

THE MARK 8/9 SERIES TRANSAXLE GEARBOX UNITS

This series is designed for rear-engined competition cars of up to 1½ litres capacity. The units are manufactured with a choice of either four or five forward gears, and reverse. There is also an option of free differential, or cam-and-pawl type limited slip differential.

The drive in either case is taken from the clutch shaft via straight cut gears. The final spiral bevel drive is available in four standard ratios – 7:31, 8:31, 9:31 and 10:31.

Gear change is effected through non-synchronised face dogs. An extensive range of gearbox ratios provides an unrestricted choice of gearing requirements, and the modification can be made without removing the unit from the chassis. All ratios except 1st and 2nd are interchangeable, and may be arranged in any order.

The gearbox gears run directly on caged needle roller bearings, and when a specific gear is selected it revolves with the bearing as an assembly.

The differential and crown wheel assembly is mounted on two taper roller bearings located in

the side plates, and is adjusted to correct pre-load by means of shims. The output shafts are also mounted in the side plates, and retained by circlips. The unit is available with 1300 Series Hardy-Spicer drive shafts, or alternatively with Metalastic shafts in sizes 4.4375" or 3.780" pcd. Oil is retained by lip oil seals.

The pinion is supported by a double angular contact bearing, clamped to the case immediately behind the gear. This bearing accepts the major radial and thrust loads, while the tail of the pinion shaft is supported by a needle roller bearing. This method of support makes the meshing of the pinion completely independent of case expansion.

Heat-treated nickle-chrome steel is used for all gears and shafts. The selector forks are of diecast aluminium bronze, and casings of light diecast alloys. The gear change rod is at the rear, low down on the righthand side, and lubrication is by splash.

In general configuration the Mark 8 Transaxle Unit achieves the maximum effective use of power, in conjunction with light weight, for the power it is required to transmit.

General notes on maintenance and overhaul

Only genuine Hewland spares should be used as replacements. These are manufactured in our own workshops to the fine tolerances necessary, and rigorously inspected and tested.

New nuts and gaskets should always be used on re-assembly.

When warming the outside of the case, keep the blow-lamp moving. Do not overheat. Test with a spot of moisture, which will bounce off when the case is hot enough.

Weight	70 lbs approx.
Oil Capacity	$1\frac{3}{4}$ - 2 pints (MAX)
Type of Oil	SAE 80 or 90

AFTER RATIO CHANGE, ADD 1PT. TO TOP UP.

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The Gearbox unit

REMOVING THE UNIT

END COVER

1. Drain oil.
2. Remove the seven ¼" UNF nuts and washers, and take off the end cover.
3. Remove the selector finger.
4. Remove the split pins from pinion and lay shafts.
5. Unscrew and remove the draw bolt from the end of the layshaft.
6. Lock the gear train by engaging reverse and top gears (that is, by pushing in the two outside selector heads).
7. Remove the castellated nut from the pinion shaft. **Note that this nut has a left-hand thread.**
8. Slacken off the layshaft nut, but do not remove it.

BEARING CARRIER

Remove nine 8mm 'Nyloc' nuts and washers, and remove bearing carrier. Withdraw it complete with layshaft assembly, and with hubs and gears from the pinion. Place one hand under hubs and gears to support them as they slide off the pinion.

Replace in reverse order to above.

CHANGING GEAR RATIOS

When changing a gear ratio, take off the slackened nut and remove the layshaft from the bearing carrier.

Gears are exchanged in pairs – one from the layshaft and one from the pinion shaft. Each gear is etched with two numbers. The first is the number of its own teeth. The second is the number of teeth on its mating gear.

It is essential that gears should be correctly paired according to these numbers.

STRIPPING THE GEAR TRAINS

1. Remove layshaft from bearing carrier as above. Slide off gears, spacer and thrust washer. Wash and inspect for wear or damage.
2. Wash and inspect the hubs, clutch rings and gears taken from the pinion.
3. Check the condition of the forks by testing. That is, by slipping the clutch rings into the forks. If there is excessive wear, dismantle forks as described below, remembering that **they will have to be re-set on re-assemble.** If there is no excessive wear, do not dismantle. But check that nuts are tight and properly tabbed.

To continue stripping:–

4. 4-SPEED GEARBOX Knock back tabs to remove nuts from 1st/2nd and 3rd/4th gear selector forks. Remove 5/16" BSF pinch bolt from reverse gear selector fork. Remove all three forks.

5-SPEED GEARBOX Knock back tabs to remove nuts from 2nd/3rd and 4th/5th gear selector forks. Remove 5/16" BSF pinch bolt from 1st/reverse gear selector fork. Remove all three forks.

5. Check selector rods for smooth movement. Inspect for wear or damage. To remove rods:–
6. Undo the three allen cap screws and take out the top selector rod springs and balls. Then take out three selector rods, followed by the bottom balls and springs.
7. Undo the two 3/8" UNC allen cap screws and push out the locking slugs.
8. Inspect the layshaft and pinion tail bearings for wear. If necessary to renew:–
9. In the case of the pinion (needle roller) bearing, remove the 5/16" UNC locating bolt and warm up surrounding area.
10. In the case of the layshaft (flanged) bearing, simply warm up.

Re-assemble in reverse order to the above, subject to the following:–

11. When replacing bottom balls and springs, set up to correct height. About one-third of the ball should be exposed. Continue by inserting locking slugs and selector rods, then top balls and springs.
12. Any hub renewed should be identical in length with the original. If replacing all hubs, or main bearing carrier, check that overall length of pinion assembly has not been altered. Clearance is essential to avoid overheating and seizure, but too much clearance will cause excessive wear.

SETTING UP THE SELECTOR FORKS

Extreme accuracy in setting up is imperative to ensure that gears engage freely, and to avoid uneven or excessive wear. The use of a Hewland Fork-setting Jig is strongly recommended. Designed specifically for Mark 8 Series gearboxes, it will save costly setting-up time and vastly reduce the possibility of error. (Fig. 1)

Note that when two layshaft gears run together, their chamfered sides must face each other. (See Diagram A).

1. Warm the case and drop in the pinion tail bearing as described above.
2. Place the jig in a vice. Slide the hubs, with top gear and thrust washer, onto the dummy pinion.
3. Attach the bearing carrier to the jig, using temporary nuts.
4. Tighten the pinion nut. Then check for correct clearance on top gear. (.008" to .010")
5. Remove from jig. Fit selector forks to rods, with nuts and washers.
6. Build up the hubs, gears and clutch rings, and slide them back onto the setting jig.
7. Adjust the forks individually. Correct positioning requires that:-

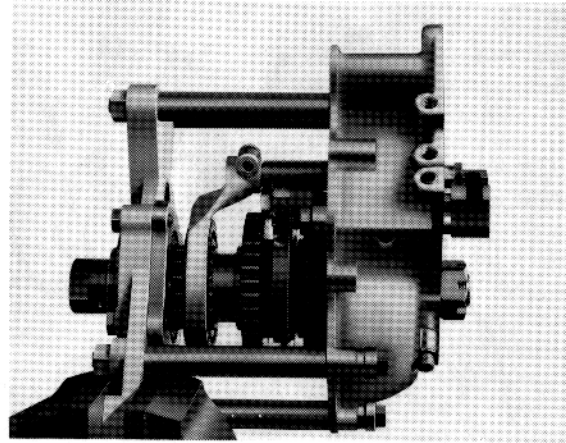
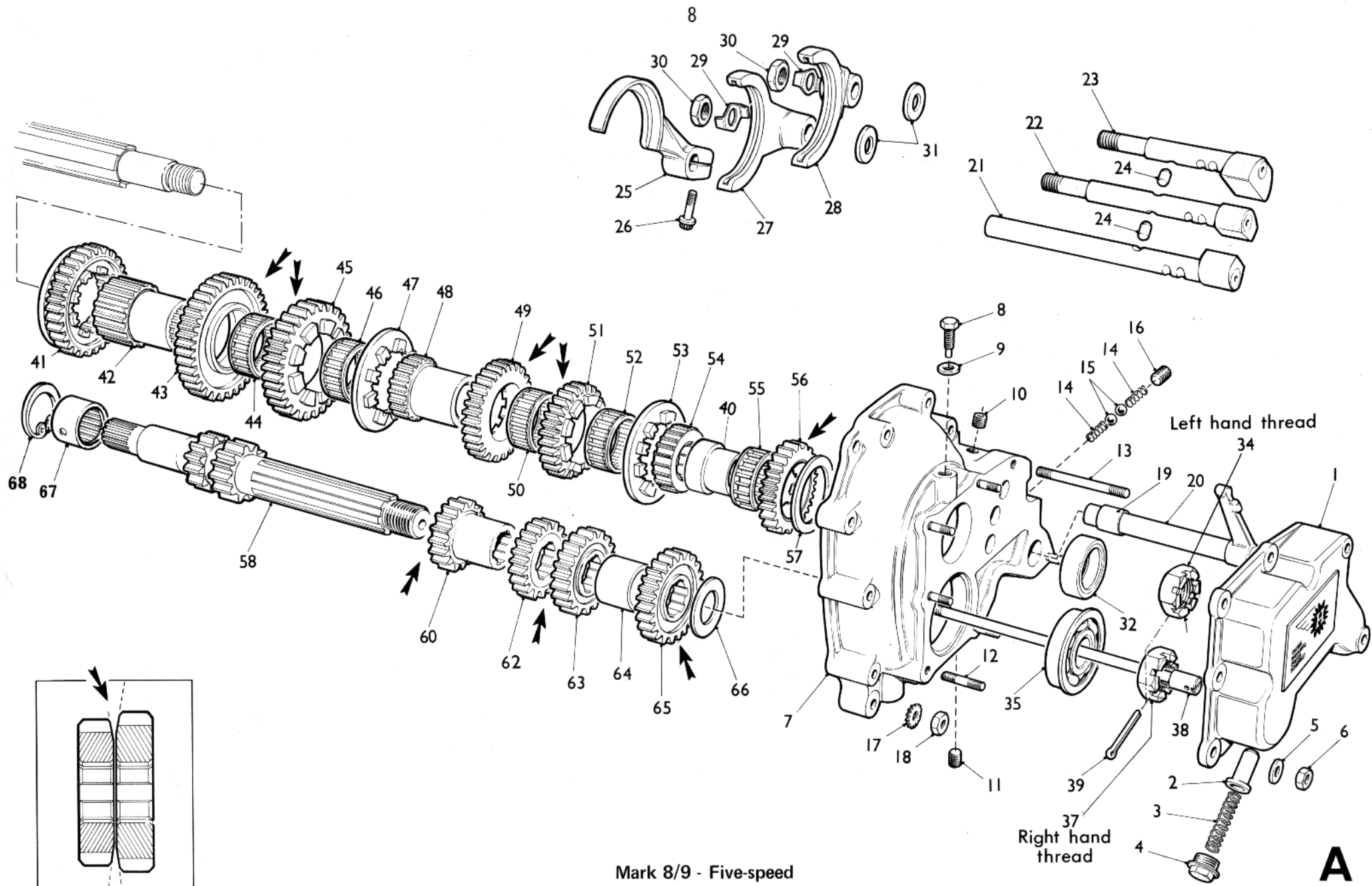


Fig. 1 Fork-setting Jig in use

- (a) The clutch ring should be centred on its hub, between the two gears.
- (b) The clutch ring should engage fully with either gear.
- (c) When fully engaged with either gear there should still be clearance between the gear and clutch-ring faces.

When satisfied with the set-up, continue as follows:-

8. Replace nuts and tabs, tighten up selector rods, and position selector rod heads correctly.
9. Build up the complete layshaft assembly with gears, spacers and thrust washer. Replace in bearing carrier.
10. Put the complete set-up back into the jig. Re-check all clearances. Test all movements. When satisfied, remove bearing carrier assembly from jig and replace it in the main case, at the same time sliding in the inner track of the pinion bearing.
11. Replace draw bolt. Run on pinion and layshaft nuts. Run on two or three 8mm nuts and go through the gears to make sure that the selector mechanism is working correctly.
12. When satisfied remove the draw bolt and pinion nut. Run off the temporary 8mm nuts, replace the Nyloc nuts and tighten up. Replace draw bolt.
13. Remove bearing carrier unit. Apply jointing compound, re-assemble and bolt up.
14. Torque up the pinion and layshaft nuts to correct setting. (115 lbs/ft for pinion nut and 70 lbs/ft for layshaft nut). Insert split pins and replace and cover.



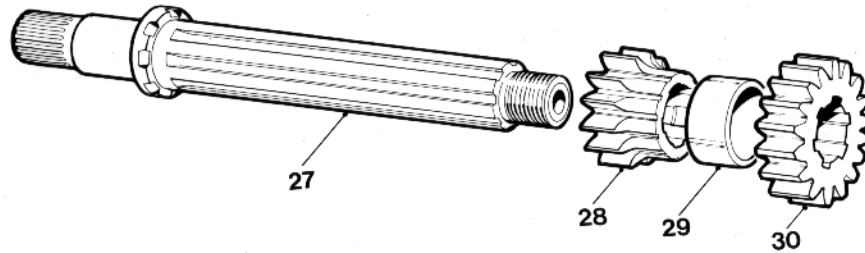
Mark 8/9 - Five-speed

SPARES LIST 'A'

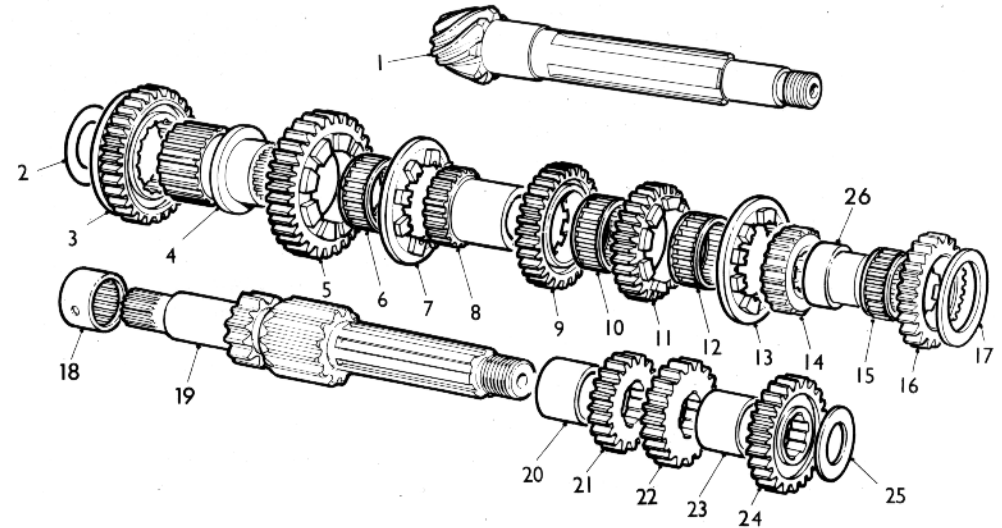
ILLUS NO.	DESCRIPTION	PART NO.	QTY
A1	End Cover	HC 204	1
A2	Plunger Reverse Stop	HC 2030	1
A3	Spring Reverse Stop	FT 2032	1
A4	Plug Reverse Stop	FT 2035	1
A5	Washer ¼" Spring	HC 2029	7
A6	Nut ¼" UNF	HC 20210	7
A7	Bearing Carrier	HC 202	1
A8	Retaining Bolt	FT 2376	1
A9	Washer 5/16"	FT 2027	1
A10	Plug 3/8" UNC x 3/8"	FT 2028	2
A11	Plug Drain ¼" BSP x ½"	HC 2028	1
A12	Stud ¼" short	HC 2025	5
A13	Stud ¼" long	HC 2026	2
A14	Spring Selector	FT 2022	6
A15	Ball 3/8" Selector	FT 2021	6
A16	Plug 7/16" UNC x ½"	FT 2023	3
A17	Washer 5/16" chamfered flat	FT 2027	9
A18	8 mm Lock Nut	HC 2013A	9
A19	Bush 5/8"	FT 2036	2
A20	Selector Finger	LG 252	1
A21	Selector Rod Reverse	HC 246	1
A21	Selector Rod Reverse	HC 246A	1
A22	Selector Rod Centre	HC 247	1
A22	Selector Rod Centre	HC 247A	1
A23	Selector Rod Top	HC 248	1
A23	Selector Rod Top	HC 248A	1
A24	Plunger Locking	HC 2024	2
A25	Selector Fork Reverse	HC 249	1
A26	Pinch Bolt	HC 2491	1
A27	Selector Fork Centre	HC 250	1
A28	Selector Fork Top	HC 251	1
A29	Tab Washer	FT 2461	2
A30	Nut 7/16" UNF (self-locking)	FT 2462	2
A31	Spacer	HC 2463	2

ILLUS NO.	DESCRIPTION	PART NO.	QTY
A32	Bearing Pinion Tail	HC 2291	1
A34	Nut L/H Thread	FT 230	1
A35	Bearing Input Shaft Rear	HC 2343	1
A36	Washer if required	HC 2361	1
A37	Nut Input Shaft	FT 236	1
A38	Draw Bolt	HC 2363	1
A39	Split Pin	FT 2362	2
A40	Inner Track	HC8 229	1
A41	Reverse Sliding Gear 5 speed	HC8 5 231	1
A42	Front Hub 5 speed	HC8 5 226	1
A43	Gear 1st Pinion	See ratio chart	1
A44	Needle Bearing	FT 2261	1
A45	Gear 2nd Pinion	See ratio chart	1
A46	Needle Bearing	FT 2261	1
A47	Clutch Ring	HC 232	1
A48	Centre Hub	HC8 227	1
A49	Gear 3rd Pinion	See ratio chart	1
A50	Needle Bearing	FT 2261	1
A51	Gear 4th Pinion	See ratio chart	1
A52	Needle Bearing	FT 2261	1
A53	Clutch Ring	HC 232	1
A54	Rear Hub	HC8 228	1
A55	Needle Bearing	FT 2261	1
A56	Gear 5th Pinion	See ratio chart	1
A57	Thrust Washer	HC 2294	1
A58	Layshaft with Integral 1st gear	See ratio chart	1
A60	Gear 2nd Input	See ratio chart	1
A62	Gear 3rd Input	See ratio chart	1
A63	Gear 4th Input	See ratio chart	1
A64	Spacer	HC 2346	1
A65	Gear 5th Input	See ratio chart	1
A66	Thrust Washer	HC 2345	1
A67	Needle Bearing (26m/m)	HC8 2341	1
A67	Needle Bearing (30m/m)	HC9 2341	1
A68	Circlip (26m/m)	HC8 2342	2
A68	Circlip (30m/m)	HC9 2342	1

4-SPEED GEAR TRAIN AND LAYSHAFT ASSEMBLY



ILLUS. No.	DESCRIPTION	PART No.	QTY
B27	Layshaft	HC234	1
B28	Reverse Input Gear	HC9 238	1
B29	Spacer (4 speed)	HC9 238I	1
B30	Input gear	Std. Mk.8/9	1



Mark 8 - 9 four-speed

SPARES LIST 'B'

ILLUS NO.	DESCRIPTION	PART NO.	QTY
B1	Crown Wheel & Pinion 7:31 ratio	HC8 221	1
B1	Crown Wheel & Pinion 8:31 ratio	HC8 221B	1
B1	Crown Wheel & Pinion 9:31 ratio	HC8 221A	1
B1	Crown Wheel & Pinion 10:31 ratio	HC8 221C	1
B3	Reverse Sliding Gear	HC8 4 231	1
B4	Front Hub 4 speed	HC8 4 226	1
B5	1st Pinion Gear	See ratio chart	1
B6	Needle Bearing	FT 2261	1
B7	Clutch Ring	HC 232	1
B8	Centre Hub	HC8 227	1
B9	2nd Pinion Gear	See ratio chart	1
B10	Needle Bearing	FT 2261	1
B11	3rd Pinion Gear	See ratio chart	1
B12	Needle Bearing	FT 2261	1

ILLUS NO.	DESCRIPTION	PART NO.	QTY
B13	Clutch Ring	HC 232	1
B14	Rear Hub	HC8 228	1
B15	Needle Bearing	FT 2261	1
B16	4th Pinion Gear	See ratio chart	1
B17	Thrust Washer 5th Gear	HC 2294	1
B18	Needle Bearing	HC8 2341	1
B19	Layshaft Integral 1st Gear	See ratio chart	1
B20	Spacer	HC 2346	1
B21	2nd Input Gear	See ratio chart	1
B22	3rd Input Gear	See ratio chart	1
B23	Spacer	HC 2346	1
B24	4th Input Gear	See ratio chart	1
B25	Thrust Washer	HC 2345	1
B26	Inner Track 5th Gear	HC8 229	1

Dismantling the Main Case

DIFFERENTIAL AND DRIVE

1. Remove the nuts and washers from the left-hand side-plate. Remove plate, loosening if necessary with light blows from a plastic mallet.
2. Lift the differential assembly out of the main case.
3. Remove the right-hand side plate.

STRIPPING THE DIFFERENTIAL

Free type

If this type of differential is fitted, dismantle by tapping out the 'Seloc' pin and removing the cross shaft. Inspect gear wheels and star wheels for wear or damage and renew as necessary. Wash all parts and re-assemble.

Cam-and-Pawl type

If this type of differential is fitted, proceed as follows:-

1. Bend back the tabs, remove the bolts and take off the crown wheel.
2. Remove in turn the outer housing, outer cam track and inner cam track.
3. Remove the eight plungers (pawls) from the plunger carrier.
4. Wash and examine for wear or damage, giving particular attention to plungers, and profiles of the cam tracks.

Re-assemble in reverse order to above, making sure that the splines of the inner cam track (16) are towards the drive shaft (22), diagram C. Use new bolts and tabs for crown wheel. Tighten with a torque spanner to 60 lbs. ft.

FINAL DRIVE

Left-hand side plate

1. Remove the drive shaft circlip and knock out the shaft.
2. Support the plate on fire bricks and warm it, having first covered the oil seal with a block of metal for protection. The outer track of the differential bearing and shims should now drop out.
3. Remove the large circlip which retains the side plate bearing and oil seal, so that both can be withdrawn.

Right-hand side plate

Follow the same procedure as above.

Re-assemble in reverse order to above, fitting new oil seals if necessary.

CLUTCH SHAFT

If the oil seal is leaking and has to be renewed, proceed as follows, referring to Diagram D:-

1. Remove the two retaining clips (30) and slide off the clutch release bearing.

2. Ease the clutch shaft forward, so that the sleeve (27) can be removed. Then remove circlip, withdraw clutch shaft and remove oil seal.

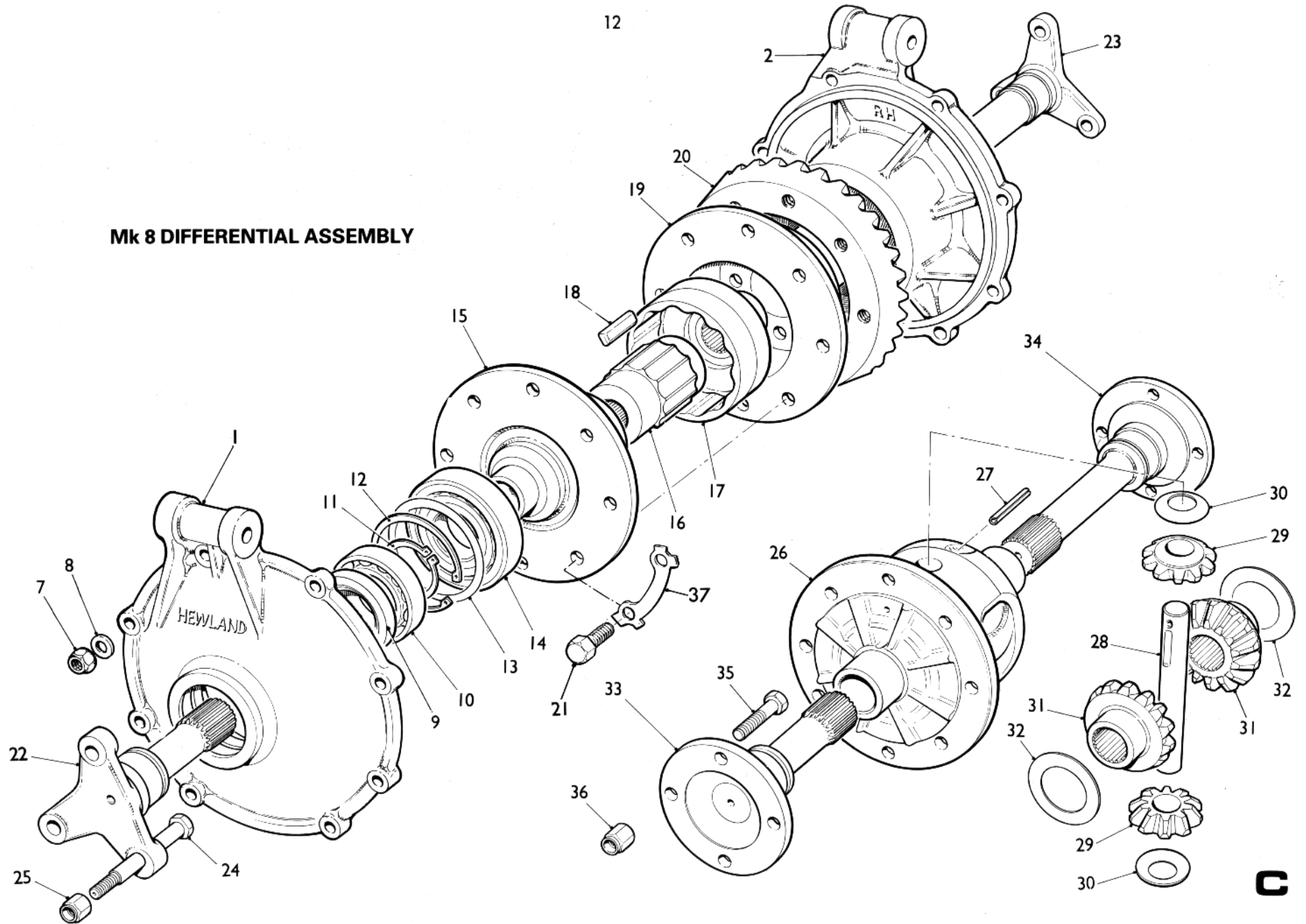
PINION

Inspect the crown wheel and pinion, and replace if necessary. See 'Fitting a New Crown Wheel and Pinion', page 17. To remove pinion:-

1. Remove the pinion clamp plate, having first knocked back the tabs and removed the four bolts.
2. Warm up the outside of the case in the area of the bearing. Withdraw pinion complete with bearing. (A new shim will be required when setting up, if replacing the crown wheel and pinion. Note that in most cases it will first be necessary to remove the idler gear.
3. Inspect the reverse idler gear for wear or damaged teeth, renewing if necessary.
4. Wash all parts. Wash out main case to remove sludge. Ensure that no metal fragments or objects have been left inside the case.

NOTE It is recommended that pinion and layshaft front bearings should always be renewed on major overhauls. To remove layshaft bearing, take out locating bolt and warm up the outside of the case.

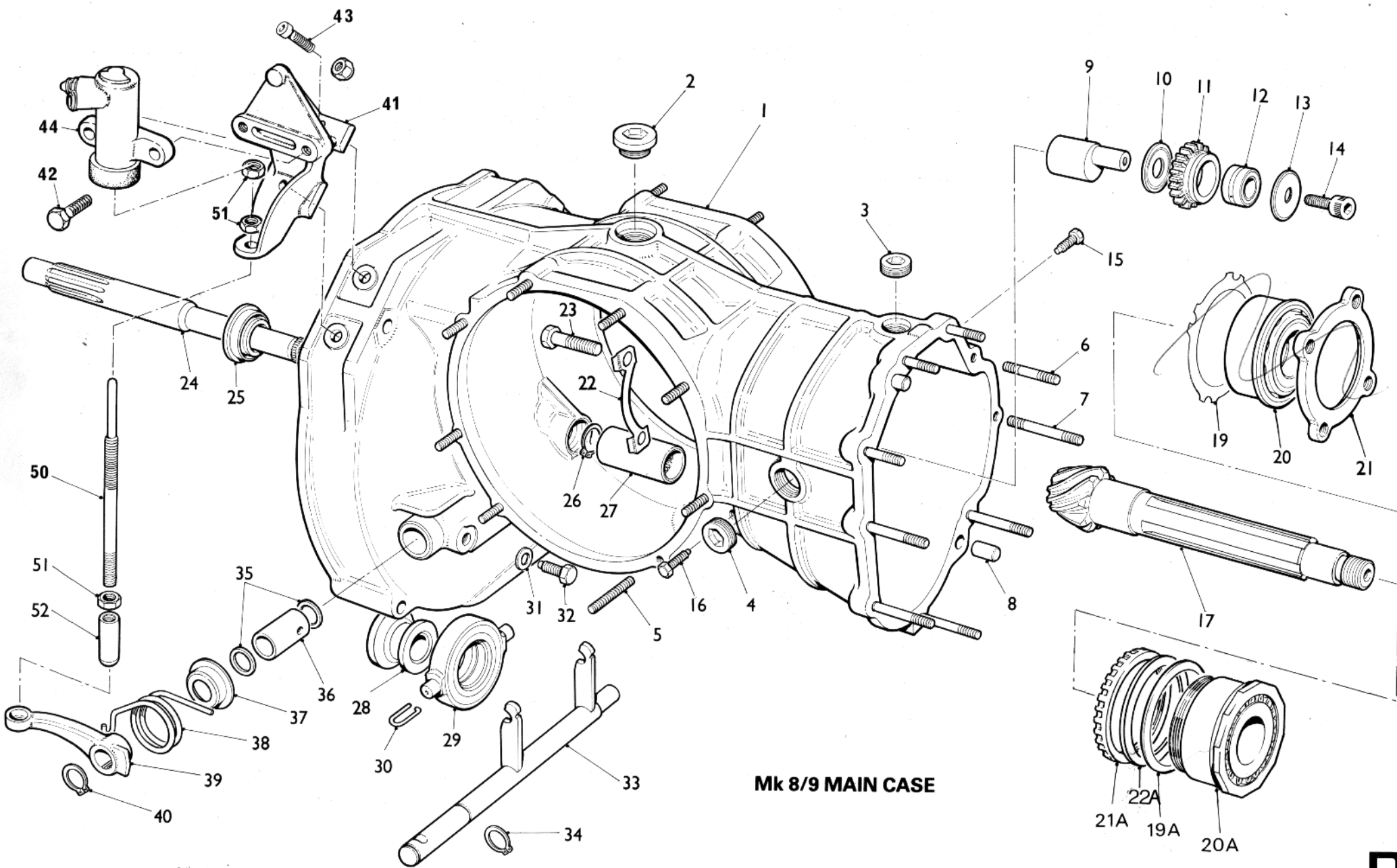
Mk 8 DIFFERENTIAL ASSEMBLY



SPARES LIST 'C'

ILLUS NO.	DESCRIPTION	PART NO.	QTY
C1	Side Plate L/H	HC8 205	1
C2	Side Plate R/H	HC8 206	1
C7	Nut 8 mm Nyloc	HC 2013A	16
C8	Washer 5/16" Flat	FT 2027	16
C9	Oil Seal	FT 2054	2
C10	Bearing	FT 2053	2
C11	Circlip	FT 2191	2
C12	Circlip	FT 2052	2
C13	Shims (Various)	FT 2061	
C14	Bearing	HC8 2051	2
C15	Plunger Carrier	HC8 214	1
C16	Inner Cam Track	HC8 216	1
C17	Outer Cam Track	HC8 215	1
C18	Plungers	FT 217	8
C19	Outer Housing	HC8 213	1
C20	Crown Wheel & Pinion 7:31 ratio	HC8 221	1
C20	Crown Wheel & Pinion 8:31 ratio	HC8 221B	1
C20	Crown Wheel & Pinion 9:31 ratio	HC8 221A	1
C20	Crown Wheel & Pinion 10:31 ratio	HC8 221C	1
C21	Bolt Crown Wheel	FT 2211	8
C22	Drive Shaft 5/4" PCD	HC8 219C (LH)	1
C22	Drive Shaft 4 7/16" PCD	HC8 219B (LH)	1
C22	Drive Shaft 3.780 PCD	HC8 219 (LH)	1

ILLUS NO.	DESCRIPTION	PART NO.	QTY
C23	Drive Shaft 5/4" PCD	HC8 219C (RH)	1
C23	Drive Shaft 4 7/16" PCD	HC8 219B (RH)	1
C23	Drive Shaft 3.780" PCD	HC8 219 (RH)	1
C24	Bolt Drive Shaft (5/4")	FT 2192	6
C24	Bolt Drive Shaft (4 7/16")	FT 2192A	6
C24	Bolt Drive Shaft (3.780")	HC 2192	6
C24	Standard Drive Shaft 7/16" x 3"	HC 2194	6
C25	Nut Nyloc 7/16"	FT 2195	6
C25	Nut Nyloc 3/8"	FT 2196	6
C26	Housing (Free Diff)	HC8 2141	1
C27	Seloc Pin	HC8 2147	1
C28	Cross Shaft	HC8 2142	1
C29	Star Wheel	HC8 2143	2
G30	Washer (Dished)	HC8 2146	2
C31	Gear Wheel	HC8 2144	2
C32	Washer (Flat)	HC8 2145	2
C33	Drive Shaft (Hardy Spicer)	HC8 218 (LH)	1
C33	Drive Shaft (Super Vee)	FV 218 L	1
C34	Drive Shaft (Hardy Spicer)	HC8 218 (RH)	1
C34	Drive Shaft (Super Vee)	FV 218 R	1
C35	Bolt Drive Shaft	FT 2193	8
C36	Nut Nyloc	FT 2196	8
C37	Lock Tab	HC8 2212	4



Mk 8/9 MAIN CASE

SPARES LIST 'D'

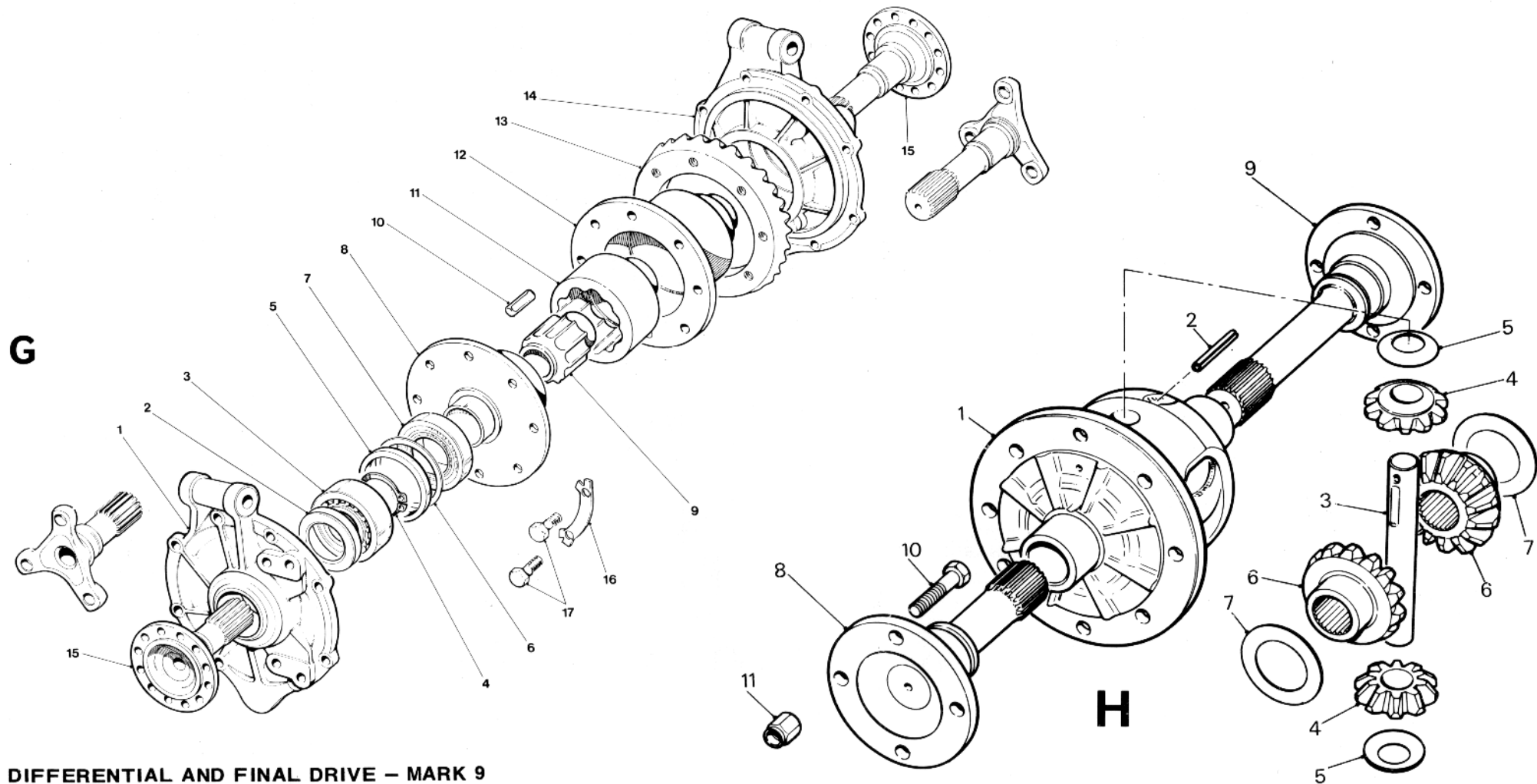
ILLUS NO.	DESCRIPTION	PART NO.	QTY
D1	Main Case used with FT 2221 pinion bearing	HC 201	1
D1	Main Case used with HC8 2221 pinion bearing	HC8 201	1
D2	Oil Filler Plug	HC 2011	1
D3	Oil Filler Plug	HC 2011	1
D4	Oil Filler Plug	HC 2011	1
D5	Stud Side Plate	HC 2012	16
D6	Stud Bearing Carrier	HC 2014	4
D7	Stud Bearing Carrier	HC 2014A	5
D8	Dowel	HC 2015	2
D9	Reverse Idler Spigot	HC 2373	1
D10	Reverse Idler Washer Grooved	HC 2374	1
D11	Reverse Idler Gear	HC 2371	1
D12	Reverse Idler Bearing	HC 2372	1
D13	Washer Plain	HC 2374A	1
D14	Screw	HC 2375	1
D15	Retaining Bolt	HC 2376	1
D16	Retaining Bolt	HC 2342	1
D17	Crown Wheel & Pinion 7:31 ratio	HC8 221	1
D17	Crown Wheel & Pinion 8:31 ratio	HC8 221B	1
D17	Crown Wheel & Pinion 9:31 ratio	HC8 221A	1
D17	Crown Wheel & Pinion 10:31 ratio	HC8 221C	1
D19	Shim Clamp Plate (Various)	HC 2253	1
D19A	Shim Pinion Bearing (Various)	HC8 2222	1
D20	Pinion Bearing	FT 2221	1
D20A	Pinion Bearing	HC8 2221	1
D21	Clamp Plate Pinion Bearing	HC 225	1
D21A	Bearing Locking Ring	HC8 2221A	1
D22	Tab Washer	HC 2252	2
D22A	Spacer Pinion Bearing	HC8 2222A	1

ILLUS NO.	DESCRIPTION	PART NO.	QTY	
D23	Bolt Clamp Plate	HC 2251	4	
D24	Clutch Shaft (when ordering specify engine, clutch & adaptor plate used)	HC 239	1	
D25	Oil Seal	HC 24411	1	
D26	Circlip	HC 2390	1	
D27	Sleeve	HC 2364	1	
D28	Bobbin (when ordering specify engine, clutch & adaptor plate used)	HC 245—	1	
	$\frac{7}{8}$ " I/D	DU Bush (not illustrated)	HC 25413	1
	1" I/D	DU Bush (not illustrated)	HC 24514	1
D29	Clutch Release Bearing	HC 245A	1	
D30	Retaining Clips	HC 24512	2	
D32	Retaining Bolt (with D31)	HC 2542	1	
D33	Cross Shaft	HC 254	1	
D34	Circlips	HC 2546	1	
D35	Washer	HC 2543	2	
D36	Bush	HC 2541	1	
D37	Spring Cap	HC 2544	1	
D38	Spring	HC 2545	1	
D39	Lever	HC 2547	1	
D40	Circlip	HC 2546	1	
D41	Slave Cylinder Bracket	HC8 2587	1	
D42	Bolt	FT 2583	2	
D43	Mounting Bolts	HC8 2583	2	
D44	Slave Cylinder	FT 2582	1	
D50	Push Rod	HC8 258	1	
D51	Nut	HC 2581	3	
D52	Nose Piece	HC 259	1	

VW 002-311-221

STATE DIAMETER OF HC254 WHEN ORDERING PARTS NUMBERED 32 - 40

Locking Ring FGA 222-1A = VW 002-311-223A



DIFFERENTIAL AND FINAL DRIVE - MARK 9

SPARES LIST 'G'

ILLUS NO.	DESCRIPTION	PART NO.	QTY
G1	Side Plate L/H	HC9-205C	1
G2	Oil Seal Drive Shaft	HC9-2054	2
G3	Bearing Drive Shaft	HC9-2053	2
G4	Circlip Drive Shaft	FT 2191A	2
G5	Bearing Spacer L/H	HC9 2052ALH	1
G5	Bearing Spacer R/H	HC9 2062ARH	1
G6	Shim Side Plate	HC9 2061	var
G7	Bearing Inner Differential	HC9 2051	2
G8	Plunger Carrier	HC8 214	1
G9	Inner Cam Track	HC8 216	1
G10	Plunger	FT 217	8
G11	Outer Cam Track	HC8 215	1
G12	Outer Housing	HC8 213	1
G13	Crown Wheel 7:31 Ratio	HC8 221	1
G13	Crown Wheel 8:31 Ratio	HC8 221A	1
G13	Crown Wheel 9:31 Ratio	HC8 221B	1
G13	Crown Wheel 10:31 Ratio	HC8 221C	1
G13	Crown Wheel 13:36 Ratio	HC8 221M	1
G14	Side Plate R/H	HC9 206C	1
G15	Drive Shaft 1300 HS 12 hole LH	HC9 218LH	1
G15R	Drive Shaft 1300 HS 12 hole RH	HC9 218RH	1
G15	Drive Shaft 1300 HS 4 hole LH	HC9 218ALH	1
G15R	Drive Shaft 1300 HS 4 hole RH	HC9 218ARH	1
G15	Drive Shaft 1300 HS 3.780 hole LH	HC9 219ALH	1
G15R	Drive Shaft 1300 HS 3.780 hole RH	HC9 219ARH	1
G15	Drive Shaft 1300 HS 4.7/16 hole LH	HC9 219BLH	1
G15R	Drive Shaft 1300 HS 4.7/16 hole RH	HC9 219BRH	1
G16	Tab Washer Crown Wheel	HC8 2212	4
G17	Bolt Crown Wheel	FT 2211	8

SPARES LIST 'H'

ILLUS NO.	DESCRIPTION	PART NO.	QTY
H1	Housing (Free Diff)	HC8 2141	1
H2	Seloc Pin	HC8 2147	1
H3	Cross Shaft	HC8 2142	1
H4	Star Wheel	HC8 2143	2
H5	Washer (Dished)	HC8 2146	2
H6	Gear Wheel	HC8 2144	2
H7	Washer (Flat)	HC8 2145	2
H8	Drive Shaft (Hardy Spicer)	HC8 218 (LH)	1
H8	Drive Shaft (Super Vee)	FV 218 L	1
H9	Drivew Shaft (Hardy Spicer)	HC8 218 (RH)	1
H9	Drive Shaft (Super Vee)	FV 218 R	1
H10	Bolt Drive Shaft	FT 2193	8
H11	Nut Nyloc	FT 2196	8

Fitting a new Crown Wheel and pinion

The crown wheel and pinion are supplied as a pair, precision matched and lapped. Each pair is individually tested and passed as perfect before leaving the factory, and neither part should ever be replaced without the other.

Setting up can be done in the usual way, using engineer's blue. A faster and more positive method, however, is to use the Hewland Setting Gauge designed for the purpose.

Procedure is as follows:—

SETTING UP USING THE HEWLAND SETTING GAUGE

1. Press the new bearing onto the pinion.
2. Warm up the outside of the case and replace bearing and pinion. (Use the old shim for setting up purposes.)
3. Replace the clamp plate and bolt up, omitting the tabs.
4. Now assemble the setting gauge to the main case, as Fig. 2.
5. Using a feeler gauge, measure the clearance between pinion face and setting gauge (Fig. 4). Correct clearance is etched on the pinion.
6. Adjust if necessary by substituting a thicker or thinner shim or shims. When satisfied, remove setting gauge. Fit new clamp plate bolts and tab washers.

TO ADJUST THE PRE-LOAD

1. Assemble the differential unit, using the new crown wheel and **solid dummy bearings** in place

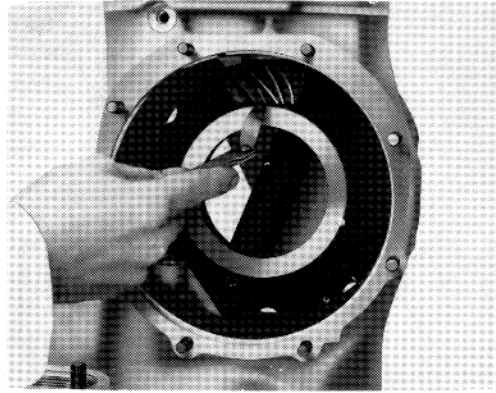


Fig. 4 With pinion in the setting gauge, a feeler gauge is used to measure clearance

- of the two inner differential bearings (14, Diag. C). The thickness of the shims is critical. If they have to be renewed, make sure they are replaced with shims of same thickness as originals.
2. Assemble the differential unit and side plates to the main case. Bolt up to normal tension.
 3. Now turn the pinion by hand to test the pre-load. Adjust by means of shims until satisfactory.

NOTE Using reasonable effort it should be possible to turn the pinion by gripping the splines, but remember that much more effort will be needed with dummy bearings than real ones. Make sure there is some evidence of backlash. Absence of backlash will give a false impression of pre-load.

TO ADJUST THE BACKLASH

For this operation you will require a post-mounted dial indicator with an extended probe (Fig. 3).

1. Remove the solid dummy bearings from the differential unit and replace them with dummy roller bearings. (Real bearings with increased tolerances for easy substitution).
2. Insert a 3/16" bolt in the split pin hole, in the tail of the pinion shaft.
3. Place the point of the probe against the bolt, and measure the backlash on the dial indicator. Turn the pinion by hand to rotate the crown wheel, and take at least 12 readings in different positions. (14 readings are standard practice in our own workshops). Minimum reading should be .004".
4. To increase or decrease backlash, change shims from one side of the differential to the other. But remember that, once the pre-load has been set, you can use only the shims that are already there. Continue to test until satisfactory.
5. Remove side plates. Replace dummy bearings with real bearings.

RE-ASSEMBLE AS FOLLOWS

6. Press inner bearings onto differential assembly.
7. Warm up one side plate. Insert oil seal, side plate bearing and circlip.
8. Insert shim or shims, and outer bearing track. Place heavy weight on bearing to flatten out shims.
9. Repeat for the other side plate. After cooling, assemble one side plate to the main case. Complete the assembly of the differential and drive unit, as described above.
10. Press in drive shaft and replace circlip.

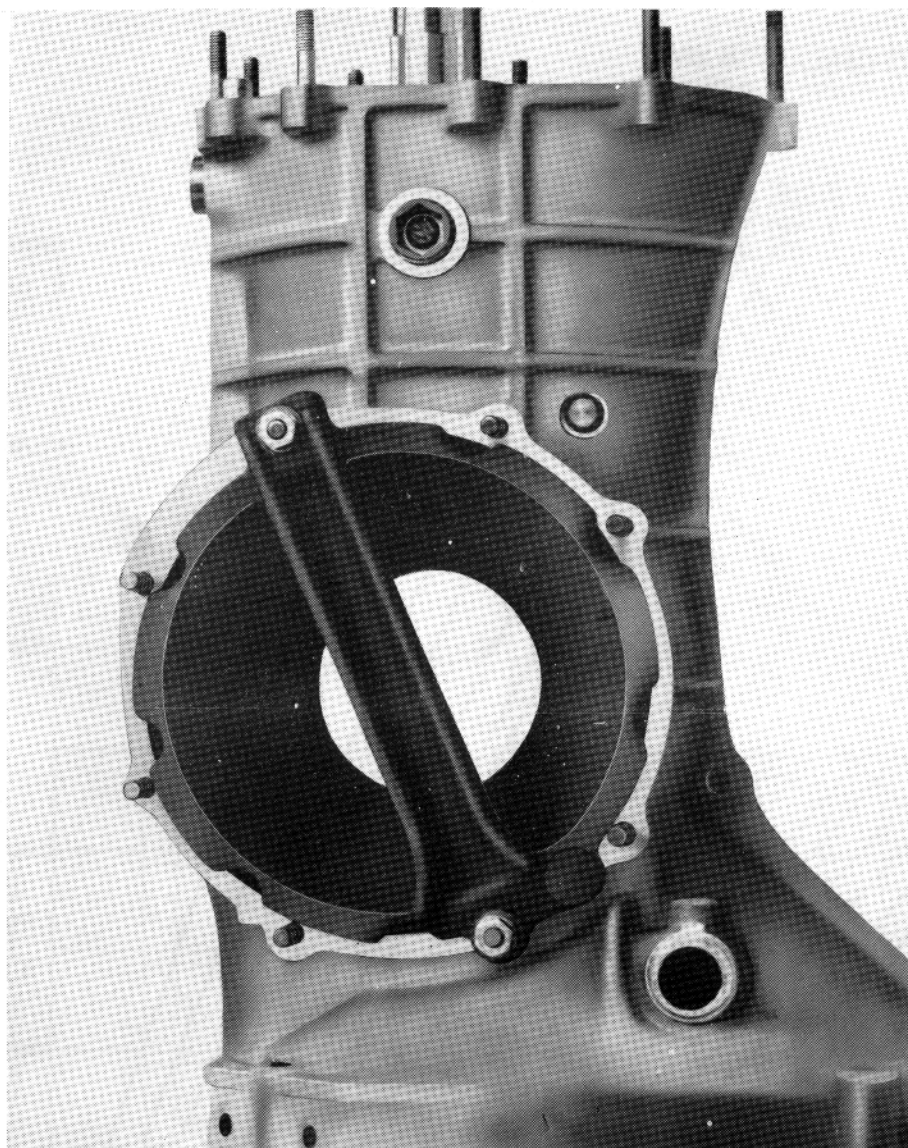


Fig. 2 The Hewland Setting gauge in position

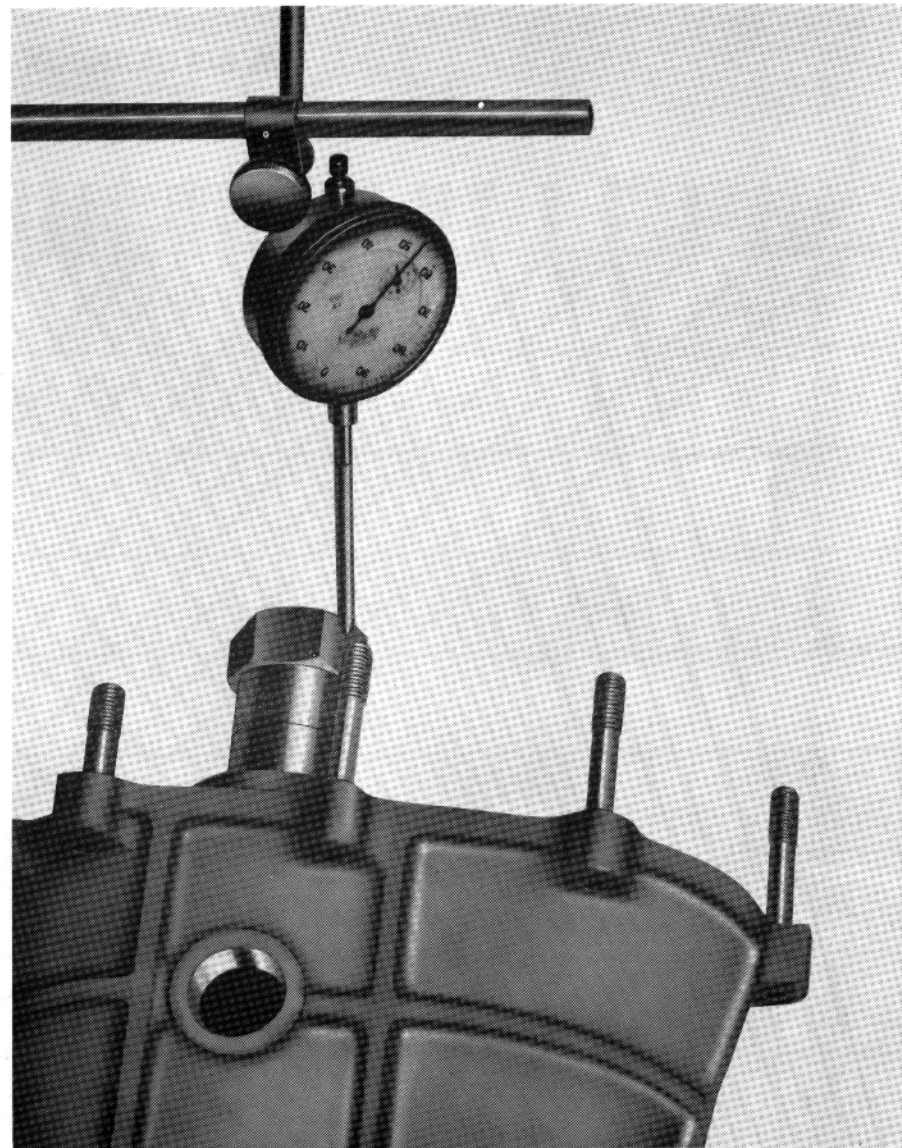


Fig. 3 Measuring backlash with a dial recording micrometer