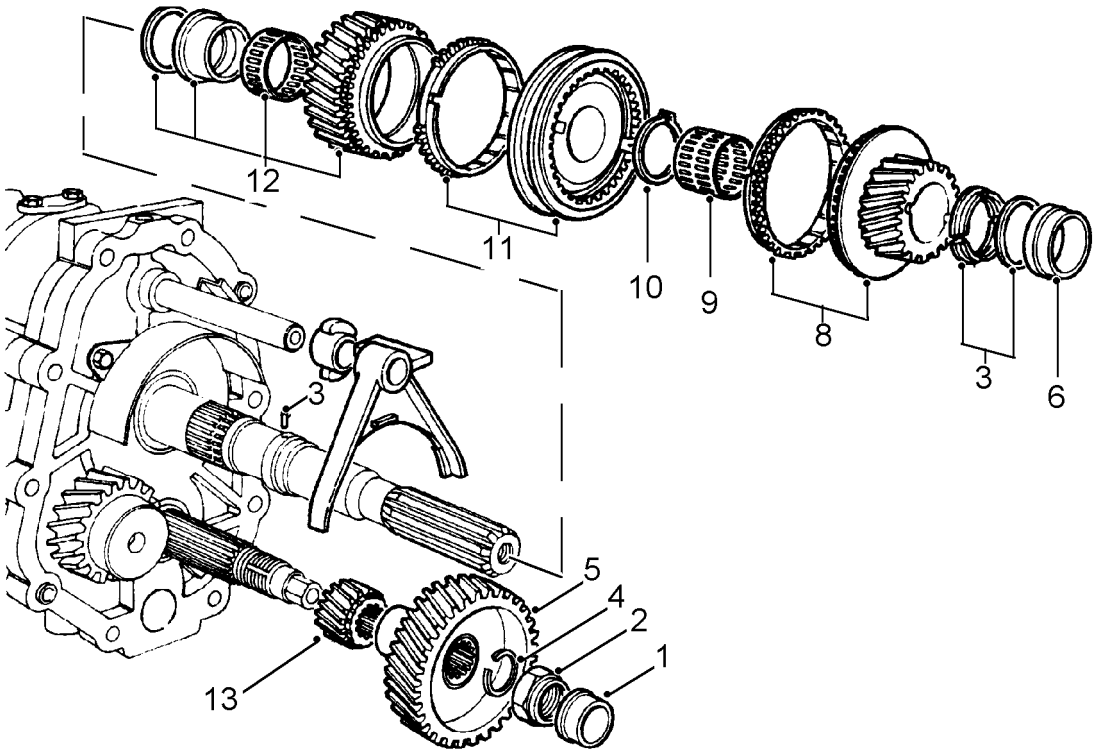
1. Remove reverse gear/5th gear selector spool retainer.



37M7123

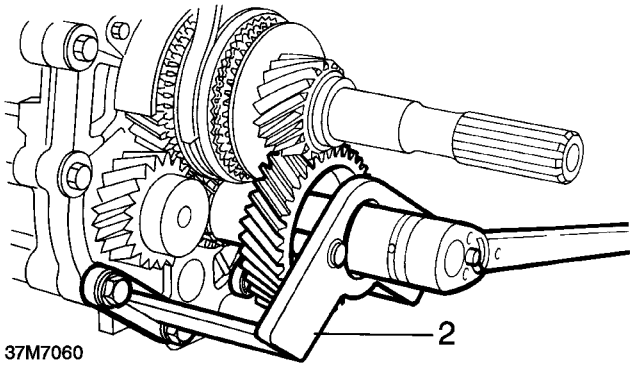
2. Remove 10 bolts securing extension case to main gearcase, noting position of longer bolts.
3. Place a suitable container underneath the box to catch any oil spillage.
4. Using a soft faced mallet, tap extension housing free from its location dowels.
5. Remove extension housing.
6. Remove oil filter.

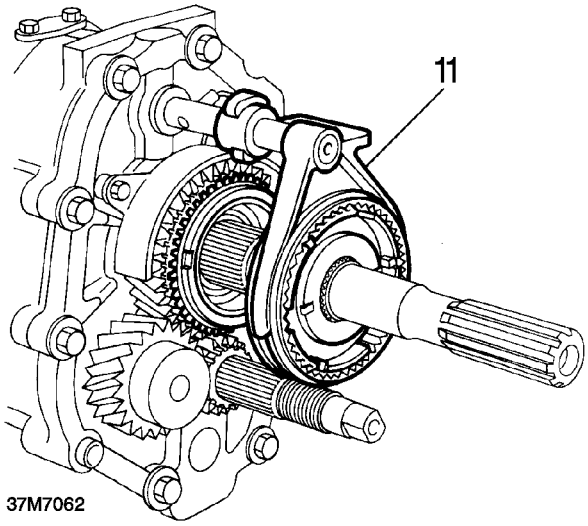
5th and Reverse gear - Remove



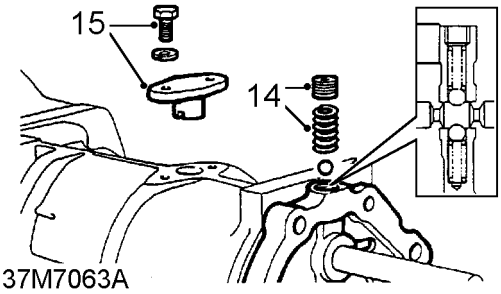
37M7061A

1. Using a suitable two legged puller remove 5th gear layshaft support bearing track from the end of layshaft.





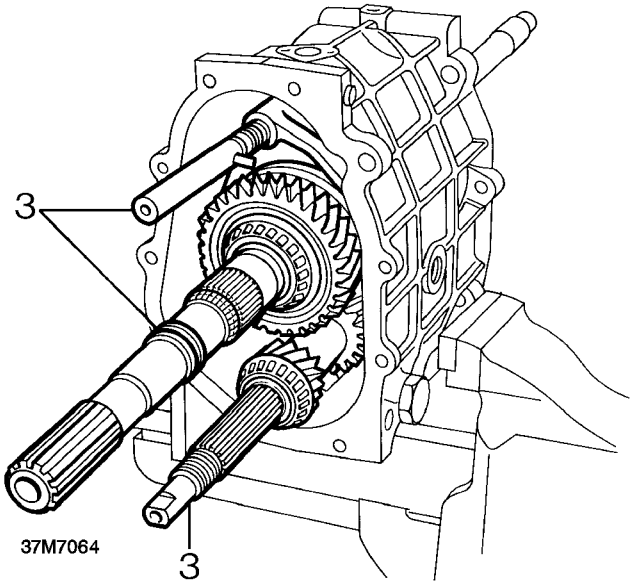
2. Using tool **LRT-37-023** to hold the 5th laygear, remove the 5th laygear nut.
3. Remove thrust collar segments, retaining ring and segments, drift out the roll pin.
4. *Later gearboxes:* Remove split washer securing 5th laygear to shaft.
5. Remove 5th laygear.
6. Remove mainshaft rear support bearing track using tools **LRT-37-009** and **LRT-37-024.**
7. Remove 12mm bolt from end of mainshaft.
8. Remove mainshaft 5th gear with synchromesh baulk ring.
9. Remove mainshaft 5th gear split needle roller bearing.
10. Remove circlip securing 5th gear synchromesh hub.
11. Rotate selector spool clear of synchro hub fork and remove 5th and reverse synchromesh hub assembly complete with fork and spool.
12. Remove mainshaft reverse gear complete with needle roller bearing and bush noting selectable spacer between reverse gear bush and centre plate bearing.
13. Remove layshaft reverse gear.



14. Remove centre plate detent plug, spring and ball.
15. Remove 2 bolts securing spool retainer, remove retainer.
16. Remove 'slave' bolts.

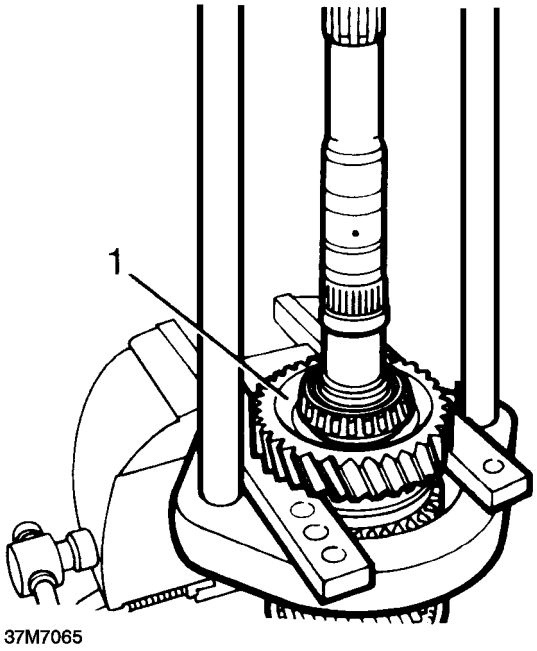
Mainshaft and layshaft - Remove

1. Align selector shaft pin with slot in centre plate and using wooden blocks and hide mallet, drive off centre plate.
2. Collect detent ball and spring, remove bearing tracks and shims.

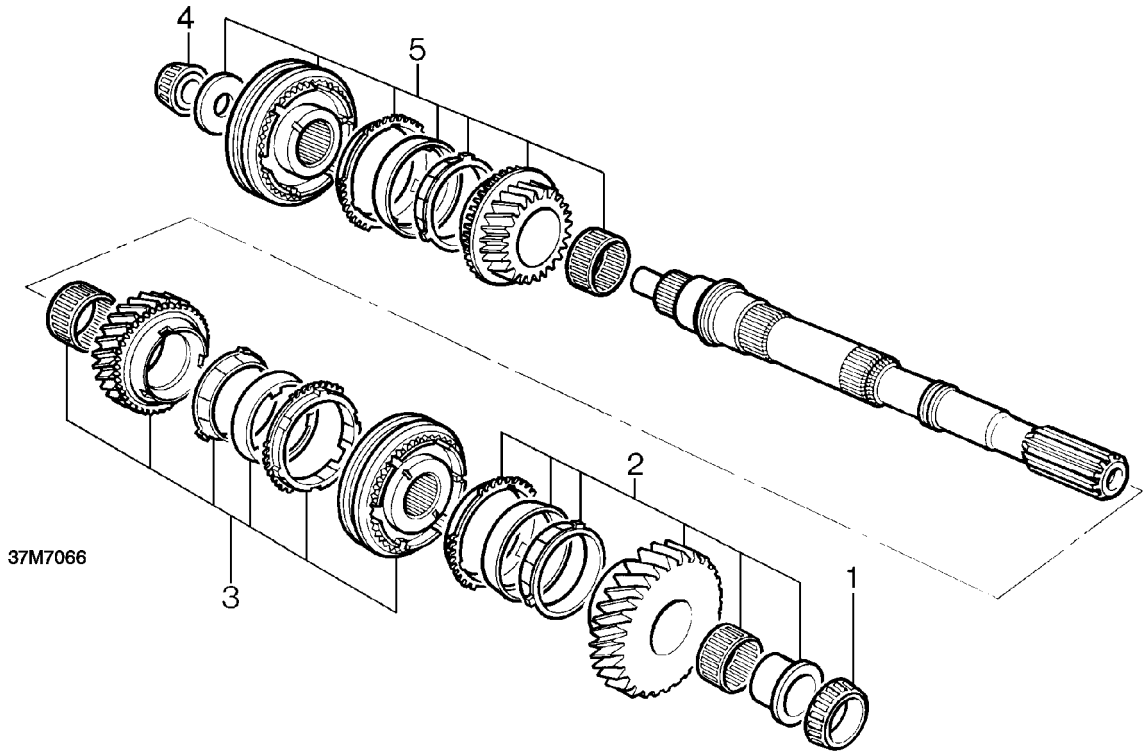


3. Remove layshaft, mainshaft and selector shaft from casing as complete unit.
4. Remove input shaft, and 4th gear baulk ring. (If not already removed with mainshaft).

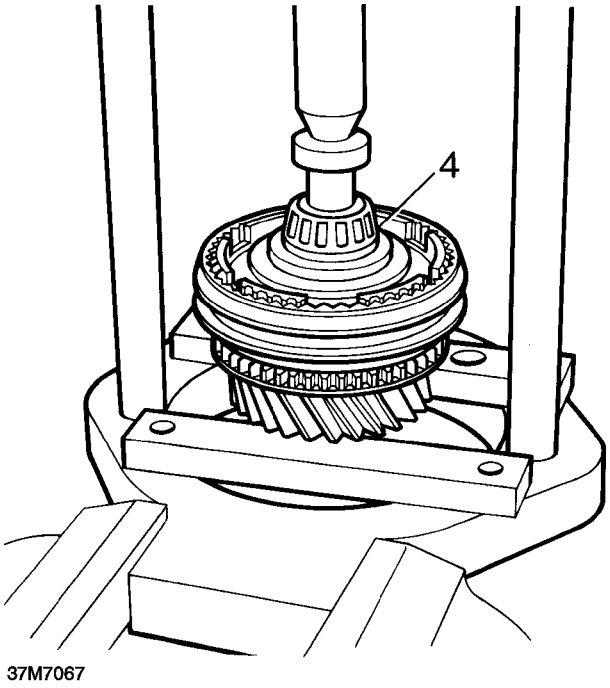
Mainshaft - Dismantle



1. Using **LRT-99-002** and support bars under 1st gear, press mainshaft support bearing from mainshaft.



5. Remove spacer, 3rd/4th gear synchromesh selector hub, synchromesh baulk rings, 3rd gear and needle bearing.



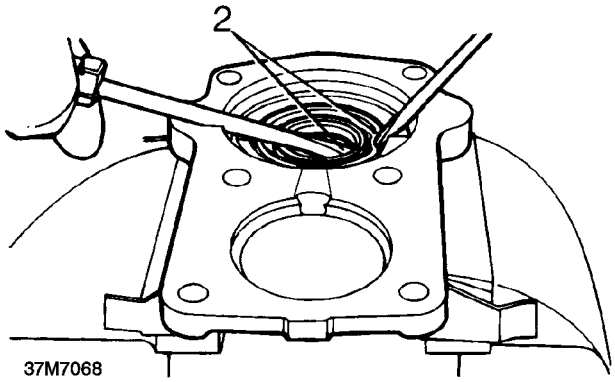
2. Remove 1st gear, bush needle bearing and synchromesh baulk rings.
3. Remove 1st/2nd gear synchromesh selector hub, 2nd gear synchromesh baulk rings, second gear and needle bearing.
4. Invert mainshaft and using **LRT-99-002** and support bars under 3rd gear, press off pilot bearing

Gearbox casing

Degrease and clean all components. Inspect casing for damage, cracks and stripped threads.

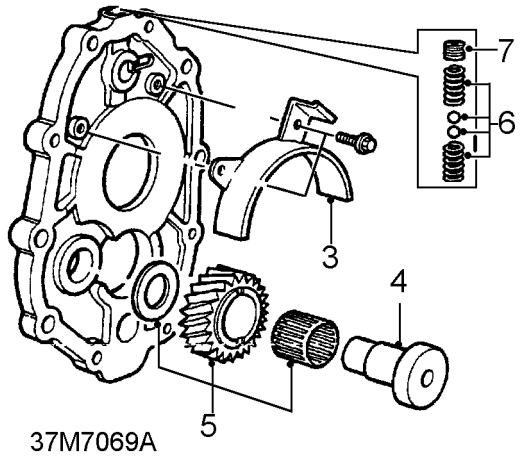
1. Fit level plug.
2. Fit new copper washer to drain plug.

Front Cover - Dismantle



1. Remove front cover and remove bearing tracks. Check that spring clips are intact.
2. Remove oil seal from cover. DO NOT fit new seal at this stage.

Centre plate - Dismantle

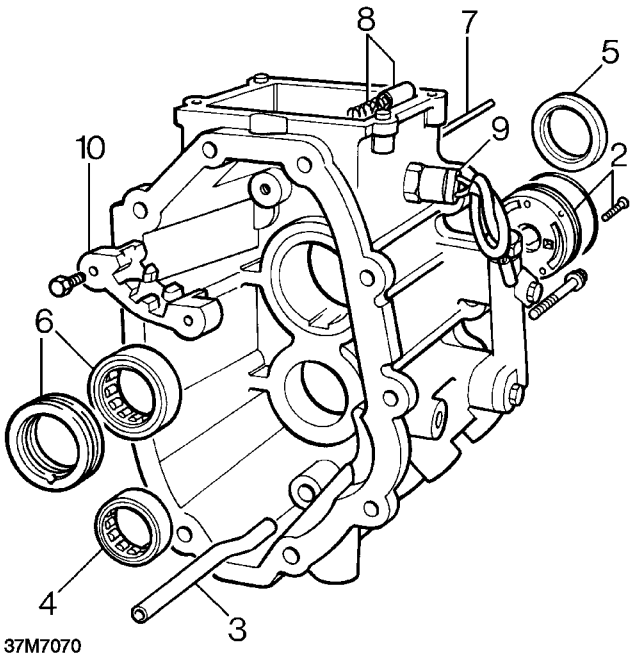


1. Remove bearing tracks and shims and check for wear and damage.
2. Inspect for damage and selector rail bore for wear.
3. Remove splash shield if required.
4. Press out reverse idler gear shaft using suitable press and check for wear.
5. Remove idler gear, needle bearing and spacer and check for wear and damage.
6. Check centre plate detent balls for wear and springs for distortion, replace as necessary.
7. Check that threads of detent plug are not damaged.

NOTE: Patchlok plug may be re-used provided threads are undamaged.

Extension housing - Types A and B gearbox - Overhaul

1. Examine for damage to threads and machined faces.



37M7070

NOTE: Types A and B gearbox extension housing shown.

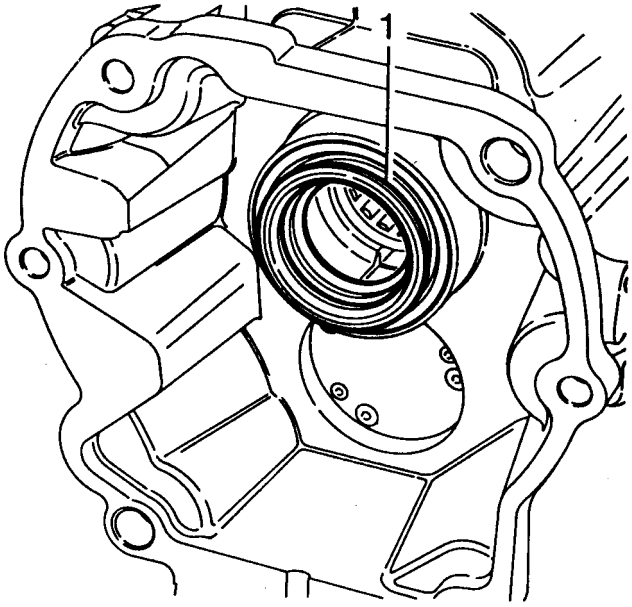
2. Remove three screws and remove oil pump.
3. Remove oil pick-up pipe and check for obstruction.
4. Drift out layshaft support bearing.
5. Remove mainshaft rear oil seal.
6. Drift out mainshaft support bearing and oil pick up ring.
7. Remove shaft retaining reverse inhibition cam.
8. Remove reverse inhibition cam and spring.
9. Remove reverse light switch and sealing washer.
10. Remove gate plate.
11. Check all components for wear and renew as required.

Type C gearbox - As for A and B Types and including the following:

12. Recover speedometer dive gear and spacer.
13. Check speedometer drive gear for wear and damage, renew if necessary.
14. Check speedometer pinion for wear and damage. Check that scrolling on shaft is clear; renew pinion and shaft if necessary.
15. Check slots in 5th gear spool guide for wear, renew spool guide if necessary.

Type C and D gearboxes

CAUTION: The rear mainshaft oil seal fitted to Type C and D extension housings is different to Types A and B. When levering out seal, take care not to damage the seal location surfaces.



37M7124

NOTE: Type D gearbox extension housing shown.

1. Lever out mainshaft oil seal, taking care not to damage the location surfaces.

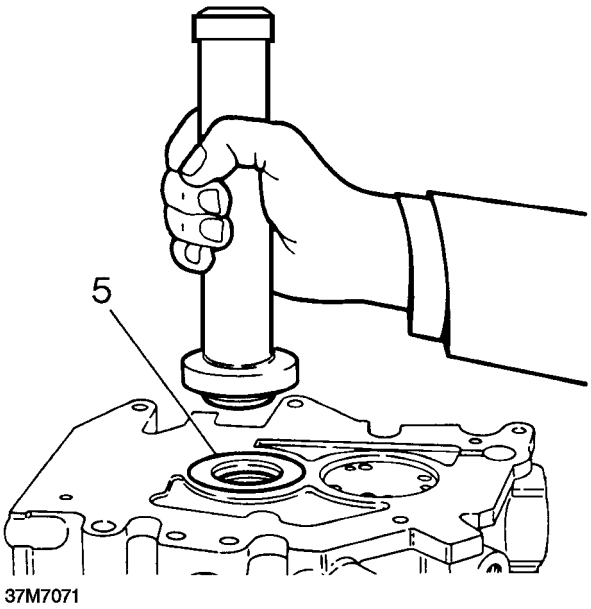
Reassembly

1. Smear a light coat of petroleum jelly into the pump recess.
2. Renew 'O' ring and press pump unit firmly into recess.

NOTE: Ensure 'TOP' marking on pump is to top of casing.

3. Tap pump lightly at edges until fully home.

NOTE: Ensure good thread engagement before tightening.

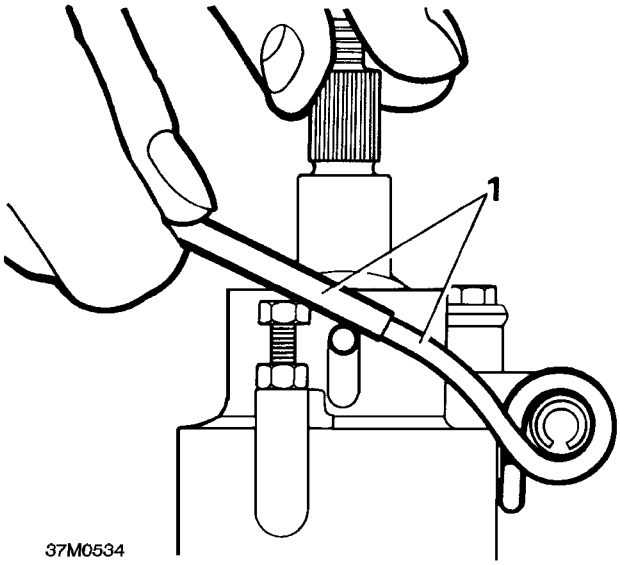


4. Fit new mainshaft support bearing.
5. Fit new mainshaft rear oil seal using tool **LRT-37-014.**
6. Fit new Layshaft support bearing.
7. Fit new oil pick-up ring (Align tag with centre of drain slot).
8. Examine gate plate and renew if worn or damaged.
9. Refit reverse light switch with new copper washer. Tighten to 24 Nm.
10. Refit reverse inhibition cam and spring.
11. Apply Hylogrip 640 and refit shaft.
12. Refit oil pipe, bend uppermost.

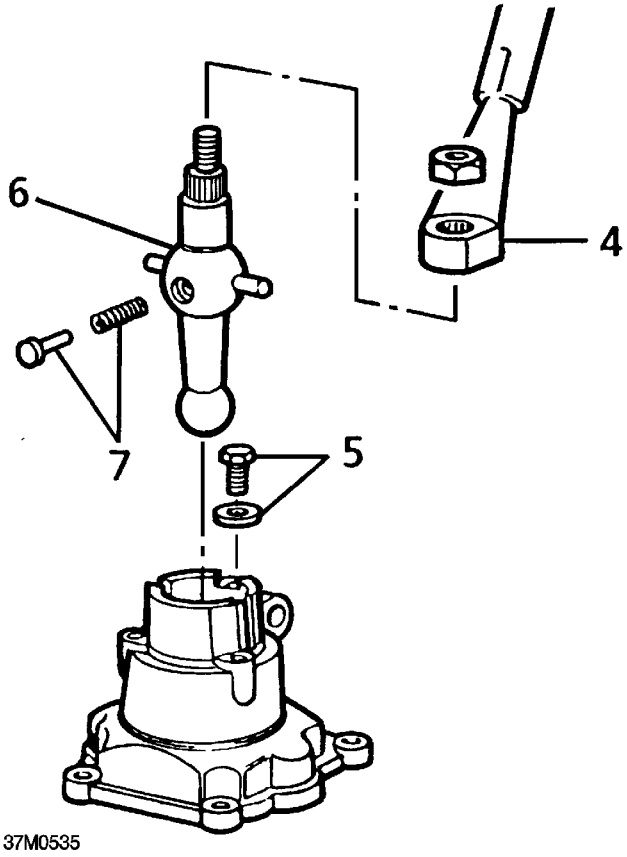
Gear change/selector housings - Overhaul

Gear change housing - Type A gearbox

Dismantle



1. Using a suitable piece of tubing, release both ends of bias spring from ball pins.
2. Slacken locknuts and remove bias spring adjusting screws.
3. Drift out roll pin, remove bias spring.



37M0535

4. Remove extension from lower gear lever.
5. Remove bolt and special washer securing lower gear lever.
6. Carefully withdraw lower gear lever from housing ensuring that spring loaded nylon pad is retained during removal.

WARNING: Personal injury may result if pad is not retained.

7. Release nylon pad, recover spring.
8. Clean all components.

Inspection

1. Check lower gear lever ball pin for wear, replace if necessary.

CAUTION: If lower gear lever is to be replaced then ball pin seating, located in remote housing should also be replaced.

2. Check nylon pad and spring for wear and damage, replace if necessary.
3. Check bias spring roll pin for damage, replace if necessary.

Reassemble

1. Smear ball pin with multi - purpose grease and fit spring and nylon pad.
2. Depress nylon pad against spring pressure, position lower gear lever in housing.

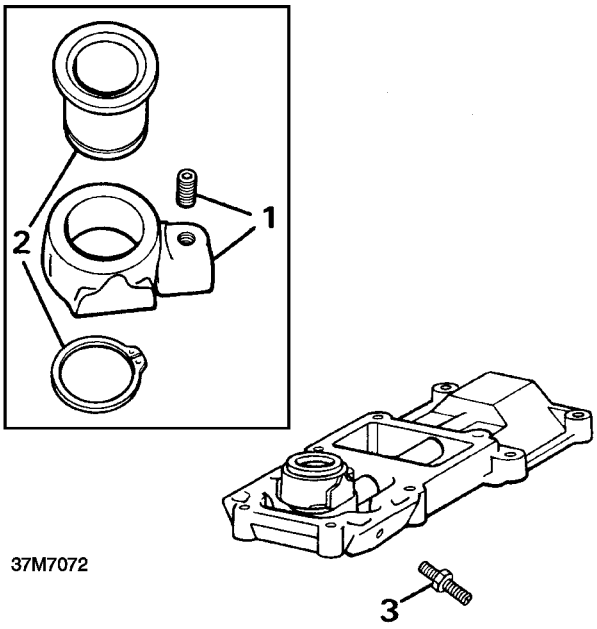
CAUTION: Ensure nylon pad is facing away from bias spring location.

3. Fit lower gear lever retaining bolt and special washer, tighten bolt to 15 Nm.
4. Fit extension to lower gear lever.
5. Position roll pin to housing, fit roll pin.
6. Fit bias spring adjusting screws and locknuts.
7. Using a suitable piece of tubing locate both ends of bias spring over ball pins.

NOTE: Do not adjust bias spring at this stage.

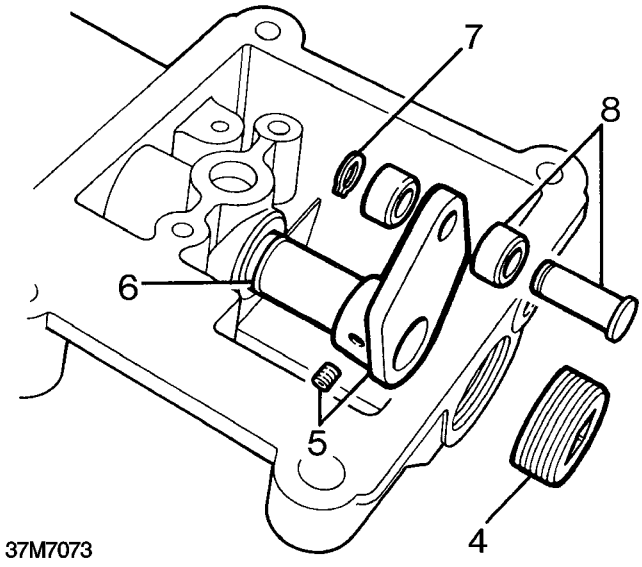
Remote housing - Type A gearbox

Dismantle



1. Remove setscrew securing trunnion to selector shaft, remove trunnion.
2. Remove and discard circlip securing ball pin seating to trunnion, remove seating.
3. Slacken locknut, remove 5th gear stop screw.

CAUTION: Retain shim(s).



4. Remove blanking plug from end of remote housing.
5. Remove setscrew securing quadrant to selector shaft, remove quadrant.
6. Remove selector shaft from remote housing, remove and discard 'O' ring.
7. Remove and discard circlip retaining rollers and pin to quadrant.
8. Remove pin, recover rollers.

Inspection

1. Check selector shaft and bore in remote housing for wear.
2. Check quadrant rollers and pin for wear.
3. Check ball pin seating for wear.
4. Replace worn components as necessary.

Reassemble

1. Lubricate selector shaft and new 'O' ring with gearbox oil.
2. Fit 'O' ring to selector shaft.
3. Fit shaft to remote housing.
4. Position rollers to quadrant, fit pin and secure with new circlip.

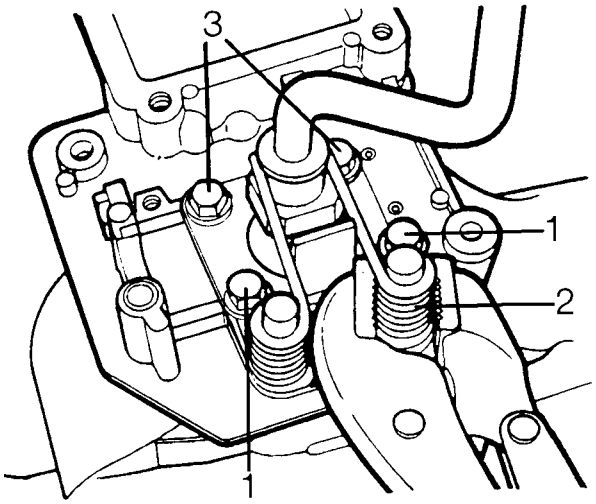
CAUTION: Ensure that head of pin is on opposite side of quadrant to selector shaft boss.

5. Fit quadrant to selector shaft.
6. Apply Loctite 270 to threads of setscrew, fit and tighten setscrew.
7. Apply Loctite 270 to threads of blanking plug, fit and tighten plug.
8. Smear ball pin seating with multi - purpose grease.
9. Position ball pin seating in trunnion, secure with a new circlip.
10. Position trunnion on selector shaft.
11. Apply Loctite 270 to threads of setscrew, fit and tighten setscrew.
12. Fit 5th gear stop screw, fit but do not tighten locknut.

NOTE: 5th gear stop screw adjustment is carried out during gearbox reassembly.

Gear change housing - Type B gearbox

Dismantle

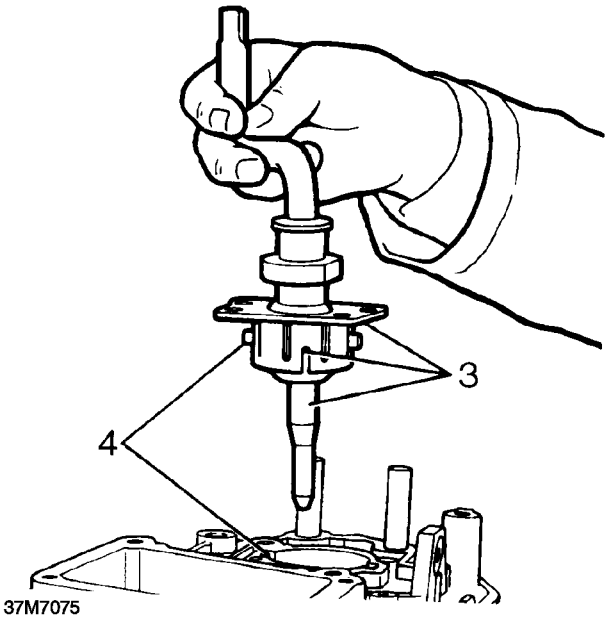


37M7074

1. 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.

2. Remove the two springs.



37M7075

3. Remove remaining bolts to release lower lever assembly.
4. Remove and discard Railko bush.
5. Remove and discard oil seal.

Inspection

1. Check ball cross pin slots in gear change housing for wear.
2. Check ball and pins for wear.
3. Check bias springs for distortion.
4. Replace worn components as necessary.

Reassemble

1. Apply multi-purpose grease to ball and cross pins.
2. Apply multi-purpose grease to new Railko bush and fit to gear change housing.

CAUTION: Ensure that the slots in each bush are aligned with slots in housing.

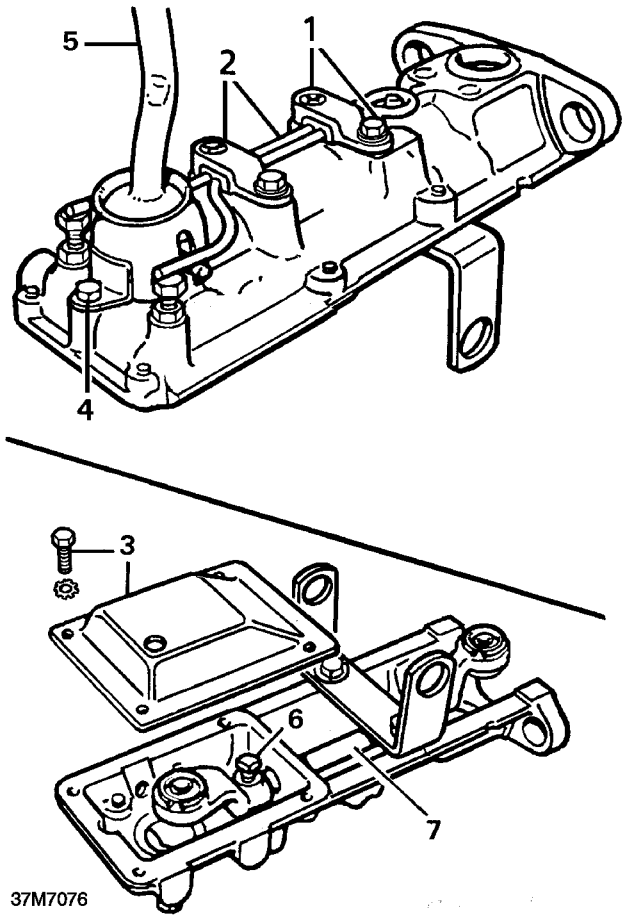
3. Lubricate a new oil seal with gearbox oil.
4. Fit oil seal using a suitable mandrel.
5. Position gear lever to gear change housing ensuring ball cross pins are located in slots in housing and Railko bush.
6. Position bias spring adjustment plate to gear change housing,
7. Apply Loctite 270 to threads of 2 short bias adjustment plate bolts.
8. Fit bolts to secure front of bias adjustment plate and tighten to 25 Nm.
9. Position bias spring to pillar ensuring longest end of spring is against gear lever.
10. Apply Loctite 270 to threads of 2 long bias bias adjustment plate bolts.
11. Restrain bias spring using a suitable pair of grips,ensure short end of bias spring is positioned on outside edge of bolt hole.

WARNING: Personal injury may result if bias spring is not retained.

12. Fit bolt and washer ensuring end of bias spring is retained beneath washer; tighten bolt to 25 Nm.
13. Repeat procedure for remaining bias spring.

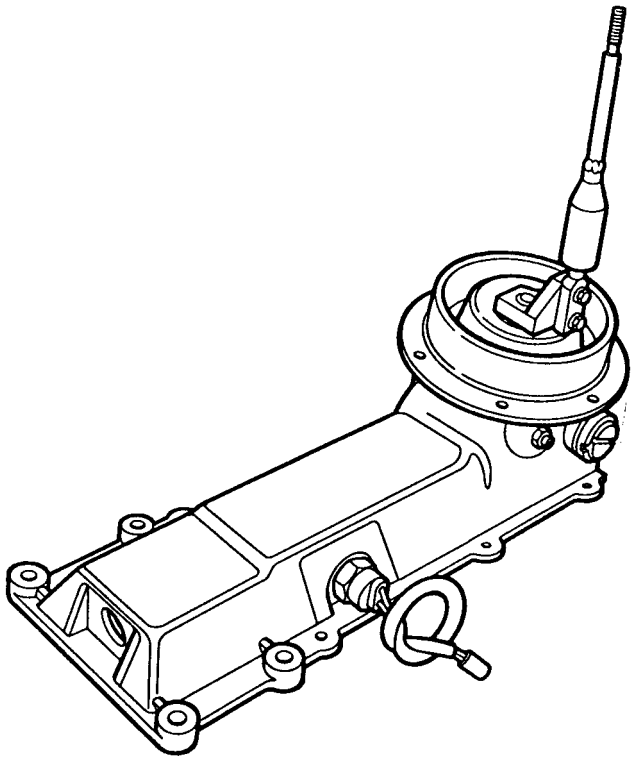
Remote gear change - Type C gearbox

Dismantle



1. Remove 2 bolts and 2 countersunk screws securing bias spring bridge plates.
2. Remove bridge plates, bridge plate liners and bias spring.
3. Remove 4 bolts and washers securing bottom cover plate, remove plate.
4. Remove bolt securing gear lever cap, remove cap.
5. Remove gear lever, recover anti-rattle spring and plunger.
6. Remove pinch bolt securing selector rod yoke, remove yoke.
7. Withdraw selector rod from remote housing.
8. Clean components.

Remote gear change - Type D gearbox



37M7126

NOTE: The remote gear change fitted to Type D gearboxes is not repairable item. It must be renewed if it is found to be excessively worn.

Inspection

1. Check selector rod bushes in remote housing for wear.

NOTE: Bushes may be pressed in and out of remote housing using a hand press and suitable mandrel.

2. Check selector rod for wear, replace if necessary.
3. Check anti - rattle spring for distortion and plunger for wear; replace if necessary.
4. Check gear lever ball pin, cross pins and bush selector rod yoke balls for wear, and replace if necessary. If yoke balls are worn, remove and discard circlip, press ball and seating out of yoke.
5. Lubricate replacement ball and seating with multi - purpose grease and press into yoke; secure using new circlip.
6. Check bias spring for distortion, replace if necessary.
7. Check condition of mounting rubbers, replace as a set if necessary.

Reassemble

1. Lubricate selector rod and bushes with multi - purpose grease, insert rod in remote housing.
2. Lubricate gear lever ball pin and selector rod yoke balls with multi - purpose grease.
3. Fit yoke to selector rod, fit and tighten pinch bolt.
4. Assemble anti - rattle spring and plunger to gear lever.
5. Fit gear lever ensuring ball pin is located in yoke and anti - rattle spring and plunger are not displaced.
6. Fit gear lever cap, fit and tighten bolt.

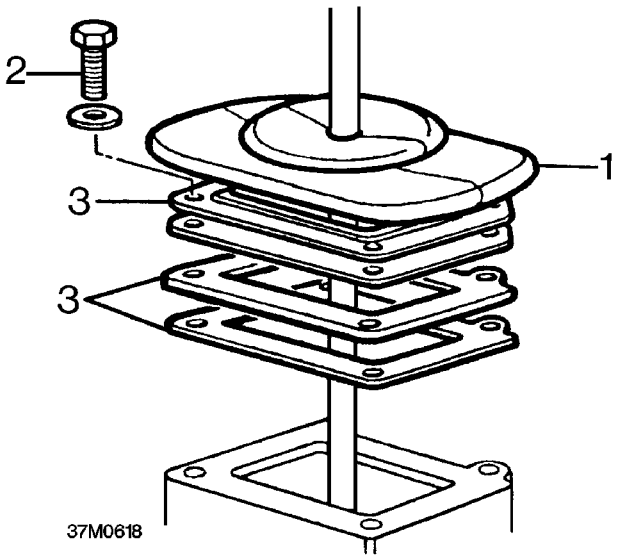
NOTE: Do not fit bottom cover plate at this stage.

7. Slacken bias spring adjustment bolt locknuts.
8. Fit bias spring, bridge plate liners and bridge plates.
9. Fit and tighten bolts and countersunk screws.

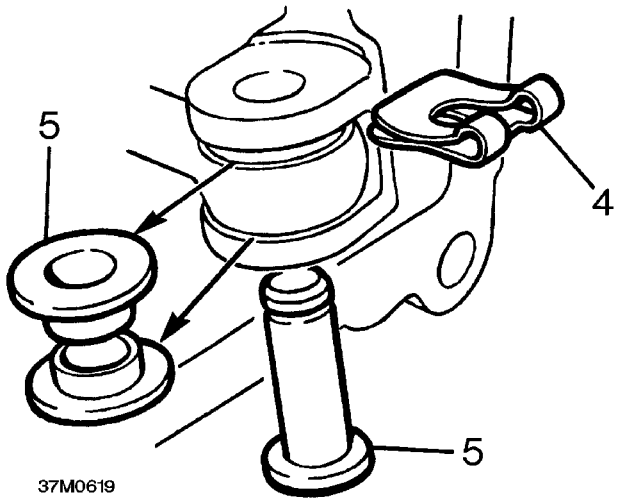
NOTE: Final adjustment of bias spring is carried out after remote gear change is fitted to gearbox.

Transfer box selector housing - Type A gearbox - Overhaul

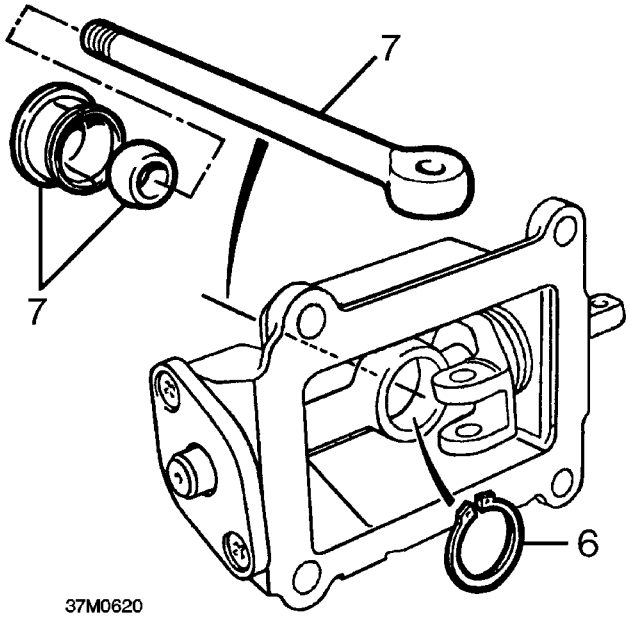
Dismantle



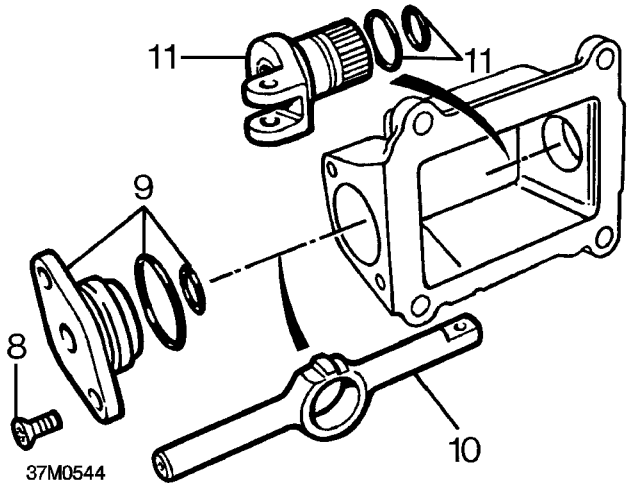
1. Slide gaiter off gear lever.
2. Remove 4 bolts securing gaiter support plate and gate plate.
3. Remove gaiter support plate and gate plate, discard gaskets.



4. Remove and discard spring clip retaining selector fork clevis pin.
5. Remove clevis pin from selector fork, remove and discard 2 bushes.



6. Remove and discard circlip retaining nylon ball seating.
7. Remove gear lever, recover nylon seating and ball



8. Remove 2 countersunk head screws securing end cover to housing.
9. Remove end cover, remove and discard 2 'O' rings.
10. Withdraw cross shaft.
11. Remove selector fork, remove and discard 2 'O' rings.
12. Clean all components.

Inspection

1. Check gaiter for splits and damage.
2. Check nylon seating and ball for wear, replace if necessary.

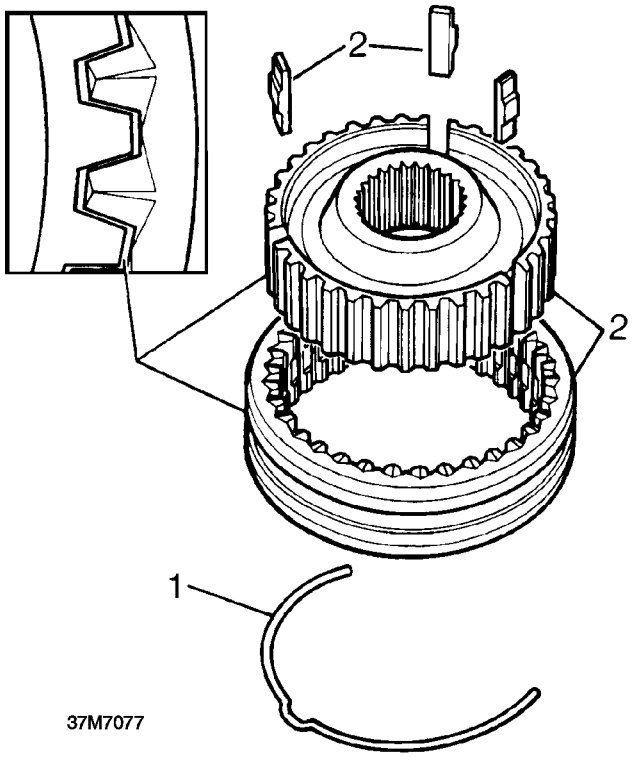
CAUTION: Seating and ball should be renewed as an assembly.

3. Check selector fork and clevis pin for wear.
4. Check cross shaft and end cover for wear.
5. Replace components as necessary.

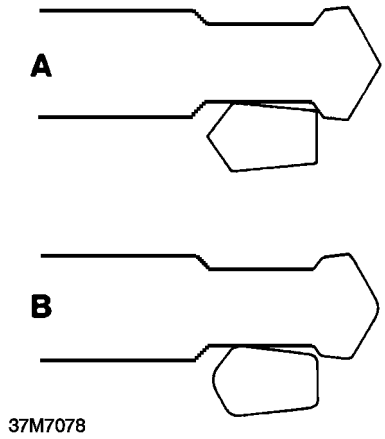
Reassemble

1. Smear new 'O' rings with gearbox oil and fit to selector fork, position fork in housing.
2. Smear cross shaft with multi - purpose grease and locate longest end of shaft in selector fork.
3. Smear new 'O' rings with gearbox oil and fit to end cover.
4. Position end cover on cross shaft, fit and tighten countersunk screws.
5. Assemble ball and nylon seating to gear lever ensuring that groove in seating is towards cross shaft.
6. Smear ball and nylon seating with multi - purpose grease and locate in cross shaft; retain with a new circlip.
7. Position new bushes to gear lever, locate in selector fork and fit clevis pin.
8. Fit new spring clip to retain clevis pin.
9. Position gate plate and gaiter support plate to housing, use new gaskets.
10. Fit retaining bolts and tighten to 15 Nm.
11. Fit gaiter.

Synchromesh assemblies - Overhaul



1. Remove spring clips from both sides of assembly.
2. Remove slippers and separate the hub from the sleeve.
3. Examine all parts for damage and wear including spring clips for tension.
4. Check no excessive radial movement exist between inner members and mainshaft splines.
5. Examine inner and outer splines for wear.



6. 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.**

7. Replace unit if excessively worn.

Reassembly

8. Refit inner hub to sleeve.

△ **NOTE: Hubs and sleeves have a master spline combination and can only be assembled one way. The sleeves are further identified with a series of half moon notches which clearly identify which side of the assembly faces which gear. Ensure the slot in the hub aligns with the centre notch on the sleeve.**

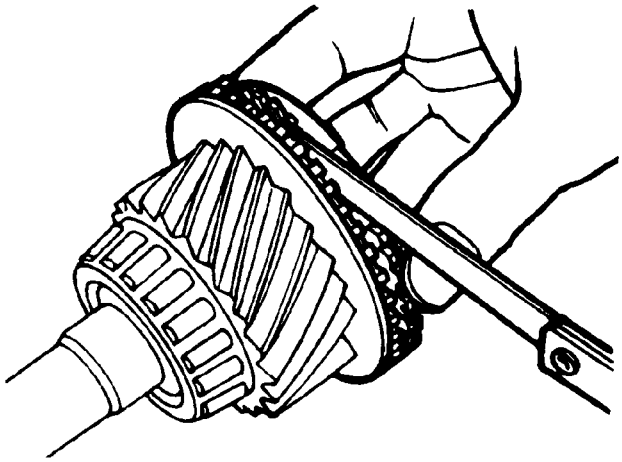
Assy	Hub	Sleeve	Against Gear
1st/2nd	-	1 Notch	1st
	2 gear side	-	2nd
3rd/4th	-	3 Notches	3rd
	-	-	4th
5th/Rev	-	5 Notches	5th

9. Fit slippers and secure with a spring each side of the synchromesh assembly ensuring the step on each spring locates on a different slipper.

△ **NOTE: 5th and reverse synchromesh hubs have different springs noted by their yellow colour.**

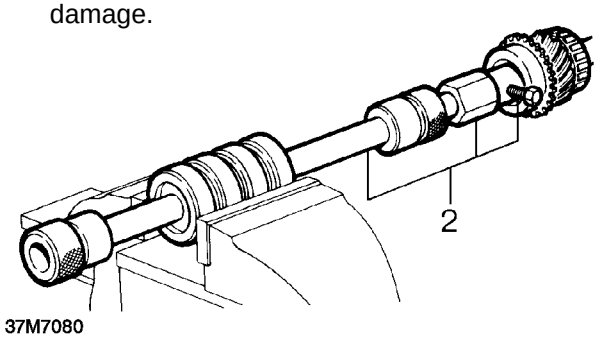
Checking baulk ring clearances

Check clearance of all baulk rings and gears by pressing the baulk rings against the gear and measuring the gap. **The minimum clearance should be 0.5mm (0.020in).**



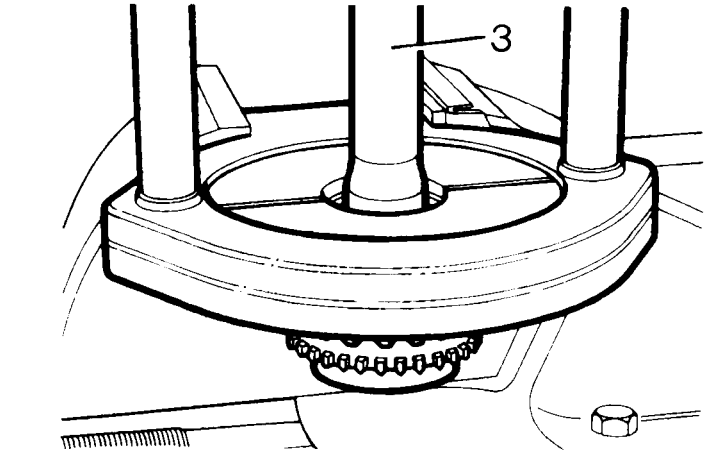
Input shaft - Overhaul

1. Examine the gear and dog teeth for wear and damage.



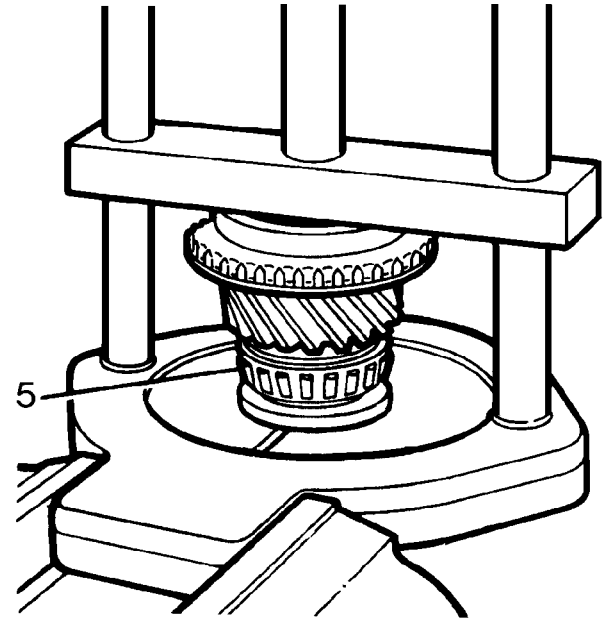
2. Using tool **LRT-99-004** and **LRT-37-004** remove pilot bearing track.

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



37M7081

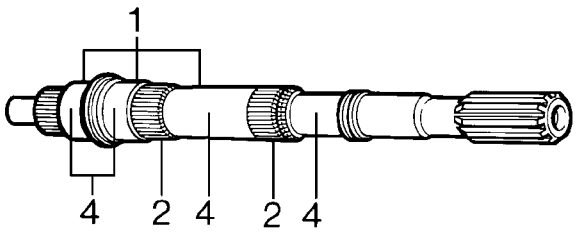
3. Using **LRT-37-001** and **LRT-99-002** remove taper roller bearing.
4. Support the shaft under **LRT-99-002** and press in a new pilot bearing track.



37M7082

5. Using **LRT-99-002**, Collets **LRT-37-001** and adapter **LRT-37-002** fit a new taper bearing.

Mainshaft - Inspection



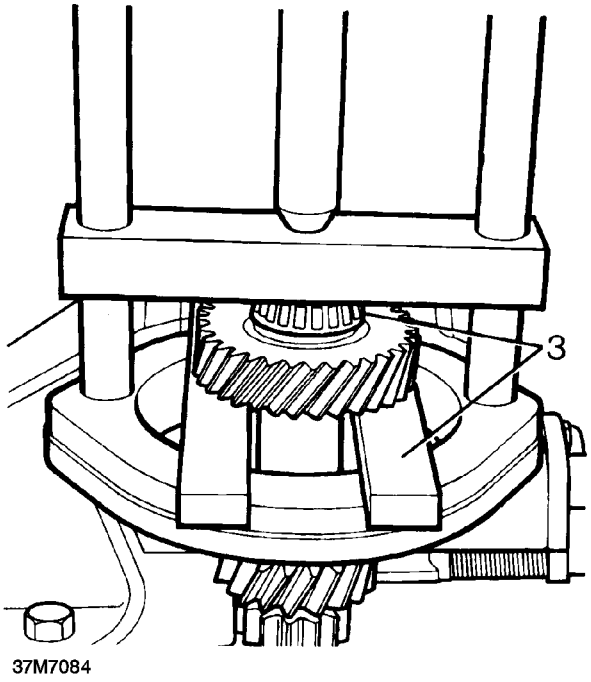
37M7083

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

Layshaft - Overhaul

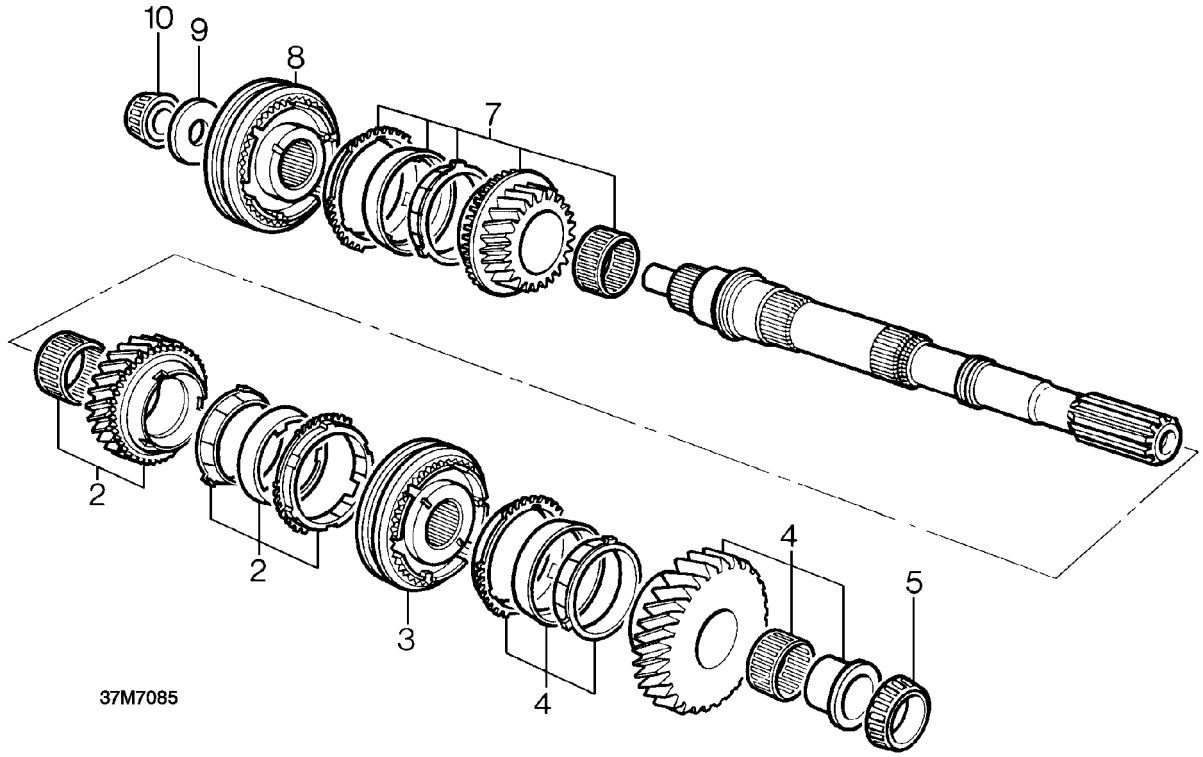
1. Using extractor tool **LRT-99-002** and collets **LRT-37-022** withdraw layshaft bearings.
2. Examine layshaft for wear and damage.

NOTE: Layshaft and layshaft 5th gear fitted to later gearboxes are machined to enable fitment of a split washer to prevent gear movement on shaft. The modified layshaft, gear and split washer may be fitted to early gearboxes as an assembly.



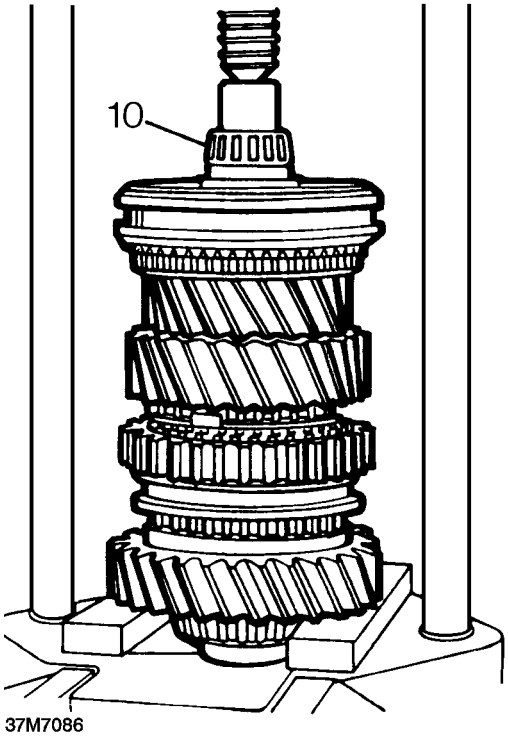
37M7084

3. Using press **LRT-99-002**, and support bars fit new taper roller bearings.



Mainshaft - Reassembly

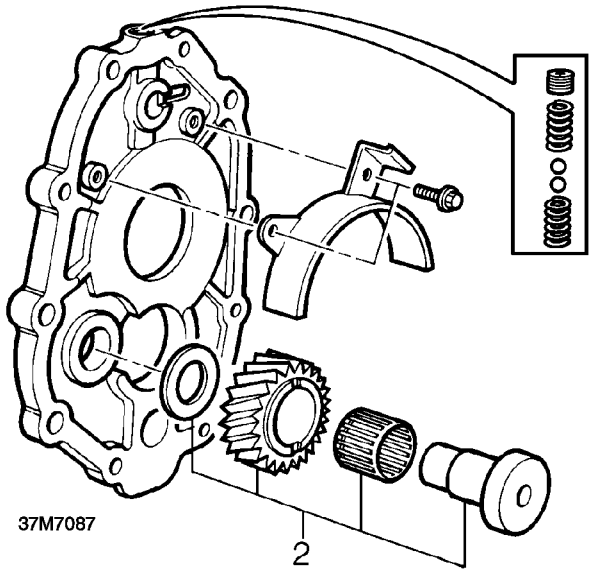
1. Clamp mainshaft in protected vice jaws, output end upwards.
2. Fit 2nd gear needle roller bearing, 2nd gear and synchromesh baulk rings onto mainshaft. *(Rotate each baulk ring to ensure they locate onto each other).*
3. Assemble the 1st and 2nd synchromesh selector hub onto mainshaft spline, *(note 2nd speed side marking).* Ensure that baulk ring has located correctly inside hub. *(Rotate the ring slightly as the hub is lowered).*
4. Fit 1st gear synchromesh baulk rings, needle roller bearing, 1st gear and bush onto mainshaft ensuring baulk rings locate correctly inside selector hub.
5. Using **LRT-99-002**, bearing guide **LRT-37-019**, collets **LRT-37-001** and adaptor **LRT-37-002** press on mainshaft taper roller bearing taking care not to disturb the lay of the synchromesh baulk rings and gears.
6. Check the end float of the 1st and 2nd gear assembly using a feeler gauge between the gear and mainshaft bearing.
   Maximum clearance:
   1st gear: 0.05 - 0.20mm (0.002 - 0.008 in)
   2nd gear: 0.04 - 0.21mm (0.0016 - 0.0083 in)
7. Invert mainshaft in vice and fit 3rd gear needle roller bearing, third gear and synchromesh baulk rings.
8. Assemble 3rd/4th gear synchromesh selector hub (note 3rd speed side markings) onto mainshaft splines taking care to locate the baulk rings into recesses in the selector hub.
9. Fit spacer.



10. Using **LRT-99-002** press on new pilot bearing.
Check end float of 3rd gear assembly as in step 6.
Maximum clearance:
0.11 - 0.21mm .

Reverse idle gear - Reassembly

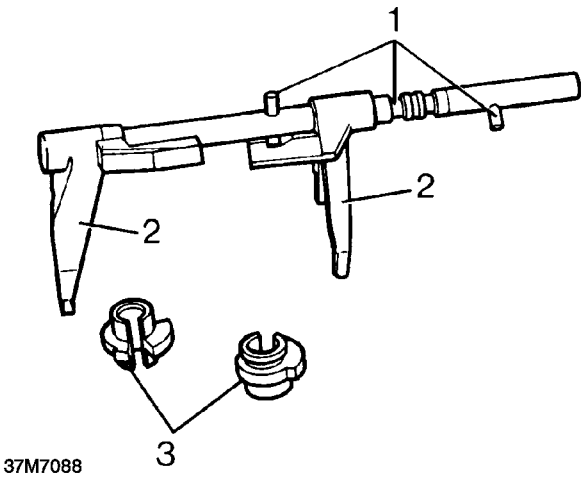
1. Examine components for wear and damage.



2. Assemble reverse idle gear needle roller bearing, idle gear, spacer and shaft and using suitable tool, press into centre plate.
Maximum clearance:
0.04 - 0.38mm (0.0016in - 0.015in)

Selectors - Inspection

1. Examine selector rail and pins for wear and damage.



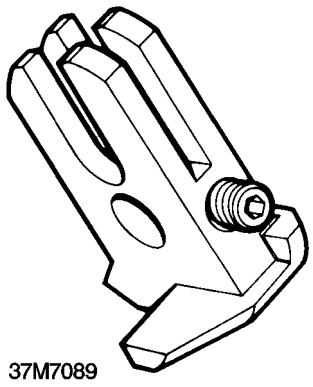
2. Examine selector forks for wear and damage.

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

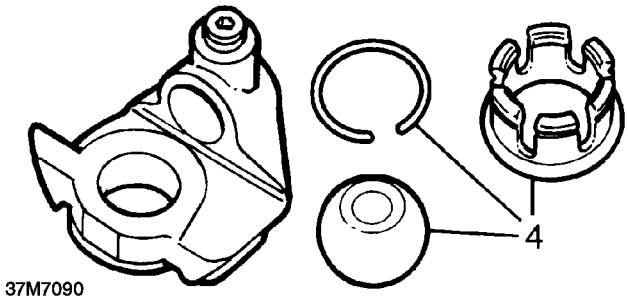
3. Examine interlock spools for wear and damage.

Selector quadrant - Type A gearbox

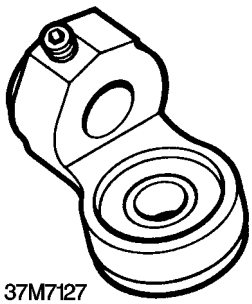
Examine selector quadrant and check for wear.



Selector yoke - Type B and D gearboxes

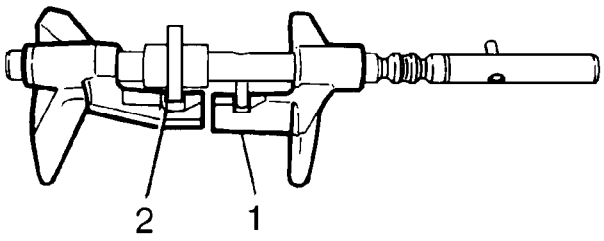


Selector yoke - Type C gearbox



4. Remove snap ring and examine selector yoke assembly.

Assembling selectors.



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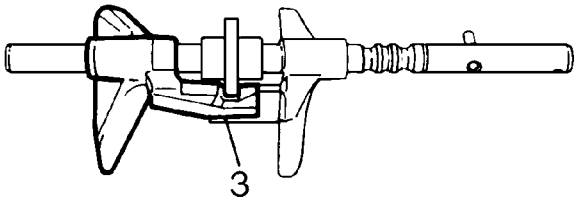
1. Rest 1st/2nd fork and shaft assembly on bench and locate pin in jaw of fork.
2. Fit interlock spool and 3rd/4th fork and engage spool in jaw of fork.



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3. Slide spool and fork towards 1st/2nd selector until slot in spool locates over pin keeping the spool engaged in 3rd/4th fork jaw.

GEARBOX REASSEMBLE

Mainshaft and layshaft end float

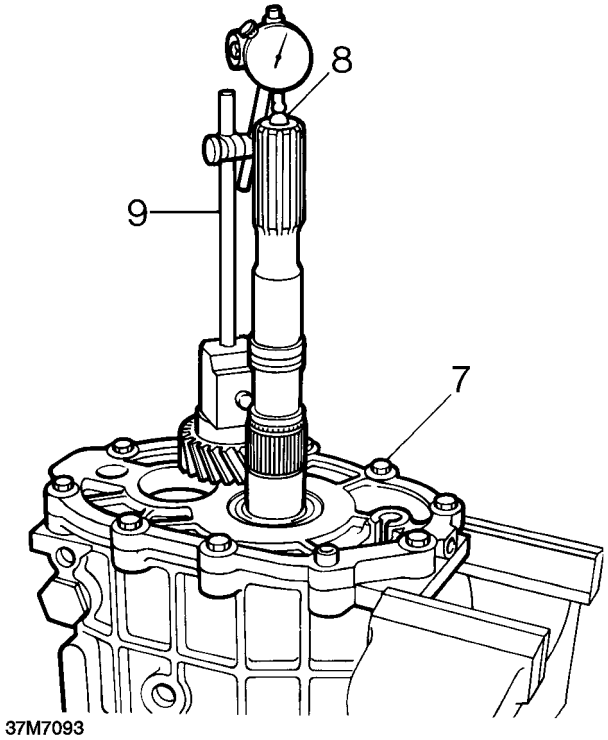
NOTE: The end float setting for both the mainshaft and the layshaft has to be determined before the gear box can be reassembled. This is achieved by clamping the mainshaft and layshaft separately between the centre plate and main casing and measuring the movement on each shaft with a Dial test indicator.

The end float setting for the mainshaft and layshaft is 0.01 - 0.06mm (0.0004 - 0. 0024in).

Shims to make up the required clearances are placed under the bearing tracks of the centre plate.

Shimming

1. Fit bearing tracks to main casing front cover.
2. Fit front cover to casing without oil seal.
3. Clamp casing in vice with front cover downwards.
4. Fit input shaft. Do not fit 4th gear baulk ring.
5. Fit mainshaft assembly to input shaft.
6. Fit mainshaft bearing shim and track to centre plate.

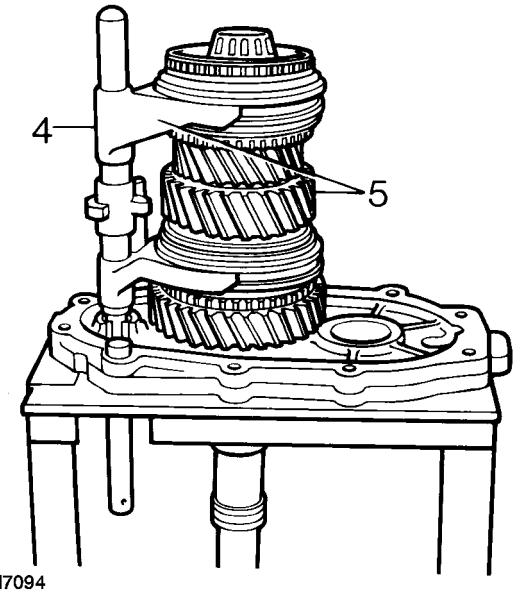


37M7093

7. Fit centre plate and bolt down using 8 'slave' bolts.
8. Fit large ball bearing to rear of mainshaft.
9. Mount dial test indicator.
10. Rotate mainshaft to settle bearings.
11. Lift mainshaft and note reading.
12. Dismantle and substitute shims if reading incorrect.
13. Repeat procedure.
14. Remove mainshaft assembly and repeat procedure for layshaft.
15. Dismantle assembly in preparation for assembly on stand.

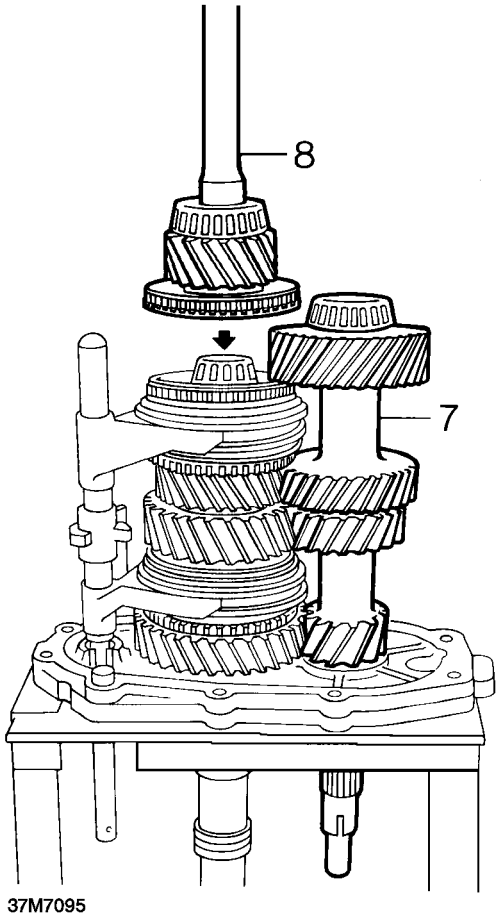
Assembling mainshaft and layshaft to centre plate

1. Secure centre plate to workstand.
2. Fit selected shims and bearing tracks.
3. Fit inboard detent ball and spring, use a dummy bar to temporarily hold the ball in place.

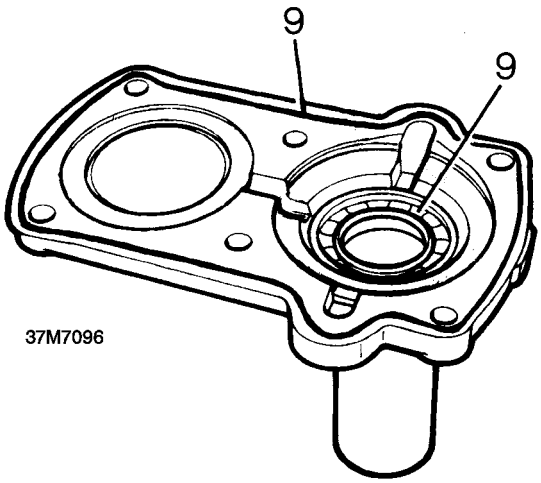


37M7094

4. Check both synchromesh units are in neutral and fit selector shaft assembly to mainshaft.
5. Fit mainshaft and selectors as complete unit to centre plate aligning pin with slot in plate.
6. Fit 4th gear synchromesh baulk ring.



7. Fit layshaft whilst lifting mainshaft to clear layshaft rear bearing.
8. Lubricate pilot bearing and fit input shaft.

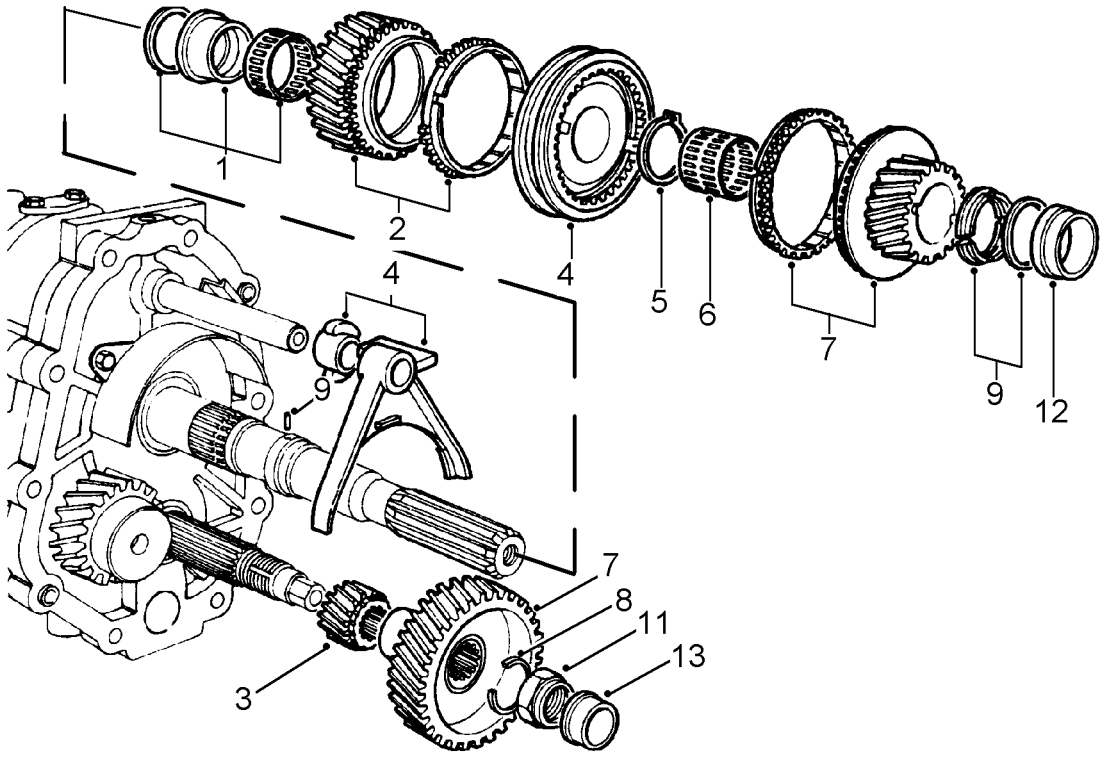


9. Fit oil seal to front cover. Ensure seal is fitted down to shoulder. Apply Hylosil RTV 102 to front cover as shown.

△ **NOTE: Early type seal - unwaxed - lubricate seal with gearbox oil.**
Later type seal - wax coated - fit seal dry.

10. Fit bearing tracks and clips to main case and fit front cover. Seal fixings with Hylogrip 640.
11. Apply Hylosil RTV 102 and fit main casing to centre plate.
12. Bolt casing and centre plate together using 2 or 3 'slave' bolts.
13. Fit new 'O' ring and fit spool retainer.
14. Remove casing from stand and clamp in vice.

Reverse and 5th gear - Reassembly



37M7098B

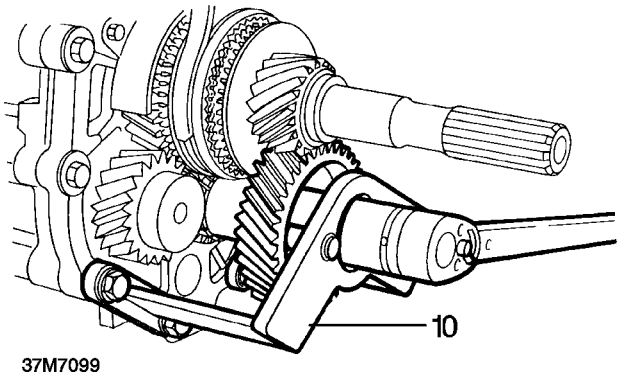
1. Fit mainshaft reverse gear selectable washer, bush and needle bearing.
2. Fit mainshaft reverse gear and synchromesh baulk ring.
3. Fit layshaft reverse gear.
4. Assemble selector spool, selector fork and reverse /5th gear synchromesh hub. Fit as one assembly to mainshaft splines and selector shaft. (Ensure synchromesh baulk ring locates inside hub).
5. Fit new circlip.

NOTE: The fit of the circlip is controlled by the selectable washer behind the reverse gear. Adjust to *0.005 - 0.055mm (0.0002 - 0.0021in).*

6. Fit 5th gear split needle bearing.
7. Fit 5th gear and 5th gear synchromesh baulk ring to mainshaft, fit layshaft 5th gear.
8. *Later gearboxes:* Fit split washer to retain layshaft 5th gear.

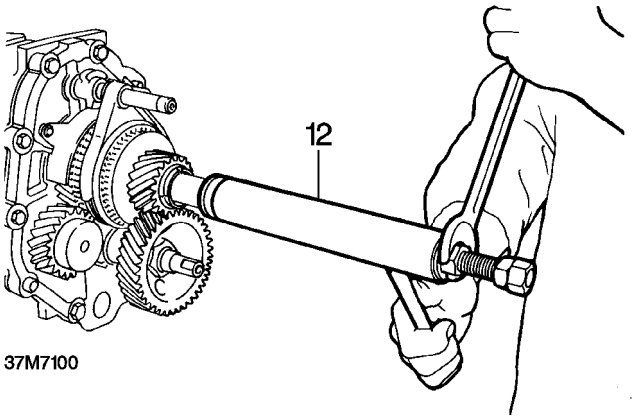
NOTE: Bevelled side of washer must face towards gear.

9. Fit new mainshaft thrust collar roll pin. Locate 5th gear thrust segments and retaining ring.

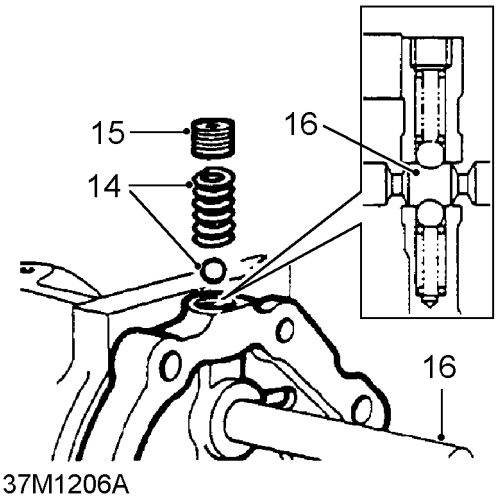


37M7099

10. Using **LRT-37-023** to hold layshaft 5th gear, tighten the layshaft 5th gear nut to 220 Nm.
11. Stake layshaft 5th gear nut.



12. Using tool **LRT-37-015** and **LRT-37-021** press mainshaft rear support bearing track to collar on mainshaft.
13. Apply small amount of heat and fit layshaft rear support bearing.



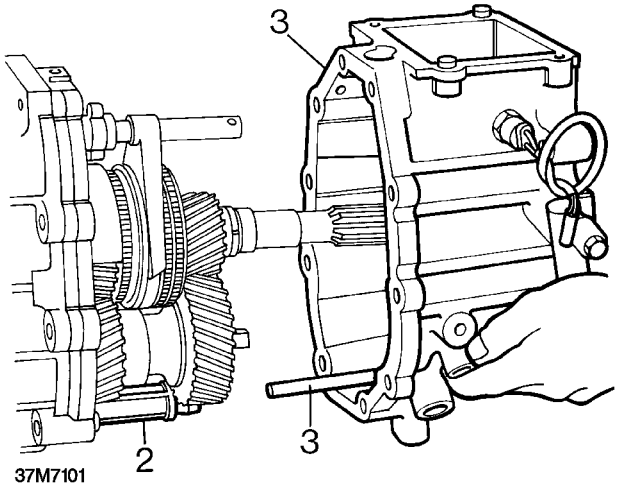
14. Fit centre plate detent ball and spring.
15. Fit and tighten plug to 25 Nm.

NOTE: Patchlok plug may be re-used provided threads are undamaged.

16. Move selector shaft and check that detent balls can be felt to engage in detent.

Extension housing - Type A and B Gearbox - Refit

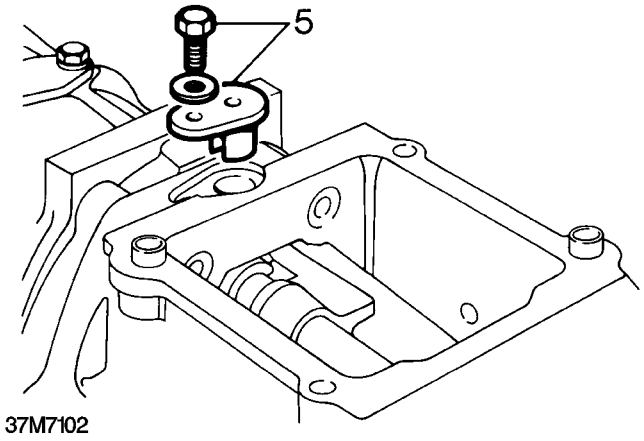
1. Remove all 'slave' bolts from centre plate and casing.
2. Refit oil filter.



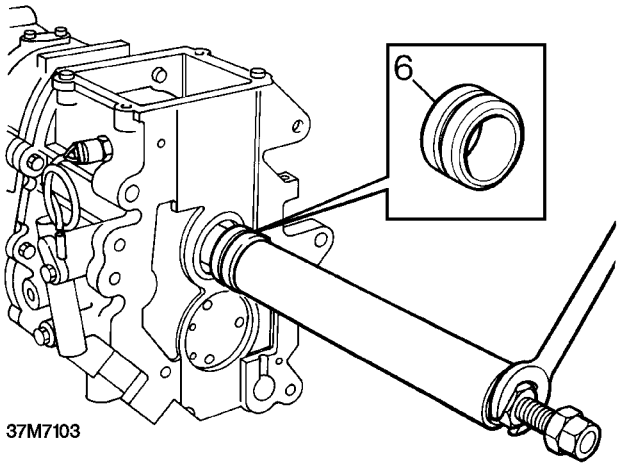
3. Apply Hylosil RTV 102 to mating surfaces and fit extension housing ensuring oil pipe locates in filter and roller bearings are not dislodged.

CAUTION: Do not use force, if necessary, remove extension housing and re - align oil pump drive.

4. Bolt extension housing to centre plate and main casing.



5. Apply Hylosil RTV 102 to extension case spool retainer, fit retainer and tighten bolt to 8 Nm.



6. Using **LRT-37-015** and **LRT-37-21** press on mainshaft oil seal collar.

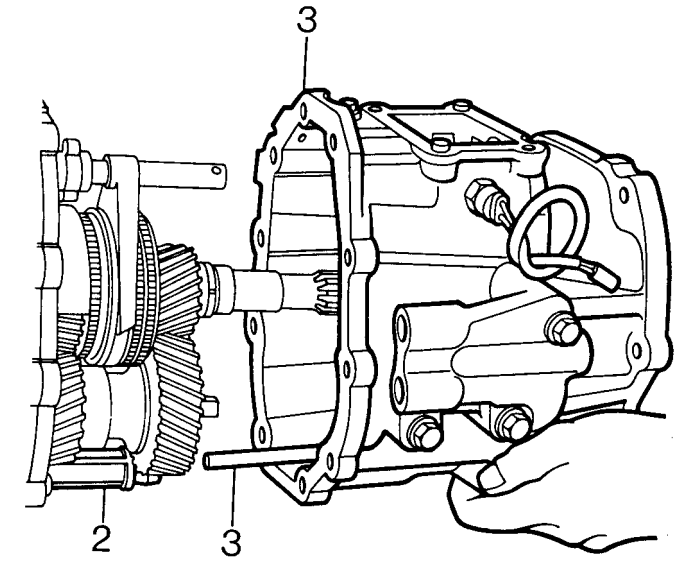
Extension housing - Type C gearbox - Refit

1. Lubricate a new selector shaft oil seal with gearbox oil.
2. Fit selector shaft oil seal.
3. Refit oil filter.
4. Apply Hylosil RTV 102 to mating surfaces.
5. Fit extension housing ensuring oil pick - up pipe locates in filter and drive locates in oil pump.

CAUTION: Do not use force, if necessary, remove extension housing and re - align oil pump drive.

6. Fit extension housing bolts and tighten by diagonal selection to 25 Nm.
7. Fit spacer
8. Position speedometer drive gear on output shaft splines.
9. Using a round nosed punch, carefully tap speedometer drive gear into position.
10. Smear a new 'O' ring with gearbox oil and fit to speedometer pinion housing.
11. Lubricate speedometer pinion with silicone grease.
12. Fit speedometer pinion housing ensuring teeth of pinion mesh with those of driven gear.
13. Apply Hylosil RTV 102 and fit 5th gear spool guide. Tighten bolt to 8 Nm.
14. Fit selector shaft pin to selector shaft, fit and tighten a new self - locking nut.
15. Fit output flange to output shaft.
16. Fit new 'O' ring and spacer.
17. Fit new tab washer.
18. Fit output flange bolt and tighten to 90 Nm.
19. Lock bolt with tab washer.

Extension housing - Type D gearbox - Refit

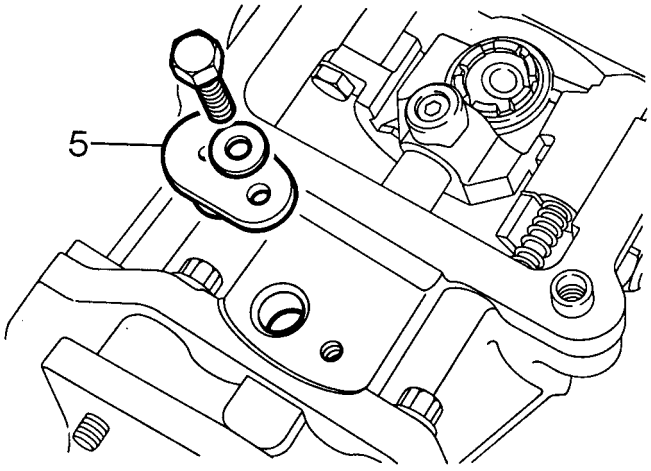


37M7128

1. Remove all 'slave' bolts from centre plate.
2. Refit oil filter.
3. Apply Hylosil RTV 102 to mating surfaces and fit extension housing. Ensure that oil pipe locates in filter and that roller bearings are not dislodged.

⚠ **CAUTION: Do not use force. If necessary, remove extension housing and re-align oil pump drive.**

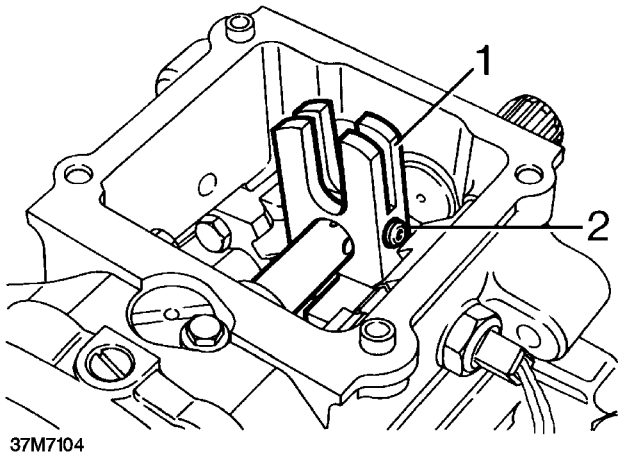
4. Bolt extension housing to centre plate and main casing.



37M7129

5. Apply Hylosil RTV 102 and fit extension case spool retainer, fit and tighten bolt to 8 Nm.

Selector quadrant - Type A gearbox - Refit

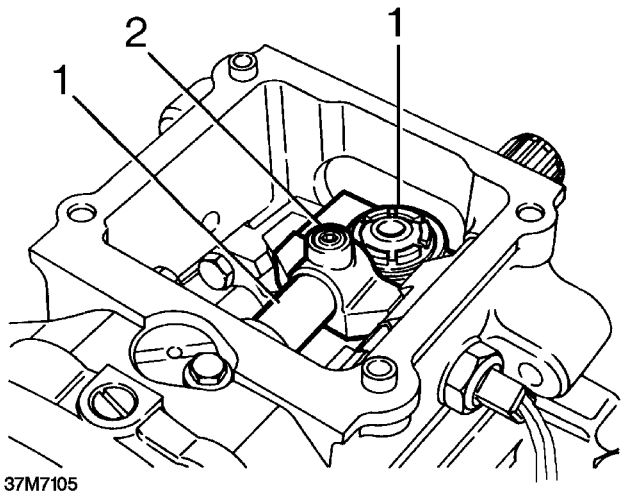


37M7104

1. Position selector quadrant to selector shaft.
2. Apply Loctite 270 to thread of a new setscrew. Fit and tighten screw to 25 Nm.
3. Move selector shaft to neutral position.

⚠ **CAUTION: Ensure end of setscrew locates in hole in selector shaft.**

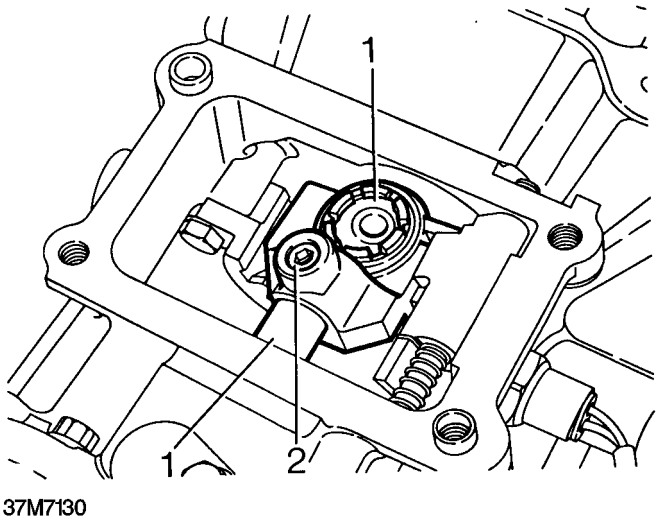
Gear change lever yoke - Type B gearbox - Refit



1. Position gear change lever yoke on selector shaft with ball facing towards output shaft.
2. Apply Loctite 270 to threads of a new setscrew, fit and tighten screw to 25 Nm.

CAUTION: Ensure end of setscrew locates in hole in selector shaft.

Gear change lever yoke - Type D gearboxes - Refit

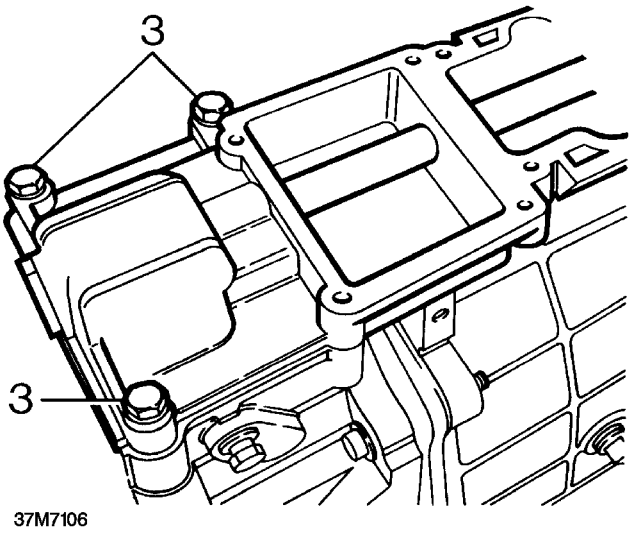


1. Position gear lever yoke on selector shaft with ball facing towards output shaft.
2. Apply Loctite 270 to threads of new setscrew. Fit and tighten screw to 25 Nm.

CAUTION: Ensure end of setscrew locates in hole in selector shaft.

Remote housing - Type A gearbox - Refit

1. Apply Hylosil RTV 102 to mating surfaces and fit to extension housing.
2. Position remote housing to extension housing and gearcase ensuring rollers locate in quadrant.



3. Fit but do not fully tighten 3 bolts in positions shown.

Transfer box selector housing - Type A gearbox - Refit

1. Smear a new gasket with grease and fit to remote housing.
2. Position transfer box selector housing to remote housing.
3. Fit but do not fully tighten 4 bolts.

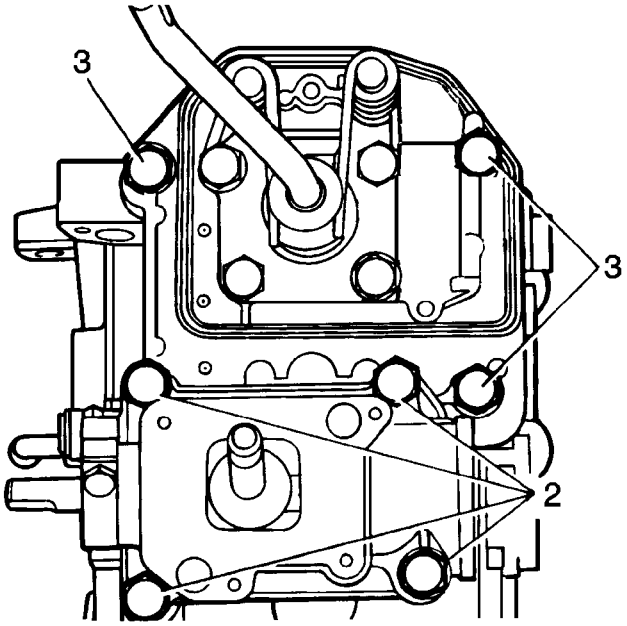
Gear change housing - Type A gearbox - Refit

1. Smear a new gasket with grease and fit to remote housing.
2. Position gear change housing to remote housing ensuring gear lever ball is correctly located.
3. Fit but do not fully tighten 4 bolts.
4. Tighten remote housing, transfer box selector housing and gear change housing bolts to 25 Nm.

Transfer box selector housing - Type B gearbox - Refit

1. Smear a new gasket with grease and fit to gearcase.
2. Position transfer box selector housing to gearcase, fit 4 bolts and tighten to 25 Nm

Gear change housing - Type B gearbox - Refit



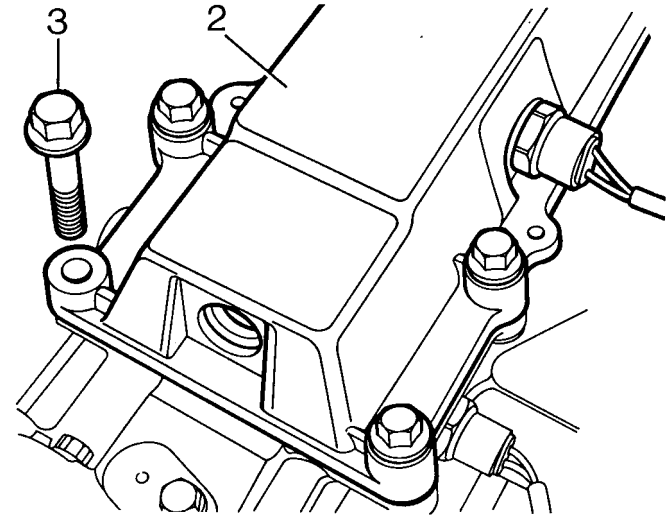
37M7107

1. Apply Hylosil RTV 102 to mating surfaces of extension housing.
2. Position gear change housing to extension housing ensuring that gear lever passes through centre of gear change lever yoke and engages in the gate plate.
3. Fit bolts and tighten to 25 Nm.

Remote gear change - Type C gearbox - Refit

1. Apply lithium based grease to selector rod yoke.
2. Position remote gear change to extension housing ensuring selector shaft pin is located in selector rod yoke.
3. Fit bolts, washers and mounting rubbers securing remote gear change to extension housing; do not tighten bolts at this stage.
4. Fit bolts, washers and mounting rubbers securing bracket to extension housing.
5. Tighten all bolts to 30 Nm.

Remote gear change - Type D gearbox - Refit



37M7131

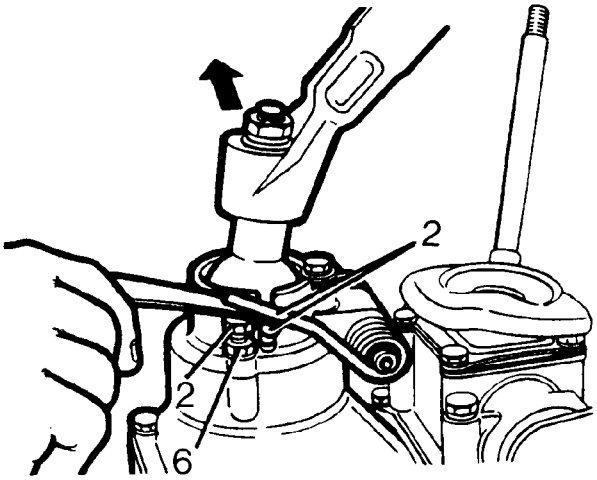
1. Apply Hylosil RTV 102 to mating surfaces of extension housing and remote gear change housing.
2. Position remote gear change housing on extension housing. Ensure that gear lever ball is correctly located.
3. Fit bolts and tighten to 25 Nm.

5th gear stop screw adjustment - Type A gearbox

1. Select reverse gear. While applying light pressure to gear lever towards left, turn screw clockwise until it contacts yoke.
2. Turn screw anti-clockwise until 25 mm free play is felt at knob, ensure 5th gear can be engaged.
3. Tighten locknut.
4. Check all other gears are selectable.

Bias spring adjustment - Type A gearbox

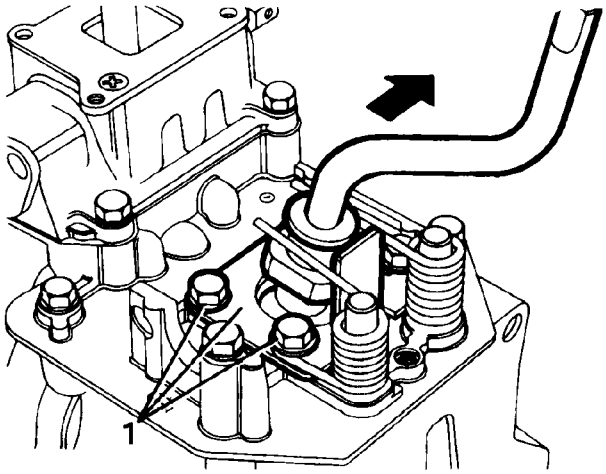
NOTE: The purpose of this adjustment is to set both bolts so that the bias spring legs apply equal pressure on both ends of the gear lever cross pin when third or fourth gear is engaged. This will ensure that when the lever is in neutral, the gear change mechanism is automatically aligned for third or fourth gear.



37M7108

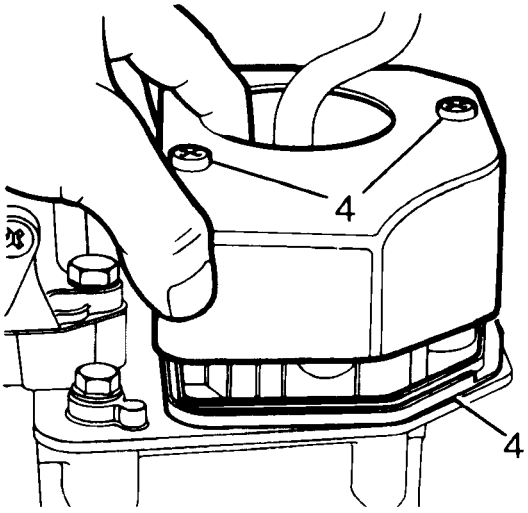
1. Select third or fourth gear.
2. Adjust the two adjusting screws until both legs of the spring are approximately 0.5 mm clear of the cross pin in the gear lever.
3. Apply a light load to the gear lever in a left hand direction and adjust the right hand adjusting screw downward until the right hand spring leg just makes contact with the cross pin.
4. Repeat the same procedure for the left hand adjusting screw.
5. Lower both adjusting screws equal amounts until the radial play is just eliminated.
6. Tighten locknuts.
7. Return gear lever to neutral position and rock across the gate several times. The gear lever should return to the third and fourth gate.

Bias spring adjustment - Type B gearbox



37M7109

1. Slacken bias adjustment plate bolts. Select fourth gear and move lever fully to the right.
2. Tighten adjustment plate bolts.
3. Check adjustment is correct by selecting third and fourth gears.

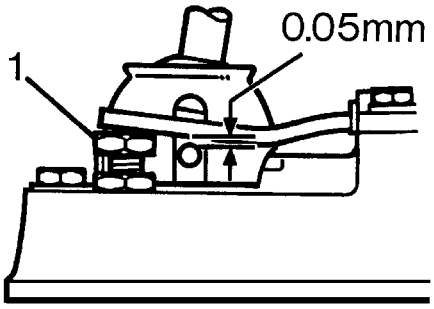


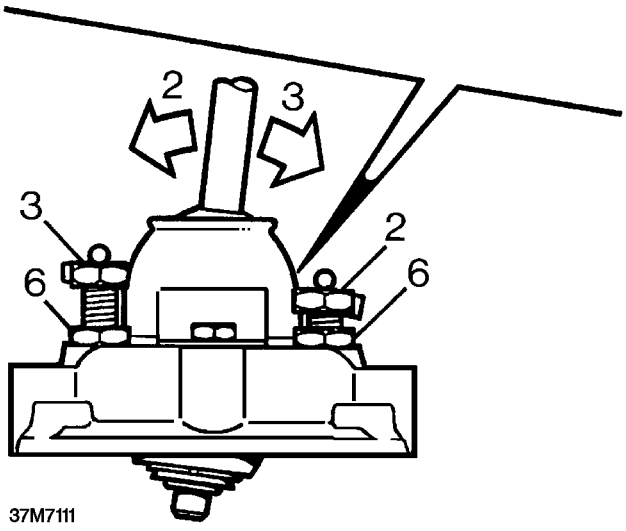
37M7110

4. Fit sealing rubber to gear change housing, apply Hylogrip 640 to screws and fit cover.

Bias spring adjustment - Type C gearbox

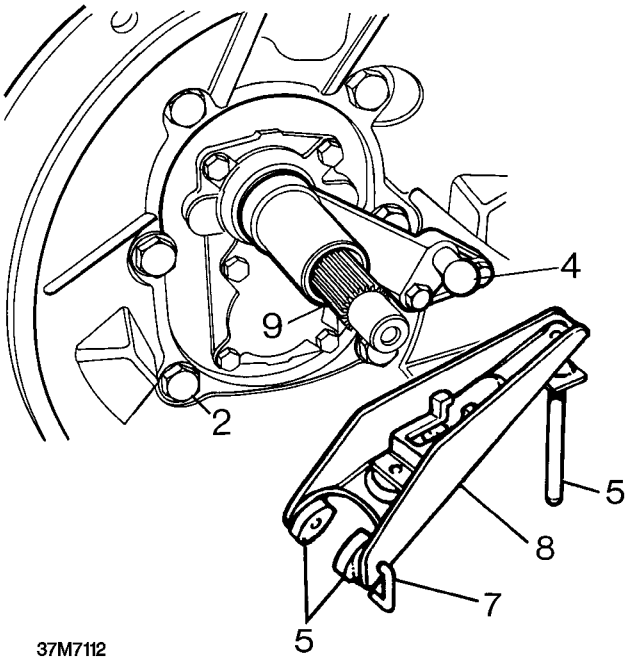
NOTE: The purpose of this adjustment is to ensure that when bias spring is correctly adjusted, the gear change mechanism is automatically aligned for 3rd or 4th gear selection when gear lever is in neutral.





1. Adjust both bias spring adjustment bolts until a clearance of 0.05mm exists between both legs of bias spring and gear lever cross pin.
2. Apply a light load to move gear lever to the left and adjust right hand bolt until right hand leg of bias spring just contacts gear lever cross pin.
3. Move gear lever to the right and adjust left hand bolt.
4. Check that with gear lever moved fully to the left and right, spring legs just contact gear lever cross pin.
5. Select neutral then rock gear lever across the gate; when released, lever should return to 3rd/4th position.
6. Tighten adjusting bolt locknuts.

Clutch housing - Type A gearbox - Refit



1. Position clutch housing to gearbox.
2. Fit securing bolts.

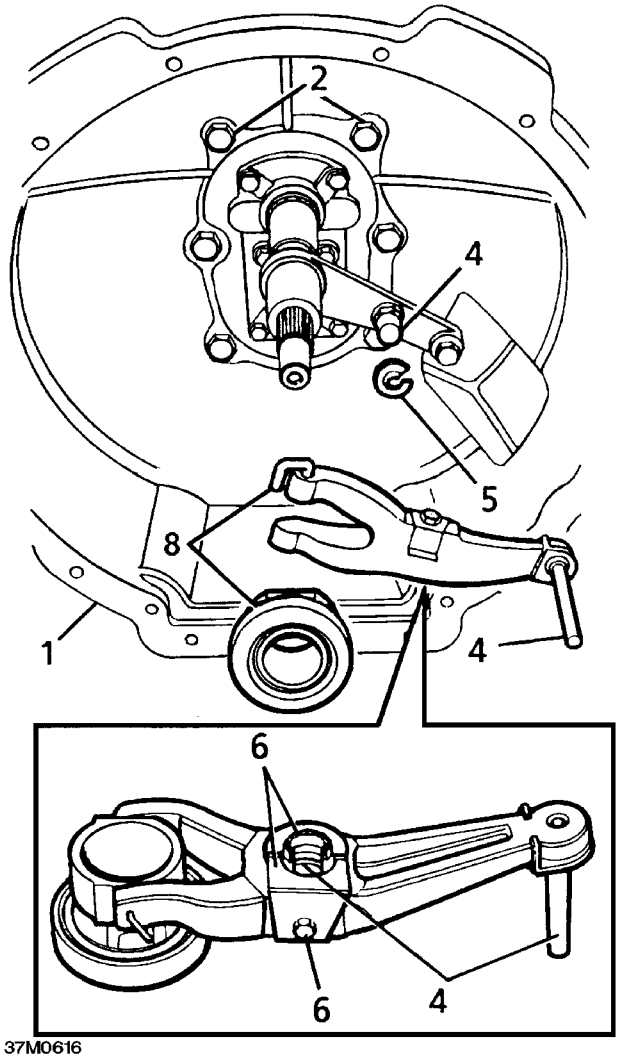
NOTE: The 12 x 45mm bolts must be fitted through locating dowels.

3. Tighten bolts by diagonal selection to 72 Nm.
4. Fit pivot post, fit and tighten bolts.
5. Apply lithium based grease to pivot post, pads and push rod.
6. Position pads to clutch release lever, fit release bearing.
7. Fit new clips to retain pads.

NOTE: Clips may become displaced in service with no loss of performance.

8. Fit release lever.
9. Apply lithium based grease to splines of input shaft.

Clutch housing - Type B gearbox - Refit



37M0616

1. Position clutch housing to gearbox.
2. Fit securing bolts.

NOTE: The 12 x 45mm bolts must be fitted through locating dowels.

3. Tighten bolts by diagonal selection to 72 Nm.
4. Apply lithium based grease to pivot post, release lever, socket and push rod.
5. Fit a new 'C' clip to pivot post, fit post.
6. Fit spring clip to release lever, fit but do not tighten bolt.
7. Position release lever to pivot post ensuring spring clip is located behind 'C' clip; tighten bolt.
8. Fit clutch release bearing and retain using new clips.

NOTE: Clips may become displaced in service with no loss of performance.

Clutch housing - Type C gearbox - Refit

1. Position clutch housing to gearbox.
2. Fit securing bolts.

NOTE: The 2 longest bolts must be fitted at locating dowel positions.

3. Tighten bolts by diagonal selection to 72 Nm.
4. Apply lithium based grease to pivot post.
5. Fit release lever and clutch release bearing.

Adaptor housing - Type D gearbox - Refit

1. Position adaptor housing to gearbox.
2. Fit securing bolts.

NOTE: The two longest bolts must be fitted at locating dowel positions.

3. Tighten bolts by diagonal selection to 72 Nm.
4. Apply lithium based grease to pivot post.
5. Fit pivot post and secure with two bolts.