

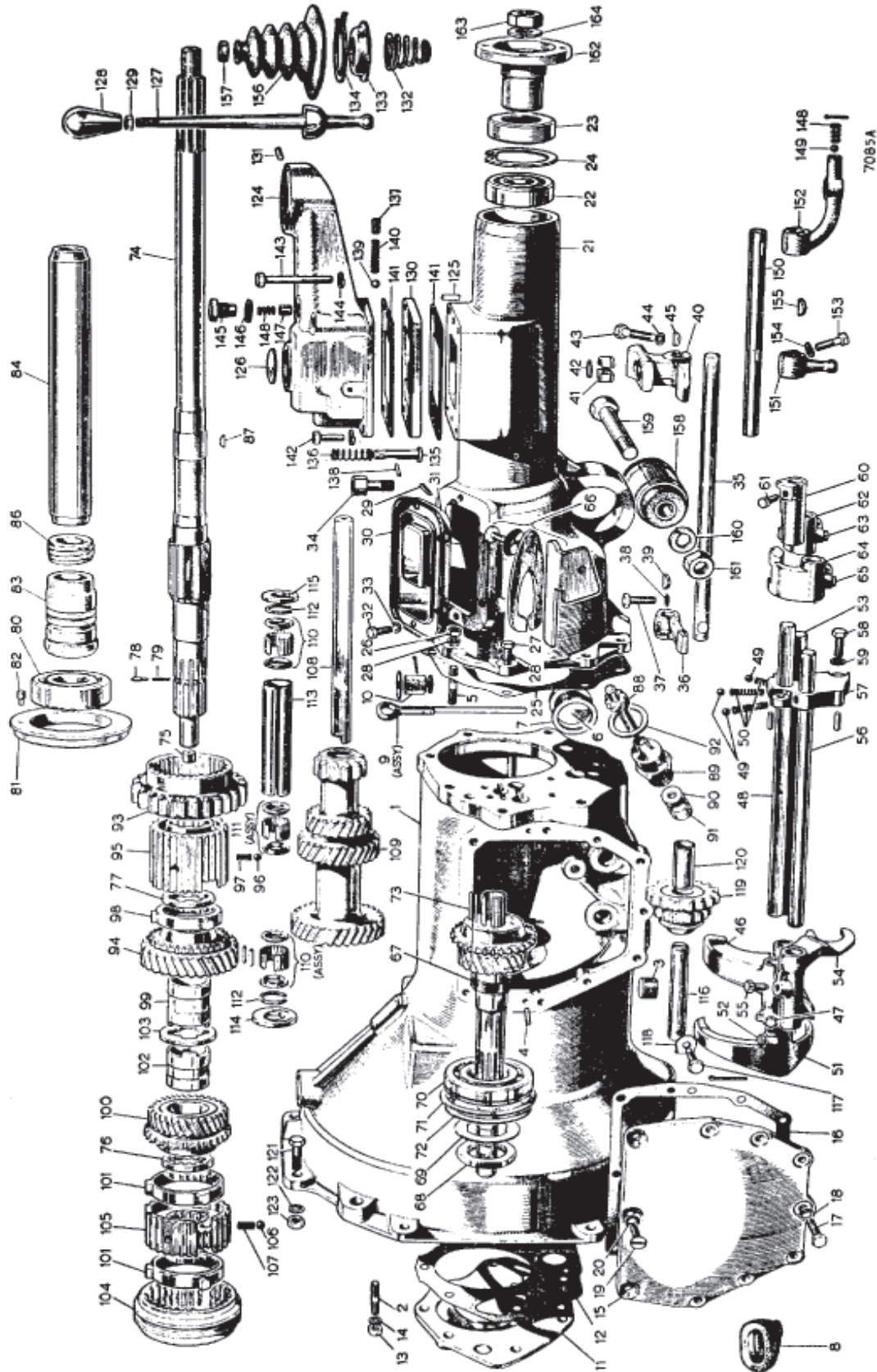
SECTION F

THE GEARBOX

General description.

- Section No. F.1 Removing the gearbox.**
- Section No. F.2 Dismantling the gearbox.**
- Section No. F.3 Dismantling the third motion shaft.**
- Section No. F.4 Assembling the third motion shaft.**
- Section No. F.5 Layshaft gear.**
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- Section No. F.7 Assembling the rear extension.**
- Section No. F.8 Assembling the gearbox.**
- Section No. F.9 Renewing the gearbox extension oil seal.**
- Section No. F.10 Refitting the gearbox front cover.**
- End of Section Service tools.**

THE GEARBOX COMPONENTS



KEY TO THE GEARBOX COMPONENTS

| No. | Description | No. | Description | No. | Description | No. | Description |
|-----|--|-----|------------------------------------|------|--|------|---|
| 1. | Gearbox casing. | 41. | Bush for rear selector lever. | 83. | Speedometer gear distance piece. | 124. | Remote control tower. |
| 2. | Stud for front cover. | 42. | Cirelip for lever bush. | 84. | Distance piece—speedometer gear to rear bearing. | 125. | Dowel for remote control tower. |
| 3. | Drain plug. | 43. | Set screw for rear lever. | 86. | Speedometer drive gear. | 126. | Core plug for tower. |
| 4. | Dowel—side cover to gearbox. | 44. | Spring washer for set screw. | 87. | Key for gear. | 127. | Change speed lever. |
| 5. | Stud for gearbox extension. | 45. | Selector lever key. | 88. | Speedometer drive pinion. | 128. | Change speed lever knob. |
| 6. | Blanking plug. | 46. | First and second speed fork. | 89. | Bush for pinion. | 129. | Locknut for change speed lever knob. |
| 7. | Joint washer for blanking plug. | 47. | Fork locating screw. | 90. | Pinion oil seal. | 130. | Stop plate. |
| 8. | Dust cover for clutch withdrawal lever. | 48. | First and second speed fork shaft. | 91. | Oil seal retaining ring. | 131. | Snug for change speed ball. |
| 9. | Dipstick. | 49. | Ball for shaft. | 92. | Joint—bush to rear cover. | 132. | Spring for change speed lever. |
| 10. | Felt. | 50. | Spring for ball. | 93. | First speed gear. | 133. | Ball spring cover. |
| 11. | Cover (front). | 51. | Third and fourth speed fork. | 94. | Second speed gear. | 134. | Cirelip for ball spring cover. |
| 12. | Joint for front cover. | 52. | Fork locating screw. | 95. | Second speed synchronizer. | 135. | Reverse selector plunger. |
| 13. | Nut for front cover studs. | 53. | Third and fourth speed fork shaft. | 96. | Synchronizer ball. | 136. | Reverse plunger spring. |
| 14. | Spring washer for front cover stud. | 54. | Reverse fork. | 97. | Spring for ball. | 137. | Reverse plunger plug. |
| 15. | Side cover. | 55. | Fork locating screw. | 98. | Second speed gear baulk ring. | 138. | Dowel for reverse plunger. |
| 16. | Joint for side cover. | 56. | Reverse fork shaft. | 99. | Second speed gear bush. | 139. | Reverse plunger ball. |
| 17. | Set screw for side cover. | 57. | Shaft locating block. | 100. | Third speed gear. | 140. | Spring for reverse plunger detent. |
| 18. | Spring washer for side cover screw. | 58. | Set screw—block to casing. | 101. | Third and fourth gear baulk ring. | 141. | Gasket for control tower. |
| 19. | Countersunk screw for side cover. | 59. | Spring washer for block screw. | 102. | Third speed gear bush. | 142. | Bolt for tower (short). |
| 20. | Shakeproof washer for countersunk screw. | 60. | First and second gear selector. | 103. | Interlocking ring for second and third bushes. | 143. | Bolt for tower (long). |
| 21. | Gearbox extension. | 61. | Selector locating screw. | 104. | Third and fourth speed sliding coupling. | 144. | Spring washer. |
| 22. | Rear extension bearing. | 62. | Third and fourth gear selector. | 105. | Third and fourth speed synchronizer. | 145. | Box cover ball retaining plug. |
| 23. | Oil seal. | 63. | Selector locating screw. | 106. | Synchronizer ball. | 146. | Washer for plug. |
| 24. | Cirelip. | 64. | Reverse gear selector. | 107. | Spring for ball. | 147. | Plunger. |
| 25. | Joint—extension to gearbox. | 65. | Screw for reverse gear selector. | 108. | Layshaft. | 148. | Spring for plunger. |
| 26. | Nut for gearbox extension stud. | 66. | Interlock arm complete. | 109. | Layshaft gear unit. | 149. | Selector lever ball. |
| 27. | Set screw for gearbox extension. | 67. | First pinion shaft. | 110. | Layshaft bearing needle roller (outer). | 150. | Remote control shaft. |
| 28. | Spring washer for stud and set screw. | 68. | Nut for shaft. | 111. | Layshaft bearing needle roller (inner). | 151. | Selector lever (front). |
| 29. | Taper plug for gearbox extension. | 69. | Lock washer. | 112. | Spring ring for needle rollers. | 152. | Selector lever (rear). |
| 30. | Extension side cover. | 70. | Ball bearing for shaft. | 113. | Bearing distance piece. | 153. | Set screw for front and rear levers. |
| 31. | Joint for extension side cover. | 71. | Spring ring for bearing. | 114. | Thrust washer (front). | 154. | Spring washer. |
| 32. | Set screw for extension side cover. | 72. | Shim for bearing. | 115. | Thrust washer (rear). | 155. | Key. |
| 33. | Spring washer. | 73. | Shaft needle rollers. | 116. | Reverse shaft. | 156. | Gear lever draught excluder (rubber). |
| 34. | Breather assembly. | 74. | Third motion shaft. | 117. | Locking screw for shaft. | 157. | Lever draught excluder ring. |
| 35. | Remote control shaft. | 75. | Oil restrictor. | 118. | Lock washer for screw. | 158. | Flexible bush for rear engine mounting. |
| 36. | Selector lever (front). | 76. | Thrust washer (front). | 119. | Reverse gear. | 159. | Bolt for rear mounting bush. |
| 37. | Set screw for front lever. | 77. | Thrust washer (rear). | 120. | Bush. | 160. | Spring washer. |
| 38. | Spring washer for set screw. | 78. | Peg for thrust washer (front). | 121. | Bolt—gearbox to mounting plate. | 161. | Nut for rear mounting bush bolt. |
| 39. | Selector lever key. | 79. | Spring for peg. | 122. | Spring washer. | 162. | Third motion shaft flange. |
| 40. | Selector lever (rear). | 80. | Third motion shaft bearing (rear). | 123. | Nut for mounting plate bolt. | 163. | Nut for flange. |
| | | 81. | Bearing housing. | | | 164. | Washer for nut. |
| | | 82. | Locating peg. | | | | |

GENERAL DESCRIPTION

The gearbox has four forward speeds and one reverse. Top gear is obtained by direct drive, third and second by gears in constant mesh, and first and reverse by sliding spur gears.

A propeller shaft driving flange is fitted at the rear end of the third motion shaft.

Section F.1**REMOVING THE GEARBOX**

Remove the power unit as described in Section A.24.

Remove the starter motor, unscrew the bolts and nuts securing the bell housing and exhaust pipe support brackets, and withdraw the gearbox and rear extension from the engine. Take care to keep the gearbox flange parallel with the crankcase face until the first motion shaft is clear of the clutch.

Section F.2**DISMANTLING THE GEARBOX**

Extract the dipstick, drain plug, and speedometer drive.

Unscrew the nuts and remove the gear lever remote control tower and joint washer.

Remove the nut and spring washer securing the propeller shaft driving flange and withdraw the flange. Use service tool 18G34A to hold the flange while the nut is removed.

Unscrew and remove the six bolts and the rear extension cover and joint washer. Remove the interlock arm and bracket.

Remove the two nuts and six set screws securing the gearbox extension to the gearbox. Pull the extension from the gearbox, at the same time manoeuvring the remote control shaft selector lever from the selectors.

Unscrew the three countersunk screws and the seven hexagon-headed set screws holding the gearbox cover; remove the cover and overshoot stop.

Cut the locking wire and unscrew the three change speed fork set screws.

Unscrew the two set screws and remove the shifter shaft locating block with shifter shafts from the gearbox; note the two dowels in the block; take care to catch the three selector balls and springs.

Withdraw the forks from the box in the following order—reverse, top and third, and first and second.

Unscrew the clutch lever pivot nut; screw out the pivot bolt and remove the lever with the thrust bearing.

Unscrew the nuts and remove the gearbox front cover; note the bearing shims between the cover and the bearing.

Tap out the layshaft, allowing the gear cluster to rest in the bottom of the box.

Unscrew the retaining set screw and remove the reverse shaft and gear.

Withdraw the mainshaft assembly to the rear.

Withdraw the first motion shaft complete with 18 spigot needle rollers.

Lift out the layshaft gear cluster and the two thrust washers.

Rear extension

Release the front and rear selector levers from the remote control shaft by removing the clamping screws and sliding the levers from the rod. Extract the keys from the shaft and withdraw the remote control shaft from the rear extension.

Section F.3**DISMANTLING THE THIRD MOTION SHAFT**

Remove the following items in this order: baulk ring, synchromesh sleeve and hub, second baulk ring. If the synchromesh sleeve is removed from the hub take care not to lose the three locating balls and springs which will be released in consequence.

Press down the third speed gear cone thrust washer plunger; rotate the thrust washer to align its splines with those on the shaft and remove the washer.

Withdraw the third speed gear and its splined bush.

Withdraw the bush interlocking washer to release the second speed gear with its bush and baulk ring.

Remove the thrust washer from the splines on the shaft and withdraw the first and second speed hub and gear; if necessary, slide the gear from the hub, taking care not to lose the three balls and springs.

Tap up the locking tab and unscrew the rear retaining nut; withdraw the washer, speedometer drive gear and key, and the distance sleeve from the shaft.

Press the rear bearing and housing from the shaft.

Section F.4**ASSEMBLING THE THIRD MOTION SHAFT**

Assemble from the front end.

- (1) Locate the rear thrust washer on the front end of the splines, ground face to the front.
- (2) Push the longer brass bush up to the splines with the dog towards the front.

NOTE.—This bush must be fitted so that the oil hole is in line with the one in the shaft and the cut-away portion of the third speed splined bush will be over the locating peg hole when the dogs

of the two bushes are engaged with the bush interlocking washer.

- (3) Fit the second speed baulk ring and gear onto the bush with the plain side of the gear towards the front.
- (4) Slide on the bush interlocking ring and the shorter splined bush, locating the dogs of both bushes in the interlocking ring.
- (5) Insert the spring and locating peg into the hole in the shaft.
- (6) Fit the third speed gear onto the bush with the cone towards the front.
- (7) Thread on the front thrust washer, machined face towards the gear, while holding down the locating peg with a thin punch through the hole in the gear cone, and push the washer over it; turn the washer to allow the locating peg to engage in one of the splines.
- (8) Fit the three springs and balls to the third speed synchronizer, using Service tool 18G223, and push on the synchronizer sleeve (striking dog).
- (9) Push on the top and third gear synchromesh assembly hub with its two baulk rings. The plain side of the hub faces the rear.

Assemble the following items from the rear:

- (1) Insert the three balls and springs in the second gear hub and, with the aid of Service tool 18G222, push the synchronizer sleeve (striking dog) into position on the hub.
- (2) Fit the first speed gear and synchromesh hub assembly, and the baulk ring, to the splines on the shaft.
- (3) Press the rear bearing into its housing and fit it to the shaft, outer flange of the housing to the rear.
- (4) Push on the distance sleeve, speedometer drive gear and key, lock washer, and nut.

Section F.5

LAYSHAFT GEAR

The assembly sequence of the layshaft bearings is as follows: a circlip at the rear, a needle race, a single long distance tube, a circlip, a needle race, a circlip, a needle race, a circlip, two races being fitted at the front end and one at the rear.

When assembling, fit a circlip to the innermost groove in the gear, pushing it in from the front, or large gear, end.

Hold the layshaft vertically in the vice, stepped end downwards.

Smear the shaft with grease and assemble a roller bearing on the shaft against the vice jaws, and then slide

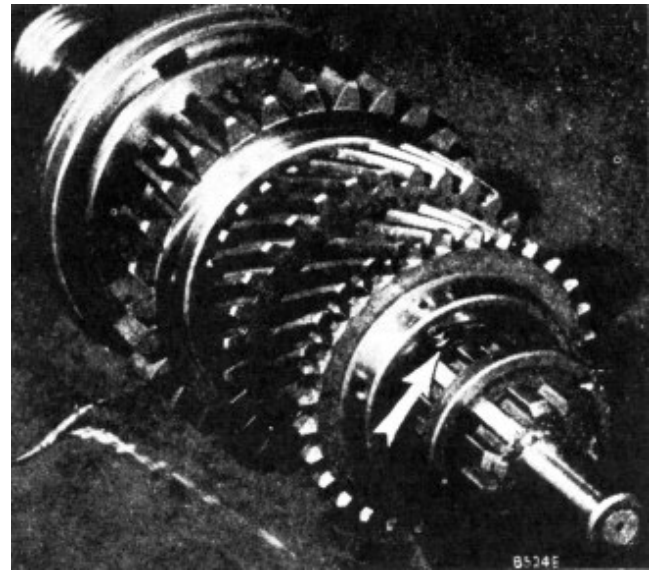


Fig. F.1

The arrow indicates the third speed thrust washer and locating peg. Note the hole in the gear cone

the gear cluster over the shaft and the bearing with the large gear downwards.

Remove the shaft from the vice and push the bearing into the gear against the circlip. Fit a retaining circlip and follow with the end roller-bearing assembly and retaining circlip.

Slide the distance tube into the other end of the gear, followed by the other end bearing and circlip. Withdraw the shaft from the gear.

Section F.6

ASSEMBLING THE FIRST MOTION SHAFT

Fit the bearing to the shaft with the spring ring away from the gear. Replace the lock washer and tighten the retaining nut; bend over the locking tab. Fit the shaft to the housing. Do not fit the front end cover until the layshaft has been refitted.

Section F.7

ASSEMBLING THE REAR EXTENSION

Locate the remote control shaft in the rear extension.

Fit the front and rear selector levers to the remote control shaft; note that they are secured and located by keys and set screws.

Fit the rear extension to the gearbox, locating the control shaft front selector lever in the shifter rod selectors.

Replace the interlock arm on the rear extension side cover flange and refit the cover. Replace the propeller shaft driving flange, nut, and spring washer.

Section F.8

ASSEMBLING THE GEARBOX

Place the layshaft gear in the box complete with end thrust washers but do not fit the shaft.

Assemble and replace the first motion shaft, and replace the 18 needle-roller bearings.

Insert the third motion shaft from the rear; use the gasket fitted between the box and rear extension to position the dowel and bearing housing. Push home the shaft, the rear bearing and housing, and enter the spigot in the needle-roller race of the first motion shaft.

Fit the layshaft and thrust washers. Line up the cut-away portion of the front end with the layshaft locating groove in the front cover.

Fit the reverse gear and shaft; tighten and lock the set screw.

Refit the front end cover (see Section F.10), replacing the bearing shims that were removed on dismantling.

Refit the clutch lever and fork.

Fit the selectors to the shifter shaft rear ends.

Bolt the shifter shaft locating block to the rear face of the gearbox; replace the balls and springs and insert the shifter shafts.

Position the gear change forks in the box in the following sequence: reverse, first and second, third and top. Push the shifter shafts into the box and through the forks; insert, tighten, and wire up the set screws.

Position the selectors on the rear ends of the shifter shafts; insert, tighten, and wire up the set screws.

Refit the gearbox rear extension.

Locate the change speed gate in the gearbox and fit the side cover, using a new joint as necessary.

Screw in the speedometer drive gear assembly, plugs, and breather.

The remote control assembly is fitted to the gearbox, and the gearbox filled with oil, after the power unit is installed in the chassis.

Section F.9

RENEWING THE GEARBOX EXTENSION OIL SEAL

Remove the four bolts securing the propeller shaft front universal joint to the gearbox flange.

Hold the flange steady with Service tool 18G34A and remove the nut and spring washer.

Remove the flange.

Using Service tool 18G389 with adaptor 18G389B, withdraw the old seal.

Use Service tool 18G134 with adaptor 18G134N to fit the new seal.

Refit the flange, nut, and spring washer.

Section F.10

REFITTING THE GEARBOX FRONT COVER

To prevent oil leaking past the gearbox front cover oil seal the cover must be correctly fitted to ensure that the seal is concentric with the first motion shaft. When refitting the cover proceed as follows.

Clean off the cover and examine it carefully for burrs and bruising, particularly around the bore, stud holes, and machined surfaces. Check the flat surfaces for twist and warp, and correct it if necessary. If the condition is too bad to correct, fit a new cover.

Remove and discard the front cover to gearbox gasket and clean off the flat surfaces around the base of all studs.

Offer the front cover (less oil seal) to the gearbox and push it fully home on the studs. The cover should be free to move in all directions, and points at which the holes may be binding on the studs must be relieved until the cover is free to float.

Remove the cover and, using Service tool 18G134 with adaptor 18G134N, fit the oil seal so that its lip faces inwards towards the gearbox. Lightly grease and fit a new gasket to the gearbox front face, then fit the centralizer (Service tool 18G598) to the bore of the front cover and push it in until it is tight. Lightly oil the seal and pass the cover over the first motion shaft, taking particular care not to cut or damage the knife edge of the seal.

Keep the centralizer firmly in position, push the cover onto the studs, and fit the spring washers and nuts, tightening the nuts finger-tight only. Use a suitable socket spanner and long extension to tighten the nuts a half-turn at a time by diametrical selection until all nuts are fully tightened.

Remove the centralizer and refit the clutch operating components.

SERVICE TOOLS

18G34A. Flange Wrench

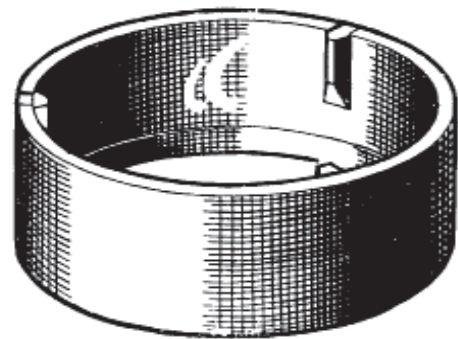
This wrench prevents the rotation of the gearbox flange when releasing or tightening the flange securing nut. The pegs of the holding wrench fit into the bolt holes of the flange.



18G34A

18G222. Synchronmesh Unit Assembly Ring—Second Speed

Designed to facilitate the assembly of mated synchronizer and sleeve by enabling the springs and balls to be inserted quickly and easily.



18G222

18G223

18G223. Synchronmesh Unit Assembly Ring—Third and Top

18G471. Dummy Layshaft

A pilot for lining up the gears and retaining the thrust washers in position prior to inserting the layshaft proper, it being necessary to drop the laygear for the first motion shaft to be inserted.



18G471

18G134. Bearing and Oil Seal Replacer Adaptor Handle (basic tool)

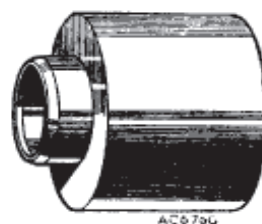
For use with adaptor 18G134P to replace the gearbox extension oil seal.



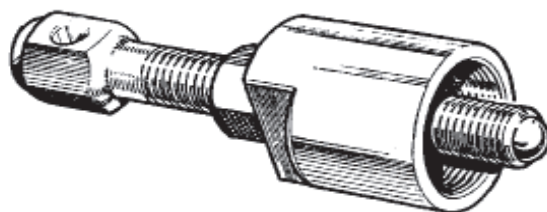
18G134

18G134N. Oil Seal Replacer Adaptor

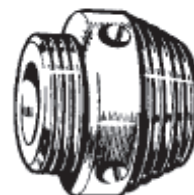
Used with handle 18G134 for the replacement of gearbox extension oil seals.

**18G134N****18G389. Oil Seal Remover (basic tool)**

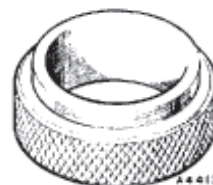
This basic tool together with the appropriate adaptor is essential for removing the gearbox extension oil seal easily and without damage to the extension.

**18G389****18G389B. Oil Seal Remover Adaptor**

Use with basic tool 18G389.

**18G389B****18G598. Gearbox Front Cover Centralizer**

This tool ensures that the front cover oil seal is concentric with the first motion shaft when the front cover is refitted to the gearbox.

**18G598**