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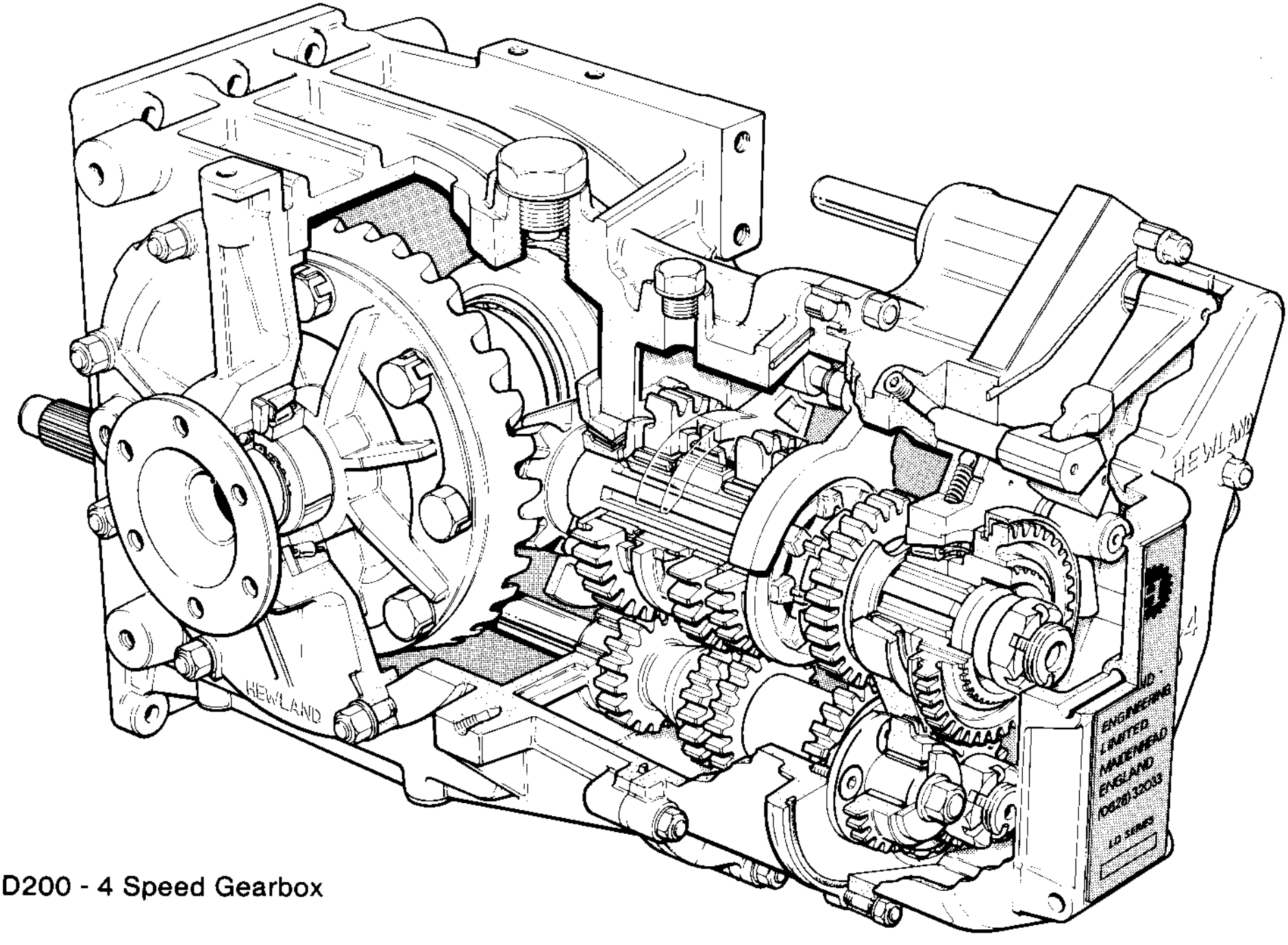
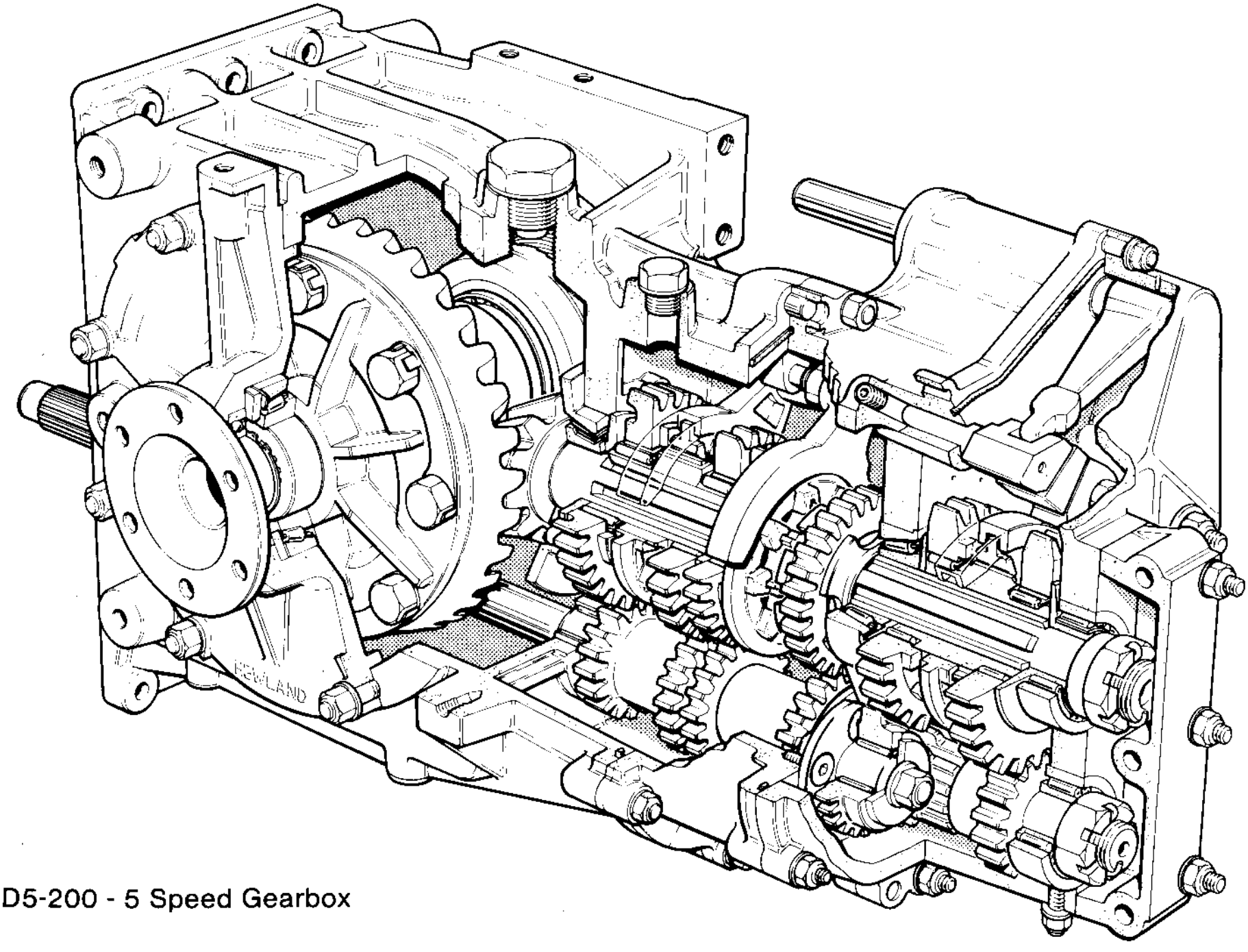


LD200 - 4 Speed Gearbox



LD5-200 - 5 Speed Gearbox

TECHNICAL SPECIFICATION

The LD 200 is designed for rear engined single seat competition cars of up to 165lbs.ft torque, exemplified by Formula Ford. The unit is produced with either four or five forward gears, and reverse. A free differential is standard, but power flow or cam & pawl limited slip differentials can be fitted if required.

The drive is taken from the engine via the clutch shaft, which turns input and pinion gears to drive the final transmission assembly.

Gear changing is effected through non-synchronised face dogs. An extensive range of gear ratios provides an unrestricted range of gearing requirements. Ratios can easily be changed whilst the unit is in the chassis.

The main case has one integral side plate, which imparts greater stiffness and rigidity to the gearbox.

The differential and crownwheel assembly is mounted on two taper roller bearings located in the side plate and main case, and is adjusted to the correct pre-load and backlash by means of shims. The output shafts are mounted in the sideplates and are retained by circlips.

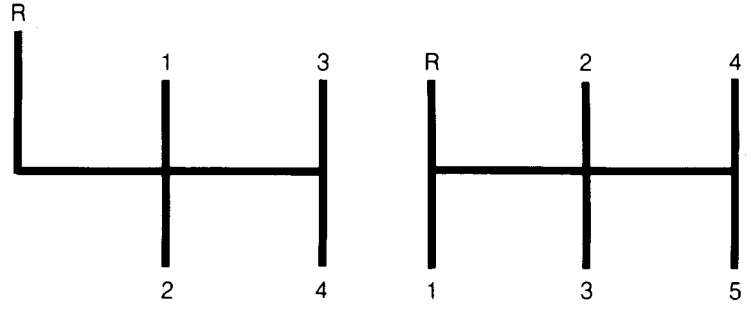
The pinion shaft is supported by two taper roller bearings, one in the main case and one in the bearing carrier. In the 5 speed box there is also a second bearing carrier, with an additional bearing on each shaft.

Heat treated nickel chrome steel is used for all gears and shafts. The selector forks are steel forgings. Lubrication is by splash, and the oil is retained by lipped oil seals. In general configuration, the LD is a high-tech racing transaxle unit which achieves the maximum effective use of power, in conjunction with light weight, for the power it is required to transmit.

	4 SPEED	5 SPEED
Weight:	66lbs.dry (29.9 kg) 68lbs.wet (30.8 kg)	72lbs.dry (32.66 kg)
Oil type:	SAE 80 or 90	As 4 Speed
Oil quantity:	1.75 pints (1 litre)	
Max. torque recommended:	165lbs.ft (22.1 mkg)	As 4 Speed
CW & pinion ratios:	7:31, 8:31, 9:31, 10:31 & 13:36	9:31 & 10:31
Gear ratios:	From 2.923:1 to 1:1	As 4 Speed
CW & pinion backlash:	0.005" minimum	As 4 Speed
Pinion shaft pre-load:	zero	As 4 Speed
Oil level:	See Page 5 (h)	As 4 Speed
Torque Settings:		
Pinion nut:	115lbs.ft (15.9 mkg)	As 4 Speed
Layshaft nut:	115lbs.ft (15.9 mkg)	As 4 Speed
Crownwheel bolts:	75lbs.ft (10.4 mkg)	As 4 Speed

Drive shaft pattern to VW (3.070" PCD) (78mm).
Clutch shaft made to customers requirements.
Selector finger diameter made to fit standard ⅝" Hookes joint.

Gear Shift Patterns



4 Speed
Sprung against
reverse

5 Speed
Sprung against
1st and reverse

a) Read these instructions carefully and with reference to the illustrations.

b) Before dismantling the gearbox see that a clean tray is available in which to place the parts.

c) Thoroughly clean and inspect all parts before reassembly. Discard any worn or damaged components and replace with new ones.

d) Use only genuine Hewland spares as replacements. These are manufactured in our workshops to the fine tolerances necessary and are rigorously inspected.

e) Always use new nuts, circlips, oil seals and gaskets when re-assembling.

f) Bearing replacement:

Bearings can only be removed or renewed if the castings have been warmed in an oven, or with a blow lamp. In the latter case, keep the blow lamp moving while heating the castings.

N.B: DO NOT OVERHEAT. Test with a spot of water which will bounce off at the correct temperature.

Once a casting is heated, all bearings, outer tracks, oil seals and reverse idler spigots etc. which need to be fitted to it should be pushed into their respective seatings without delay, thus obviating any need for further re-heating. At the correct temperature fitting these items should present no difficulty.

When the castings have cooled down, it is advisable to place them once more under the press, as a matter of course, and apply light pressure to the bearings etc. to ensure that they are fully "home" and are seated squarely, before carrying out any settings or adjustments.

g) Retaining screws:

There are two types of bearing retaining screw used on LD boxes, both of which have a short plain spigot section at the end, which locates in a recess on the O.D. of the bearing.

When fitting these bearings (see "f" above) it is important to see that the recess lines up accurately with the hole for the retaining screw, which can then be fitted when the casting has cooled down. The procedure for fitting retaining screws differs, depending on the type of screw. The "grub screw" type should be screwed in very gently until it is felt to just touch the bottom of the recess in the bearing. Turn the screw back about ¼ turn, which will withdraw it approximately 0.010" (0.25mm).

Making sure that the screw is held in this position, fit the washer & nut and tighten the nut, which will lock the screw in place. In the case of the "cap head" type fitted to the pinion tail bearing on the five speed box, fit a washer (FT 202-7) to it and wind the screw in finger tight until it can be felt to bottom in the recess. Measure the gap between the washer and the underside of the screw head and add another 0.010" (0.25mm) to this figure. Take the screw out again and remove this amount from the end of the spigot. (This ensures that the screw does not "bottom out" against the bearing and create distortion). Fit the retaining screw & washer, and tighten. After retaining screws have been fitted, it is well worth checking that the inner tracks can still be fitted into their respective bearings, and that they rotate freely.

h) Oil:
Always fill or top up the oil through the plug hole on top of the gear change section of the main case, with the gearbox/vehicle level. The oil will find its own level, with a proportion flowing through into the 'diff' compartment. When the oil has settled, its surface should be ¼" (6.3mm) below the bottom of the plug hole on the right hand side of the gearbox. This is the same for both 4-speed and 5-speed gearboxes, and the level can easily be checked with a piece of thin metal rod, bent at right angles and inserted through the plug hole.

NOTE: The large plug hole on top of the 'diff' housing is primarily for inspection purposes and should not be used for filling or topping up the oil. To do so would create a false reading of the level, as most of the oil would be trapped in the 'diff' compartment.
(Too much oil will not cause any harm however, but is nevertheless undesirable, as it may induce some power loss and overheating of the gearbox).

j) A 1/16" dia. breather hole is provided in the top of the end cover (4 speed) or the second bearing carrier (5 speed).

k) Where a procedure concerning either gearbox is only described briefly, it may be found useful to cross-refer to the appropriate sections(s) dealing with the other box, for more detailed information.

POWERFLOW DIFFERENTIAL

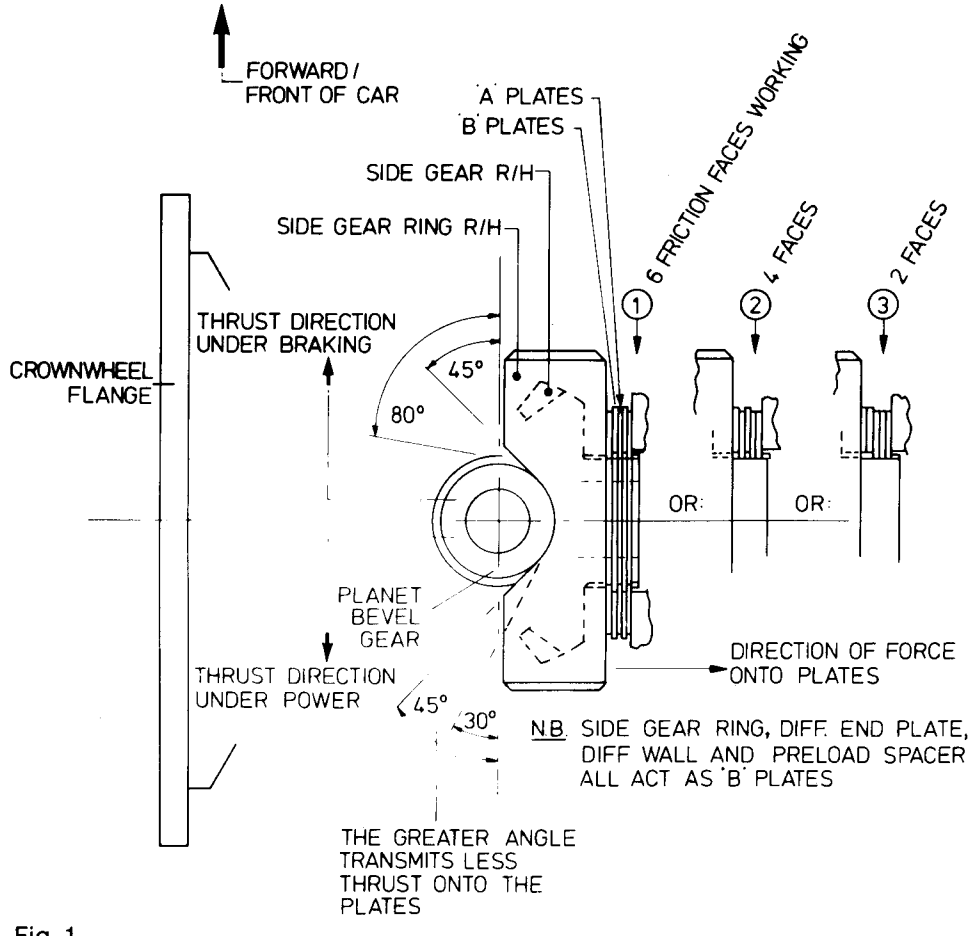


Fig. 1

POWERFLOW DIFFERENTIALS - DETAILS AND SET UP. LD212.

These differentials ('diffs') are designed with versatility as their major asset. Many factors will contribute to the setting required. A car with good grip and low power may require a completely different arrangement to that of a high power/low grip example.

The principle; 10 slipping plates within the 'diff' (6 connected to the side gears/4 to the 'diff' casing) control the amount of differential action possible. So the amount of 'slip limiting' is dependent on one factor alone:

FRICTION RESISTANCE OF THE TEN PLATES.

4 factors contribute to this: see diagram.

1) The bevel gears thrust apart as soon as the car moves. This is a feature of bevel gears and is not adjustable.

2) The ramp angle on the side gear ring has an effect on how much of the force driving the 'diff' round is directed sideways and on to the plates. For example, on the power/drive side ramp, 45 degrees transmits less force sideways than 30 degrees. Likewise on the brake/coast side ramp, an 80 degree angle will transmit little or no force wheras 45 degrees will transmit force. Check to see which different side gear rings are available for each model of 'diff'. 45/45 or 45/80 are normally fitted as standard.

3) The second adjustable factor for friction between the plates is simple; how tightly they are assembled to start with; or 'preload'.
In each 'diff' there is a preload spacer. This looks like one of the 'B' plates, but thicker. It is the first component assembled into the 'diff' casing. The thickness of this dictates to what degree the plates are preloaded/forced against each other. This is set and checked on each 'diff' by holding one side gear still and turning the other with a torque wrench. A kit of bench service tools for this is available, with explanatory diagrams (part no. SK 846). If the measured resistance is deemed too high, the spacer is ground down until the desired figure is achieved. (Usually between 5 to 20 ft/lbs). The figure should be checked periodically as it tends to reduce as the 'diff' runs in. A new, slightly thicker spacer will allow resetting.

4) The final and easiest adjustment is the re-arrangement of the contact order of the plates. (See diagram). Arranged as shown; A to B to A to B to A. This has the maximum amount of friction faces working, and is the way in which they are arranged as standard. If they are arranged so as not to have an A touching a B as frequently, then the torque figure measuring the resistance; as in 3); will reduce. e.g: The minimum amount of faces working is B to B to A to A to A. To swap from maximum to minimum in this way tends to approximately halve the torque figure. Always ensure that the plate arrangements on both the right and left hand sides of the 'diff' correspond.

a) Assemble the differential unit and fit crownwheel to it.

b) With pinion shaft and 1 st bearing carrier assembled and correctly set up in accordance with Pinion Pre-load (page 11), fit the differential unit and sideplate to the main-case, using solid dummy bearings (SK 119-Mk 9) in place of the two taper roller bearings.

c) Turn the pinion shaft by hand to test the pre-load. Adjust by means of sideplate shims (HC 9-206-1) until satisfactory.
NB. Using reasonable effort, it should be possible to turn the pinion shaft by hand by gripping the rear hub. Bear in mind that greater effort will be needed with dummy bearings than with real ones. It is essential to retain some backlash during this operation. Absence of backlash will create a false impression of pre-load.

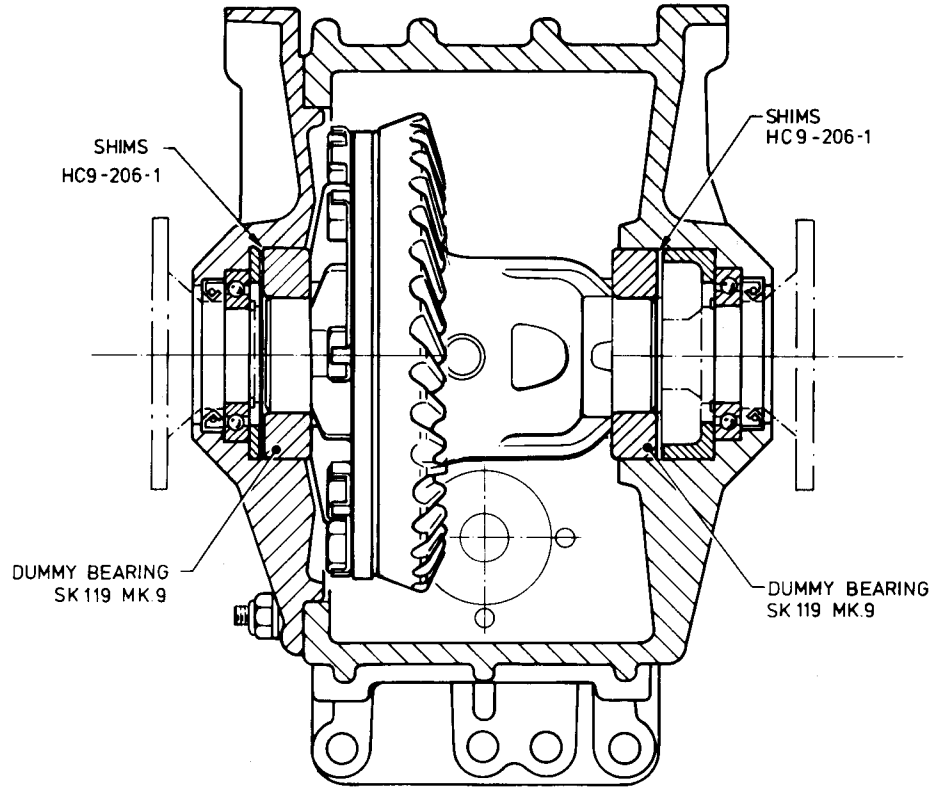


Fig. 2

PINION SETTING - 4 SPEED

Special Hewland part required: Pinion Setting Jig SK 681.

a) Assemble the bearings and pinion shaft, together with reverse hub, spacer and left hand thread nut as shown. Tighten the nut until the bearings are just fully seated, and all end play is eliminated.

b) Fit Pinion Setting Jig and check the clearance at point "Y". This clearance should comply with the dimension stamped on the face of the pinion head.
The gap can be adjusted by the addition or removal of shims (LD 222-2) as necessary at point "X" until the correct clearance is obtained.

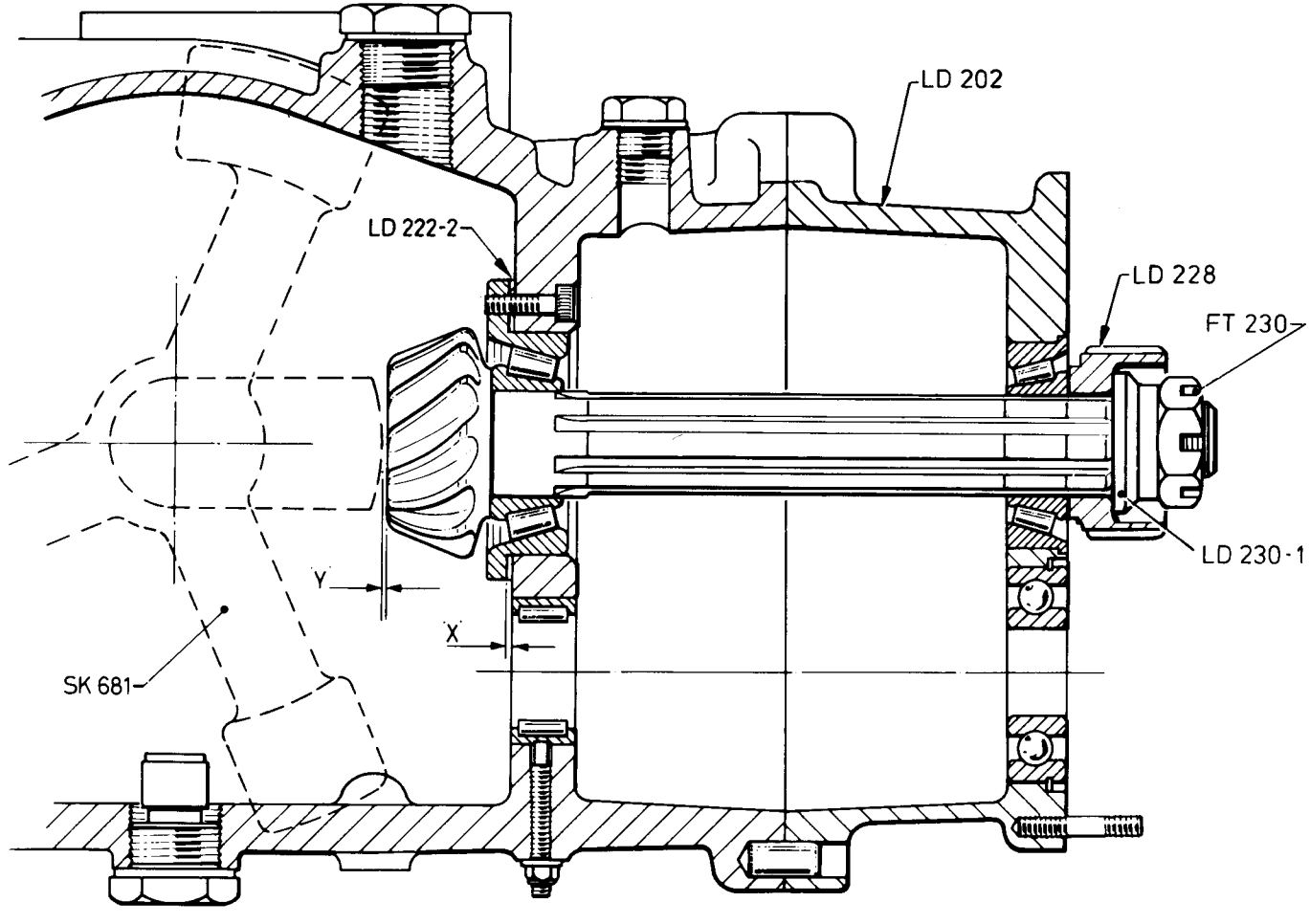


Fig. 3

Special Hewland part required: Pinion Setting Jig SK 681

a) Attach the 1st bearing carrier (LD 5-202) to the main case and assemble the bearings and pinion shaft, together with spacer (LD 5-229-5), 1st/rev hub (LD 227), inner track (F3A 229) and nut (FT 230) as shown. Tighten the nut until the bearings are just fully seated and all end play is eliminated.

b) Fit pinion setting jig and check the clearance at point "Y". This clearance should comply with the dimension stamped on the face of the pinion head. The gap can be adjusted by means of the addition or removal of shims (LD 222-2) as necessary at point "X" until the correct clearance is obtained.

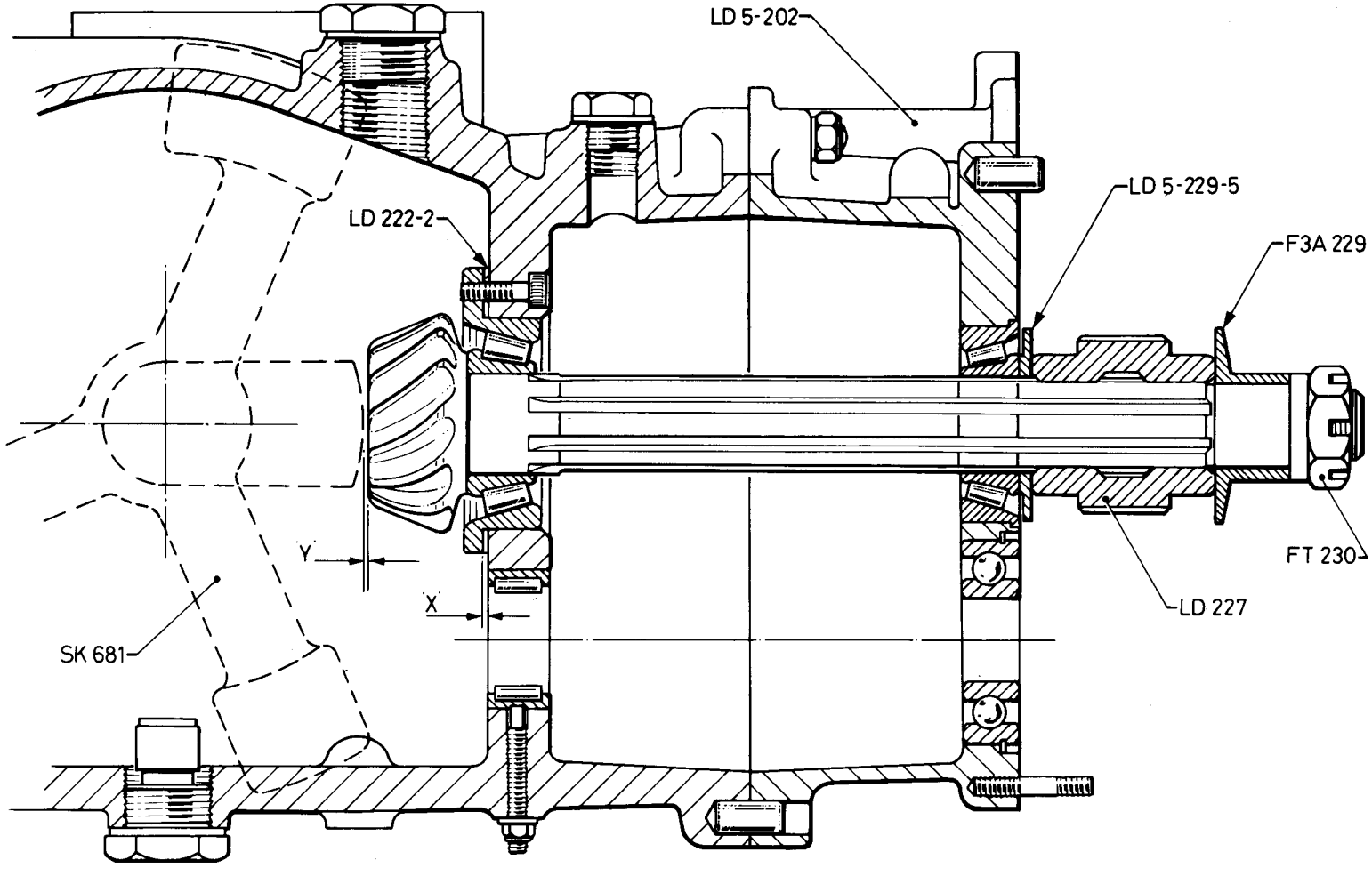


Fig. 4

CROWNWHEEL & PINION BACKLASH SETTING - 4 & 5 SPEED

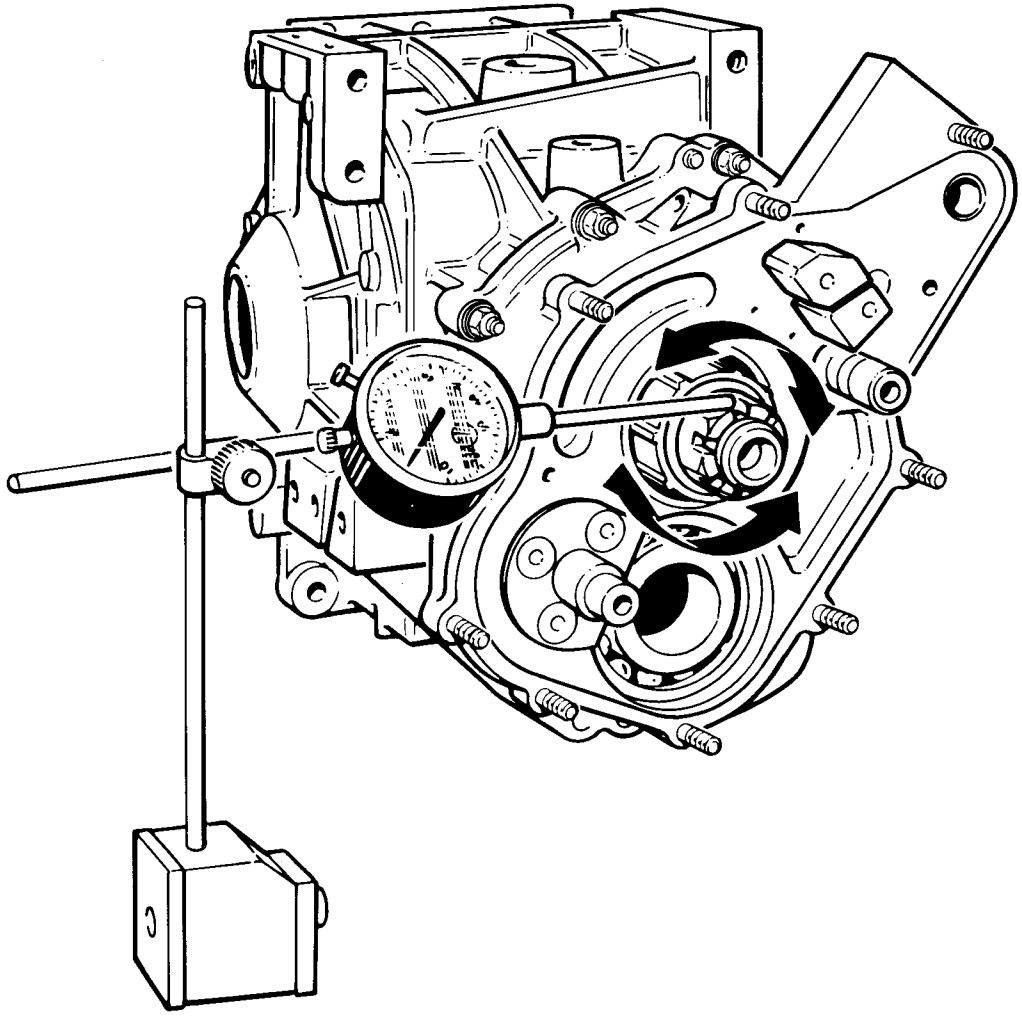


Fig. 5

a) When the correct pre-load has been obtained, as described previously (page 7), the actual amount of backlash can be ascertained by means of a dial test indicator against the rear hub or tail nut. Take at least 20 readings, rotating the crownwheel 15-20 degrees between each reading. (This is to ensure that any variations due to manufacturing tolerances, or heat treatment, are taken into account). Using this method, the minimum measured backlash at any point should not be less than 0.005" (0.127mm).
If backlash is found to be incorrect, the condition is rectified by removing shims (HC 9-206-1) from one side and inserting them in the opposite side, as appropriate. Do not discard or add any shims at this stage, as to do so would affect the pre-load.
NOTE: Dummy bearings (SK 119-Mk 9) should be retained in the sideplates to facilitate shim changing.
Before new bearing outer tracks are subsequently shrunk into the sideplates, the width of each must be measured and compared with the relevant dummy bearing. Any difference must be compensated for in final shimming.

b) Refer to General Notes, part "f" for method of fitting bearings and seals.

c) Press bearings (HC 9-205-1) on to the differential; press in drive shafts (LD 218) and fit circlips (FT 219-1A).

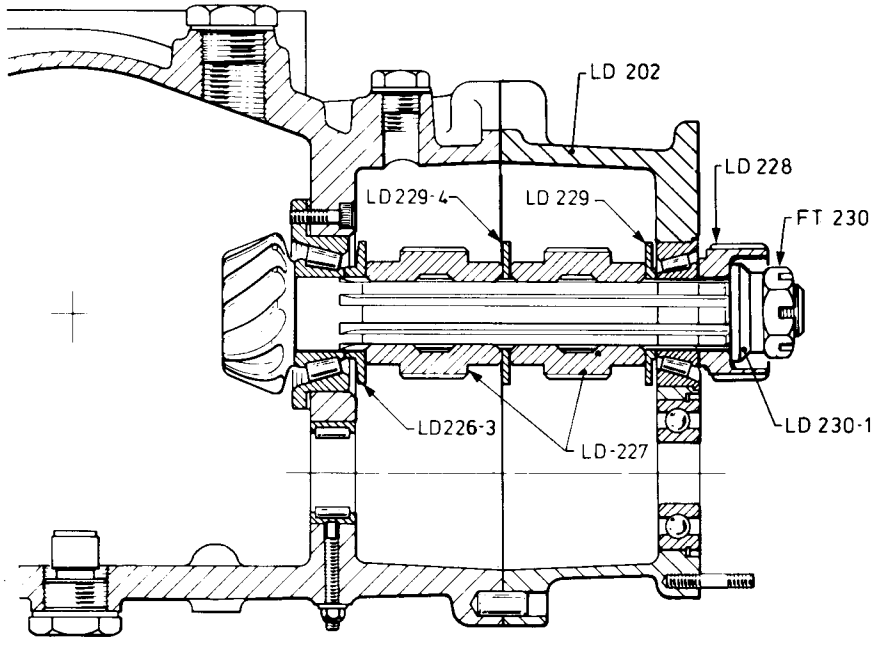


Fig. 6

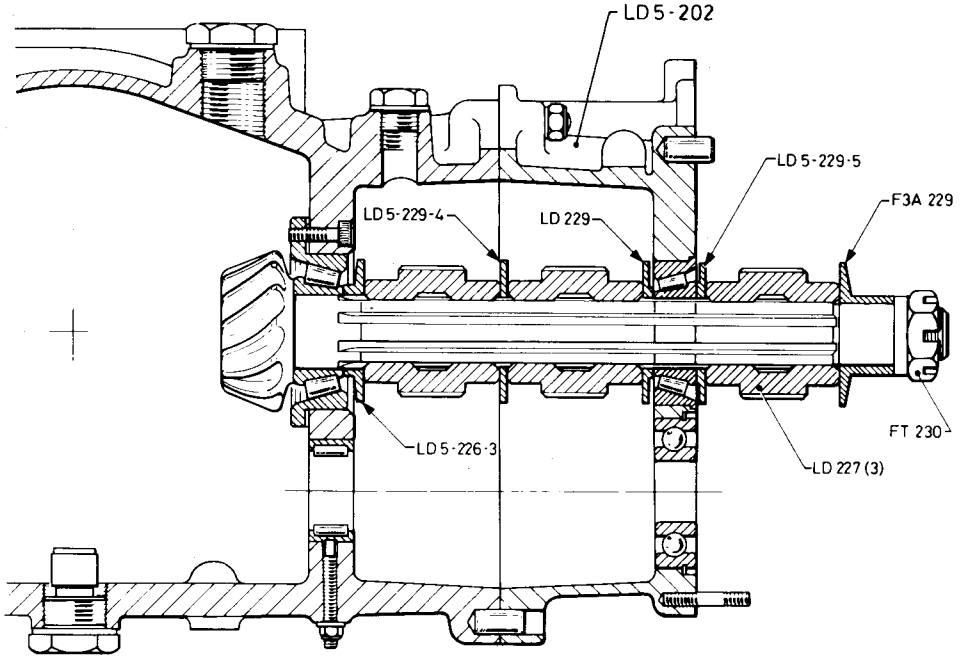


Fig. 7

a) Assemble pinion shaft into the bearings with the hubs and spacers as shown in Fig. 6 (4 speed) or Fig. 7 (5 speed).

b) Measure the end float.

c) Calculate for zero pre-load as follows:-
Thickness of LD 229 less the measured end float.

d) The faces of LD 229 must be ground evenly to the thickness calculated at "c".