By Appointment to Her Majesty Queen Elizabeth II
Manufacturers of Motor Cars and Land-Rovers

By Appointment to Her Majesty Queen Elizabeth
the Queen Mother
Suppliers of Motor Cars and Land-Rovers

REPAIR OPERATION MANUAL

for

Land-Rover Series III
Half-tonne 4 x 2
with 24 volt electrical equipment

BRITISH LEYLAND

ROVER TRIUMPH BRITISH LEYLAND UK LIMITED
SERVICE DEPARTMENT
COVENTRY
ENGLAND CV4 9DB

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CONTENTS

INTRODUCTION

The purpose of this Manual is to assist skilled mechanics in the efficient repair and maintenance of Land-Rover Series III vehicles.
The procedures detailed, carried out in the sequence given and using the appropriate service tools, will enable the operations to be completed in the time stated in the Repair Operation Times.

Indexing

For convenience, this Manual is divided into a number of divisions. A contents page listing the titles and reference numbers of the various divisions is provided.
A list of the operations within each of the divisions appears in alphabetical order on the contents page preceding each of the divisions.

Operation Numbering

Each instruction within an operation has a sequence number and, to complete the operation in the minimum time it is essential that these instructions are performed in numerical sequence commencing at 1 unless otherwise stated. Where applicable the sequence numbers identify the components in the appropriate illustration.
Where performance of an operation requires the use of a service tool, the tool number is quoted under the operation heading and is repeated in, or following the instruction involving its use.
An illustrated list of all service tools necessary to complete the operations described in the Manual is also included.

References

References to the left or right hand side in the Manual are made when viewing the vehicle from the rear. With the engine and gearbox assembly removed, the water pump end of the engine is referred to as the front.

Amendments

Revised and additional procedures resulting from changes in the vehicle specification will be issued as revised or additional pages.

Repairs and Replacements

When service parts are required it is essential that only genuine Rover or Unipart replacements are used.
Attention is particularly drawn to the following points concerning repairs and the fitting of replacement parts and accessories.

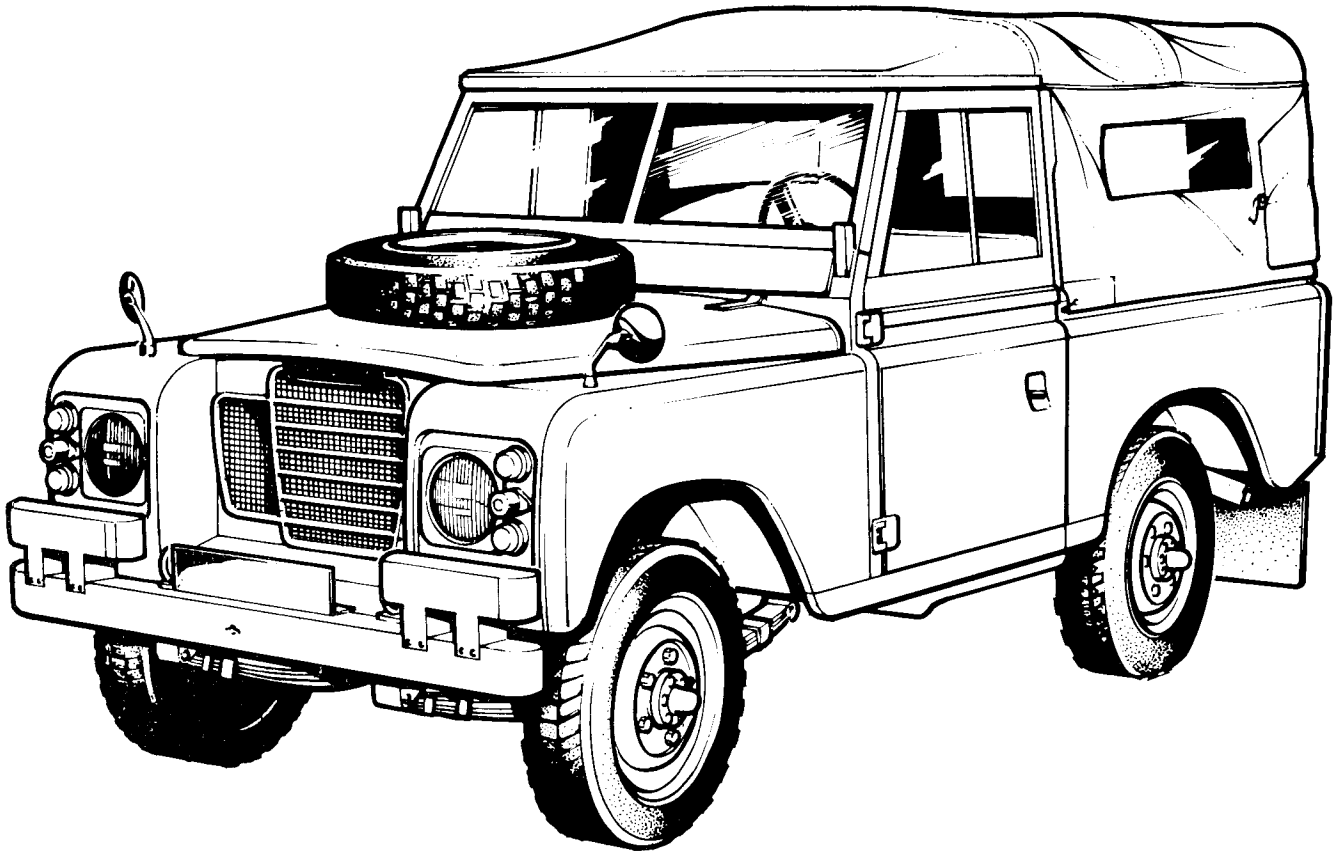
Safety features embodied in the car may be impaired if other than genuine parts are fitted.
In certain territories, legislation prohibits the fitting of parts not to the vehicle manufacturers' specification.
Torque wrench setting figures given in the Repair Operation Manual must be strictly adhered to. Locking devices, where specified, must be fitted. If the efficiency of a locking device is impaired during removal it must be renewed.
Drivers purchasing accessories while travelling abroad should ensure that the accessory and its fitted location on the car conform to mandatory requirements existing in their country of origin.
The car warranty may be invalidated by the fitting of other than genuine Rover or Unipart parts. All Rover or Unipart replacements have the full backing of the factory warranty.
Rover British Leyland Distributors and Dealers are obliged to supply only genuine service parts.

ABBREVIATIONS AND SYMBOLS IN THIS MANUAL

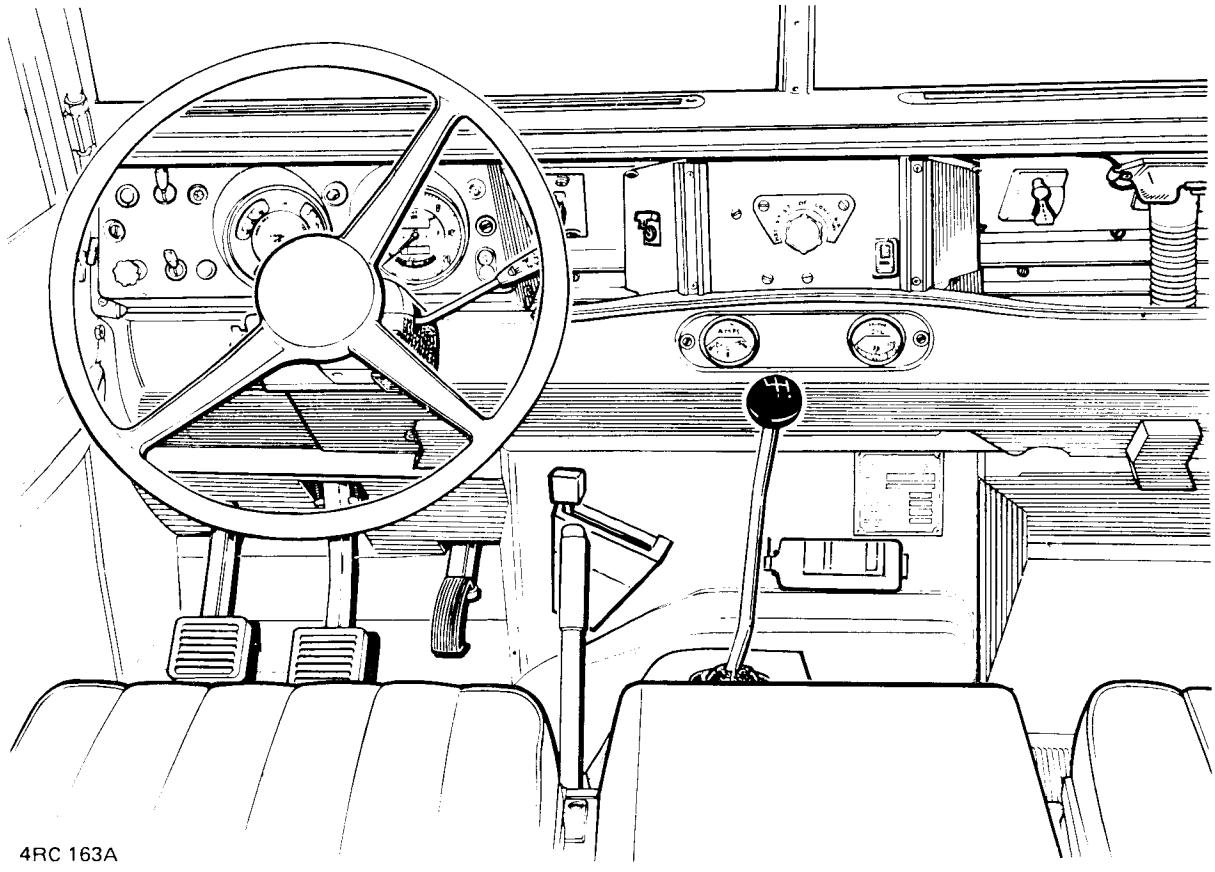
Across flats (bolt size)	AF
After bottom dead centre	ABDC
After top dead centre	ATDC
Alternating current	a.c.
Ampere	amp
Ampere-hour	amp hr
Atmospheres	Atm
Before bottom dead centre	BBDC
Before top dead centre	BTDC
Bottom dead centre	BDC
Brake mean effective pressure	BMEP
Brake horse power	bhp
British Standards	BS
Carbon monoxide	CO
Centimetre	cm
Centigrade (Celsius)	C
Cubic centimetre	cm^3
Cubic inch	in^3
Degree (angle)	deg or °
Degree (temperature)	deg or °
Diameter	dia.
Direct current	d.c.
Fahrenheit	F
Feet	ft
Feet per minute	ft/min
Fifth	5th
Figure (illustration)	Fig.
First	1st
Fourth	4th
Gramme (force)	gf
Gramme (mass)	g
Gallons	gal
Gallons (US)	US gal
High compression	h.c.
High tension (electrical)	H.T.
Hundredweight	cwt
Independent front suspension	i.f.s.
Internal diameter	i.dia.
Inches of mercury	in.Hg
Inches	in
Kilogramme (force)	kgf
Kilogramme (mass)	kg
Kilogramme centimetre (torque)	kgf cm
Kilogramme per square centimetre	kg/cm^2
Kilogramme metres (torque)	kgf m
Kilometres	km
Kilometres per hour	km/h
Kilovolts	kV
King pin inclination	k.p.i.
Left-hand steering	LHStg
Left-hand thread	LHThd
Litres	litre
Low compression	l.c.
Low tension	l.t.
Maximum	max.
Metre	m
Microfarad	mfd
Midget edison screw	MES
Millimetre	mm
Miles per gallon	mpg
Miles per hour	mph
Minimum	min
minute (of angle)	'
Minus (of tolerance)	-
Negative (electrical)	-
Number	No.
Ohms	ohm
Ounces (force)	ozf
Ounces (mass)	oz
Ounce inch (torque)	ozf in
Outside diameter	o.dia.
Paragraphs	para.
Part number	Part No.
Percentage	%
Pints	pt
Pints (US)	US pt
Plus (tolerance)	+
Positive (electrical)	+
Pound (force)	lbf
Pounds feet (torque)	lbf ft
Pounds inches (torque)	lbf in
Pound (mass)	lb
Pounds per square inch	lb/in^2
Radius	r
Rate (frequency)	c/min
Ratio	:
Reference	ref.
Revolution per minute	rev/min
Right-hand	RH
Right-hand steering	RHStg
Second (angle)	"
Second (numerical order)	2nd
Single carburetter	SC
Specific gravity	sp.gr.
Square centimetres	cm^2
Square inches	in^2
Standard	std.
Standard wire gauge	s.w.g.
Synchroniser/synchromesh	synchro.
Third	3rd
Top dead centre	TDC
Twin carburetters	TC
United Kingdom	UK
Volts	V
Watts	W

SCREW THREADS

American Standard Taper Pipe	NPTF
British Association	BA
British Standard Fine	BSF
British Standard Pipe	BSP
British Standard Whitworth	Whit.
Unified Coarse	UNC
Unified Fine	UNF



Exterior view of Land-Rover Series III Half-tonne 4 × 2



Interior view of Land-Rover Series III Half-tonne 4 × 2

AMENDMENTS

To ensure that a record of amendments to this manual is available, this page will be re-issued with each set of revised pages. The date of issue, the page/division numbers affected and the issue number will be quoted under the appropriate instruction heading.

Revised pages must be inserted in place of existing pages carrying the same number, and the old pages discarded.

Additional pages or complete major assembly groups may be issued. In such cases the new pages must be inserted immediately following the existing pages carrying the next lowest number.

To assist in identifying amendments on revised pages, two asterisks (**) will be inserted at the beginning and end of the amended paragraph, section or instruction.

Date	Filing Instructions				Date	Filing Instructions			
	Discard	Issue	Insert	Issue		Discard	Issue	Insert	Issue

Annexe C

Z031 / 100 / TME / 301 - erratum

1. Texte F

   a. Remplacer la page 6 - 0 Sheet 4 par les nouvelles pages 6 - 0 Sheet 4 (1 de 3), 6 - 0 Sheet 4 (2 de 3) et 6 - 0 Sheet 4 (3 de 3) (app 1 à 3)

   b. Page 6 - 0 Sheet 5 : barrer les numéros de série 46 et 77 à 88 inclus

   c. Ajouter la page 6 - 0 Sheet 5 bis ("Mise à jour") (app 4)

2. Tekst N

   a. Bladzijde 6 - 0 Sheet 4 vervangen door de nieuwe bladzijden 6 - 0 Sheet 4 (1 van 3), 6 - 0 Sheet 4 (2 van 3) en 6 - 0 Sheet 4 (3 van 3) (aanh 1 tot 3)

   b. Bladzijde 6 - 0 Sheet 5 : reeksnummers 46 en 77 tot en met 88 schrappen

   c. Bladzijde 6 - 0 Sheet 5 bis ("verbetering") bijvoegen (aanh 4)

ENGINE—2¼ LITRE PETROL

Type	4 cylinder
Bore	90,47 mm (3.562 in)
Stroke	88,9 mm (3.500 in)
Capacity	2286 cm^3 (139.500 in^3)
Valve operation	Overhead by pushrod

Crankshaft

Main journal diameter	63,487 mm to 63,500 mm (2.4995 in to 2.500 in)
Minimum regrind diameter	62,48 mm (2.460 in)
Crankpin journal diameter	58,72 mm to 58,733 mm (2.312 in to 2.31275 in)
Minimum regrind diameter	57,70 mm (2.272 in)
Crankshaft end thrust	Taken on thrust washers at centre main bearing
Crankshaft end float	0,05 mm to 0,15 mm (0.002 in to 0.006 in)

Main bearings

Number and type	3 halved shells
Material	Steel shell, tin-aluminium lined
Diametrical clearance	0,020 mm to 0,055 mm (0.0008 in to 0.0022 in)
Undersizes	0,25 mm, 0,50 mm (0.010 in, 0.020 in)

Connecting rods

Type	Horizontally split big end, plain small end
Length between centres	175,36 mm to 175,46 mm (6.904 in to 6,908 in)

Big end bearings

Type and material	Steel shell, copper-lead lined
Diametrical clearance	0,019 mm to 0,063 mm (0.0007 in to 0.0025 in)
End float on crankpin	0,20 mm to 0,30 mm (0.007 in to 0.012 in)
Undersizes	0,25 mm, 0,50 mm (0.010 in, 0.020 in)

Gudgeon pins

Type	Floating
Fit in piston	Push fit by hand
Clearance in connecting rod	0,007 mm to 0,015 mm (0.0003 in to 0.0006 in)

Pistons

Type	Aluminium alloy, flat top
Clearance in bore, measured at bottom of skirt at right angles to gudgeon pin	
Standard size pistons	0,058 mm to 0,068 mm (0.0023 in to 0.0027 in)
Oversize pistons	0,043 mm to 0,055 mm (0.0017 in to 0.0022 in)

ENGINE—2¼ LITRE PETROL

Piston rings	
Compression	2
Gap in bore	0,38 mm to 0,50 mm (0.015 in to 0.020 in)
Clearance in groove	0,046 mm to 0,097 mm (0.0018 in to 0.0038 in)
Oil control	1
Gap in bore	0,38 mm to 0,50 mm (0.015 in to 0.020 in)
Clearance in groove	0,038 mm to 0,089 mm (0.0015 in to 0.0035 in)
Camshaft	
Location	Right-hand side (thrust side) of engine
End float	0,06 mm to 0,13 mm (0.0025 in to 0.0055 in)
Number of bearings	4
Material	Steel shell, white metal lined
Valves	
Length	
Inlet	111,25 mm to 111,60 mm (4.380 in to 4.394 in)
Exhaust	111,22 mm to 111,58 mm (4.379 in to 4.393 in)
Seat angle	
Inlet	30°
Exhaust	45°
Head diameter	
Inlet	44,45 mm to 44,57 mm (1.750 in to 1.755 in)
Exhaust	35,02 mm to 35,05 mm (1.375 in to 1.380 in)
Stem diameter	
Inlet	7,891 mm to 7,904 mm (0.3107 in to 0.3112 in)
Exhaust	8,661 mm to 8,674 mm (0.3410 in to 0.3145 in)
Stem to guide clearance	
Inlet	0,033 mm to 0,048 mm (0.0013 in to 0.0019 in)
Exhaust	0,058 mm to 0,073 mm (0.0023 in to 0.0029 in)
Valve lift	
Inlet	9,49 mm (0.374 in)
Exhaust	9,85 mm (0.388 in)
Valve springs	
Type	Duplex interference coil
Inner	
Length, free	42,67 mm (1.680 in)
Length, under 8,0 kg (17.7 lb) load	37,13 mm (1.462 in)
Outer	
Length, free	46,28 mm (1.822 in)
Length, under 21 kg (46 lb) load	40,30 mm (1.587 in)

ENGINE—2¼ LITRE PETROL

Valve timing	
Inlet opens	6° BTDC
Inlet closes	52° ABDC
Inlet peak	113° ATDC
Exhaust opens	34° BBDC
Exhaust closes	24° ATDC
Exhaust peak	85° ABDC
Lubrication	
System	Wet sump, pressure fed
System pressure, engine warm at 2000 rev/min	2,5 to 4,57 kgf/cm² (35 to 65 lbf/in²)
Oil pump	
Type	Double gear
Drive	Splined shaft from camshaft skew gear
End float of gears	
Steel gear	0,05 mm to 0,12 mm (0.002 in to 0.005 in)
Aluminium gear	0,07 mm to 0,15 mm (0.003 in to 0.006 in)
Radial clearance of gears	0,02 mm to 0,10 mm (0.001 in to 0.004 in)
Backlash of gears	0,15 mm to 0,28 mm (0.006 in to 0.012 in)
Oil pressure relief valve	
Type	Non-adjustable
Relief valve spring	
Full length	67,82 mm (2.670 in)
Compressed length at 2,58 kg (5.7 lb) load	61,23 mm (2.450 in)

Clutch

Make	Borg and Beck
Type	Diaphragm spring
Drive plate diameter	241,3 mm (9.500 in)
Damper spring colour	Dark green
Facing material	Raybestos WR7

TRANSMISSION

Main gearbox

Type	Single helical constant mesh with synchro-mesh on all forward speeds
Ratios: Top	Direct
Third	1.50:1
Second	2.22:1
First	3.68:1
Reverse	4.02:1

Transfer gearbox

Type	Single speed reduction on main gearbox output
Ratios:	High transfer
Helical and spur gear transfer gearbox	1.15:1
Overall ratios (final drive) with helical and spur gear transfer gearbox. Top	5.4:1
Third	8.05:1
Second	12.0:1
First	19.88:1
Reverse	21.6:1

REAR AXLE

Type	Spiral bevel	floating shafts
Ratio	4.7:1	

FRONT AXLE

Type	Tube with swivels

PROPELLER SHAFT

Type	Hardy-Spicer, needle bearing
Diameter of tubular shaft	50,8 mm (2.000 in)
Overall length (face to face in midway position)	554,00 mm (21.812 in)

COOLING SYSTEM

Type	Pressurized spill return system with thermostat control, pump and fan assisted
Thermostat	73°C (165°F)
Pressure cap	0,6 kgf cm² (9 lbf in²)
Type of pump	Centrifugal

FUEL SYSTEM

Carburetter	see **'ENGINE TUNING DATA'**
Air cleaner	Oil bath with built-in centrifugal pre-cleaner
Fuel pump	
Type	Mechanical
Pressure range	0,10 to 0,17 kgf cm² (1.5 to 2.5 lbf in²)

SUSPENSION	
Type	Rigid axles, semi-elliptic springs
Springs	
Front (Driver)	
Length	920,7 mm (36.25 in)
Width	63,5 mm (2.5 in)
No. of leaves	9
Thickness	
1 at	5,15 mm (0.203 in)
8 at	4,19 mm (0.165 in)
Rate	233 kg cm (203 lb in)
Free camber	154,4 mm (6.080 in)
Front (Passenger)	
Length	920,7 mm (36.25 in)
Width	63,5 mm (2.5 in)
No. of leaves	9
Thickness	
1 at	5,15 mm (0.203 in)
8 at	4,19 mm (0.165 in)
Rate	233 kg cm (203 lb in)
Free camber	135,3 mm (5.330 in)
Rear (Driver)	
Length	1219 mm (48 in)
Width	63,5 mm (2.5 in)
No. of leaves	11
Thickness	
1 at	6,3 mm (0.250 in)
10 at	4,7 mm (0.187 in)
Rate	191 kg cm (166 lb in)
Free camber	188,4 mm (7.420 in)
Rear (Passenger)	
Length	1219 mm (48 in)
Width	63,5 mm (2.5 in)
No. of leaves	11
Thickness	
1 at	6,3 mm (0.250 in)
10 at	4,7 mm (0.187 in)
Rate	191 kg cm (166 lb in)
Free camber	171,4 mm (6.750 in)

Hydraulic dampers	Telescopic: non-adjustable
Piston diameter	25,4 mm (1.000 in)
STEERING	
Type	Recirculating ball
Ratio: Straight ahead	15.6:1
Full lock	23.8:1
Front wheel toe-in	1,2 mm to 2,4 mm (0.046 in to 0.093 in)
Camber angle	$1\frac{1}{2}°$
Castor angle	3°
Swivel pin inclination	7°
BRAKES	
System	Dual line with servo
Front	
Drum diameter	254 mm (10 in)
Reclamation limit	0,75 mm (0.030 in) oversize
Wheel cylinder bore diameter	31,75 mm (1.250 in) Single leading shoe
Lining dimensions	220,98 mm × 38,1 mm × 4,75 mm (8.700 in × 1.500 in × 0.187 in)
Lining material	Mintex M22
Rear	
Drum diameter	254 mm (10 in)
Reclamation limit	0,75 mm (0.030 in) oversize
Wheel cylinder bore diameter	31,75 mm (1.250 in) single leading shoe
Lining dimensions	220,98 mm × 38,1 mm × 4,74 mm (8.700 in × 1.500 in × 0.187 in)
Lining material	Mintex M22
Total swept area, foot brakes	1212,9 cm^2 (188.0 in^2)

Hand brake

Drum diameter	228,6 mm (9.000 in)
Lining dimensions	209,55 mm × 44,45 mm × 4,74 mm (8.250 in × 1.750 in 0.187 in)
Master cylinder bore diameter	22,2 mm (0.875 in)

WHEELS

Size	5.00F × 16

TYRES

Type/Size	
Standard	Cross Ply 6.00—16
Optional	Cross Ply 6.50—16
	Cross Ply 7.00—16
	Cross Ply 7.50—16 with 5.50F × 16 wheel

Tyre pressures

		Normal				**Emergency soft**			
		Load under 250 kg (550 lb)		Load over 250 kg (550 lb)		Load under 250 kg (550 lb)		Load over 250 kg (550 lb)	
		Front	Rear	Front	Rear	Front	Rear	Front	Rear
6.00 6.50 and 7.00—16	kg/cm²	1,8	1,8	1,8	2,1	1,1	1,1	1,1	1,4
	lb/in²	25	25	25	30	15	15	15	20
	bars	1.72	1.72	1.72	2.07	1.03	1.03	1.03	1.38
7.50—16	kg/cm²	1,8	1,8	1,8	2,1	0,8	0,8	0,8	1,4
	lb/in²	25	25	25	30	12	12	12	20
	bars	1.72	1.72	1.72	2.07	0.83	0.83	0.83	1.38

Battery

Make/type	Two 12 volt. Oldham or Lucas UK 2HN
Capacity	50 AH at 20 hour rate

Alternator

Make/type	CAV AC5/24
Nominal output	31 amps at 27.5 volts
Field resistance	9.6 ohms $\pm 5\%$
Brush spring pressure	227 g (8 oz)
Brush minimum length	7,9 mm (0.312 in)

Starter motor

Make/type	CAV SCA 150
Brush spring tension	840 g to 1120 g (30 oz to 40 oz)

Wiper motor

Make/type	Lucas 14 W two speed
Armature end float	0,1 mm to 0,20 mm (0.004 to 0.008 in)
Brush minimum length	4,8 mm (0.190 in)
Brush spring tension	140 g to 200 g (5 oz to 7 oz)
Light running, rack disconnected	
Current	0.8 amps
Speed 60 seconds from cold	46 to 52 rev/min

GENERAL DIMENSIONS

	Metric	British
Overall length	3,62 m	142.562 in
Overall width	1,68 m	66 in
Overall unladen height, hood up	1,97 m	77.5 in
Overall unladen height, hood down, screen up	1,73 m	68 in
Overall unladen height, hood down, screen down	1,46 m	57.5 in
Overall unladen height, with cab or hard top	1,97 m	76.875 in
Wheelbase	2,23 m	88 in
Track	1,31 m	51.5 in
Turning circle	11,6 m	38 ft
Unladen ground clearance under differential, 6.50 × 16 tyres	177 mm	7 in
Unladen ground clearance under differential, 7.00 × 16 tyres	197 mm	7.75 in
Internal body dimensions:		
Length (between cappings)	1,206 m	47.5 in
Width (between cappings)	1,448 m	57 in
Height of body sides	508 mm	20 in
Height of wheel arch	216 mm	8.5 in
Width of wheel arch (to body side)	292 mm	11.5 in
Width of floor (between wheel arches)	921 mm	36.25 in
Height, floor to roof (maximum)	1.23 m	48.5 in

WEIGHTS

	Metric	British
Maximum approved payload, normal roads	*Driver, two passengers and: 454 kg	1,000 lb
Maximum approved payload, cross-country	Driver, two passengers and: 363 kg	800 lb
Maximum drawbar pull, dependent upon surface conditions:	1800 kg	4,000 lb
Maximum roof rack load	50 kg	112 lb
Weight running, with water, oil, 5 gallons fuel:		
Petrol models	1339 kg	2,953 lb

*Maximum loads for cross-country when heavy duty springs are fitted.

ENGINE — 2¼ litre 4-cylinder Petrol models

Type	In line four cylinder four stroke, overhead valves
Capacity	2286 cm^3 (139,5 in^3)
Compression ratio	8.0:1
Firing Order	1—3—4—2
Compression pressure	11,2 kgf cm^2 (160 lbf in^2)
Idling speed	500 rev/min
Fast idle setting	1,40 mm (0.055 in) Throttle butterfly clearance
Ignition timing, static	TDC when using 90 octane fuel 3° ATDC when using 85 octane fuel
Timing marks	On crankshaft pulley
Valve clearance, inlet and exhaust	0,25 mm (0.010 in)

DISTRIBUTOR

Make/type	Lucas DZS4A
Rotation of rotor	Anti-clockwise
Dwell angle	49° ± 4°
Contact breaker gap	0,25 mm to 0,30 mm (0.010 in to 0.012 in)
Condenser capacity	0.18 to 0.25 microfarad
Serial number	484342

Centrifugal advance with TDC ignition timing

Decelerating check with vacuum unit disconnected

Crankshaft angle	Engine rev/min
38° to 42°	4500
30° to 34°	3500
22° to 26°	2500
12° to 16°	1200
4° to 12°	900
0° to 4°	600
No advance below	450

SPARKING PLUGS

Make/type	Champion RSN12Y
Gap	0,75 mm to 0,80 mm (0.029 to 0.032 in)

IGNITION COIL

Make/type	Lucas 5C10
Primary resistance at 20°C (68°F)	2.6 to 3.0 ohms

CARBURETTER

Make/type	Zenith 36IV
Choke diameter	27 mm
Main jet	125
Compensating (enrichment) jet	150
Pump jet	65 (short stroke, outer hole)
Needle valve	1.75

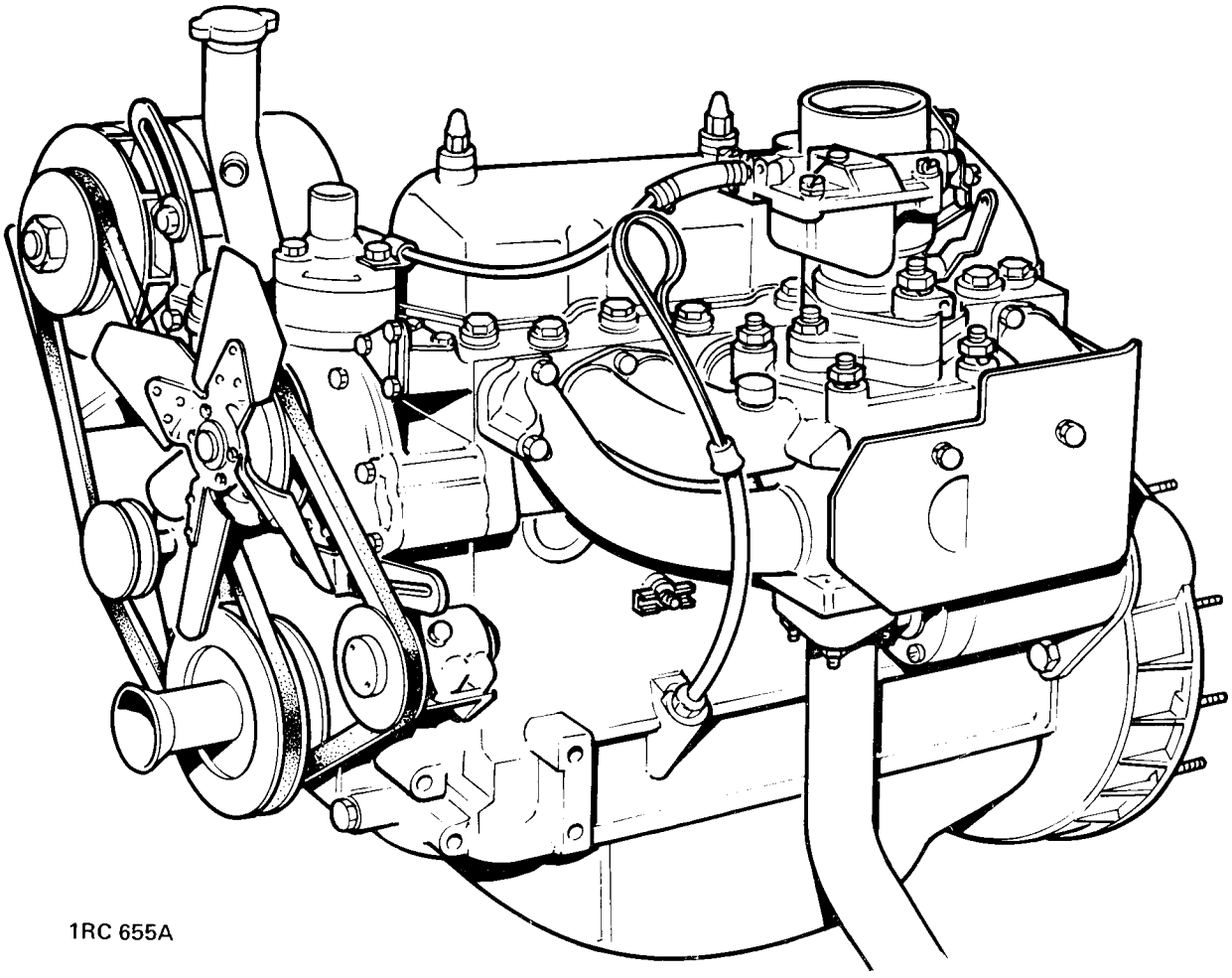
	kgf m	lbf ft
Engine—2¼ litre 4-cylinder		
Connecting rod cap nuts	3,5	25
Main bearing cap bolts	11,5	85
Cylinder head bolts:		
$\frac{5}{16}$ in UNF	2,4	18
$\frac{1}{2}$ in UNF	8,9	65
Rocker shaft bolts:		
$\frac{5}{16}$ in UNF	2,4	18
$\frac{1}{2}$ in UNF	8,9	65
Starter dog	20,5	150
Flywheel bolts	8,5 to 9,0	60 to 65
Manifold and exhaust system		
Induction manifold to exhaust manifold nuts	2,3	17
Clutch		
Clutch cover bolts	3,0 to 3,5	22 to 25
Gearbox		
Output drive flange nut	11,75	85
Layshaft bolt	8,5	60
Rear axle and final drive		
Hub driving flange bolts	3,9	28
Bevel pinion driving flange nut	11,75	85
Differential case screws	1,4 to 1,7	10 to 13
Crownwheel bolts	5,5 to 6,2	40 to 45
Differential bearing cap bolts	8,9	65
Hub driving flange nut	1,4 to 2,0	10 to 15
Front axle and final drive		
Hub driving flange bolts	3,9	28
Hub driving flange nut	1,4 to 2,0	10 to 15
Steering		
Steering wheel nut	5,4	40
Ball joint nuts	4,0	30
Relay lever pinch bolts	7,6	55
Steering box to support bracket bolts	7,0 to 8,5	50 to 60
Steering box support bracket to chassis bolts	2,0	15
Steering box drop arm nut	8,5 to 11,0	60 to 80

continued

TORQUE WRENCH SETTINGS

	Kgf.m	lbf.ft.
Brakes		
Wheel cylinder bleed nipple	0,5 to 0,8	4 to 6
Master cylinder to servo nuts	2,2 to 2,6	16 to 19
Tipping valve retainer (Dual system master cylinder)	4,9 to 6,2	35 to 45
Brake failure switch end pipe union	2,2	16
Fluid reservoir to master cylinder screws	0,3 to 0,4	2 to 3
Servo assembly securing nuts	1,2	9
Windscreen wipers and washers		
Wiper blade drive adaptor bolts	0,34 (34 kgf cm)	2.5 (30 lbf in)
Wiper motor yoke bolts	14 to 18 kgf cm	12 to 16 lbf in
Electrical equipment		
Alternator shaft nut	5,3	40
Alternator through bolts	0,52	45 lbf in

ENGINE OPERATIONS



2¼ litre 4-cylinder Petrol engine

ENGINE ASSEMBLY

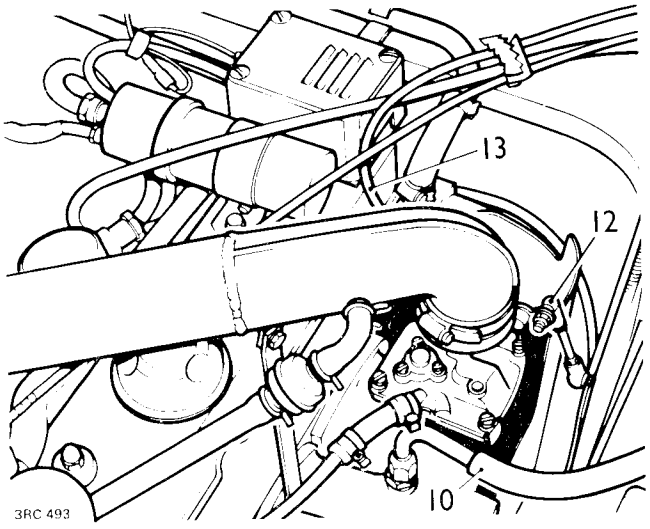
—Remove and refit **1.1**

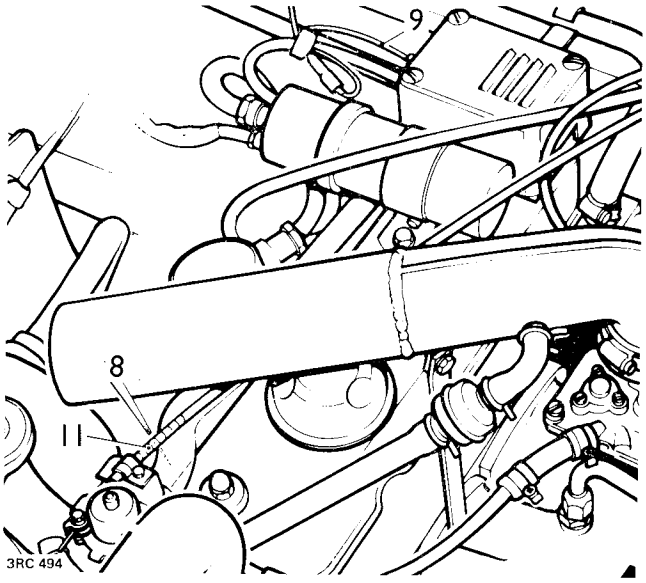
Service tool: 600963 Engine sling

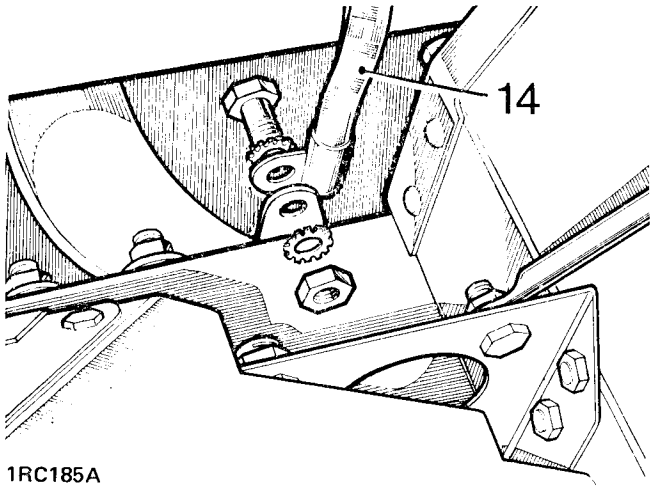
Removing

1. Disconnect the battery earth lead.
2. Remove the bonnet. 17.7.
3. Remove the air cleaner. 3.5.
4. Remove the radiator assembly. 17.16.
5. Remove the front floor. 17.4.
6. Disconnect the exhaust pipe at the manifold.
7. Disconnect the heater hoses.
8. Disconnect the coolant temperature gauge pipe at the front of the cylinder head.
9. Disconnect the feed lead to the ignition filter.
10. Disconnect the brake servo pipe.
11. Disconnect the control cable from the heater water valve.
12. Disconnect the carburetter linkage at the ball joint.
13. Disconnect the cold start cable at the carburetter.
14. Disconnect the engine earth cable.

continued

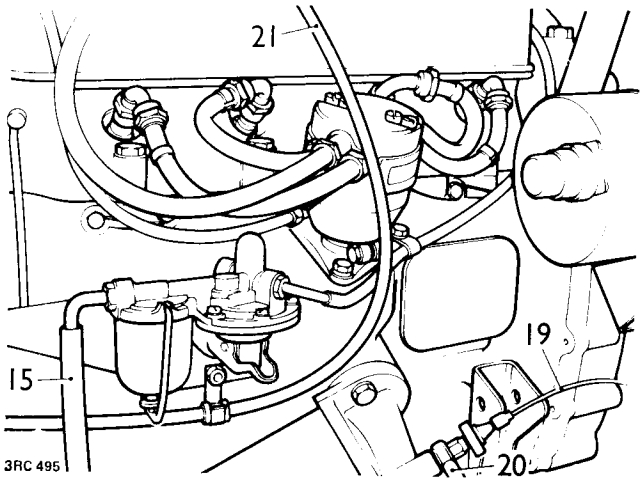






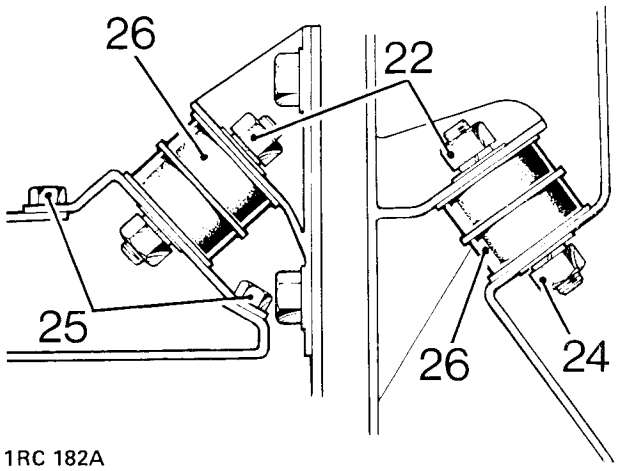
15. Disconnect the fuel inlet pipe at the fuel pump.
16. Release the clutch fluid pipe from the clips at the rear of the engine.
17. Disconnect the starter motor leads at the solenoid on the dash.
18. Disconnect the electrical leads from the alternator.
19. Disconnect the lead from the oil pressure switch.
20. Disconnect the oil pressure gauge pipe from the oil filter.
21. Release the speedometer drive cable from the clip at the engine.

continued

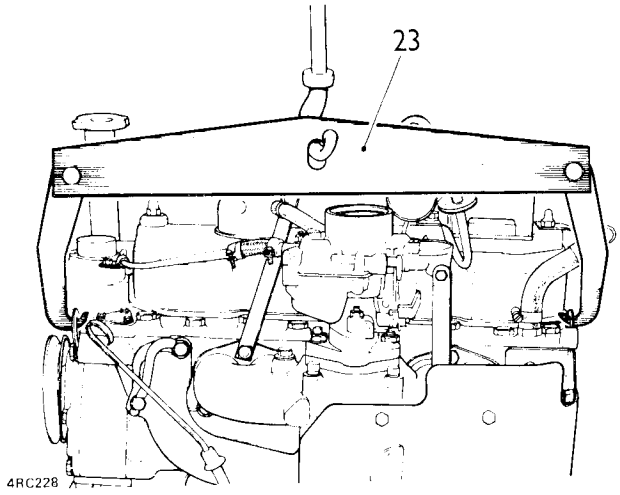


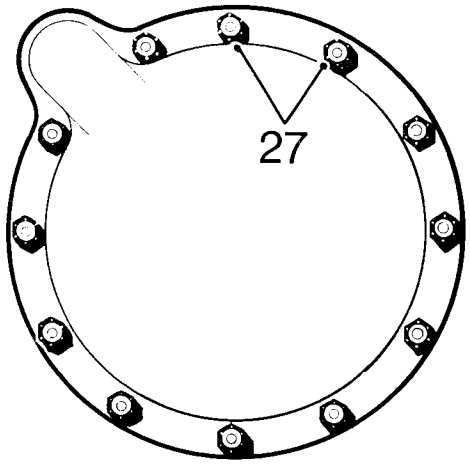
22. Remove the upper fixings from the engine mounting rubbers.
23. Attach a suitable lifting sling and hoist to the engine lifting hooks. 600963.
24. Remove the bottom fixing from the left hand engine mounting rubber.
25. Remove the support bracket fixings from the right hand engine mounting rubber.
26. Tension the hoist sufficient to withdraw the engine mounting rubbers, then lower the engine to its original position to maintain alignment with the gearbox.
27. Remove the fixings securing the bell housing to the flywheel housing.
28. Support the gearbox assembly using a suitable packing block or jack.
29. Draw the engine forward to release it from the dowelled location to the bell housing, and to clear the primary pinion from the clutch.
30. Lift the engine clear.

continued



1RC 182A





1RC 184A

Refitting

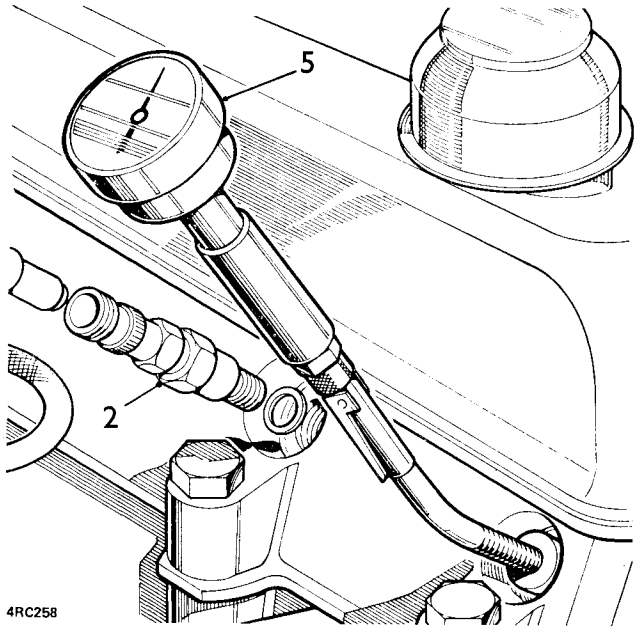
31. Attach a suitable lifting sling and hoist to the engine lifting hooks. 600963.
32. Lower the engine into position, locating the primary pinion into the clutch and engage the bell housing dowels.
33. Secure the bell housing to the flywheel housing.
34. Tension the hoist sufficient to remove the support from the gearbox and insert the engine front mounting rubbers.
35. Lower the engine and secure the engine mounting upper and lower fixings.
36. Remove the engine lifting sling.
37. Reverse 1 to 21.
38. Check, and if necessary replenish the engine lubricating oil.
39. Check, and if necessary replenish, the gearbox lubricating oil.
40. Start the engine. Check that the oil pressure warning light goes out, and check the cooling system for leaks.
41. Check, and if necessary adjust, the engine idle speed.
42. Check, and if necessary adjust, the ignition timing.
43. When the engine is cold, check the coolant level in the radiator and top up if necessary.

CYLINDER PRESSURES

—Check **1.2**

Checking

1. Run the engine until it attains normal operating temperature.
2. Remove the sparking plugs.
3. Secure the throttle in the fully open position.
4. Check each cylinder in turn as follows:
5. Insert a suitable pressure gauge into the sparking plug hole.
6. Crank the engine with the starter motor for several revolutions and note the highest pressure reading obtainable.
7. If the pressure is appreciably less than the correct figure, the piston rings or valves may be faulty.
8. Low pressure in adjoining cylinders may be due to a faulty cylinder head gasket.



Compression ratio	**8.0:1**
Compression pressure	11,2 kgf cm² (160 lbf/in²)
Cranking speed	300 rev/min

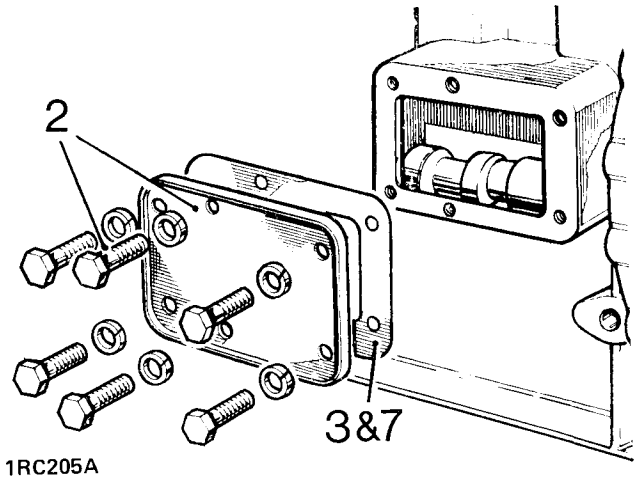
CYLINDER SIDE COVERS

—Remove and refit

Front side cover 1 to 3, 7 and 8	**1.3**
Rear side cover 1, 4 to 7 and 9 to 11	**1.4**

Removing

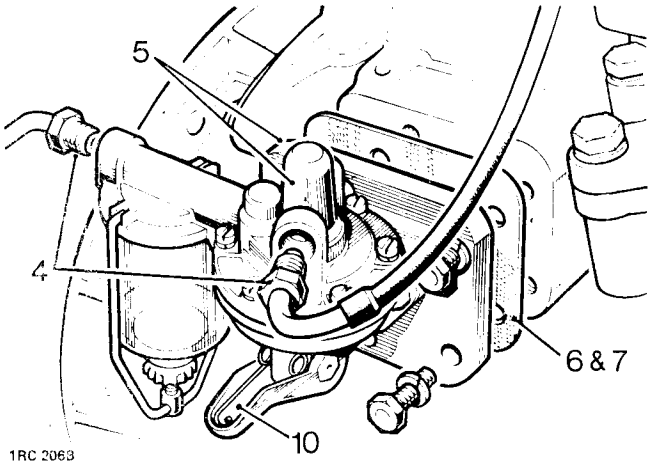
1. Remove the bonnet. 17.7.
2. Remove the front side cover.
3. Withdraw the joint washer.
4. Disconnect the fuel pipes at the fuel pump.
5. Remove the rear side cover complete with fuel pump.
6. Withdraw the joint washer.



1RC205A

Refitting

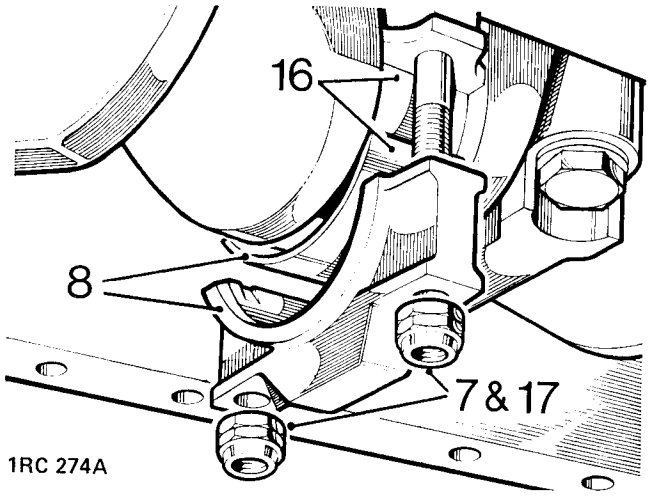
7. Smear both sides of a new joint washer with general purpose grease.
8. Reverse 1 to 3.
9. Reverse 4 to 6.
10. Prime the fuel pump by operating the hand prime lever until no resistance is felt.
11. Reverse 1.



1RC 2063

CONNECTING RODS AND PISTONS

—Remove and refit **1.5**



Removing

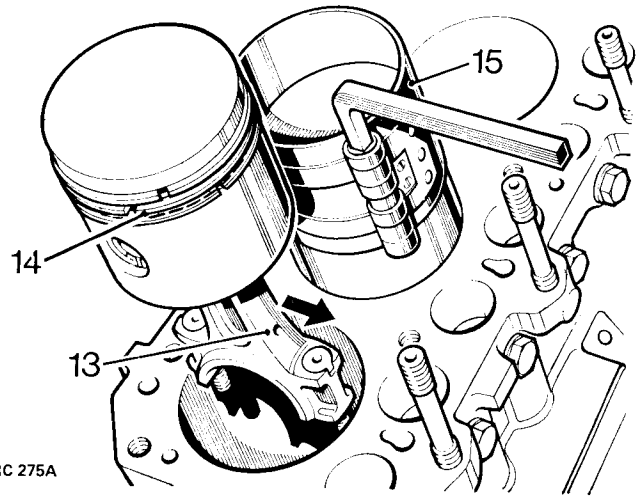
1. Disconnect the battery earth lead.
2. Remove the bonnet. 17.7.
3. Remove the air cleaner. 3.5.
4. Remove the valve gear. 1.19.
5. Remove the cylinder head. 1.16.
6. Remove the oil sump. 1.10.
7. With two pistons at bottom dead centre (BDC) remove the connecting rod cap fixings.
8. Remove the caps and withdraw the connecting rod bearing halves. Retain the caps and bearings in related sets.
9. Withdraw the pistons and attached connecting rods from the top of the bore.
10. Position the remaining pistons at BDC and repeat the removal procedure.
11. Retain the removed components in related sets. The correct cap for each connecting rod is denoted by the number stamped near the joint faces. This number also indicates the crankshaft journal to which it must be fitted.

continued

Refitting

NOTE: If replacement components are to be fitted, the checks detailed in 1.6 must be carried out.

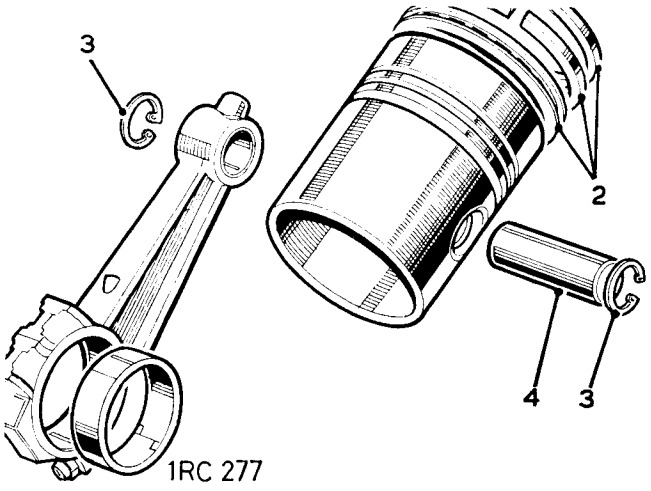
12. Position the crankshaft with two crankpins at BDC.
13. Insert the appropriate connecting rod and piston assemblies into their respective bores, noting that the oil hole in the connecting rods must be towards the camshaft.
14. Position the piston rings so that their gaps are staggered around the piston thrust face (camshaft side of the engine).
15. Using a piston ring compressor, locate the pistons into the cylinder bores.
16. Lubricate the journals and bearing halves and fit the appropriate bearing halves to the connecting rods and caps.
17. Fit the connecting rod caps using NEW securing nuts. Torque 3.5 kgf m (25 lbf ft).
18. Repeat 12 to 17 for the remaining connecting rod and piston assemblies.
19. Reverse 1 to 6.



1RC 275A

CONNECTING RODS AND PISTONS

—Overhaul **1.6**



Dismantling

NOTE: During the following procedures retain all components in related sets to facilitate subsequent assembly. If the same pistons are to be refitted, add location marks to ensure reassembling in the same relative position.

1. Remove the connecting rods and pistons. 1.5.
2. Remove the piston rings.
3. Remove the circlips from the gudgeon pin bosses.
4. Withdraw the gudgeon pins from the pistons.

Overhauling pistons

Original pistons

5. Remove the carbon and deposits, particularly from the ring grooves.
6. Examine the pistons for damage or excessive wear—see under 'New pistons' for clearance dimensions—fit new replacements as necessary.

New pistons

Pistons are available in Service standard size and in oversizes of 0,25 mm, 0,50 mm, 0,76 mm and 1,01 mm (0.010 in, 0.020 in, 0.030 in, and 0.040 in).

Service standard size pistons are supplied in a 0,0254 mm (0.001 in) oversize condition, to accommodate production tolerances allowed on new engines. When fitting a new Service standard size piston to a cylinder block, offer the new piston to the bore, carefully check for correct piston to bore clearance, honing the bore if necessary.

continued

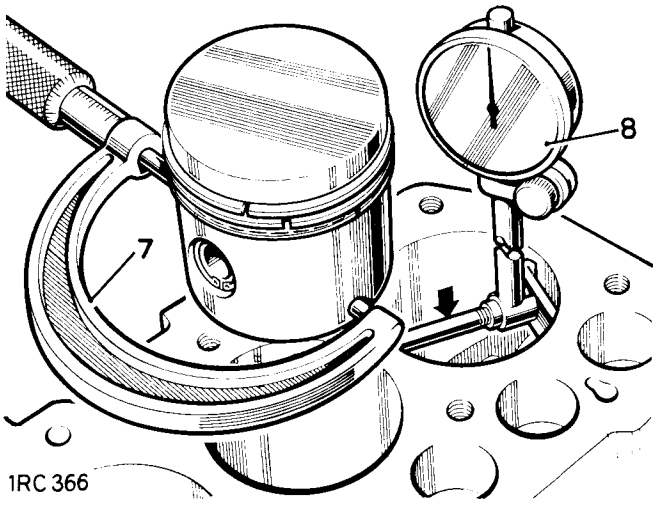
The clearance limits with new standard size pistons and a new cylinder block are 0,058 mm to 0,068 mm (0.0023 in to 0.0027 in).

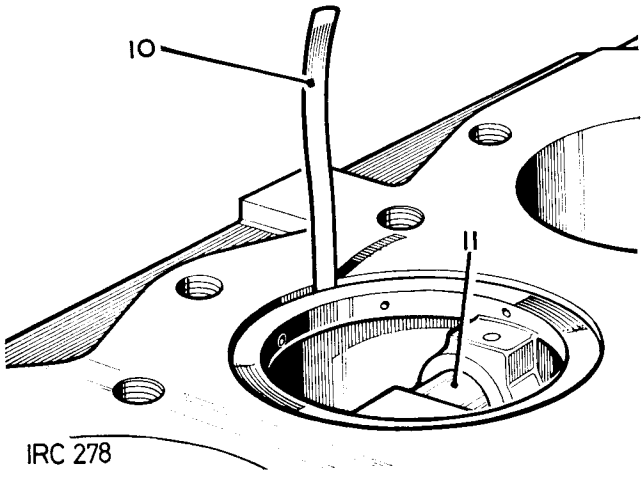
The clearance limits with new oversize pistons and a newly rebored cylinder block are 0,043 mm to 0,055 mm (0.0017 in to 0.0022 in).

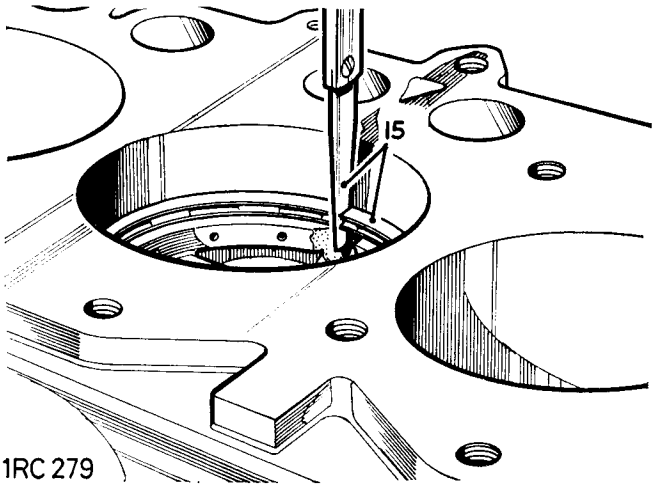
The temperature of the piston and cylinder block must be the same to ensure accurate measurements.

7. Check the piston diameter at the bottom of the skirt at right angles to the gudgeon pin.
8. Check the bore diameter at approximately half way down.
9. If gauge equipment is not available, the piston clearance can be assessed using long feeler gauges. 10 to 12.
10. Insert a long, suitably sized feeler gauge down the right hand side of the cylinder bore.
11. Insert the correct piston, inverted, into the cylinder bore and position it with the gudgeon pin paralell with the axis of the crankshaft.
12. Push the piston down the cylinder until the piston reaches its tightest point in the bore, at this point withdraw the feeler gauge—a steady resistance should be felt.
13. If standard size pistons are being fitted, check the diameter of the piston, as already described, and if necessary hone the cylinder bore to obtain the correct clearance.
14. If new piston rings are to be fitted without reboring, deglaze the cylinder walls with a hone, without increasing the bore diameter. A deglazed bore must have a cross-hatch finish.
15. Check the compression and oil control ring gaps in the applicable cylinder, held square to the bore with the piston. Gap limits: 0,38 mm to 0,5 mm (0.015 in to 0.020 in). Use a fine cut flat file to increase the gap if required. Select a new piston ring if the gap exceeds the limit.

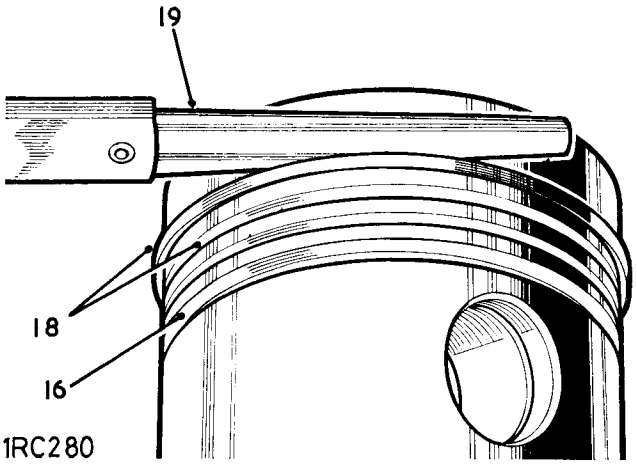
continued







16. Fit the oil control ring to the piston.
17. Check the oil control ring clearance in the piston groove. Clearance limits: 0,038 mm to 0,089 mm (0.0015 in to 0.0035 in).
18. Fit the two compression rings to the piston with the sides marked 'T' or 'Top' uppermost.
19. Check the compression ring clearance in the piston grooves. Clearance limits: 0,046 mm to 0,097 mm (0.0018 in to 0.0038 in).



Where maximum permitted boring tolerance is not sufficient to reclaim the bores, cylinder liners may be fitted.

Fitting the cylinder liners conforms to normal practice. Machine the cylinder block bores to 94,425 mm + 0,012 mm (3.7175 in + 0.0005 in) diameter. This will provide the liner with 0,076 mm to 0,114 mm (0.003 in to 0.0045 in) interference fit.

Press the liners into the cylinder block. The liners must not be proud of, or more than 0,254 mm (0.010 in) below, the top face of the cylinder block.

Cylinder liners should be bored to standard size of 90,47 mm (3.562 in) diameter.

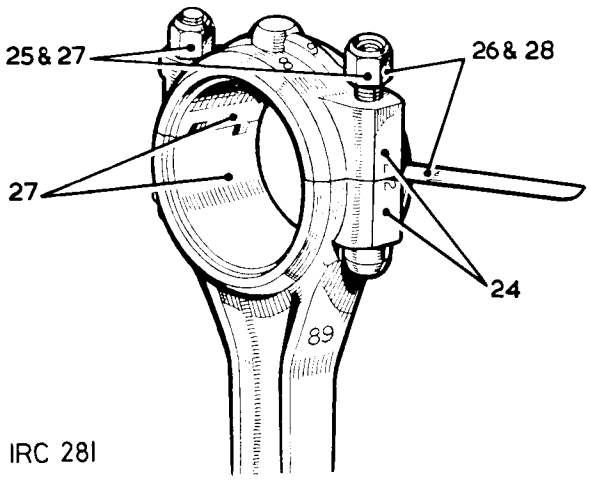
Liners may be rebored 0,254 mm (0.010 in) oversize.

Connecting rods

20. Check the alignment of the connecting rod.
21. Check the gudgeon pin clearance in the connecting rod. Clearance limits: 0,007 mm to 0,015 mm (0.0003 in to 0.0006 in).
22. If a new connecting rod small end bush is required, ensure that the oil holes are aligned when pressing in the replacement, then reamer the bush to obtain the correct clearance, as above.
23. Check the fit of the gudgeon pin in the piston, the pin must not fall through either boss but be capable of being fitted by hand at normal room temperature 20°C (68°F).

continued

24. Select the correct cap for each connecting rod as denoted by the number stamped near the joint faces. This number also indicates the crankshaft journal to which it must be fitted.
25. Assemble the caps, less bearing halves, to the respective connecting rods. Torque 3.5 kgf m (25 lbf ft).
26. Slacken the fixing on one side of the cap only and check that there is no clearance at the joint face. If there is clearance, a new assembly must be fitted.



Connecting rod bearing nip and clearance

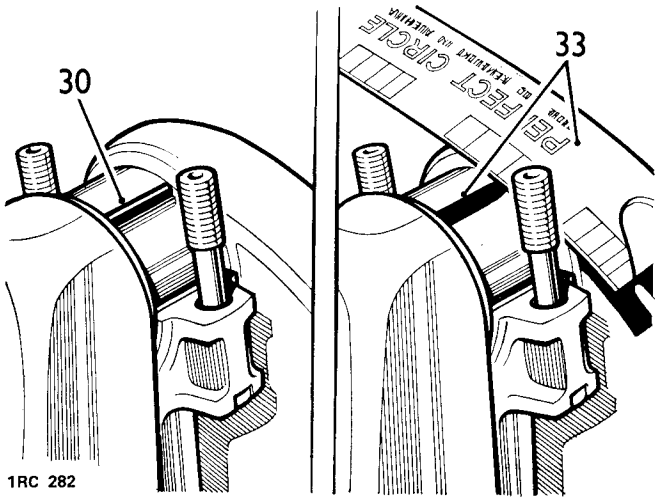
NOTE: New bearing halves are supplied with a protective coating and must be degreased, prior to fitting, to remove the coating.

27. Fit the bearing halves to the connecting rod and cap, and secure the assembly. Torque 3.5 kg fm (25 lbf ft).
28. Slacken the fixing on one side of the cap only and check the clearance between the joint faces. The clearance must be 0,10 mm to 0,20 mm (0.004 in to 0.008 in). The bearing nip can be corrected by selective assembly of the bearing shells; these are available in slightly varying thicknesses. Do not file or machine the caps or connecting rods to vary the bearing nip.
29. Make a final check to prove the bearing clearance, using a 0,063 mm (0.0025 in) shim paper. The connecting rod should resist rotation when fitted to the crankshaft with the shim paper fitted between the journal and one half of the bearing shell, and move freely by hand with the shim paper removed.

    NOTE: As an alternative, Plastigauge may be used to check the connecting rod bearing clearance. Items 30 to 36.

    Do not rotate the connecting rod or crankshaft while the Plastigauge is fitted, or the reading will be impaired.

30. Place a piece of Plastigauge across the centre of the lower half of the crankshaft journal. 605238.
31. Fit the connecting rod complete with bearings to the applicable journal. Torque 3.5 kgf m (25 lbf ft).
32. Remove the connecting rod cap and lower half bearing.
33. Using the scale printed on the Plastigauge packet, measure the flattened Plastigauge at its widest point. The graduation that most closely corresponds to the width of the Plastigauge indicates the bearing clearance.

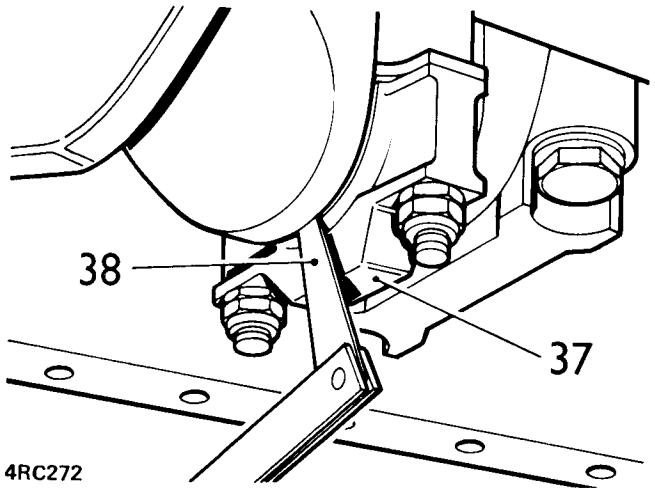


continued

34. The correct clearance with new or overhauled components is 0,019 mm to 0,063 mm (0.0007 in to 0.0025 in).
35. If a new bearing is being fitted, use selective assembly to obtain the correct clearance.
36. Wipe off the Plastigauge with an oily rag. DO NOT scrape it off.

Connecting rod end float

37. Fit the connecting rods complete with bearings to their applicable journals. Torque 3,5 kgf m (25 lbf ft).
38. Check the end float between the end face of the connecting rod and the journal shoulder. End float limits: 0,20 mm to 0,30 mm (0.007 in to 0.012 in).
39. Remove the connecting rods from the crankshaft and retain all parts in related sets.



Assembling

40. Assemble the pistons to their respective connecting rods.
41. Fit new circlips to retain the piston gudgeon pins.
42. Refit the connecting rods and pistons 1.5.

continued

DATA

Pistons

Clearance in bore, measured at bottom of skirt at right angles to gudgeon pin	
Standard size pistons	0,058 mm to 0,068 mm (0.0023 in to 0.0027 in)
Oversize pistons	0,043 mm to 0,055 mm (0.0017 in to 0.0022 in)

Piston rings

Compression (2)	
Gap in bore	0,38 mm to 0,50 mm (0.015 in to 0.020 in)
Clearance in groove	0,046 mm to 0,097 mm (0.0018 in to 0.0038 in)
Oil control	
Gap in bore	0,38 mm to 0,50 mm (0.015 in to 0.020 in)
Clearance in groove	0,038 mm to 0,089 mm (0.0015 in to 0.0035 in)

Gudgeon pin

Clearance in connecting rod	0,007 mm to 0,015 mm (0.0003 in to 0.0006 in)
Fit in piston	Push fit by hand

Connecting rods

Clearance, bearing to crankpin	0,019 mm to 0,063 mm (0.0007 in to 0.0025 in)
End float on crankpin	0.20 mm to 0,30 mm (0.007 in to 0.012 in)

CRANKSHAFT REAR OIL SEAL

—Remove and refit **1.7**

Service Tool: 270304 Guides for oil seal
600963 Engine lifting sling

Removing

1. Disconnect the battery earth lead.
2. Remove the bonnet. 17.7.
3. Remove the front floor. 17.4.
4. Remove the gearbox assembly. 7.10.
5. Remove the starter motor. 6.7.
6. Remove the oil sump. 1.10.
7. Remove the clutch assembly. 2.5.
8. Remove the flywheel. 2.1.
9. Attach a suitable lifting sling and hoist to the engine-lifting hooks. 600963.
10. Tension the hoist sufficient to support the engine weight.
11. Withdraw the packing piece from between the flywheel housing and the chassis cross-member, previously fitted during gearbox removal.
12. Remove the flywheel housing.
13. Remove the oil seal ring.
14. Remove the rear main bearing cap.
15. Remove the lower half of the oil seal retainer from the rear main bearing cap.
16. Remove the upper half of the oil seal retainer from the cylinder block, by rotating the crankshaft to align the cut-out with the fixings.
17. Remove the oil seal from the crankshaft.

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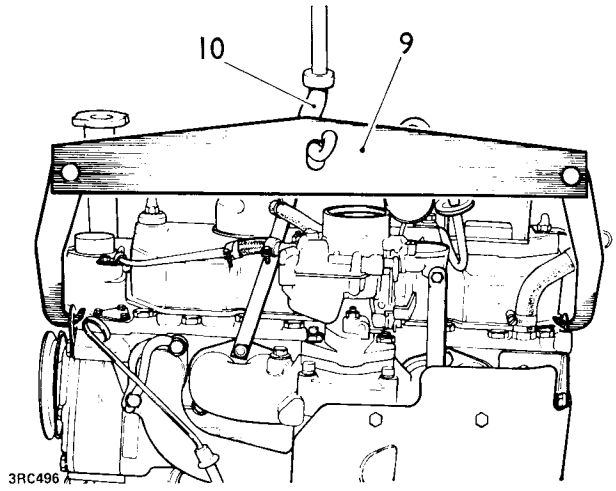
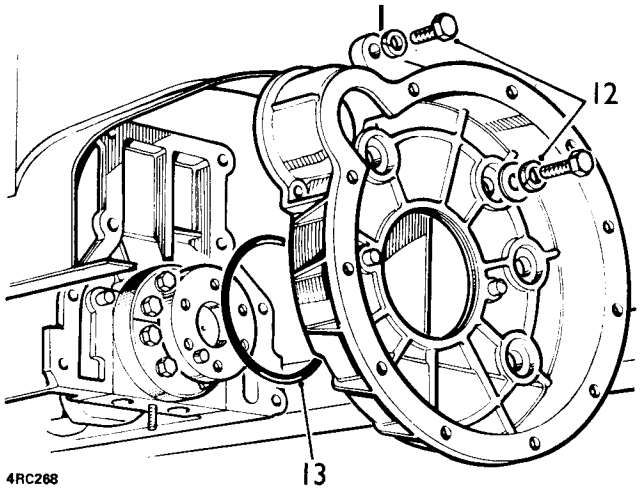
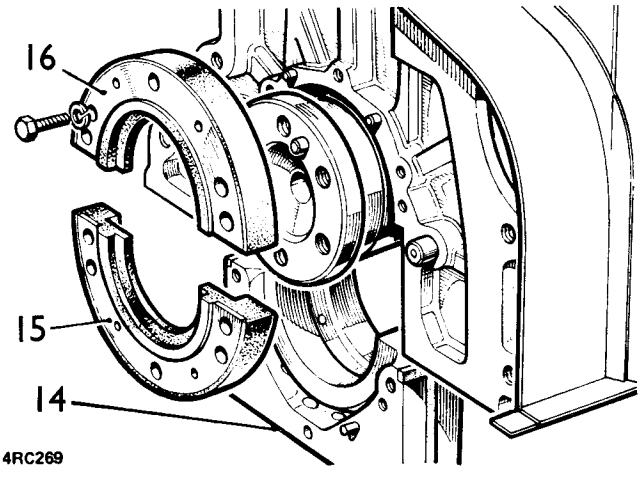






Refitting

18. Assemble the garter spring on the crankshaft journal by engaging the hook and eye. Do not stretch the spring.
19. Move the assembled spring along the journal until it is against the thrower flange.
20. Apply Silocone Grease MS4 to the crankshaft oil seal journal and to both end faces of the split oil seal.
21. Open the split seal sufficiently to allow it to be fitted over the crankshaft oil seal journal. The recess in the oil seal must be towards the thrower flange and the garter spring.

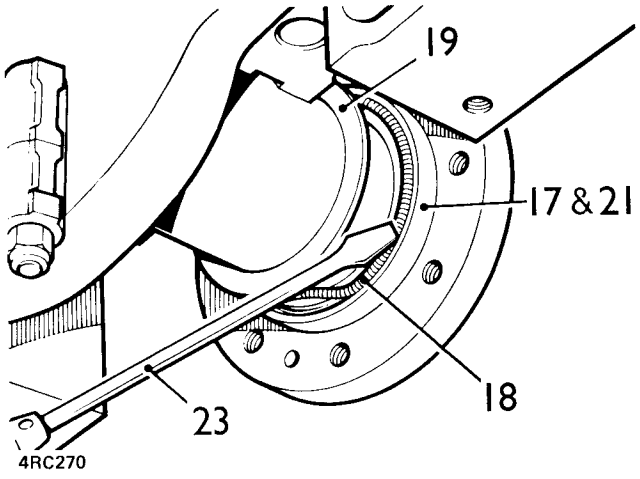
    NOTE: The oil seal must not be repeatedly fitted and removed from the crankshaft, as this can damage the sealing lip.

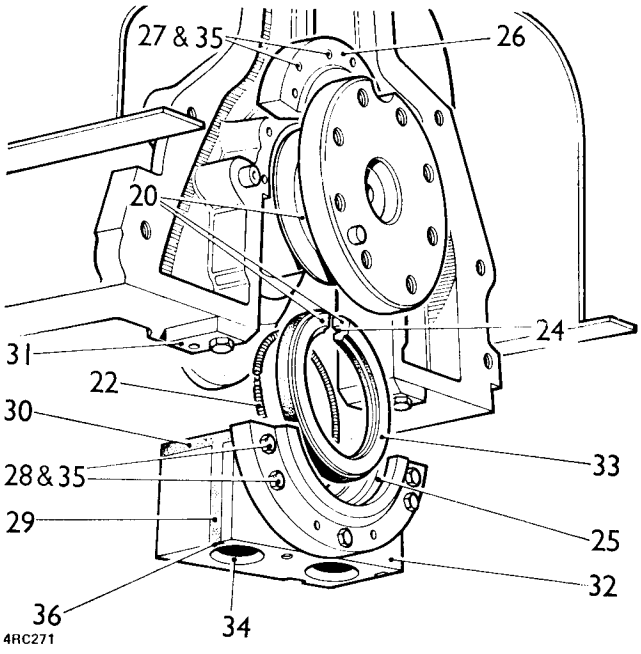
22. Position the garter spring so that the hook and eye is located mid-way between the split and hinge of the oil seal.
23. Using a small screwdriver, ease the spring into the recess in the oil seal.
24. Rotate the oil seal until the split is on the vertical axis pointing towards the cylinder head and in its approximate running position on the journal; this position is important.

    NOTE: Do not degrease the seal retainer halves with trichlorethylene, but wipe clean with a dry cloth prior to applying Hylomar.

25. Apply Hylomar PL 32/M jointing compound, Rover Part No. 534244, to the seal location diameter of both retainer halves.
26. Locate one half of the oil seal retainer onto the cylinder block dowels. The oil seal should be compressed to assist assembly, also ensure that it is correctly located in the retainer recess.

    CAUTION: The seal must be held so that it does not rotate when the crankshaft is being rotated to fit the retainer securing bolts.



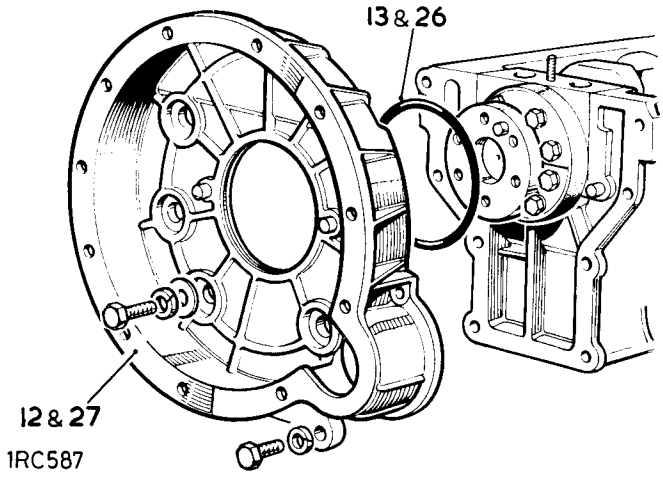


continued

27. Secure the upper half of the oil seal retainer with the three inner bolts, leaving the outer bolt at each end finger tight at this stage.
28. Secure the lower half of the oil seal retainer to the rear main bearing cap in the same manner as described for the upper half.
29. Apply Silicone Grease MS4 to the 'T' seals and fit them to the rear main bearing cap.
30. Trim the top edges of the 'T' seals to prevent them from fouling the cylinder block when being fitted.
31. Fit the seal guides to the crankcase. 270304.
32. Fit the rear main bearing cap complete with the seal retainer, 'T' seals and bearing shell to the crankcase until there is an 0,8 mm (0.030 in) gap between the cap and the crankcase.
33. Check that the seal is correctly located in the retainer recess.
34. Tighten the bearing cap bolts ensuring that there is no buckling of the split seal or misalignment of the butt joint. Torque: 11,5 kgf m (85 lbf ft).
35. Fully tighten all the bolts securing the retainer halves. Turn the bolt heads so that the hexagon corners will not foul the flywheel housing seal when fitting.
36. Trim the ends of the 'T' seals to leave 0,8 mm (0.030 in) protruding from the bearing cap.
37. Reverse 1 to 13.

CRANKSHAFT

—Remove and refit **1.8**



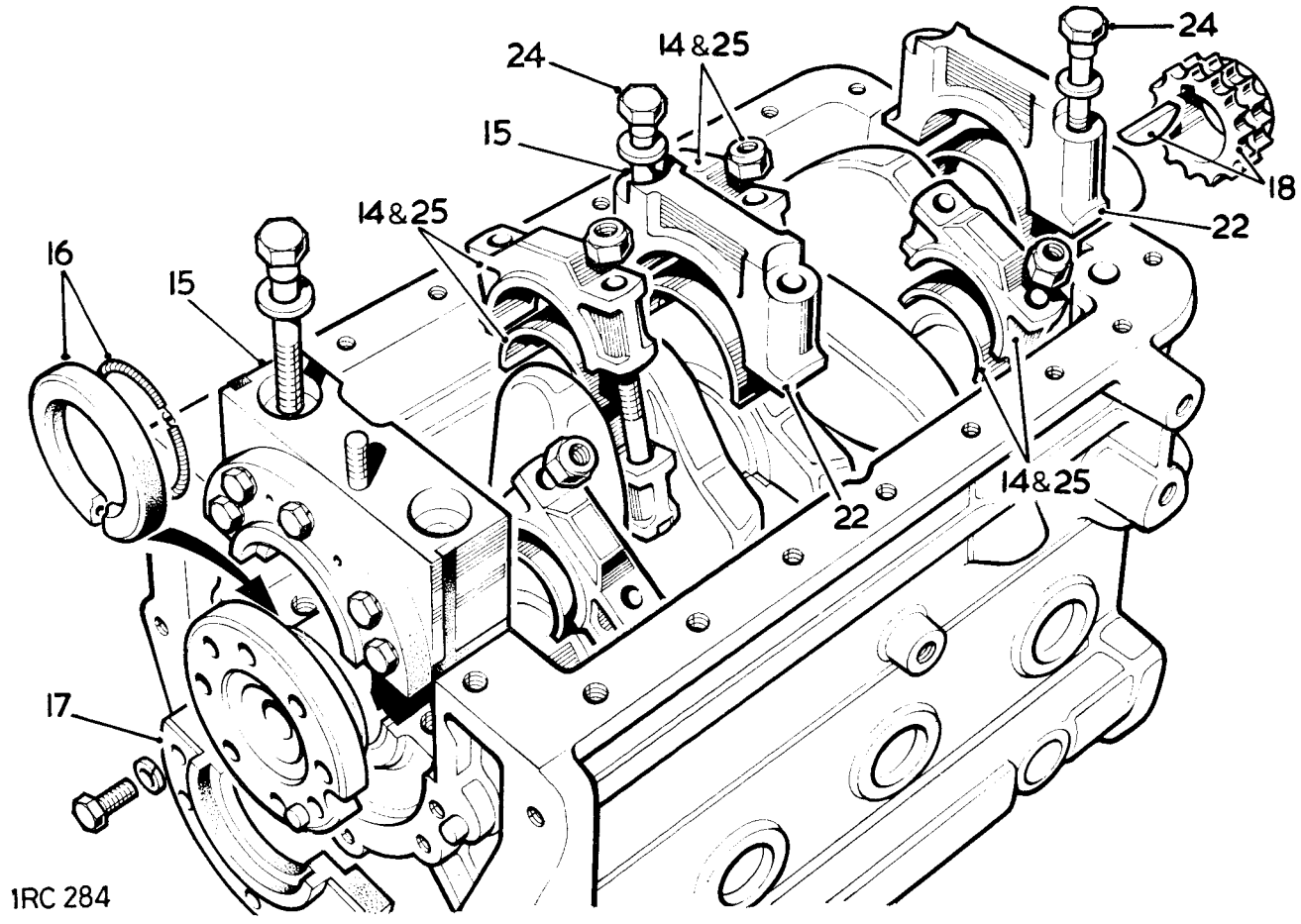
Removing

1. Remove the bonnet. 17.7.
2. Remove the air cleaner. 3.5.
3. Remove the radiator assembly. 17.16.
4. Remove the front floor. 17.4.
5. Remove the engine assembly. 1.1.
6. Remove the oil sump. 1.10.
7. Remove the oil pump. 1.11.
8. Remove the timing gear cover. 1.23.
9. Remove the timing chain and tensioner. 1.28.
10. Remove the clutch assembly. 2.5.
11. Remove the flywheel. 2.1.
12. Remove the flywheel housing.
13. Remove the oil seal ring.

continued

14. Remove the connecting rod caps and bearing lower halves. Retain in related sets.
15. Remove the main bearing caps and lift the crankshaft clear. Retain the bearing halves and caps in related sets.
16. Remove the oil seal from the crankshaft.
17. Remove the upper half of the oil seal retainer from the cylinder block.
18. If required, remove the chainwheel and key from the crankshaft.

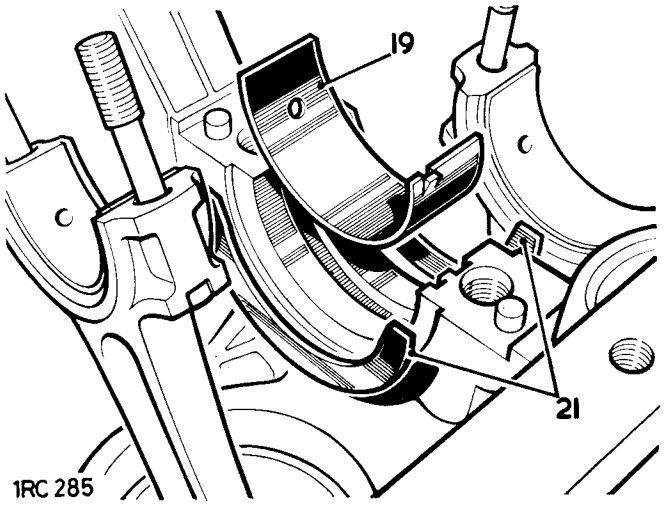
continued



Refitting

NOTE: If replacement components are to be fitted, the checks detailed in 1.9 must be carried out.

19. Locate the upper main bearing halves into the cylinder block.
20. Lubricate the bearings and crankshaft journals with clean engine oil, and place the crankshaft in position.
21. Insert a thrust washer at each side of the centre main bearing shell with the unplated faces towards the cylinder block.
22. Locate the bearing lower halves into the front and centre main bearing caps. Fit the caps but do not fully tighten the fixings at this stage.
23. Fit the crankshaft rear oil seal. 1.7.
24. Tighten the front and centre main bearing cap fixings. Torque: 11,5 kgf m (85 lbf ft).
25. Fit the appropriate bearing halves and caps to the connecting rods, using NEW securing nuts. Torque: 3,5 kgf m (25 lbf ft).
26. Fit the oil seal ring to the flywheel housing.
27. Refit the flywheel housing.
28. Refit the flywheel. 2.1.
29. Refit the clutch assembly. 2.5.
30. Reset the valve timing. 1.22.
31. Reverse 1 to 9.



CRANKSHAFT

—Overhaul 1.9

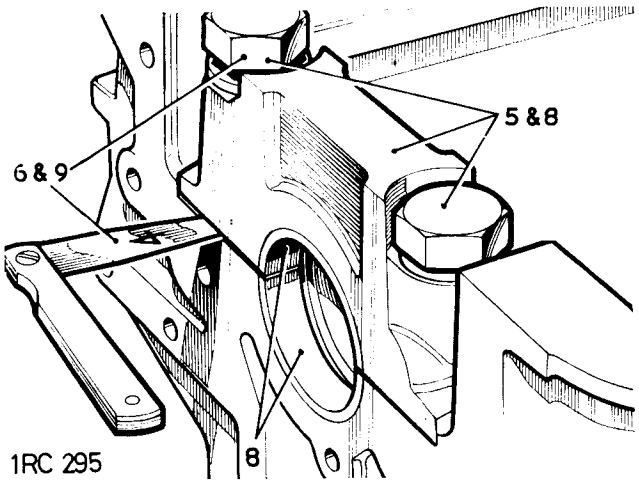
1. Remove the crankshaft. 1.8.

Inspecting

2. Check each crankshaft journal for ovality. If ovality exceeds 0,040 mm (0.0015 in) a reground or new crankshaft should be fitted.
3. Bearings for the crankshaft main journals and the connecting rod journals are available in the following undersizes:
   0,25 mm (0.010 in).
   0,50 mm (0.020 in).
4. Thrust washers for the crankshaft centre main journal, to control the crankshaft end float, are available in the following oversizes:
   0,06 mm (0.0025 in).
   0,12 mm (0.005 in).
   0,18 mm (0.0075 in).
   0,25 mm (0.010 in).

continued

5. Fit the front main bearing cap, less bearing halves, to the cylinder block. Torque: 11,75 kgf m (85 lbf ft).
6. Slacken the fixing on one side of the cap only and check that there is no clearance at the joint face. If there is clearance, a complete new cylinder block must be fitted.
7. Repeat 5 and 6 for the centre and rear main bearing caps.



Main bearing nip and clearance

NOTE: New bearing halves are supplied with a protective coating and must be degreased prior to fitting, to remove the coating.

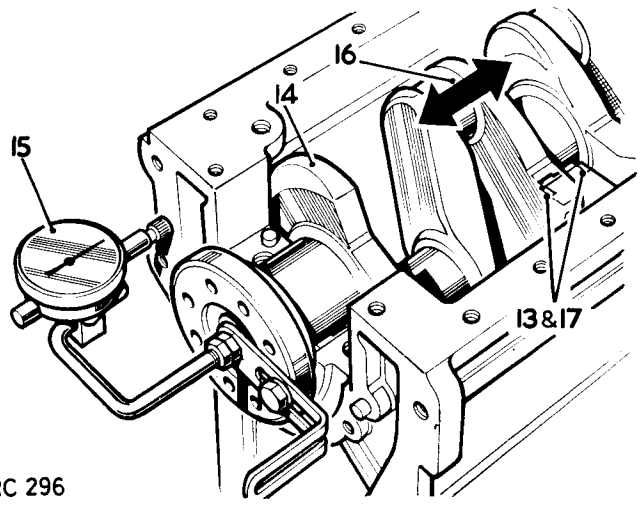
8. Locate the bearing halves into the front main bearing cap and the cylinder block, and fit the cap to the block. Torque: 11,75 kgf m (85 lbf ft).
9. Slacken the fixing on one side of the cap only and check the clearance between the joint faces. The clearance must be 0,10 mm to 0,15 mm (0.004 in to 0.006 in).
10. The bearing nip can be corrected by selective assembly of the bearing halves; these are available in slightly varying thicknesses. Do not file or machine the caps or cylinder block to vary the bearing nip.
11. Repeat 8 to 10 for the centre and rear main bearings.
12. When the bearing nip has been checked, remove the caps and bearing shell bottom halves.

continued

13. Position a standard size thrust washer each side of the centre main bearing shell, top half, with the unplated faces towards the cylinder block. The thrust washer thickness must agree within 0,08 mm (0.003 in).
14. Place the crankshaft in position on the cylinder block.
15. Mount a dial test indicator to read off the end of the crankshaft.
16. Check the crankshaft end float limits are 0,05 mm to 0,15 mm (0.002 in to 0.006 in).
17. The crankshaft end float can be adjusted by fitting oversize thrust washers. The variation of thrust washer thickness at each side must not exceed 0,08 mm (0.003 in) to ensure that the crankshaft remains centralised.
18. Make a final check to prove the main bearing clearance, using a 0,063 mm (0.0025 in) shim paper. Check each bearing in turn by fitting both bearing halves and the bearing cap, with the shim paper between the crankshaft and one half of the bearing. The crankshaft should resist rotation with the shim paper fitted, and move freely by hand with the shim paper removed.

NOTE: As an alternative, Plastigauge may be used to check the main bearing clearance. Items 19 to 26. Do not rotate the crankshaft while the Plastigauge is fitted, or the reading will be impaired.

continued



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19. Locate the crankshaft in position on the upper bearing halves in the cylinder block.
20. Place a piece of Plastigauge across the centre of the lower half of the crankshaft journal. 605238.
21. Fit the bearing cap complete with the lower bearing half. Torque: 11,75 kgf m (85 lbf ft).
22. Remove the bearing cap and lower half bearing.
23. Using the scale printed on the Plastigauge packet, measure the flattened Plastigauge at its widest point. The graduation that most closely corresponds to the width of the Plastigauge indicates the bearing clearance.
24. The correct clearance with new or overhauled components is 0,020 mm to 0,055 mm (0.0008 in to 0.0022 in).
25. If a new bearing is being fitted, use selective assembly to obtain the correct clearance.
26. Wipe off the Plastigauge with an oily rag. Do not scrape it off.
27. Retain all components in related sets.
28. Refit the crankshaft. 1.8.

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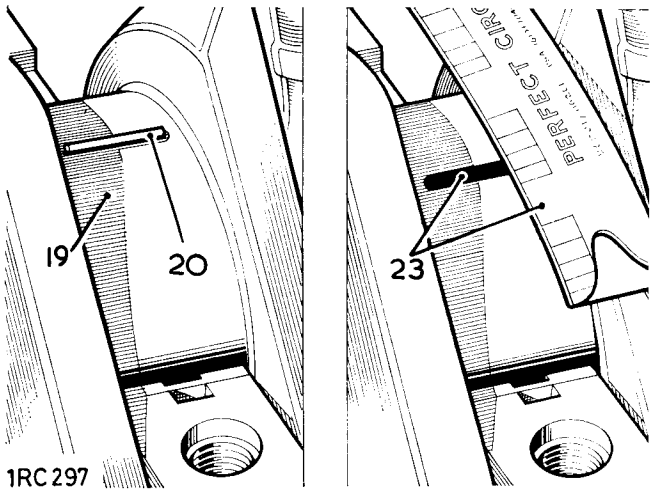


DATA

Crankshaft

Journal diameter	63,5 mm—0,012 mm (2.5 in—0.0005 in)		
Crankpin diameter	58,7 mm (2.312 in)		
End-float (controlled by thrust washers at centre bearing)	0,05 mm to 0,15 mm (0.002 to 0.006 in)		
Regrind sizes:—	Undersize	Journal dia.	Crankpin dia.
	0,25 mm (0.010 in)	63,24 mm (2.490 in)	58,47 mm (2.302 in)
	0,50 mm (0.020 in)	62,99 mm (2.480 in)	58,22 mm (2.292 in)
Main bearing running clearance	0,020 mm to 0,055 mm (0.0008 in to 0.0022 in)		
Connecting rod bearing running clearance	0,019 mm to 0,063 mm (0.0007 in to 0.0025 in)		

OIL SUMP

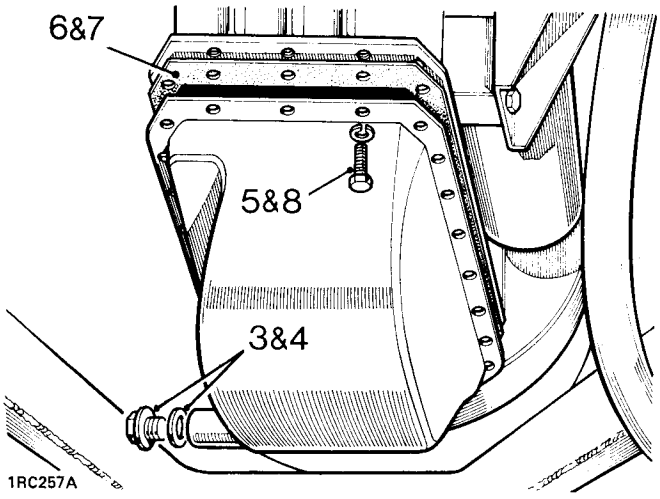
—Remove and refit **1.10**

Removing

1. Prop open the bonnet.
2. Remove the oil filler cap.
3. Remove the sump drain plug.
4. Allow the oil to drain, then refit the drain plug and sealing washer.
5. Remove the sump.
6. Withdraw the joint washer.

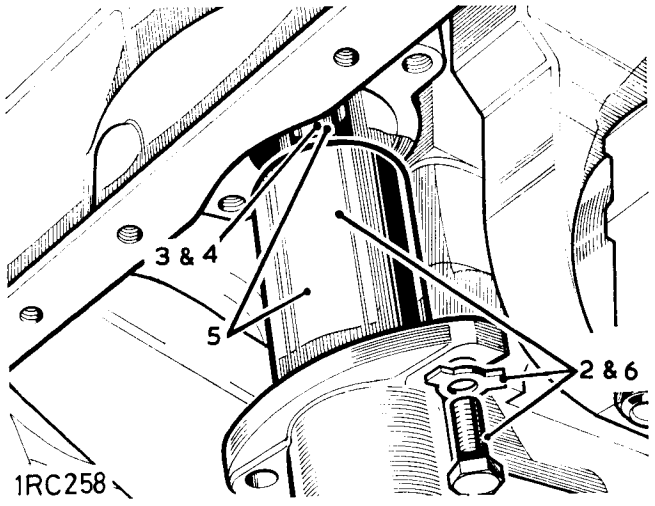
Refitting

7. Place a new joint washer in position.
8. Fit the sump. Torque tighten the fixings 1,65 kgf m (12 lbf ft).
9. Replenish the engine lubricating oil to the 'high' mark on the oil level dipstick.
10. Reverse 1 and 2.
11. Check the sump oil level after a short engine run and top up as necessary to the 'high' mark on the oil level dipstick.
12. After 1.600 km (1,000 miles) running, recheck the sump fixings for correct tightness, as follows.
13. Slacken each fixing in turn approximately one flat, then retighten to the correct torque. 1,65 kgf m (12 lbf ft).



OIL PUMP

—Remove and refit 1.11



Removing

1. Remove the oil sump. 1.10.
2. Remove the oil pump.
3. Withdraw the oil pump drive shaft.

Refitting

4. Locate the longer splined end of the drive shaft into the oil pump.
5. Offer up the pump and drive shaft and engage the drive splines at the engine.
6. Secure the oil pump.
7. Fit the oil sump. 1.10.
8. Replenish the engine lubricating oil to the 'high' mark on the oil level dipstick.
9. Check the sump oil level after a short engine run and top up as necessary to the 'high' mark on the oil level dipstick

OIL PUMP

—Overhaul 1.12

Dismantling

1. Remove the oil pump. 1.11.
2. Straighten the lockwasher for the oil filter union nut.
3. Unscrew the oil filter union nut.
4. Withdraw the oil filter.
5. Withdraw the sealing ring.
6. Remove the oil pump cover.
7. Withdraw the pump gears.
8. Remove the plug for the oil pressure relief valve.
9. Withdraw the sealing washer.
10. Withdraw oil pressure relief valve spring, plunger and ball.

Inspecting

11. If necessary the idler gear bush may be renewed. Press the new bush into the gear, drill the lubrication hole 3,175 mm (0.125 in) diameter and ream the bush to 12,7 mm (0.500 in) diameter.
12. Inspect the pressure relief valve ball seating and renovate, if necessary, using a locally manufactured lapping tool consisting of a steel ball, Rover Part No. 3748, soldered to suitable tubing.
13. The lapping tool may be installed in a drilling machine or hand brace and the ball seating refaced, using coarse grinding paste. The tool may then be removed and used to 'hand lap' the ball seating with fine grinding paste to a good finish. The seat must then be thoroughly cleaned.
14. Check the end float of the oil pump gears, as follows 15 and 16, and fit new parts as necessary.
15. Steel gear: 0,05 mm to 0,12 mm (0.002 in to 0.005 in).
16. Aluminium gear: 0,07 mm to 0,15 mm (0.003 in to 0.006 in).

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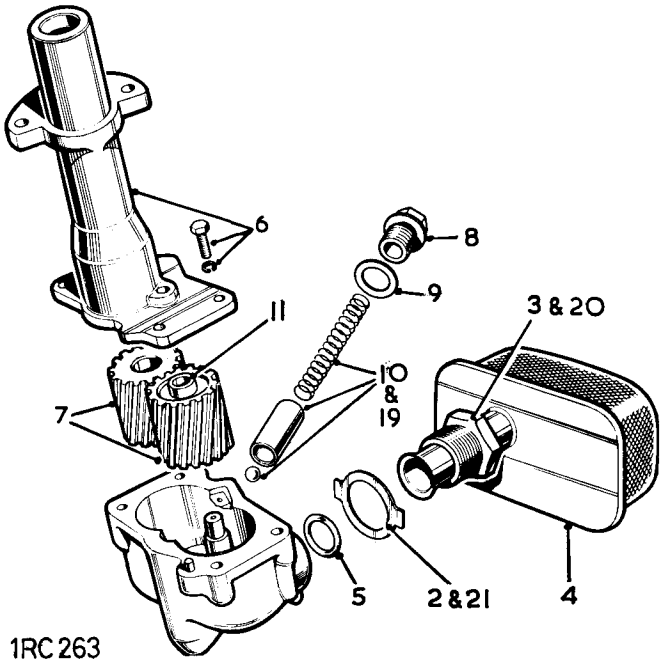

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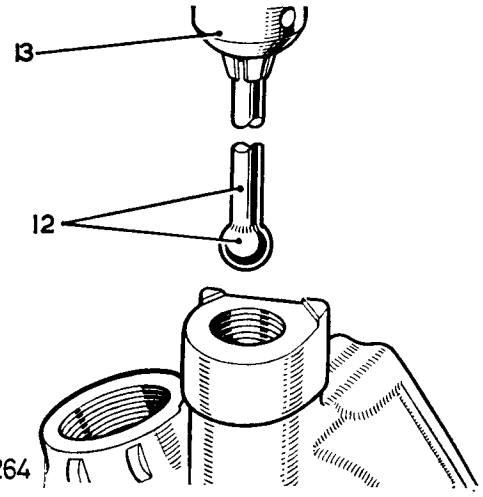

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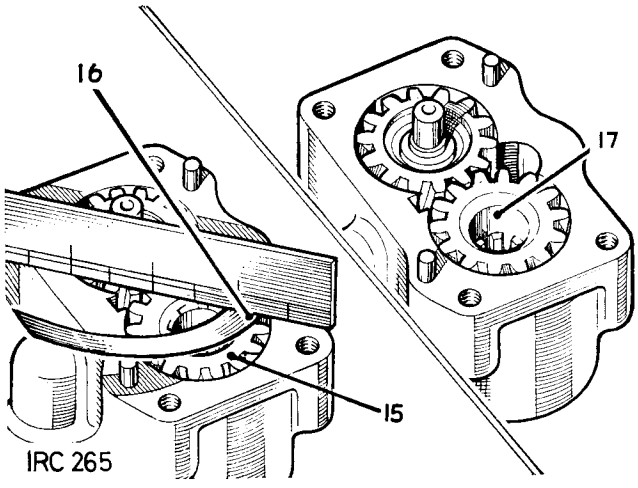


1RC 265

Assembling

17. Fit the pump gears to the body, with the plain portion of the drive gear bore uppermost.
18. Smear the joint faces with suitable jointing compound and fit the pump cover to the pump body, locating on the dowels.
19. Assemble the pressure relief valve components to the housing bore. When fitting the plunger, insert the end with the integral ball seating first.
20. Fit the oil filter to the pump.
21. Position the filter such that it will be square to the sump baffle plate when fitted and secure with the lock-washer.
22. Fit the oil pump to the engine. 1.11.

DATA

Pump gear end float	
Steel gear	0,05 mm to 0,12 mm (0.002 in to 0.005 in)
Aluminium gear	0,07 mm to 0,15 mm (0.003 in to 0.006 in)
Relief valve spring free length	67,82 mm (2.670 in)

OIL FILTER ASSEMBLY—EXTERNAL

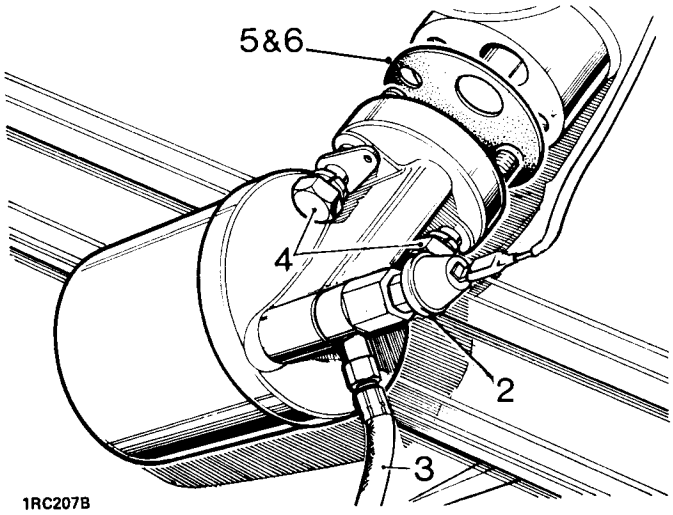
—Remove and refit **1.13**

Removing

1. Prop open the bonnet.
2. Disconnect the electrical lead from the oil pressure switch.
3. Disconnect the pipe to the oil pressure gauge.
4. Remove the oil filter.
5. Withdraw the joint washer.

Refitting

6. Smear both sides of the joint washer with general purpose grease.
7. Reverse 2 to 5.
8. Check the sump oil level after a short engine run and top up as necessary to the 'high' mark on the oil level dipstick.



1RC207B

CAMSHAFT

—Remove and refit **1.14**

Service tools: 507231 Chainwheel extractor
530101 Camshaft extractor

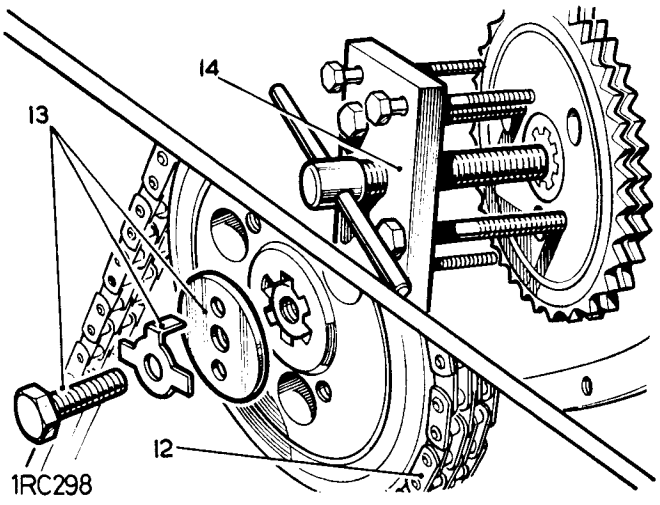
Removing

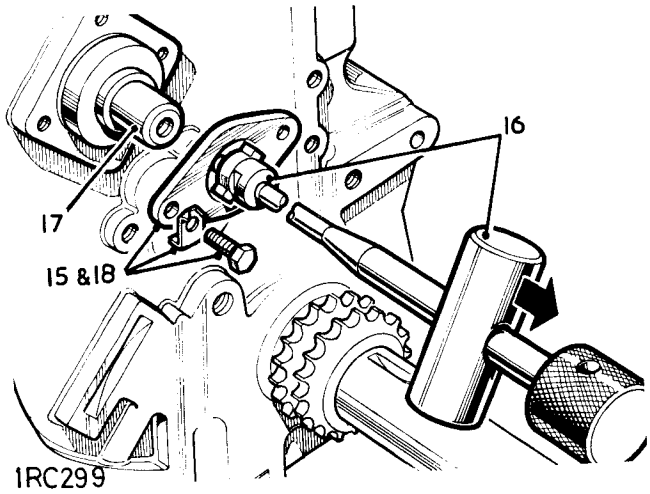
1. Remove the bonnet. 17.7.
2. Remove the air cleaner. 3.5.
3. Remove the radiator assembly. 5.3.
4. Remove the external oil filter assembly. 1.13.
5. Remove the ignition coil and filter from the engine top cover.
6. Remove the distributor and drive gear. 6.10.
7. Remove the valve gear. 1.19.
8. Remove the cylinder head. 1.16.
9. Remove the tappets. 1.20.
10. Remove the timing gear cover. 1.23.
11. Remove the timing chain tensioner. 1.21.
12. Withdraw the timing chain.
13. Remove the fixings from the camshaft chainwheel.
14. Extract the chainwheel from the camshaft. 507231.
15. Remove the thrust plate from the camshaft.
16. Extract the camshaft. 530101.

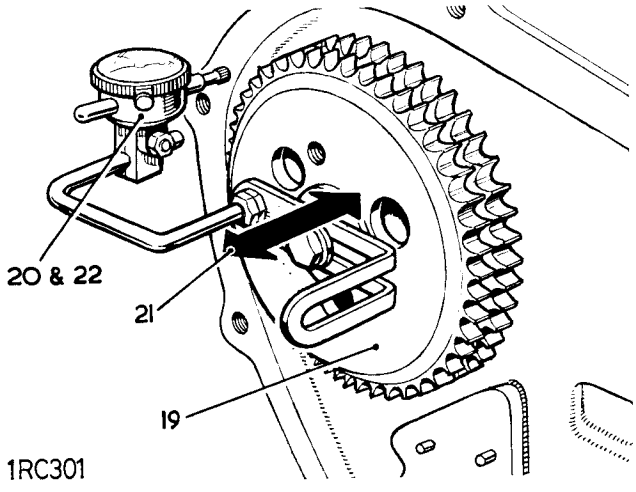
NOTE: For details of camshaft bearings, refer to 1.15.

Refitting

17. Insert the camshaft into the cylinder block.
18. Fit the thrust plate.
19. Fit the chainwheel to the camshaft but do not engage the lock washer at this stage.
20. Mount a dial test indicator to read off the end of the camshaft.
21. Check the camshaft end float. The correct end float limits are 0.06 mm to 0.13 mm (0.0025 in to 0.0055 in). If the end float is excessive, fit a new thrust plate and/or camshaft.
22. Remove the dial test indicator.
23. Reset the valve timing. 1.22.
24. Reverse 1 to 11.







DATA

Camshaft end float	0,06 mm to 0,13 mm (0.0025 in to 0.0055 in)

CAMSHAFT BEARINGS

—Remove and refit **1.15**

Service tools: 605975 Bearing drift and adaptor assembly comprising:
274388 Bearing drift
531760 Adaptor
274389 Reamer for bearings includes:
274394 Guide plug

NOTE: Prior to removing the camshaft bearings, the engine must be removed from the vehicle and be completely dismantled until only the camshaft bearings remain in the cylinder block.

Removing

1. Drift out the front and rear bearings and withdraw them through the side cover apertures. 274388.
2. Drift the two centre bearings into the distributor drive chamber and collapse them to enable withdrawal. 274388.

Refitting

NOTE: The two centre and rear bearings are of the same width, whereas the front bearing is wider and has an additional oil feed hole.

3. Position the cylinder block vertical, rear face down.
4. Place a new bearing into the front camshaft chamber and position it so that it is above the second bearing housing, counting from the front of the block.
5. The chamfer on the bearing edge must be towards the housing bore.
6. Align the oil hole in the bearing with the innermost oil feed drilling in the housing bore. Accuracy is essential otherwise misalignment of the oil holes may result and once the bearing is in place it cannot be rotated to correct any error.
7. Add pencil marks to the bearing outer diameter and the cylinder block adjacent to the housing to assist in checking alignment.
8. Having visually aligned the bearing, place inside it the adaptor. 531760.
9. Maintain the bearing in a level position. Pass the drift through the front bearing housing into the camshaft chamber so that it rests on top of the adaptor. Commence drifting the bearing into the block. Ensure that the bearing is not drifted in too far, and that the oil feed holes are correctly aligned.

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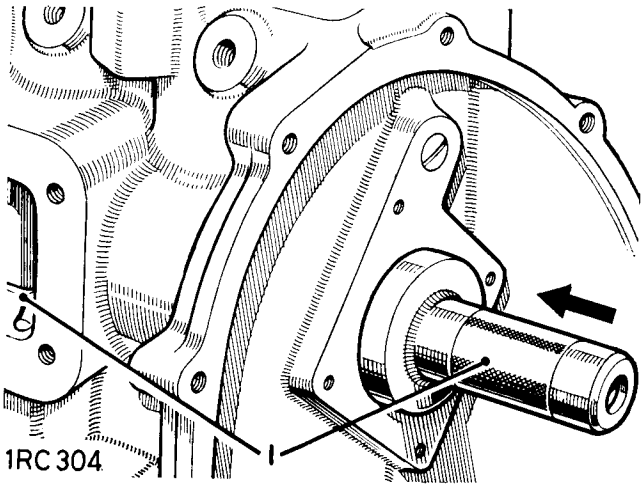
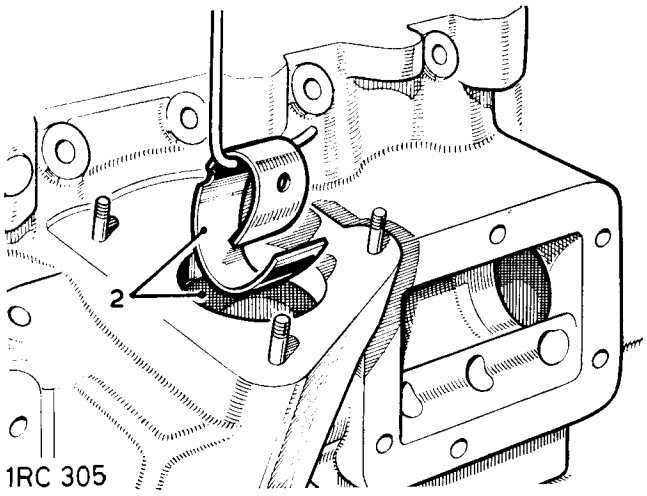
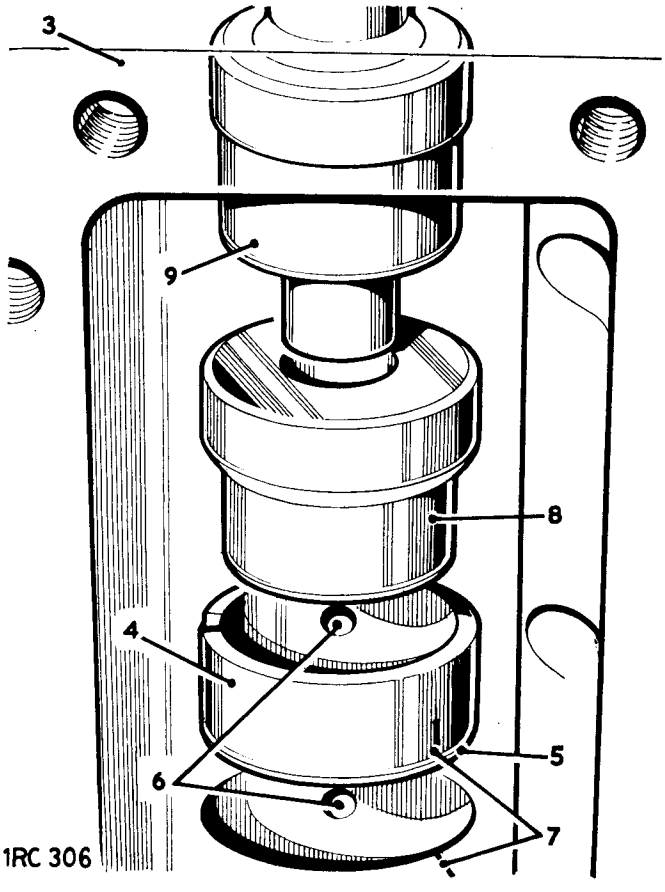




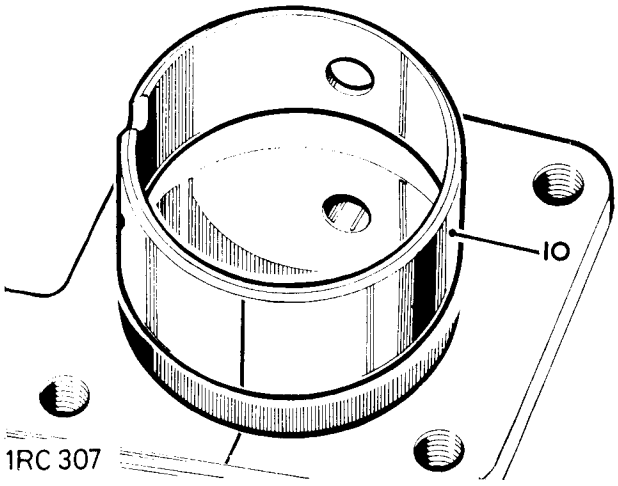


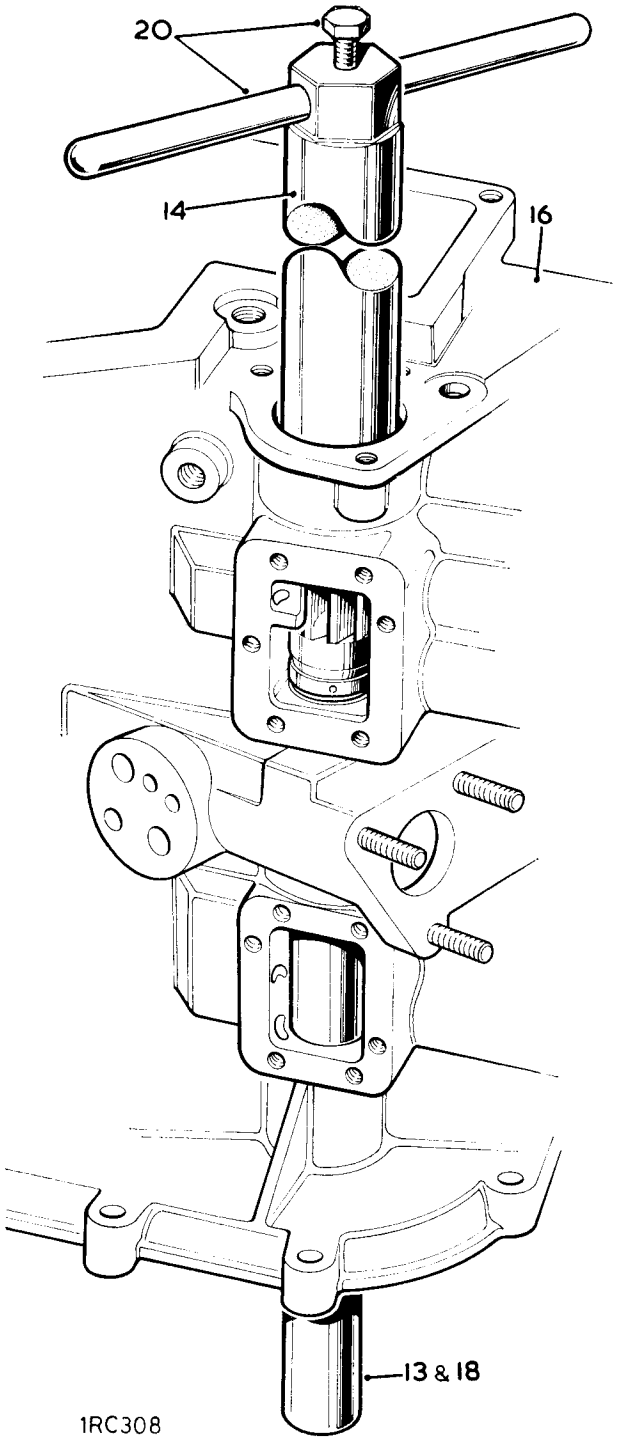
10. Repeat 5 to 9 for the front bearing. Note that the front bearing is wider and has a small hole in addition to the large oil feed hole. This small hole aligns with a vertical drilling in the block, which in turn feeds a horizontal drilling for the tappet mechanism. Drift this bearing in so that the outer edge is just below the machined surface of the front face. This is to ensure that when the camshaft thrust plate is fitted it will not stand proud on the bearing edge.
11. Turn the cylinder block over so that the rear face is uppermost.
12. Repeat the foregoing procedures for the two remaining camshaft bearings.

Reamering the camshaft bearings

NOTE: No lubricant is necessary for the reamering operation, best results are obtained when the bearings are cut dry.

13. Locate the guide plug 274394, into the front camshaft bearing and retain using the thrust plate screws, but do not tighten the screws at this stage.
14. Insert the reamer 274389 from the rear of the cylinder block, locating it through the guide plug at the front.
15. Locate the guide collar immediately in front of the reamer cutter into the rearmost bearing, then secure the screws retaining the guide plug at the front.
16. Position the cylinder block vertical, rear face uppermost.
17. Reamer the rear and two centre bearings. As each bearing is cut the reamer should be held steady by the operator whilst an assistant, using a high pressure air line, blows away the white metal cuttings, before allowing the reamer to enter the next bearing.
18. Remove the guide plug 274394, before reamering the front bearing.
19. Reamer the front bearing.
20. Remove the reamer handle and bolt.
21. Remove the reamer, turning it in the same direction as for cutting.
22. Remove the plugs from the ends of oil gallery passage and clean the gallery and oil feed passages to camshaft and crankshaft bearings, using compressed air. Refit the plugs and lock in position.
23. The hexagon-headed plugs at the rear of the block should have new washers fitted, and their threads coated with a suitable jointing compound.
24. Clean the cylinder block ready for engine reassembly.





CYLINDER HEAD

—Remove and refit **1.16**

Removing

1. Disconnect the battery earth lead.
2. Remove the bonnet. 17.7.
3. Remove the air cleaner. 3.5.
4. Drain the cooling system.
5. Disconnect the distributor leads at the ignition coil.
6. Disconnect the distributor leads from the sparking plugs.
7. Remove the sparking plugs.
8. Disconnect the oil gallery pipe.
9. Disconnect the coolant by-pass hose.
10. Disconnect the coolant hoses from the thermostat housing.
11. Disconnect the brake servo pipe.
12. Disconnect the heater pipe from the water valve.
13. Disconnect the control cable from the water valve.
14. Disconnect the heater pipe from the rear of the cylinder head.
15. Disconnect the carburetter linkage at the ball joint.
16. Disconnect the cold start cable at the carburetter.
17. Disconnect the fuel inlet pipe at the carburetter and release the pipe clip at the cylinder head.
18. Remove the heat shield from the manifold.
19. Disconnect the exhaust pipe at the manifold.
20. Remove the valve gear. 1.19.

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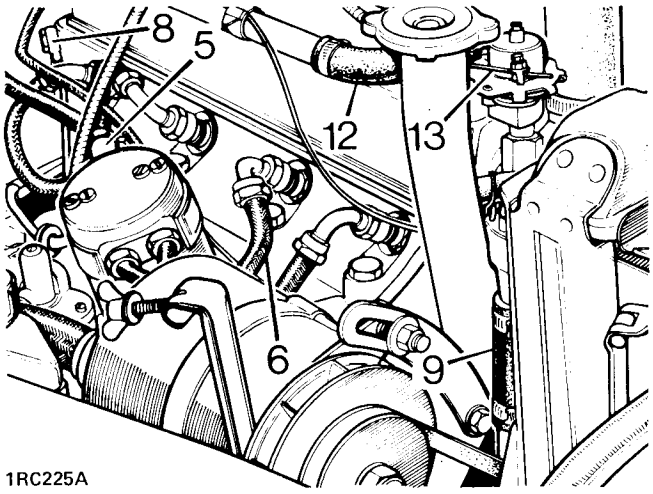

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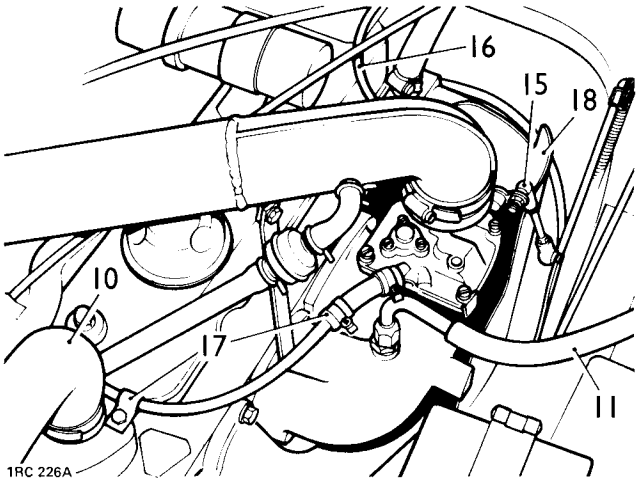

1RC 226A

21. Slacken evenly and remove the remaining cylinder head fixings.
22. Lift off the cylinder head.
23. Withdraw the gasket

Refitting

24. Smear clean engine oil on the cylinder block and cylinder head gasket joint faces.
25. Position the gasket on the cylinder block with the lettering 'PETROL' uppermost.
26. Place the cylinder head in position.
27. Engage all the cylinder head fixing bolts except those also used to secure the rocker shaft assembly.

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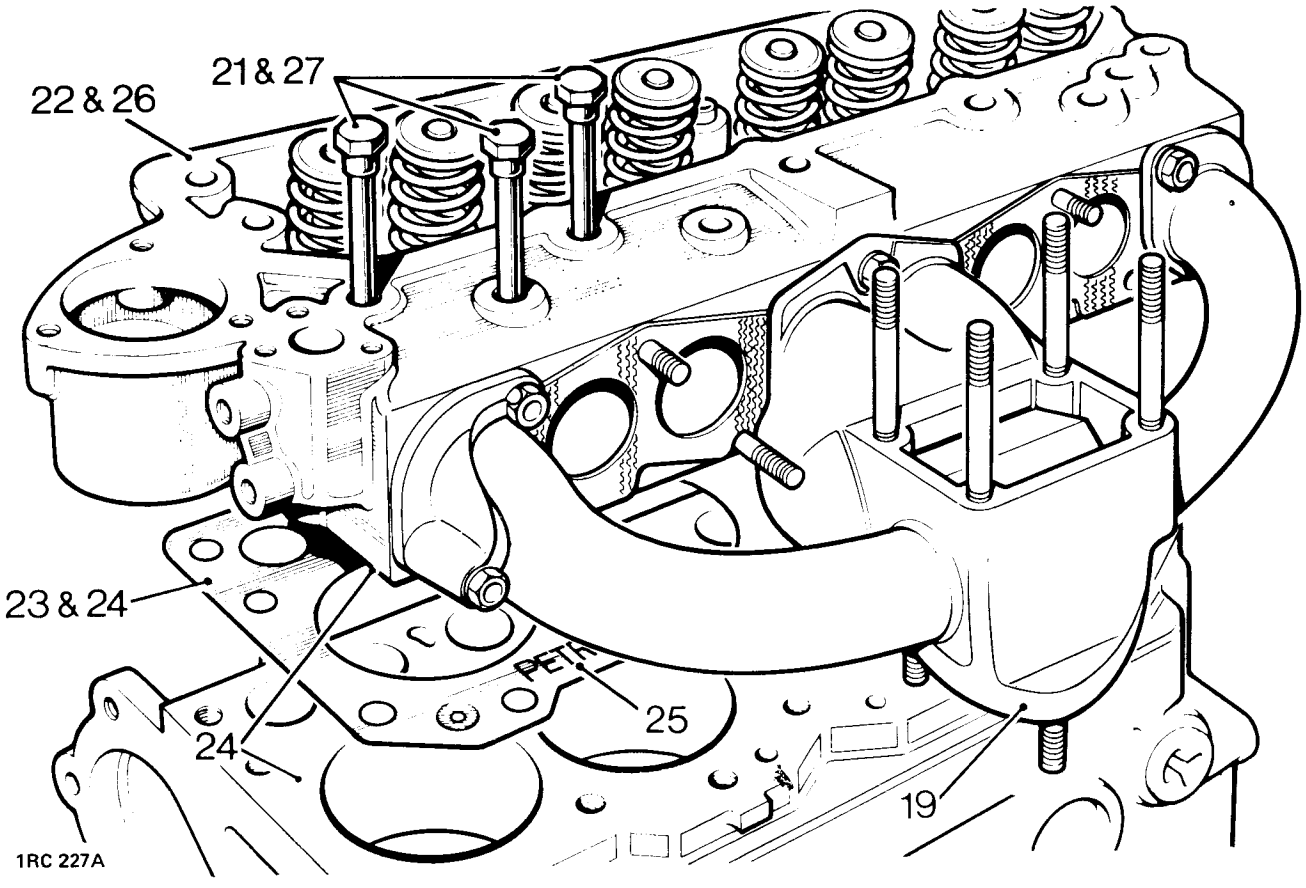
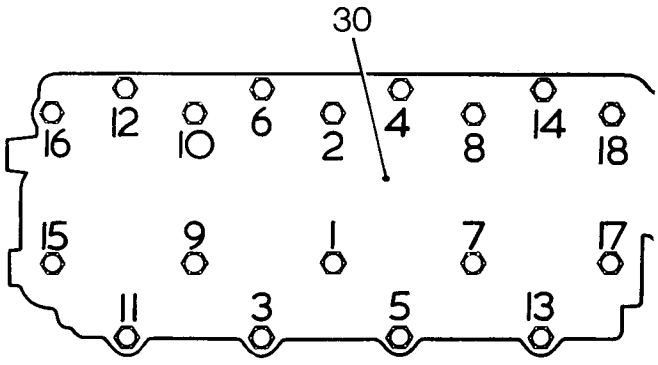
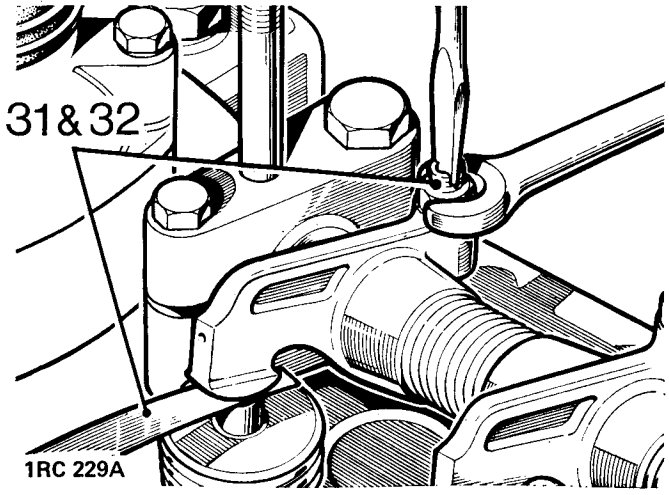


28. Place the push rods into position and ensure that they bottom correctly into the spherical seats in the tappet slides.
29. Fit the rocker shaft assembly and engage the fixings.
30. Secure the cylinder head and rocker shaft fixings in the sequence illustrated. Torque: ½ in UNF bolts 8.9 kgf.m (65 lbf.ft), 5/16 in UNF bolts 2.4 kgf.m (18 lbf.ft).
31. Set the tappet clearances to 0.25 mm (0.010 in) for all valves, as follows:
    Set No. 1 tappet with No. 8 valve fully open.
    Set No. 3 tappet with No. 6 valve fully open.
    Set No. 5 tappet with No. 4 valve fully open.
    Set No. 2 tappet with No. 7 valve fully open.
    Set No. 8 tappet with No. 1 valve fully open.
    Set No. 6 tappet with No. 3 valve fully open.
    Set No. 4 tappet with No. 5 valve fully open.
    Set No. 7 tappet with No. 2 valve fully open.
32. Recheck the tappet clearances with the locknuts tightened, and readjust if necessary.
33. Place the joint washer for the engine top cover in position.
34. Fit the engine top cover.
35. Reverse 1 to 19.
36. After the initial engine run, that is with the engine at normal running temperature, check the cylinder head fixings to the correct torque load with the sparking plugs removed.



1RC 228A



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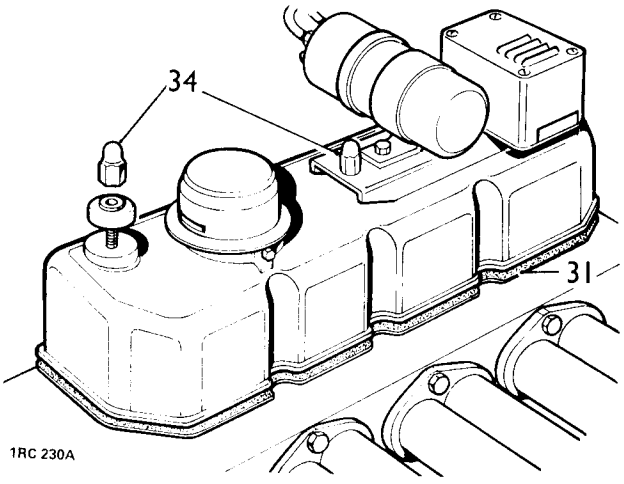


1RC 230A

CYLINDER HEAD

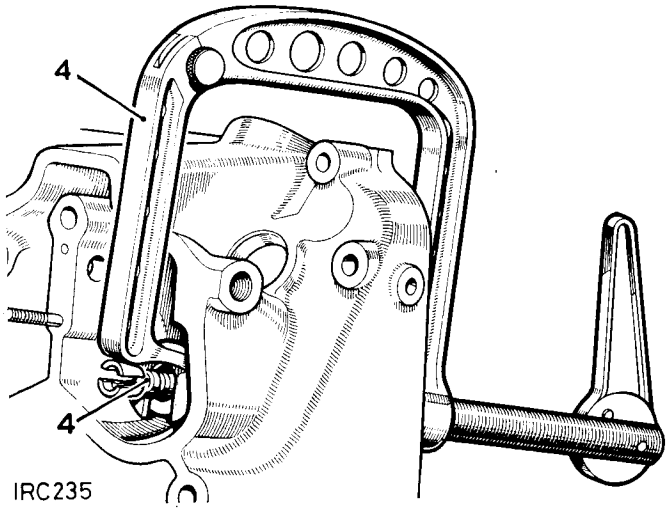
—Overhaul 1.17

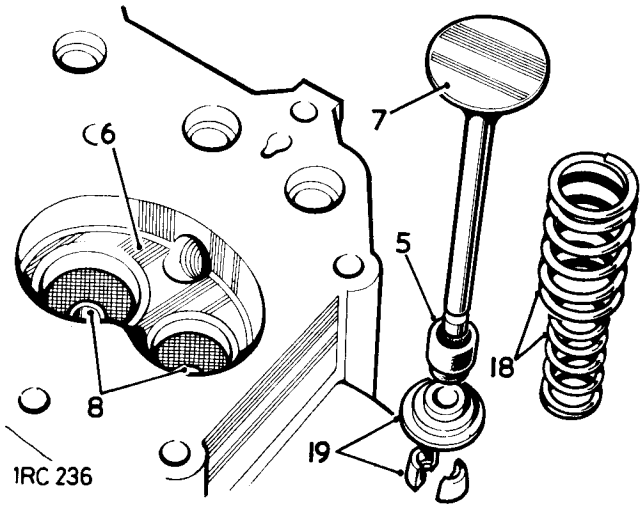
Service tools: 276102 Valve spring compressor
274400 Inlet valve guide remover
274401 Exhaust valve guide remover
600959 Exhaust valve guide replacer
601508 Inlet valve guide replacer

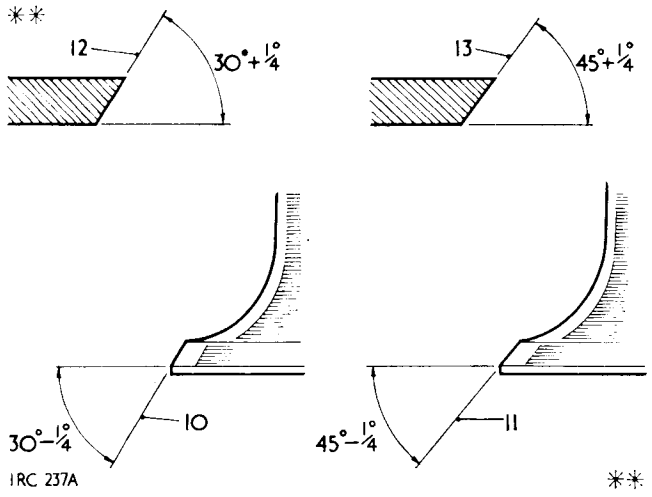
Dismantling

1. Remove the cylinder head. 1.16.
2. Remove the induction and exhaust manifold assembly. 1.25.
3. Remove the thermostat housing complete.
4. Remove the valve assemblies and retain the components in related sets. Compressor 276102.
5. Withdraw the oil seals from the valve guides.
6. Clean the combustion chambers and piston crowns with a soft wire brush.
7. Clean the valves.
8. Clean the valve guide bores.
9. Regrind or fit new valves as necessary.
10. The correct angle for the inlet valve face is 30°—¼°.
11. The correct angle for the exhaust valve face is 45°—¼°.
12. The correct angle for the inlet valve seat is 30°+¼°.
13. The correct angle for the exhaust valve seat is 45°+¼°.

continued







14. Check the valve guides and fit replacements as necessary. 15 to 17.
15. Drive out the old guides from the combustion chamber side. 274400 and 274401.
16. Lubricate the new valve guides and drive them into position. 600959 and 601508.
17. Check and if necessary, reface the valves and seats, as previously described.
18. Inspect the valve springs which are provided as paired assemblies. The springs must be an interference fit with each other.
19. Inspect the valve split cones and valve spring caps for general condition.
20. Inspect the cylinder head for general condition and for damage to threads.

Assembling

21. Fit the oil seals, fitted with springs, to the inlet valve guides.
22. Fit the oil seals, with external moulded grid pattern, to the exhaust valve guides.
23. Lubricate the valve stems and guides with engine oil and fit each valve as follows:
24. Insert the valve into its respective guide.
25. Place the valve springs in position.
26. Locate the cap on the springs.
27. Compress the springs and fit the valve collets. 276102.
28. Reverse 1 to 3.
29. After the initial engine run, that is with the engine at normal running temperature, check the cylinder head fixings to the correct torque load with the sparking plugs removed. Torque: ½ UNF bolts 8,9 kgf m (65 lbf ft). ⅝ UNF bolts 2,4 kgf m (18 lbf ft).

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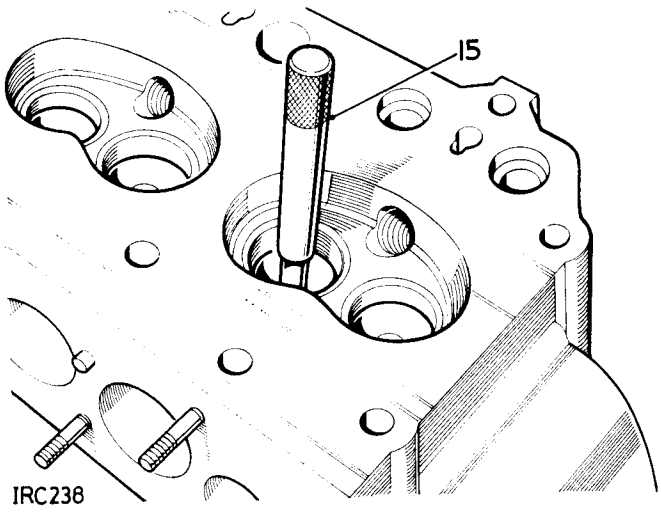
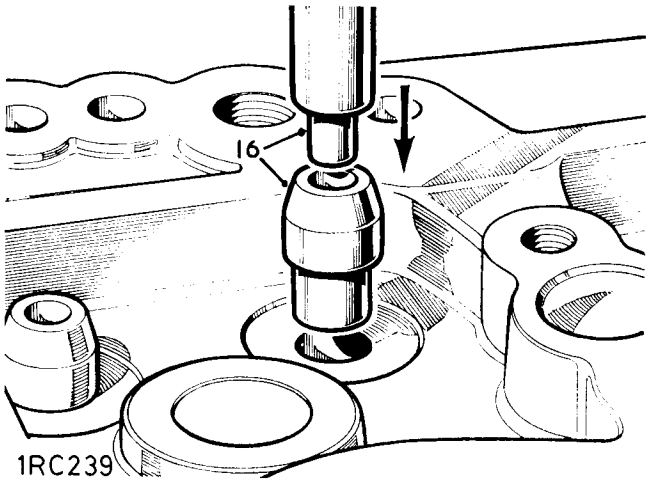
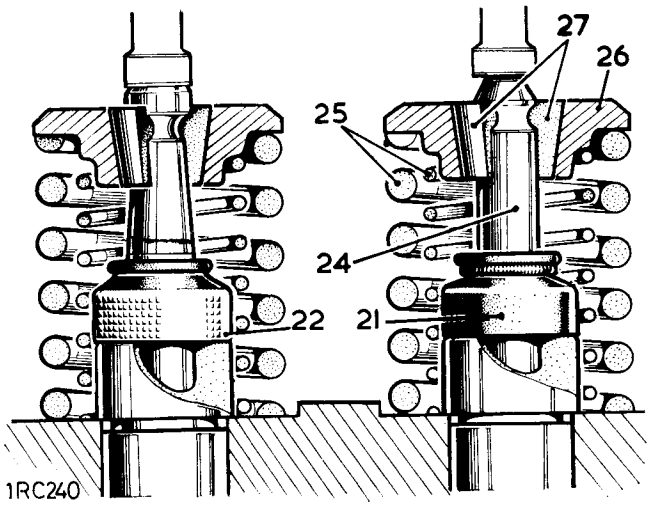






DATA

Cylinder head

Inlet valve seat angle	30° + ¼°
Exhaust valve seat angle	45° + ¼°

Valves

Inlet valve	
Diameter of stem	7,88 mm to 7,90 mm (0.3107 in to 0.3112 in)
Face angle	30°—¼°
Exhaust valve	
Diameter of stem	8,65 mm to 8,67 mm (0.3410 in to 0.3415 in)
Face angle	45°—¼°

Valve guides

Inlet bore size, after fitting	7,93 mm to 7,97 mm (0.3125 in to 0.3140 in)
Exhaust bore size after fitting	8,73 mm to 8,77 mm (0.3435 in to 0.3450 in)

Valve springs

Inner	
Length, free	42,67 mm (1.680 in)
Length, under 8,0 kg (17.7 lb) load	37,13 mm (1.462 in)
Outer	
Length, free	46,28 mm (1.822 in)
Length, under 21 kg (46 lb) load	40,30 mm (1.587 in)

ROCKER SHAFT ASSEMBLY

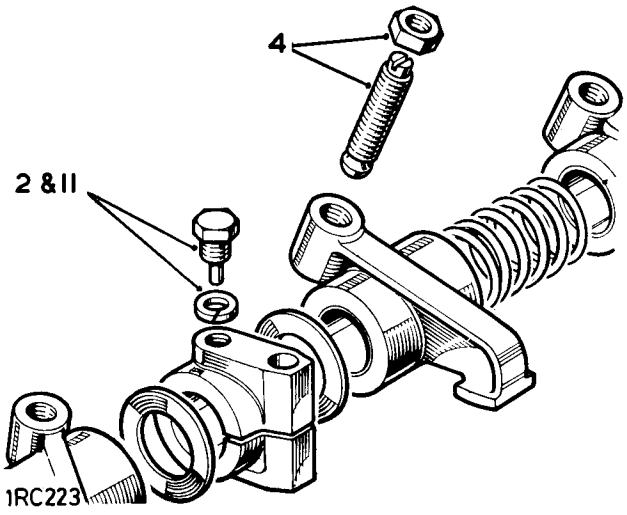
—Overhaul **1.18**

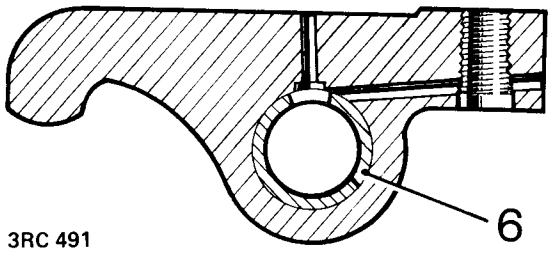
Dismantling

1. Remove the valve gear. 1.19.
2. Remove the locating screw and washer from the intermediate rocker bracket.
3. Withdraw all the components from the rocker shaft.
4. Remove the tappet adjustment screws.

Inspecting

5. Rocker brackets. Ensure the oil feed holes are clear. Inspect the locating dowel spigots; the spigots must be undamaged to ensure a correct fit on the locating dowels in the cylinder head.
6. Visually inspect the rocker bushes for wear. If necessary, press replacement bushes into the rockers and ream to 13,5 mm + 0,02 mm (0.530 in + 0.001 in). The oil holes in the rocker bushes are pre-drilled and must be aligned with the oil holes in the valve rocker when assembled.
7. Check that all oil passage drillings are clear.
8. Tappet adjusting screws and locknuts. Examine threads for damage. Check that the oil relief drilling is clear.
9. Inspect the rocker shaft for wear and scores; check that the oil feed holes are clear.
10. Examine the rocker shaft springs, spacing washers and the locating screw for soundness and general condition.





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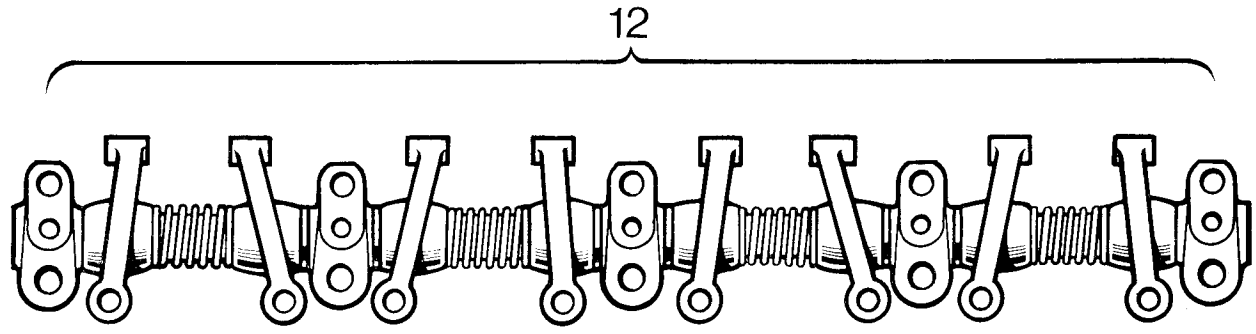
11. Fit an intermediate rocker bracket to the rocker shaft and engage the locating screw through the bracket and into the larger hole in the shaft.
12. Assemble the components to the rocker shaft as illustrated and note the assembled position of the spacing washers and the handed valve rockers.
13. Refit the tappet adjustment screws.
14. Refit the valve gear. 1.19.



3RC 492

DATA

Rockers

Bush internal diameter, reamed in position	13,40 mm to 13,42 mm (0.530 in to 0.531 in)
Shaft clearance in rocker bush	0.013 mm to 0,038 mm (0.0005 in to 0.0015 in).

VALVE GEAR

—Remove and refit 1.19

Removing

1. Disconnect the battery earth lead.
2. Remove the bonnet. 17.7.
3. Remove the air cleaner. 3.5.
4. Disconnect the leads from the ignition coil.
5. Disconnect the leads from the ignition filter.
6. Disconnect the hose from the engine breather filter.
7. Disconnect the heater pipe from the water valve.
8. Remove the engine top cover.
9. Slacken locknuts and turn tappet adjusting screws to disengage from push rods.
10. Remove fixings from rocker shaft support brackets. Do not remove shaft assembly at this stage.
11. Withdraw the rocker shaft assembly complete, using the engine top cover secured inverted to the rocker bracket studs to retain the assembly.
12. Withdraw the tappet push rods and retain them in numbered sequence related to the tappet served.

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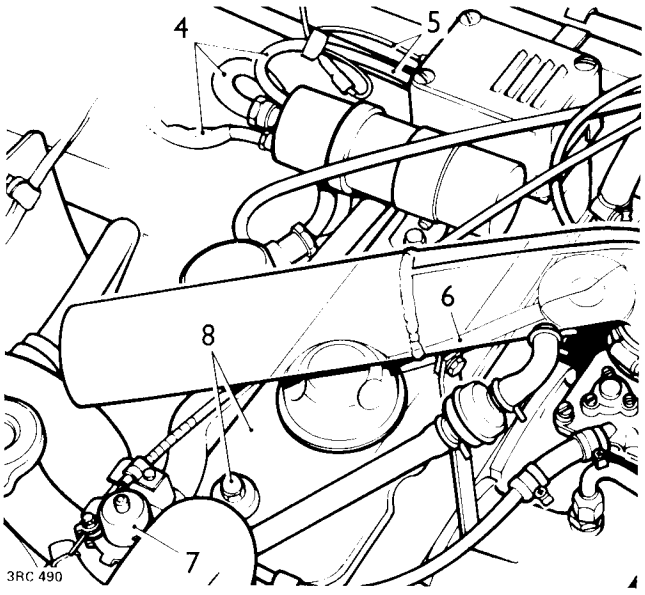
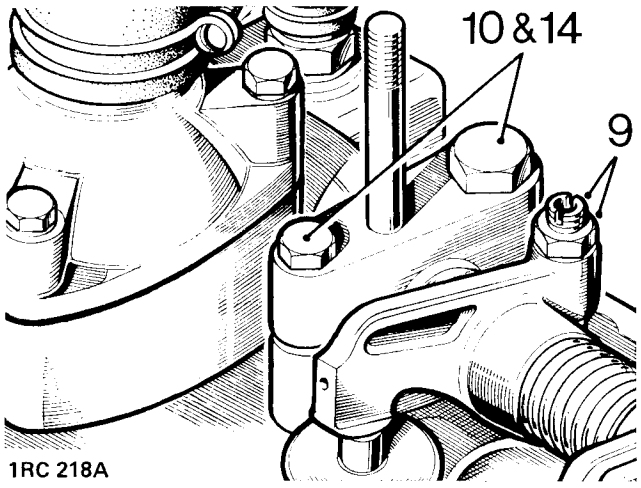
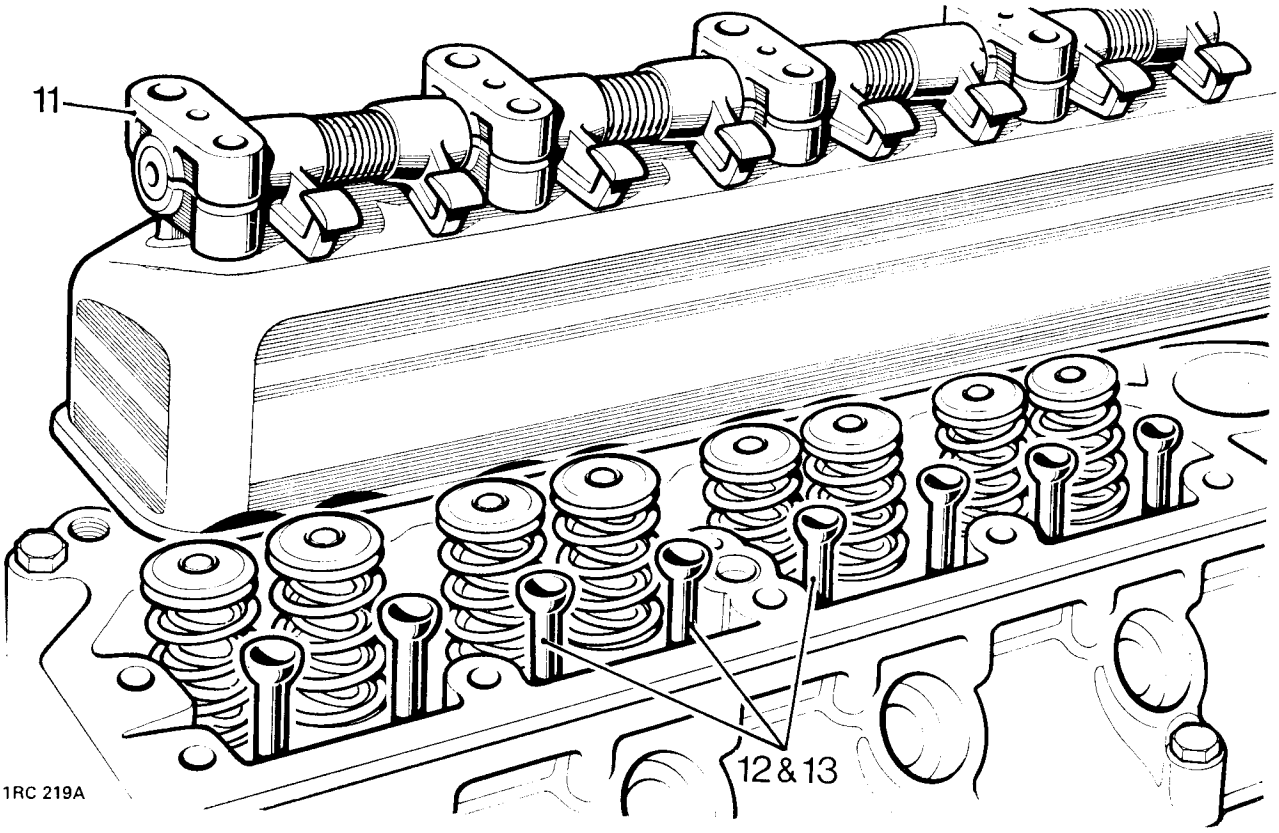
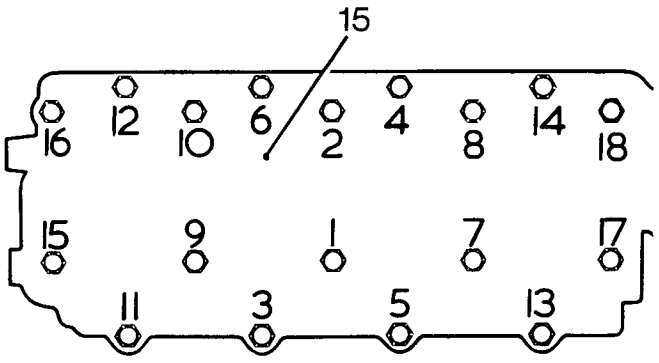




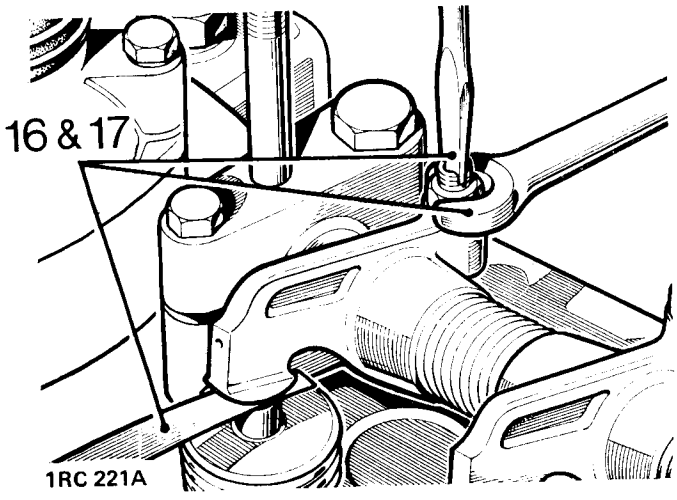


Refitting

13. Fit the tappet push rods to their original bores. Ensure that the bottom end of the push rods locate in the spherical tappet seats.
14. Refit the rocker shaft assembly, located by spigots. Torque: ½ in UNF bolts: 8,9 kgf m (65 lbf ft). 5/16 in UNF bolts: 2,4 kgf m (18 lbf ft).
15. Check tighten all ½ in UNF cylinder head fixings in the order shown. Torque: 8,9 kgf m (65 lbf ft).
16. Set the tappet clearances to 0,25 mm (0.010 in) for all valves, as follows:
    Set No. 1 tappet with No. 8 valve fully open.
    Set No. 3 tappet with No. 6 valve fully open.
    Set No. 5 tappet with No. 4 valve fully open.
    Set No. 2 tappet with No. 7 valve fully open.
    Set No. 8 tappet with No. 1 valve fully open.
    Set No. 6 tappet with No. 3 valve fully open.
    Set No. 4 tappet with No. 5 valve fully open.
    Set No. 7 tappet with No. 2 valve fully open.
17. Recheck the tappet clearances with the locknuts tightened, and readjust if necessary.
18. Place the joint washer for the engine top cover in position.
19. Reverse 1 to 8.



1RC 220A



1RC 221A

DATA

Tappet clearance 0,25 mm (0.010 in) inlet and exhaust

TAPPETS

—Remove and refit **1.20**

Service tool: 530101 Tappet guide remover

Removing

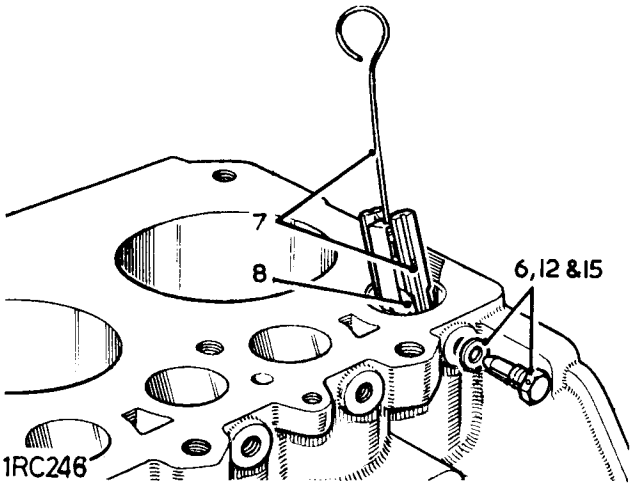
1. Disconnect the battery earth lead.
2. Remove the bonnet. 17.7.
3. Remove the air cleaner. 3.5.
4. Remove the valve gear. 1.19.
5. Remove the cylinder head. 1.16.
6. Remove the tappet guide locating bolts from the R.H. side of the cylinder block.

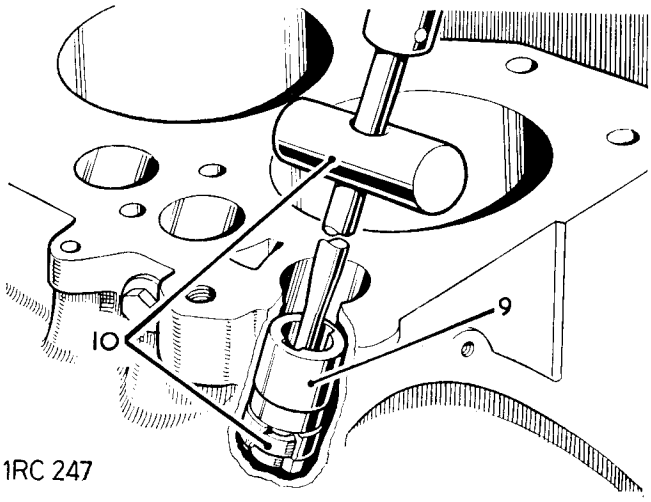
   CAUTION: Do not remove the tappet guides before the rollers have been withdrawn, otherwise the rollers may fall behind the camshaft.

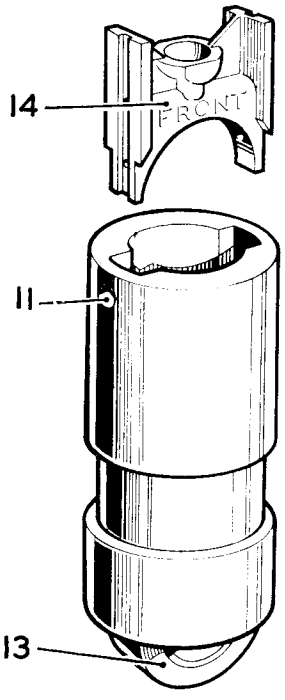
7. Using a long nose pliers or a suitably made wire clip, withdraw the tappet slides and retain in sequence.
8. Withdraw the tappet rollers and retain with the related slides.
9. Withdraw the tappet guides and retain in sequence with the other related parts.
10. If the guides are difficult to withdraw, use Service Tool 530101.

Refitting

11. Fit the tappet guides in the sequence removed, aligning the locating holes.
12. Engage the locating bolts sufficient to retain the guides.
13. Fit the tappet rollers with the larger chamfer towards the front of the engine.
14. Fit the tappet slides with the marking 'FRONT' towards the front of the engine.
15. Tighten the tappet guide locating bolts and secure in pairs by wire-locking.
16. Reverse 1 to 5.







TIMING CHAIN TENSIONER

—Remove and refit **1.21**

Removing

1. Remove the bonnet. 17.7.
2. Remove the radiator assembly. 5.3.
3. Turn the crankshaft in the direction of rotation until the timing mark on the crankshaft pulley is aligned with the longest tongue of the timing pointer. (No. 1 piston at TDC).
   NOTE: The timing pointer may vary slightly from that illustrated, and have an additional point past TDC. This is for ignition timing, see Operation 6-10.
4. Remove the timing gear cover. 1.23.
5. Remove the tensioner ratchet and spring.
6. Remove the fixings from the piston housing.
7. Compress the tensioner spring by hand and withdraw the tensioner assembly complete.
8. Clean the tensioner components in clean fuel.
9. Fit a new piston and housing if unduly worn.
10. If the tensioner cylinder bush is unduly worn, fit a new cylinder and bush complete.
11. Fit a new idler wheel and ratchet arm if the bushes are unduly worn.

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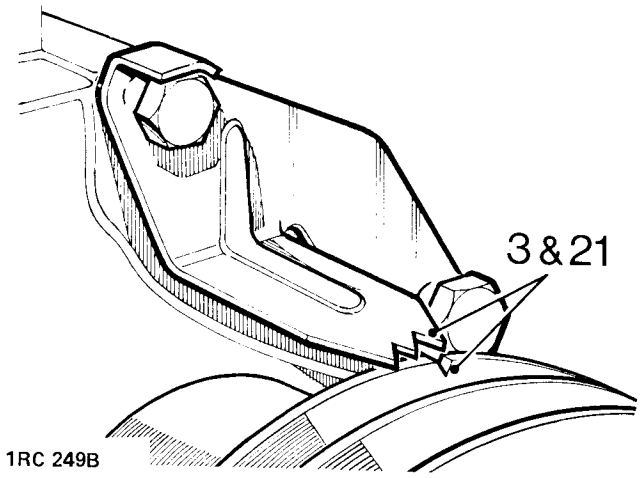
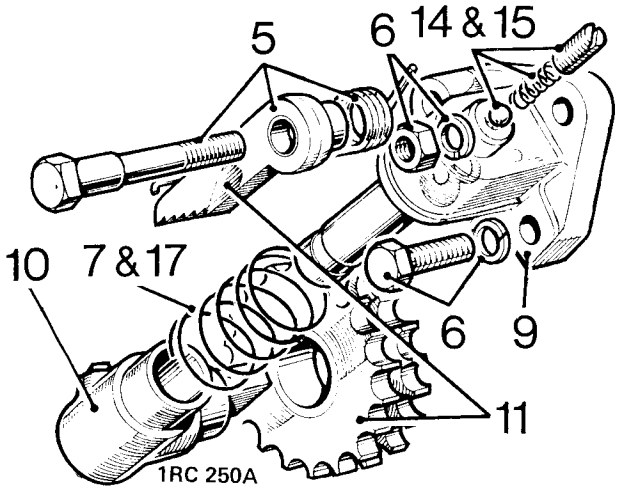
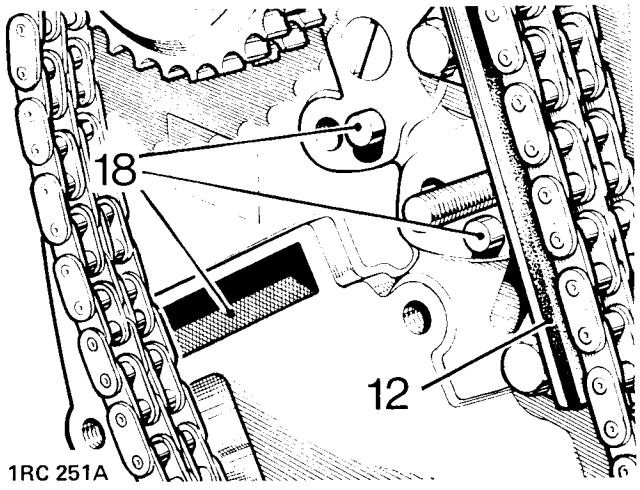




12. Fit a new chain vibration damper if the rubber pad is grooved.
13. Ensure that all oil passage drillings are clear.
14. If required, remove the non-return valve plug, spring and ball.

Refitting

15. If removed, refit the non-return valve ball, spring and plug.
16. Assemble together, the piston housing, tensioner spring, cylinder and idler wheel.
17. Compress the assembly against the tensioner spring.
18. Fit the assembly to the engine, locating the piston housing onto the dowels and the cylinder spigot into the slot.
19. Fit the ratchet and spring and allow the idler wheel to take up the timing chain slack.
20. If necessary, adjust the position of the chain vibration damper to allow 0,25 mm (0.010 in) maximum clearance between the timing chain and the vibration pad.
21. Temporarily, refit the timing gear cover, timing pointer and crankshaft pulley, and ensure that the timing marks are still correctly aligned. Then providing that the camshaft has not been rotated, the engine valve timing should be correct. If there is any doubt, check the valve timing. 1.22.
22. Fit the timing gear cover. 1.23.
23. Reverse 1 and 2.



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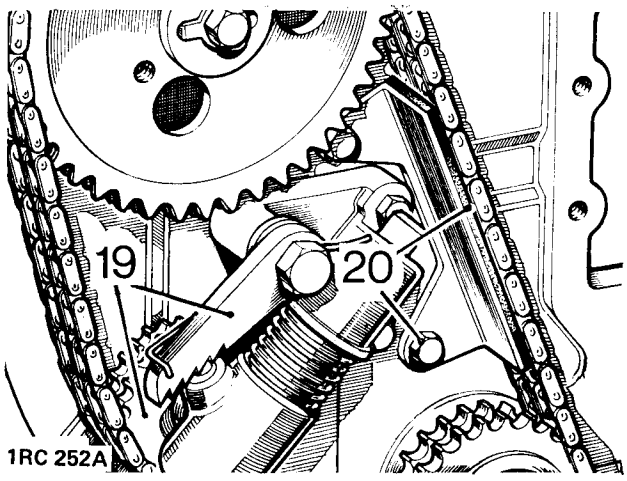


1RC 252A

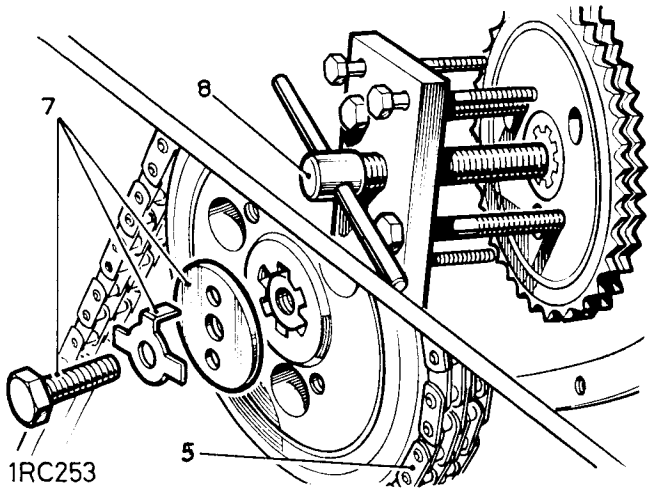
TIMING GEARS

—Remove and refit 1.22

Service tool: 507231 Chainwheel extractor

Removing

1. Remove the bonnet. 17.7.
2. Remove the radiator assembly. 5.3.
3. Remove the timing gear cover. 1.23.
4. Remove the timing chain tensioner. 1.21.
5. Withdraw the timing chain.
6. Withdraw the chainwheel from the crankshaft.
7. Remove the fixings from the camshaft chainwheel.
8. Extract the chainwheel from the camshaft. 507231.



Refitting

9. Check that the key for the chainwheel is correctly located in the crankshaft slot.
10. Fit the chainwheel, large shoulder first, to the crankshaft.
11. Locate the timing gear cover in position.
12. Fit the timing pointer.
13. Locate the crankshaft pulley in position.
14. Rotate the crankshaft until the timing mark in the crankshaft pulley is aligned with the longest tongue on the timing pointer (No. 1 piston at TDC).

    NOTE: The timing pointer may vary from that illustrated and have an additional point past TDC. This is for ignition timing, see Operation 6-10.

15. Without disturbing the crankshaft, remove the pulley, timing pointer and gear cover.

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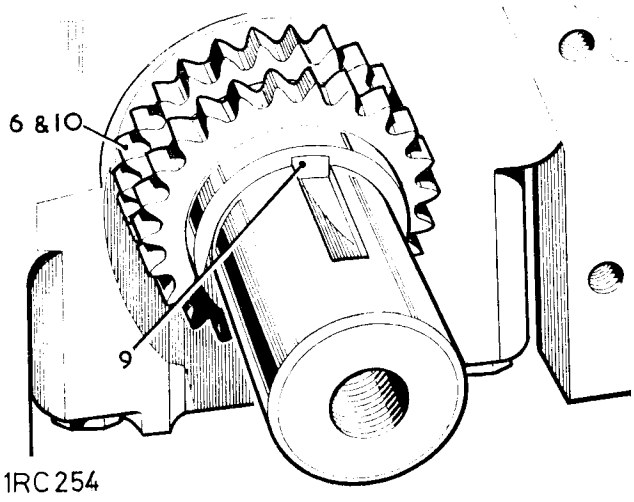
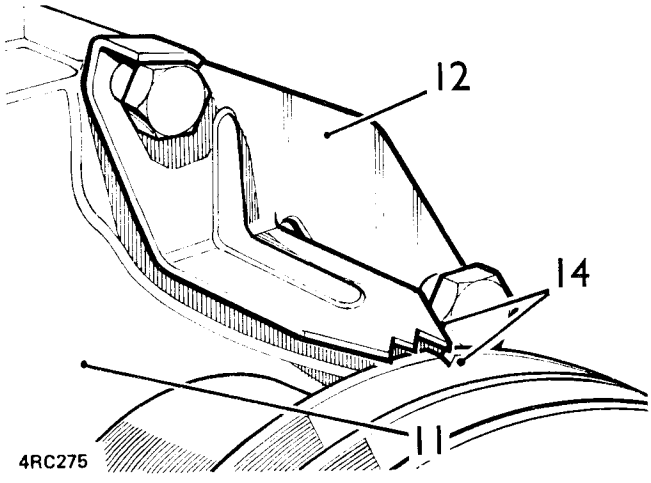
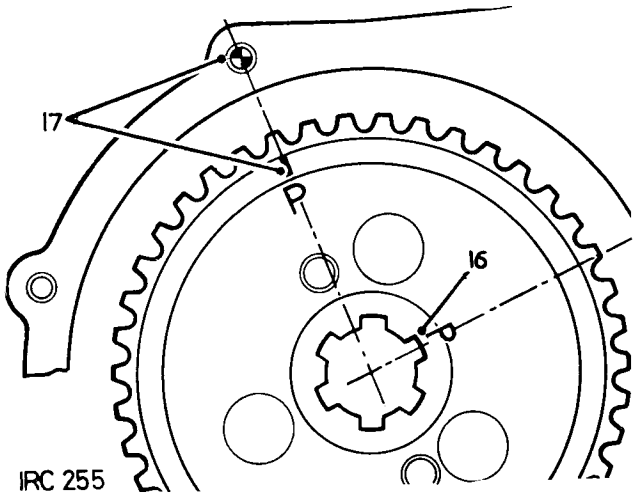
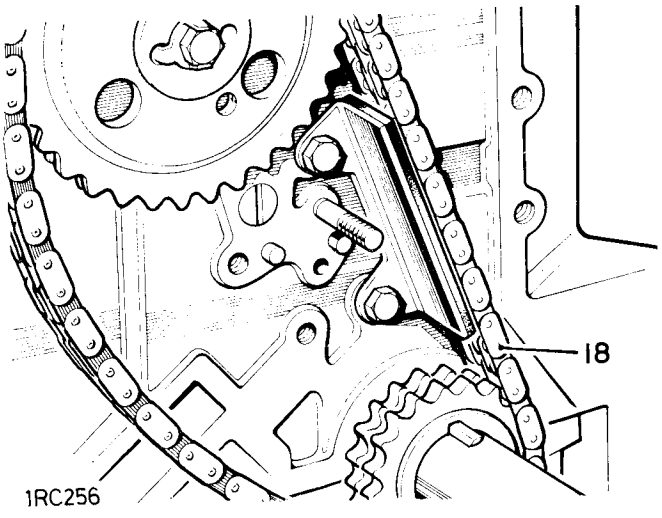




16. Fit the camshaft chainwheel, using keyway marked 'P'.
17. Rotate the camshaft chainwheel until the groove marked 'P' is in line with the centre of the tapped hole, as illustrated.
18. Retaining the chainwheels in the set positions, fit the timing chain ensuring that there is no slack chain on the driving side.
19. If it is not possible to obtain a taught fit on the driving side of the chain with the chainwheels in the set positions, withdraw the camshaft chainwheel without disturbing the set position of the camshaft, and refit the chainwheel using one of the alternative keyways. This procedure may be repeated until a taught chain is obtained on the driving side with the camshaft and crankshaft in their previously set positions.
20. Reverse 1 to 4.





TIMING GEAR COVER AND OIL SEAL

—Remove and refit

Gear cover 1 to 17 and 21 to 34	**1.23**
Oil seal 1 to 34	**1.24**

Service tool: 530102 Spanner for starter dog

Removing

1. Disconnect the battery earth lead.
2. Remove the bonnet.
3. Remove the radiator assembly. 17.16.
4. Remove the alternator. 6.1.
5. Disconnect the breather pipe from the oil filler tube.
6. Remove the idler pulley adjusting link, slacken the pivot fixings and remove the fan belt.
7. Remove the timing pointer and the front mounting bracket for the idler pulley.
8. Disengage the lockplate from the starter dog.
9. Remove the starter dog. 530102.
10. Withdraw the lockplate.
11. Withdraw the crankshaft pulley.

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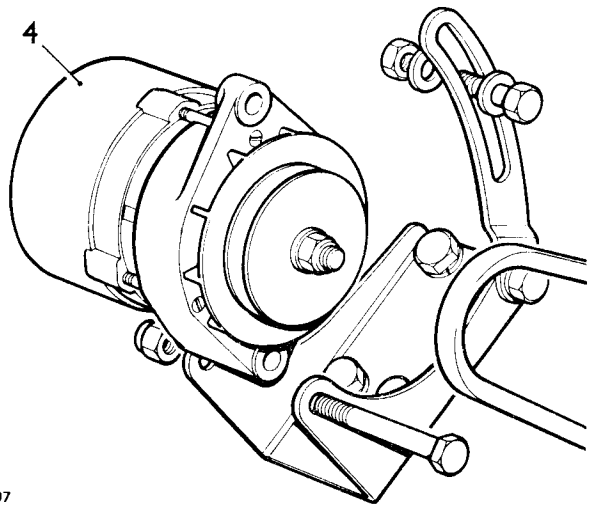
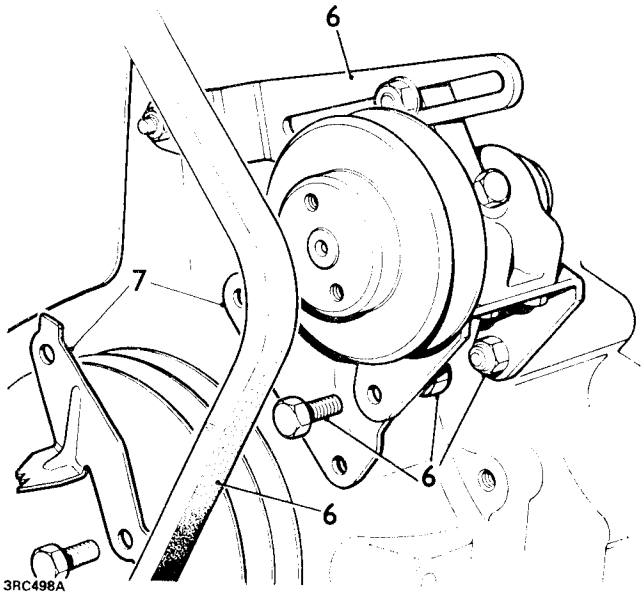


3RC 497



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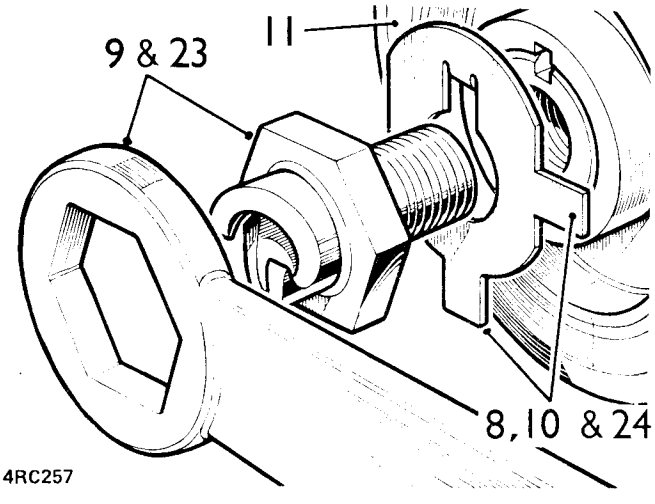
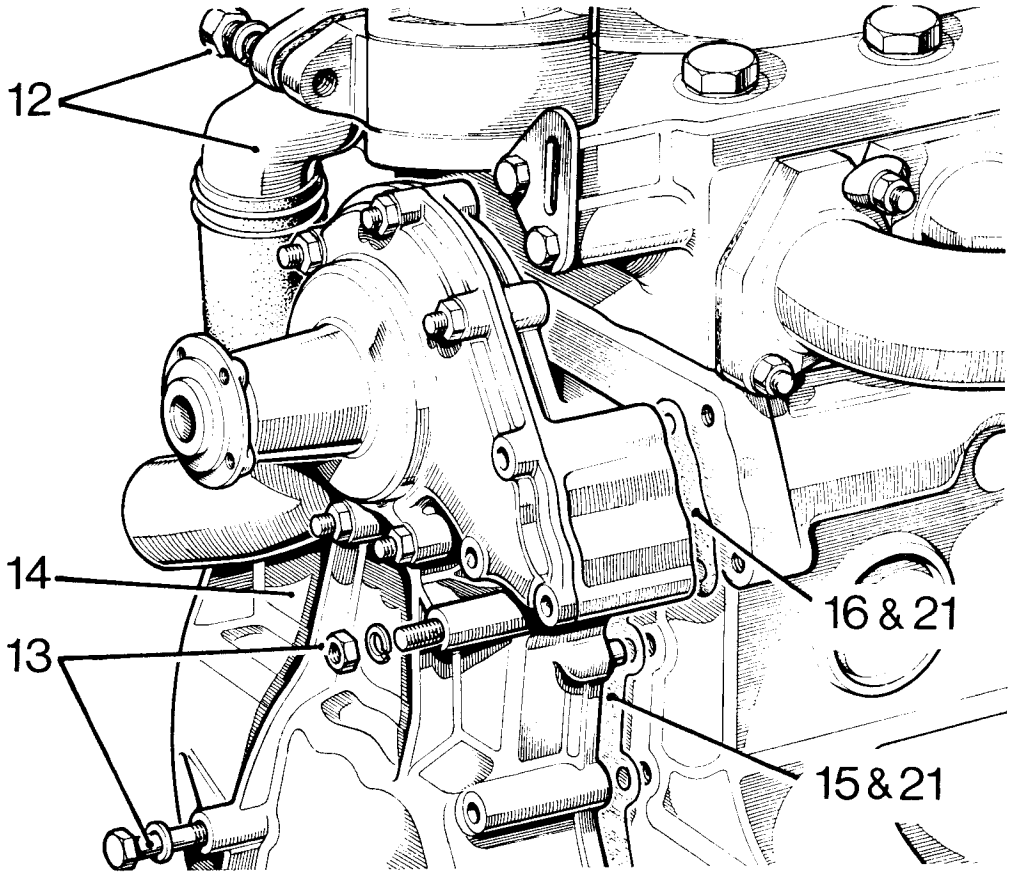


4RC257



1RC243A

12. Disconnect the by-pass pipe from the thermostat housing.
13. Remove the timing cover fixings, including those at the sump front flange.
14. Withdraw the timing cover.
15. Withdraw the joint washer from the timing cover.
16. Withdraw the joint washer from the water inlet.
17. If required, remove the alternator belt jockey pulley, the alternator mounting bracket and the oil filler tube.
18. Drive the oil seal from the timing cover.
19. Smear the outside diameter of a new oil seal with Hylomar PL32/M jointing compound, Rover Part No. 534244.
20. Press the oil seal into the timing cover.

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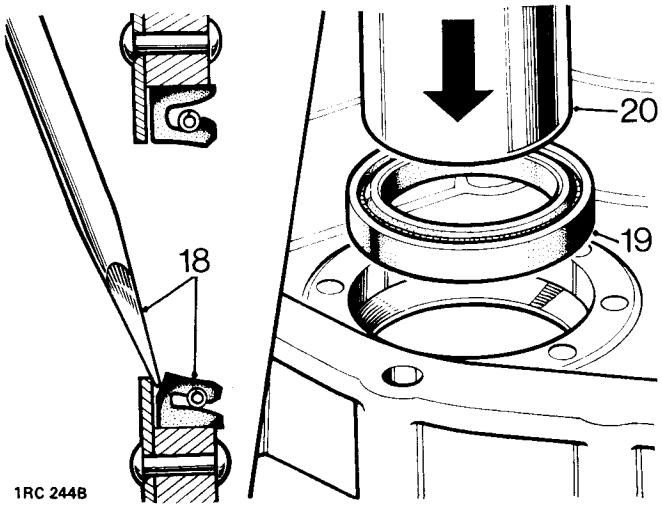


1RC 244B

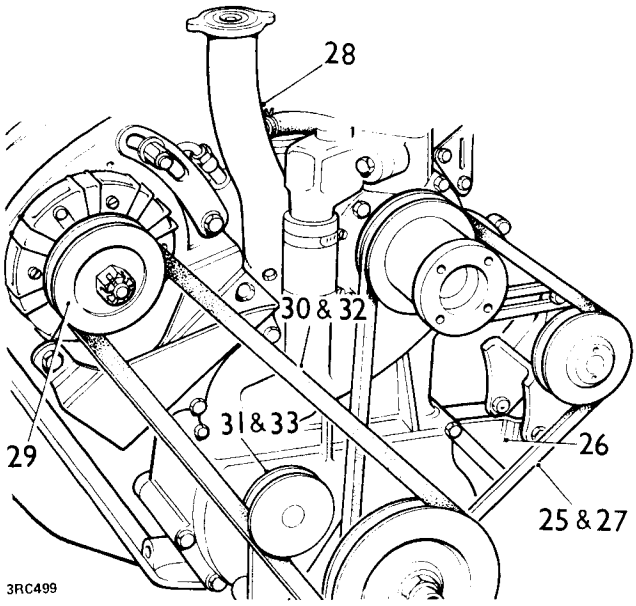
Refitting

NOTE: It is of advantage temporarily to remove the fixing stud from the cylinder block front face. This will enable the front cover to be lifted sufficient to clear the edge of the sump gasket when offering the front cover to the engine.

21. Smear general purpose grease on both sides of the front cover and water inlet joint washers.
22. Reverse 10 to 17.
23. Fit the starter dog. Torque: 20.5 kgf.m (150 lbf.ft).
24. Engage the lockplate over the starter dog.
25. Locate the fan belt over the pulleys.
26. Fit the front mounting bracket for the idler pulley together with the timing pointer and adjusting link.
27. Adjust the fan belt to give 8 to 11 mm (0.312 to 0.437 in) free movement when checked midway between the crankshaft and idler pulleys. Then secure the idler pulley fixings.
28. Reconnect the breather pipe to the oil filler tube.
29. Refit the alternator.
30. Locate the alternator drive belt over the pulleys.

    NOTE: The jockey pulley must not be used to adjust the alternator belt, otherwise premature bearing wear will occur.

31. Temporarily slacken the fixings and move the jockey pulley out of tension with the alternator belt.
32. Adjust the alternator belt to give 12 to 19 mm (0.500 to 0.750 in) free movement when checked midway between the crankshaft and alternator pulleys.
33. Position the jockey pulley against the alternator belt so that the pulley can just be turned by hand, but does not distort the belt in any way. Then, secure the jockey pulley fixings.
34. Reverse 1 to 3.

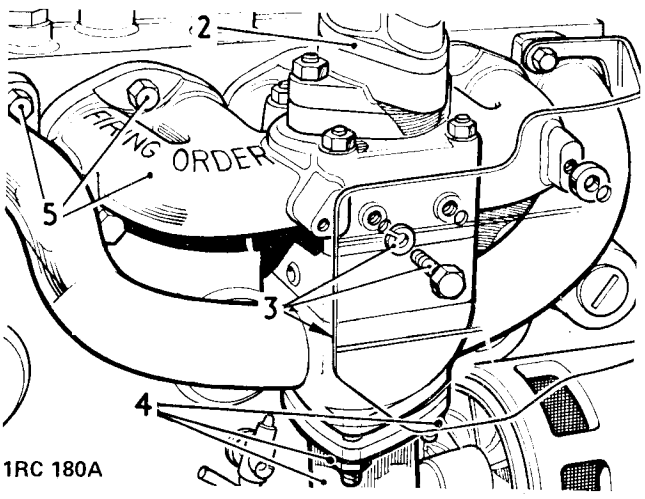


INDUCTION AND EXHAUST MANIFOLD ASSEMBLY

—Remove and refit **1.25**

Removing

1. Remove the bonnet. 17.7.
2. Remove the carburetter. 3.1.
3. Remove the exhaust heat shield.
4. Disconnect the front exhaust pipe from the manifold.
5. Remove the induction and exhaust manifold assembly.
6. Withdraw the joint washers for the induction manifold.
7. Separate the induction manifold from the exhaust manifold.
8. Withdraw the joint washer.

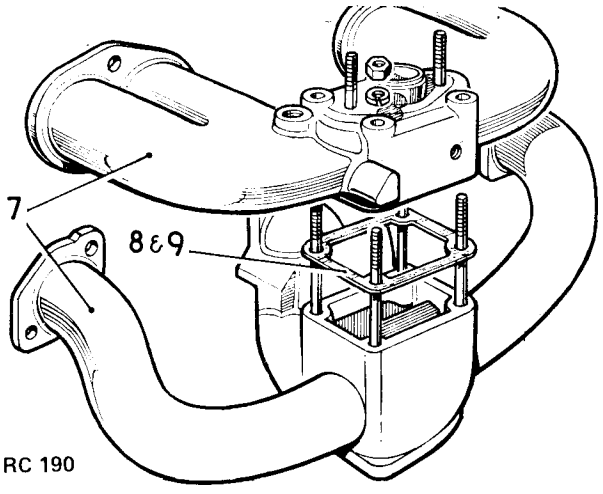


1RC 180A

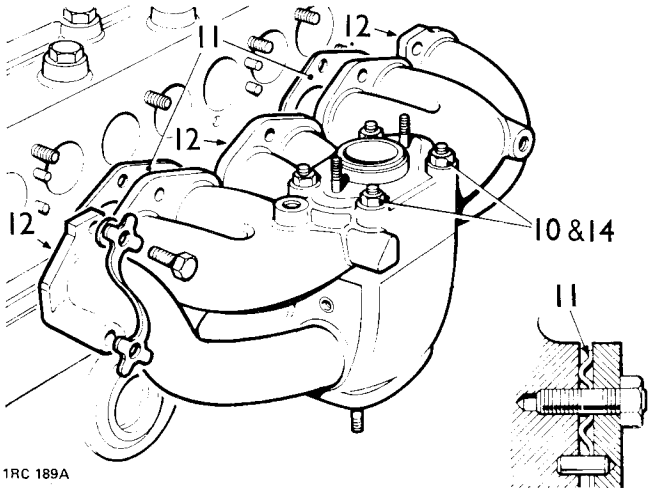
Refitting

9. Using a new joint washer, assemble the induction manifold to the exhaust manifold.
10. Tighten the fixings, induction manifold to exhaust manifold, to a torque of 2,3 kgf.m (17 lbf.ft), then slacken off slightly.
11. Fit the joint washers for the induction manifold with the raised rings towards the cylinder head.

    NOTE: Joint washers are not fitted to the exhaust manifold.
12. Coat the cylinder head engaging surfaces of the exhaust manifold with 'Rocol' anti-seize compound 'Foliac J166 (paste)'.
13. Fit the induction and exhaust manifold assembly. Torque tighten the exhaust manifold bolts 1,3 kgf.m (10 lbf.ft) and engage the lock plates.
14. Tighten the fixings, induction manifold to exhaust manifold Torque 2,3 kgf.m (17 lbf.ft).
15. Reverse 1 to 4.



1RC 190

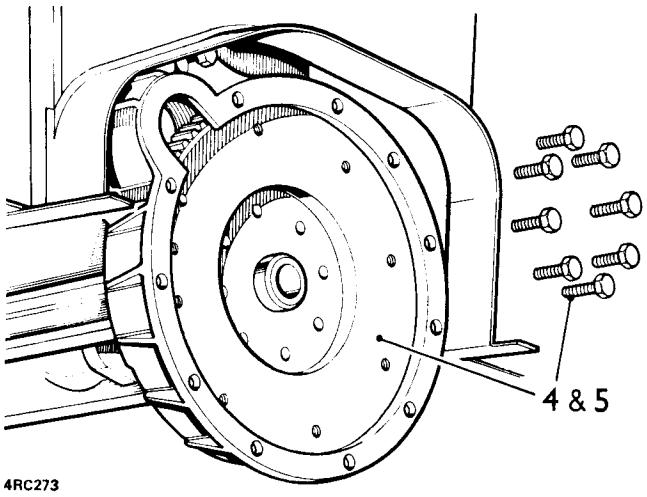


1RC 189A

FLYWHEEL AND CLUTCH OPERATIONS

FLYWHEEL

—Remove and refit 2.1



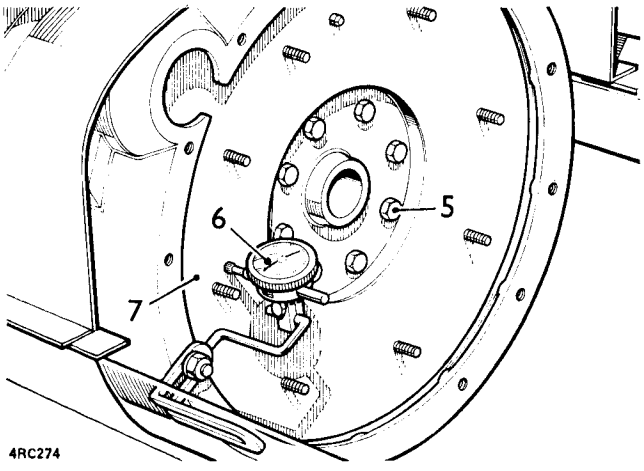
4RC273

Removing

1. Remove the front floor. 17.4.
2. Remove the gearbox assembly. 7.10.
3. Remove the clutch assembly. 2.5.
4. Remove the flywheel.

Refitting

5. Fit the flywheel to the crankshaft and tighten the securing bolts. Torque: 8,5 to 9,0 kgf m (60 to 65 lbf ft).
6. Mount a dial test indicator to read off the flywheel face.
7. Check the run-out on the flywheel face, this must not exceed 0,05 mm (0.002 in).
8. If the run-out is excessive, remove the flywheel and investigate the cause.
9. When the flywheel run-out is within the limits, reverse 1 to 3.



4RC274

FLYWHEEL

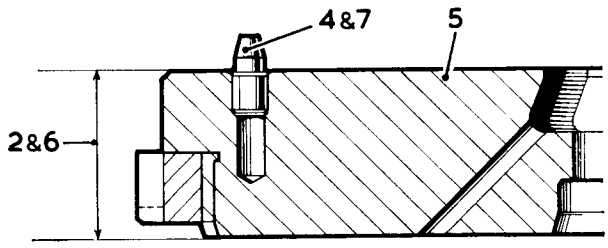
—Overhaul 2.2

Procedure

1. Remove the flywheel. 2.1.

Wear or scoring on the flywheel pressure face may be corrected by machining, providing that the overall thickness of the flywheel is not reduced below the following dimension: 34,72 mm (1.375 in)

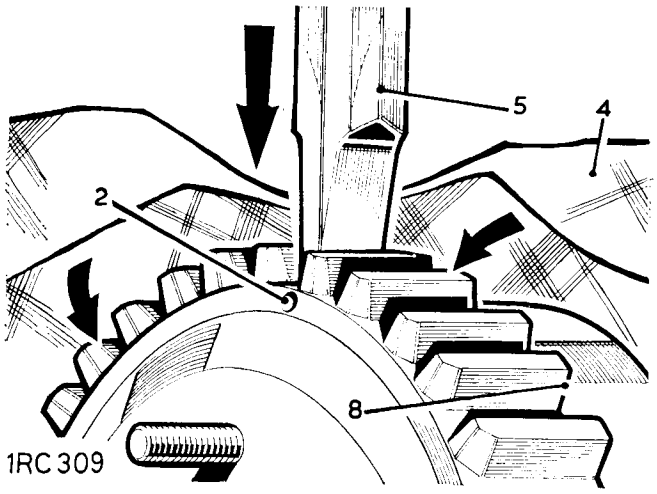
2. Check the overall thickness of the flywheel, as it may have been previously machined.
3. If the flywheel is above the minimum thickness, the clutch face can be replaced as follows:
4. Remove the dowels.
5. Replace the flywheel over the complete surface.
6. Check the overall thickness of the flywheel to ensure that it is still above the minimum thickness.
7. Fit the dowels.
8. Refit the flywheel. 2.1.



IRC 310

STARTER RING GEAR

—Remove and refit **2.3**



Removing

1. Remove the flywheel. 2.1.
2. Drill an 8,0 mm (0.312 in) diameter hole axially between the root of any tooth and the inner diameter of the starter ring sufficiently deep to weaken the ring. DO NOT allow the drill to enter the flywheel.
3. Secure the flywheel in a vice fitted with soft jaws.
4. Place a cloth over the flywheel to protect the operator from flying fragments.

   WARNING: Take adequate precautions against flying fragments as the starter ring may fly asunder when being split.

5. Place a chisel immediately above the drilled hole and strike it sharply to split the starter ring.

Refitting

6. Heat the starter ring gear uniformly to between 225°C and 250°C (437°F and 482°F) but do not exceed the higher temperature.
7. Place the flywheel, flanged side down, on a flat surface.
8. Locate the headed starter ring gear in position on the flywheel with the square edge of the teeth against the flywheel flange.
9. Press the starter ring gear firmly against the flange until the ring contracts sufficiently to grip the flywheel.
10. Allow the flywheel to cool gradually. DO NOT hasten cooling in any way.
11. Refit the flywheel. 2.1.

SPIGOT BEARING

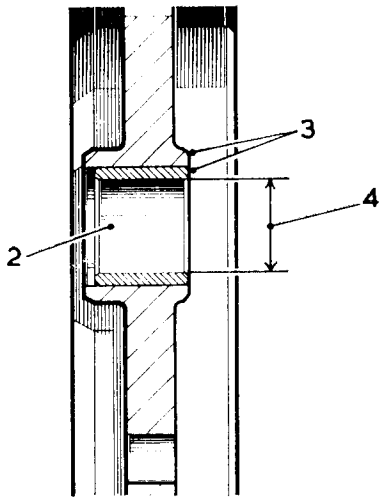
—Remove and refit **2.4**

Removing

1. Remove the flywheel. 2.1.
2. Press the spigot bearing from the flywheel.

Refitting

3. Press in the new spigot bearing flush with the clutch side of the flywheel.
4. Check, and if necessary, reamer the spigot bearing to 22,237 mm to 22,242 mm (0.8755 in to 0.8757 in).
5. Refit the flywheel. 2.1.



IRC 311

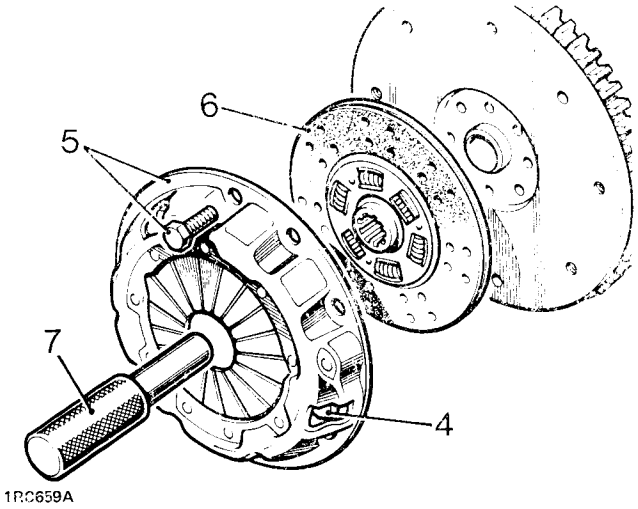
CLUTCH ASSEMBLY

—Remove and refit **2.5**

Service tool: 605022 Clutch plate alignment gauge

Removing

1. Remove the front floor. 17.4.
2. Remove the gearbox assembly. 7.10.
3. Mark the clutch cover fitted position relative to the flywheel.
4. Do not disturb the three bolts located in the apertures in the clutch cover.
5. Remove the clutch assembly.
6. Withdraw the clutch driven plate.



Refitting

7. Reverse 5 and 6 locating the driven plate with the side marked 'Flywheel side' towards the flywheel, and ensure that the clutch cover and flywheel assembly marks are aligned. Centralising tool 605022.
8. Secure the cover fixings evenly, using diagonal selection. Torque 3,0 to 3,5 kgf m (22 to 25 lbf ft).
9. Reverse 1 and 2.

DATA

Clutch driven plate diameter	241,3 mm (9.500 in)
Damper springs colour identification	Dark green

CLUTCH ASSEMBLY

—Overhaul **2.6**

Clutch assembly

The clutch assembly is of the diaphragm spring type and no overhaul procedures are applicable. Repair is by replacement only.

Clutch driven plate

Examine clutch driven plate for wear and signs of oil contamination. Examine all rivets for pulling and distortion, rivets must be below the friction surface. If oil contamination is present on the friction linings or if they are appreciably worn, replace the clutch driven plate assembly complete or alternatively, replace the friction linings following standard workshop practices.

DATA

Clutch driven plate diameter	241,3 mm (9.5 in)
Damper springs colour identification	Dark green

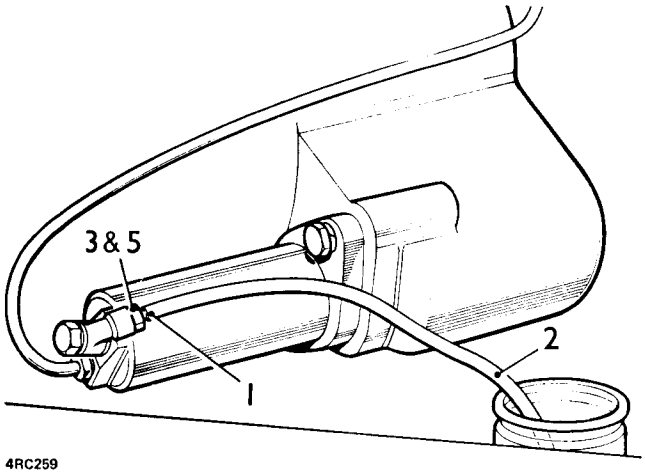
HYDRAULIC SYSTEM

—Bleed **2.7**

Procedure

NOTE: During the procedure, keep the fluid reservoir topped up to avoid introducing further air into the system. Use only the recommended type of hydraulic fluid.

1. Attach a length of suitable tubing to the slave cylinder bleed screw.
2. Place the free end of the tube in a glass jar containing clutch fluid.
3. Slacken the bleed screw.
4. Pump the clutch pedal, pausing at the end of each stroke, until the fluid issuing from the tubing is free of air with the tube free end below the surface of the fluid in the container.
5. Hold the tube free end immersed and tighten the bleed screw when commencing a pedal down stroke.



4RC259

MASTER CYLINDER

—Remove and refit **2.8**

Removing

1. Remove the bonnet. 17.7.
2. Remove the LH front ring. 17.5.
3. Disconnect the fluid pipe from the clutch master cylinder.
4. Disconnect the return spring from the clutch pedal.
5. Remove the fixings securing the clutch pedal bracket from inside the vehicle cab.
6. Withdraw the bracket complete with pedal and master cylinder.

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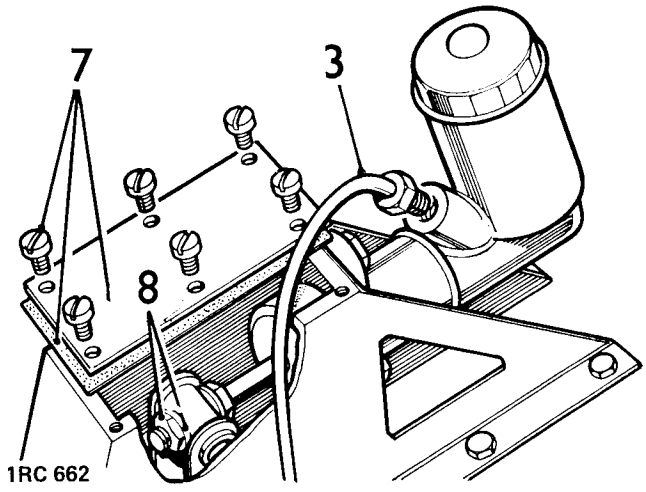
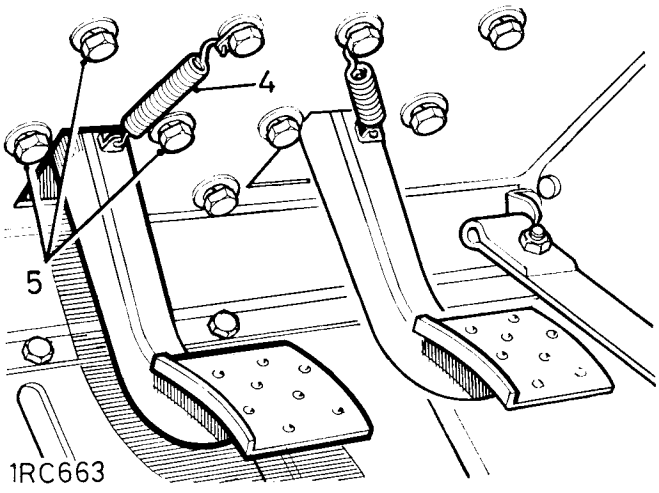
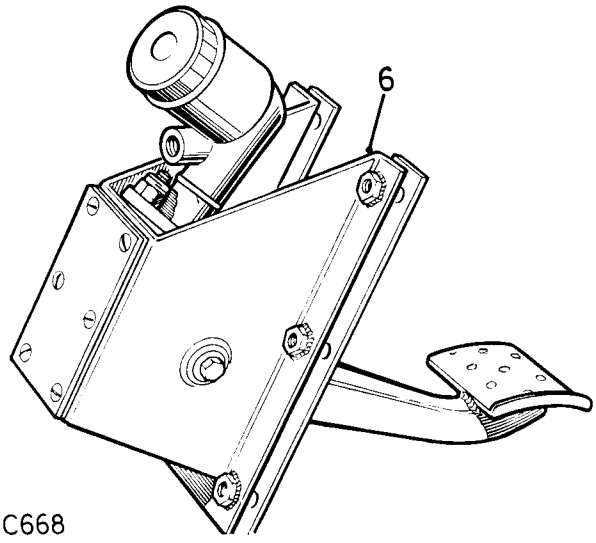






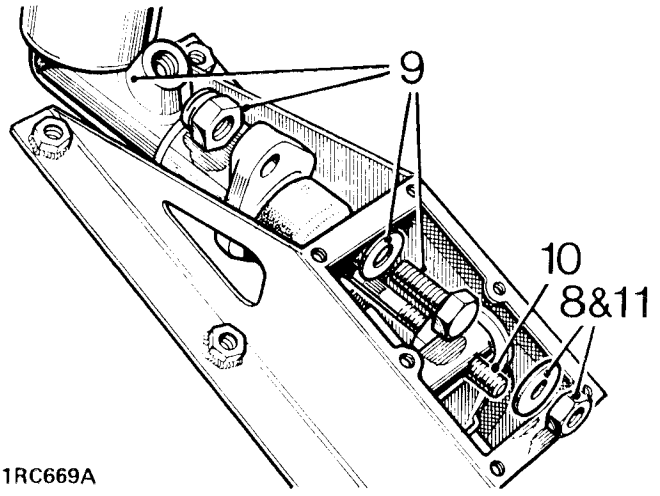
7. Remove the top cover and gasket from the clutch pedal bracket.
8. Remove the fixings from the end of the master cylinder push rod.
9. Remove the master cylinder from the pedal bracket.

Refitting

10. Fit the master cylinder to the pedal bracket, engaging the cylinder push rod through the pedal trunnion.
11. Fit the plain washer and nut to the end of the push rod.
12. Reverse 3 to 6.
13. Bleed the clutch hydraulic system. 2.7.

Clutch pedal and master cylinder setting

14. Slacken both locknuts on the master cylinder push rod.
15. Check the distance from the lower edge of the clutch pedal to the floor. The correct distance is 140 mm (5.500 in).
16. Adjust the pedal stop, as required, to obtain the correct distance.
17. Adjust the master cylinder push rod until there is approximately 1,5 mm (0.062 in) free play between the push rod and the master cylinder piston.
18. Tighten both locknuts.
19. Check the operation of the clutch pedal and ensure that there is a minimum of 6 mm (0.250 in) free movement of the pedal before pressure is felt. If necessary, readjust the master cylinder push rod.
20. Fit the gasket and top cover to the clutch pedal bracket.
21. Reverse 1 and 2.



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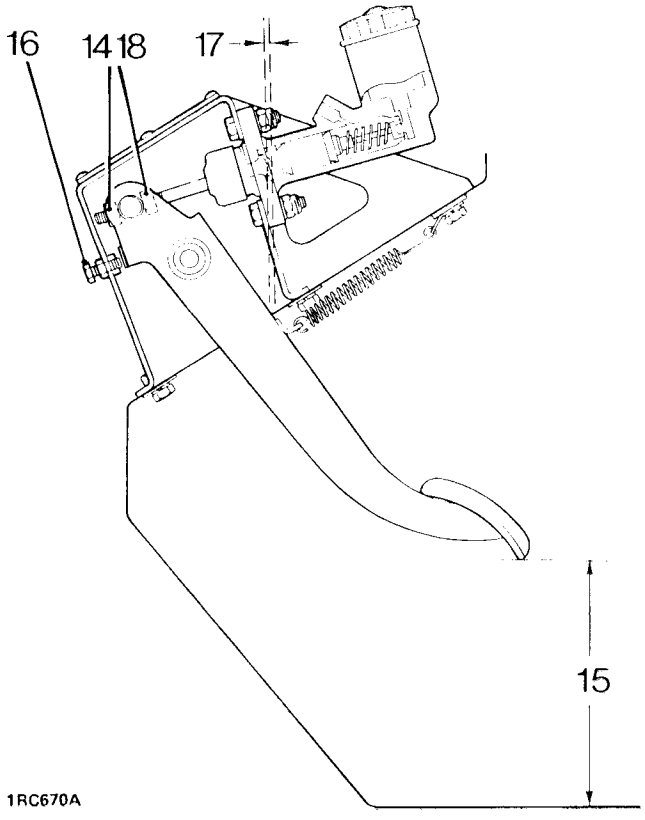

1RC670A

MASTER CYLINDER

—Overhaul **2.9**

Dismantling

1. Remove the master cylinder. 2.8.
2. Remove the circlip.
3. Withdraw the push rod and retaining washer.
4. Withdraw the piston assembly. If necessary, apply a low air pressure to the outlet port to expel the piston.
5. Prise the locking prong of the spring retainer clear of the piston shoulder and withdraw the piston.
6. Withdraw the piston seal.

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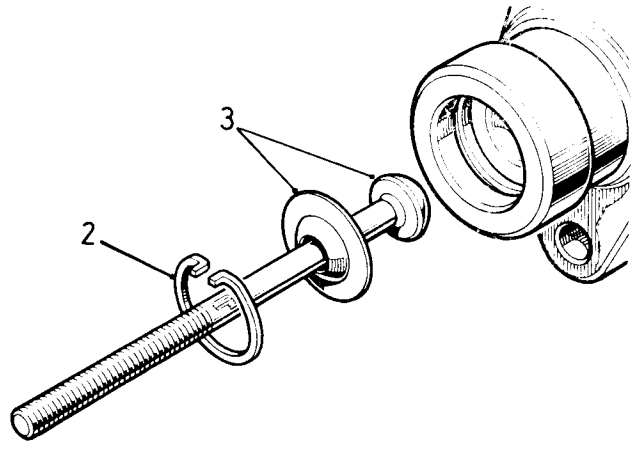

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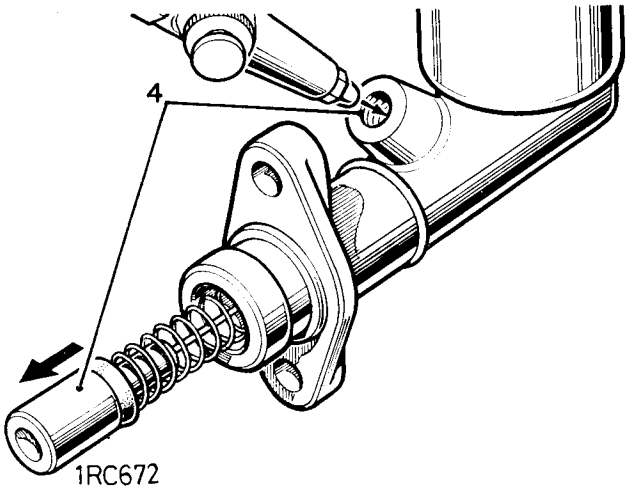

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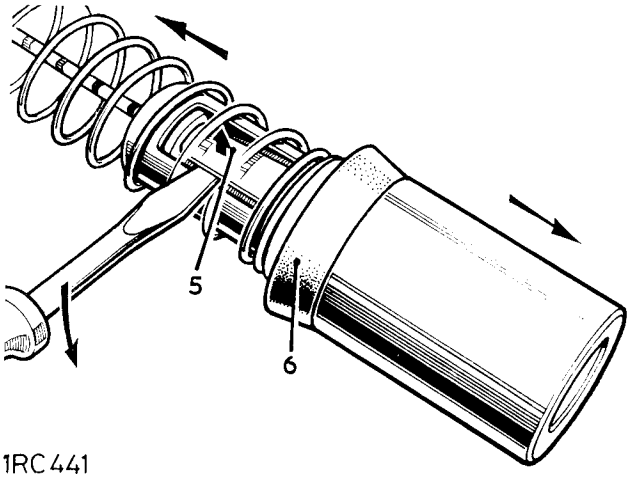

1RC441

7. Compress the spring and position the valve stem to align with the larger hole in the spring retainer.
8. Withdraw the spring and retainer.
9. Withdraw the valve spacer and spring washer from the valve stem.
10. Remove the valve seal.

Inspecting

11. Clean all components in Girling cleaning fluid and allow to dry.
12. Examine the cylinder bore and piston, ensure that they are smooth to the touch with no corrosion, score marks or ridges. If there is any doubt, fit new replacements.
13. The seals should be replaced with new components.

Assembling

14. Smear the seals with Castrol-Girling rubber grease and the remaining internal items with Castrol-Girling Brake and Clutch Fluid.
15. Fit the valve seal, flat side first, on to the end of the valve stem.
16. Place the spring washer, domed side first, over the small end of the valve stem.
17. Fit the spacer, legs first.
18. Place the coil spring over the valve stem.
19. Insert the retainer into the spring.
20. Compress the spring and engage the valve stem in the keyhole slot in the retainer.

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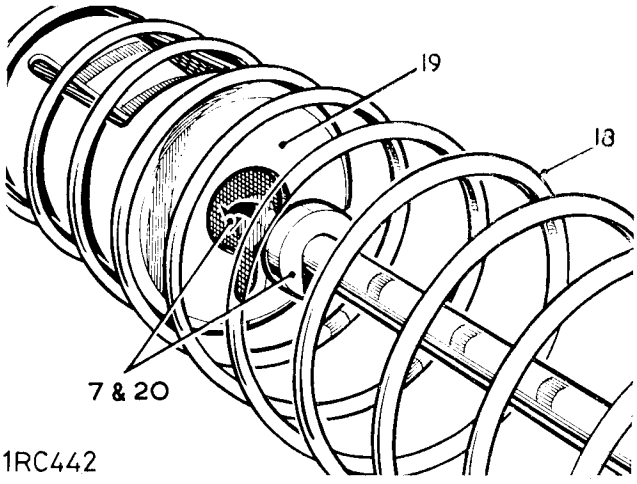

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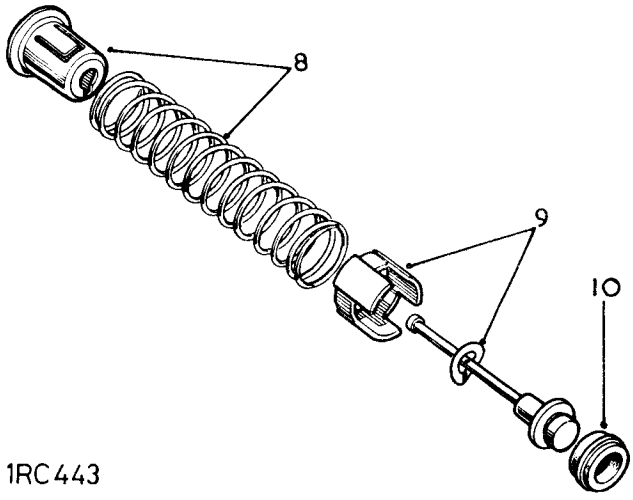

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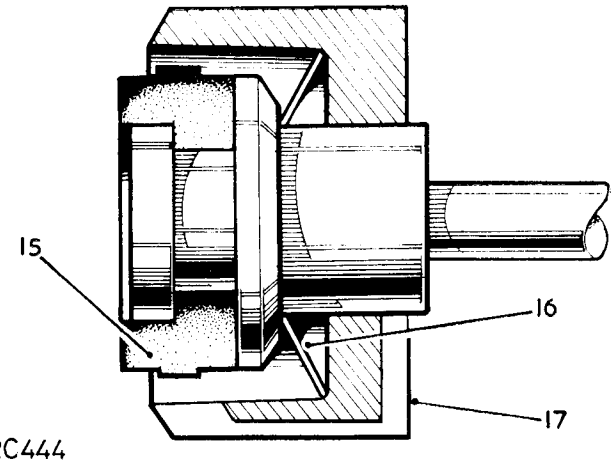
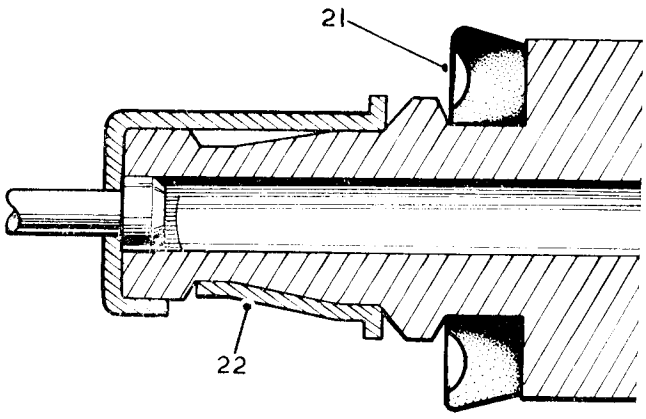


1RC444

21. Fit the seal, large diameter last, to the piston.
22. Insert the piston into the spring retainer and engage the locking prong.
23. Smear the piston with Castrol-Girling rubber grease and insert the assembly, valve end first, into the cylinder.
24. Fit the push rod, retaining washer and circlip.
25. Refit the master cylinder. 2.8.



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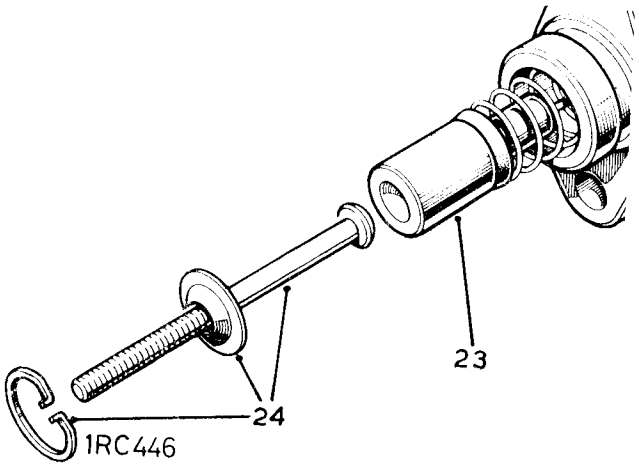


1RC446

SLAVE CYLINDER

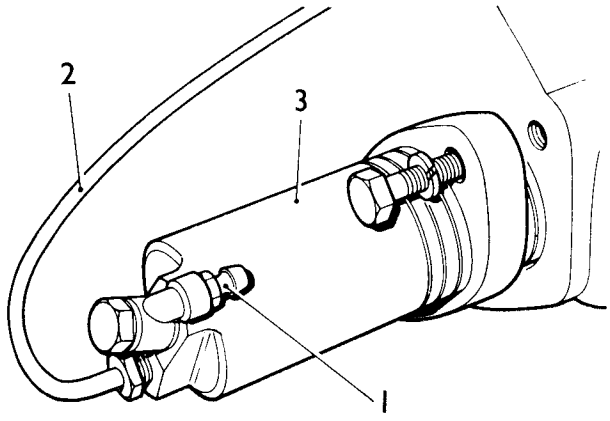
—Remove and refit **2.10**

Removing

1. Evacuate the clutch system fluid at the slave cylinder bleed valve.
2. Disconnect the fluid pipe.
3. Remove the slave cylinder.

Refitting

4. Position the push rod central to the body.
5. Fit the slave cylinder, bleed valve uppermost.
6. Fit the fluid pipe.
7. Bleed and replenish the hydraulic system.
8. Check for fluid leaks with the pedal depressed and also with the system at rest.



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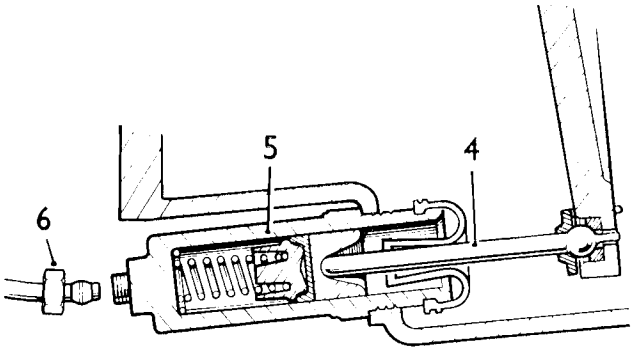
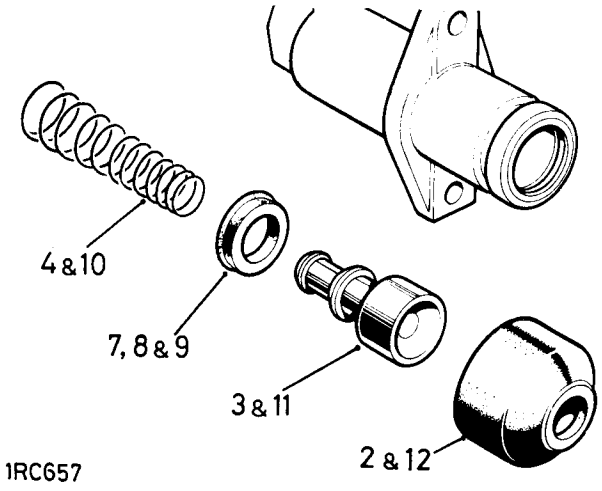


1RC661C

SLAVE CYLINDER

—Overhaul **2.11**



Dismantling

1. Remove the slave cylinder. 2.10.
2. Withdraw the dust cover.
3. Expel the piston assembly, applying low pressure air to the fluid inlet.
4. Withdraw the spring.

Inspecting

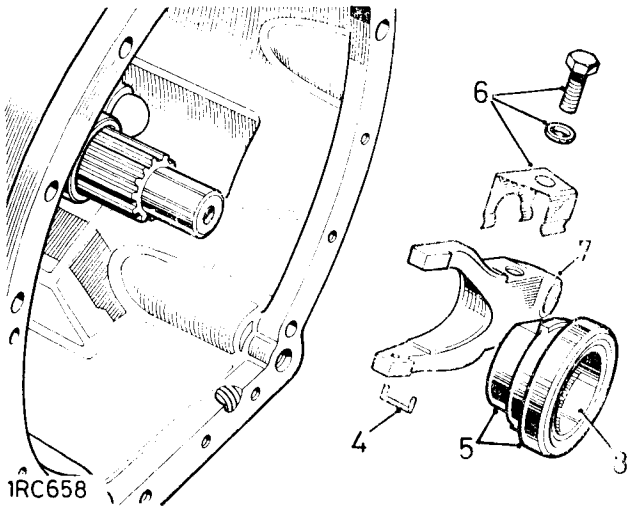
5. Clean all components in Girling cleaning fluid and allow to dry.
6. Examine the cylinder bore and piston, ensure that they are smooth to the touch with no corrosion, score marks or ridges. If there is any doubt, fit new replacement.
7. The seal should be replaced with a new component.

Assembling

8. Smear the seal with Castrol-Girling rubber grease and the remaining internal items with Castrol-Girling brake and clutch fluid.
9. Fit the seal, large diameter last, to the piston.
10. Locate the conical spring, small diameter first, over the front end of the piston.
11. Smear the piston with Castrol-Girling rubber grease and insert the assembly, spring end first, into the cylinder.
12. Fill the dust cover with Castrol-Girling rubber grease and fit the cover to the cylinder.
13. Refit the slave cylinder. 2.10.

CLUTCH RELEASE ASSEMBLY

—Remove and refit **2.12**



Removing

1. Remove the front floor. 17.4.
2. Remove the gearbox. 7.10.
3. Remove the clutch slave cylinder.
4. Withdraw the retainer staple.
5. Withdraw the bearing and sleeve. If required, press the bearing off the sleeve. Fit the replacement bearing with the domed face outwards from sleeve.
6. Remove the spring clip and fixings.
7. Withdraw the release lever assembly.

Refitting

8. Reverse 1 to 7. Lubricate the bearing sleeve inner diameter with PBC (Poly Butyl Cuprysil) grease.

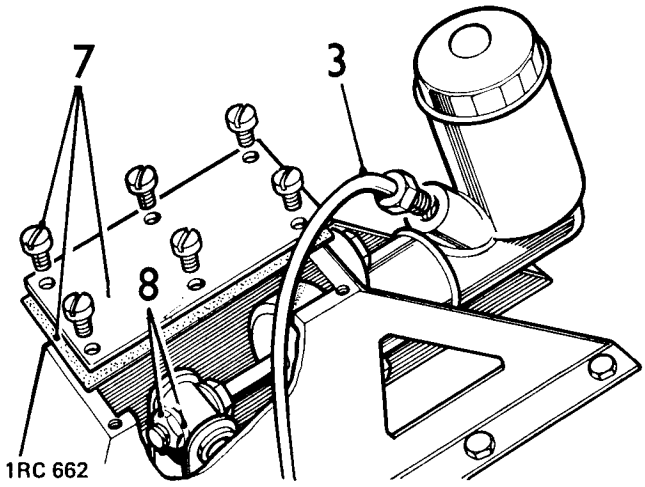
CLUTCH PEDAL

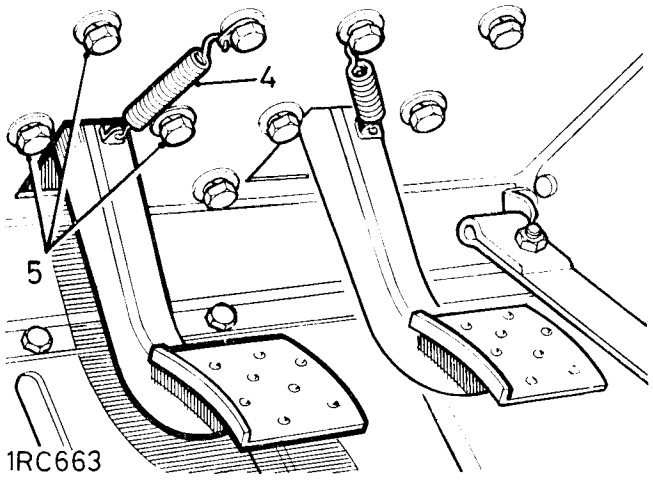
—Remove and refit **2.13**

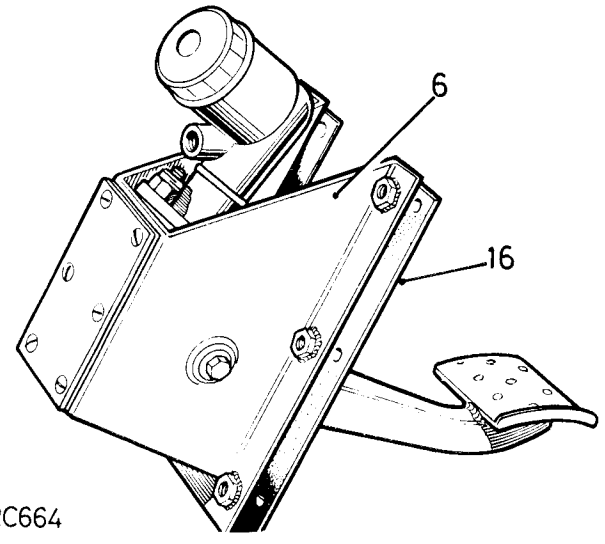
Removing

1. Remove the bonnet. 17.7.
2. Remove the LH front wing. 17.5.
3. Disconnect the fluid pipe from the clutch master cylinder.
4. Disconnect the return spring from the clutch pedal.
5. Remove the fixings securing the clutch pedal bracket from inside the vehicle cab.
6. Withdraw the bracket complete with pedal and master cylinder.
7. Remove the top cover and gasket from the clutch pedal bracket.
8. Remove the fixings from the end of the master cylinder push rod and push the rod into the master cylinder to clear the pedal trunnion.

continued







9. Using a suitable punch, drift out the pin from the pedal shaft.
10. Withdraw the pedal shaft.
11. Withdraw the clutch pedal complete with trunnion and bushes.
12. If required, remove the bushes, trunnion and distance piece from the clutch pedal.

Refitting

13. If removed, fit the distance piece, trunnion and bushes to the clutch pedal. Lubricate the trunnion and distance piece with general purpose grease on assembly. New pedal bushes must be reamered to 15,87 mm + 0,02 mm (0.750 in + 0.001 in).
14. Remove the oil plug and washer from the pedal shaft. Fill the shaft bore with clean engine oil and refit the plug and washer.
15. Reverse 8 to 11.
16. Place the gasket in position on the securing flange of the brake pedal bracket. If necessary, use Bostik adhesive to retain the gasket.
17. Reverse 3 to 6.
18. Bleed the clutch hydraulic system. 2.7.

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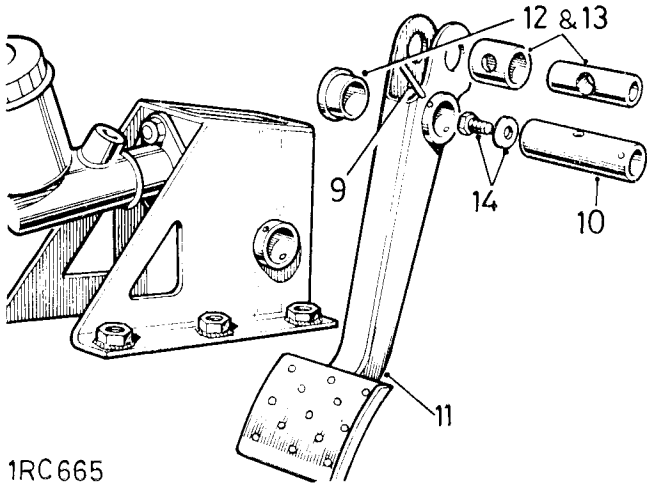
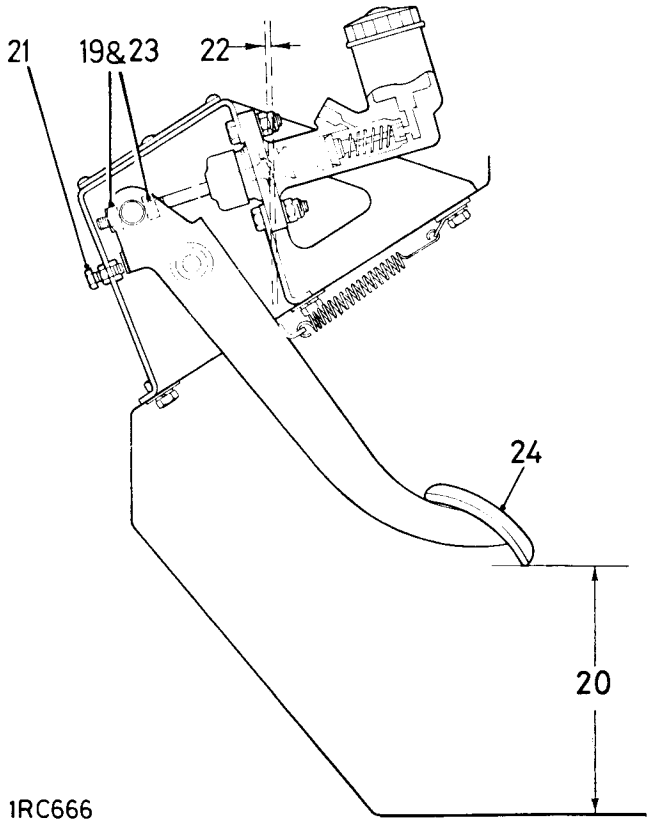


Clutch pedal and master cylinder setting

19. Remove the top cover and slacken both locknuts on the master cylinder push rod.
20. Check the distance from the lower edge of the clutch pedal to the floor. The correct distance is 140 mm (5.500 in).
21. Adjust the pedal stop, as required, to obtain the correct distance.
22. Adjust the master cylinder push rod until there is approximately 1,5 mm (0.062 in) free play between the push rod and the master cylinder piston.
23. Tighten both locknuts.
24. Check the clutch pedal and ensure that there is a minimum of 6 mm (0.250 in) free movement of the pedal before pressure is felt. If necessary, readjust the master cylinder push rod.
25. Fit the gasket and top cover to the clutch pedal bracket.
26. Reverse 1 and 2.



DATA

Clutch pedal pivot bushes, reamered diameter	15,87 mm + 0,02 mm (0.750 in + 0.001 in)
Clutch pedal height setting	140 mm (5.500 in)
Master cylinder push rod free play	1,5 mm (0.062 in)
Clutch pedal free play (minimum)	6,0 mm (0.250 in)

FUEL SYSTEM OPERATIONS

CARBURETTER, Zenith type 36IV

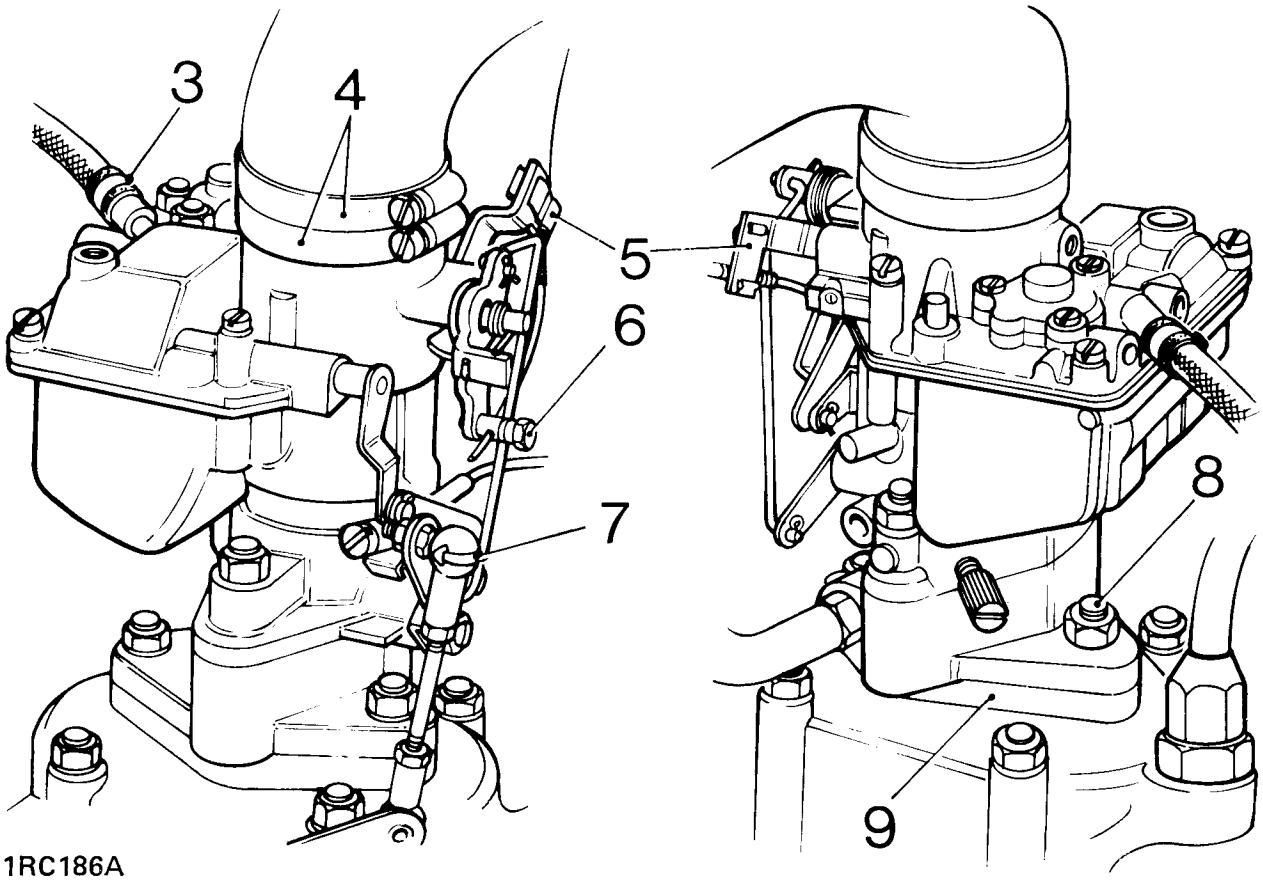
—Remove and refit 3.1

Removing

1. Prop open the bonnet.
2. Disconnect the battery earth lead.
3. Disconnect the fuel inlet pipe.
4. Disconnect the air inlet hose.
5. Release the cold start outer cable.
6. Disconnect the cold start inner cable.
7. Disconnect the throttle linkage.
8. Remove the carburetter.
9. Lift off the adaptor piece and joint washers.

Refitting

10. Reverse 2 to 9. When the cold start cable is connected, check that the maximum travel on the carburetter linkage is obtainable in both directions.
11. Close the bonnet.



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CARBURETTER, Zenith type 36IV

—Overhaul and adjust **3.2**

Dismantling

1. Remove the carburetter. 3.1.

Linkages, removing

2. Disconnect the interconnecting link.
3. Disconnect the accelerator pump spindle lever from throttle relay lever.

Top cover and emulsion block, separating

4. Remove the top cover from the carburetter body.
5. Withdraw the float assembly.
6. Remove the needle valve housing and needle.
7. Remove emulsion block from carburetter top cover, taking care not to drop the accelerator pump assembly which is now freed.
8. Withdraw the gasket from top cover.

Emulsion block, dismantling

9. Lift out the accelerator pump piston.
10. Remove all jets in the emulsion block.
    NOTE: At the base of the accelerator pump housing bore is a ball inlet valve retained by a circlip, there is no need to remove the valve for overhaul purposes.

Carburetter body, dismantling

11. Remove the idling volume control screw.
12. Detach the adaptor from the carburetter body.
13. Mark up for re-assembly purposes then remove the throttle butterfly disc followed by the throttle spindle and linkage if required.
14. Remove the 'O' ring seal from the choke venturi tube.

Carburetter top cover, dismantling

15. Dismantle the economy valve assembly, taking care to retain the diaphragm spring.
16. If required remove the choke butterfly (after marking up) followed by the choke spindle, taking care to retain the thin washer.
17. Remove the spindle and lever for the accelerator pump.
18. Remove the ventilation screw for the choke.

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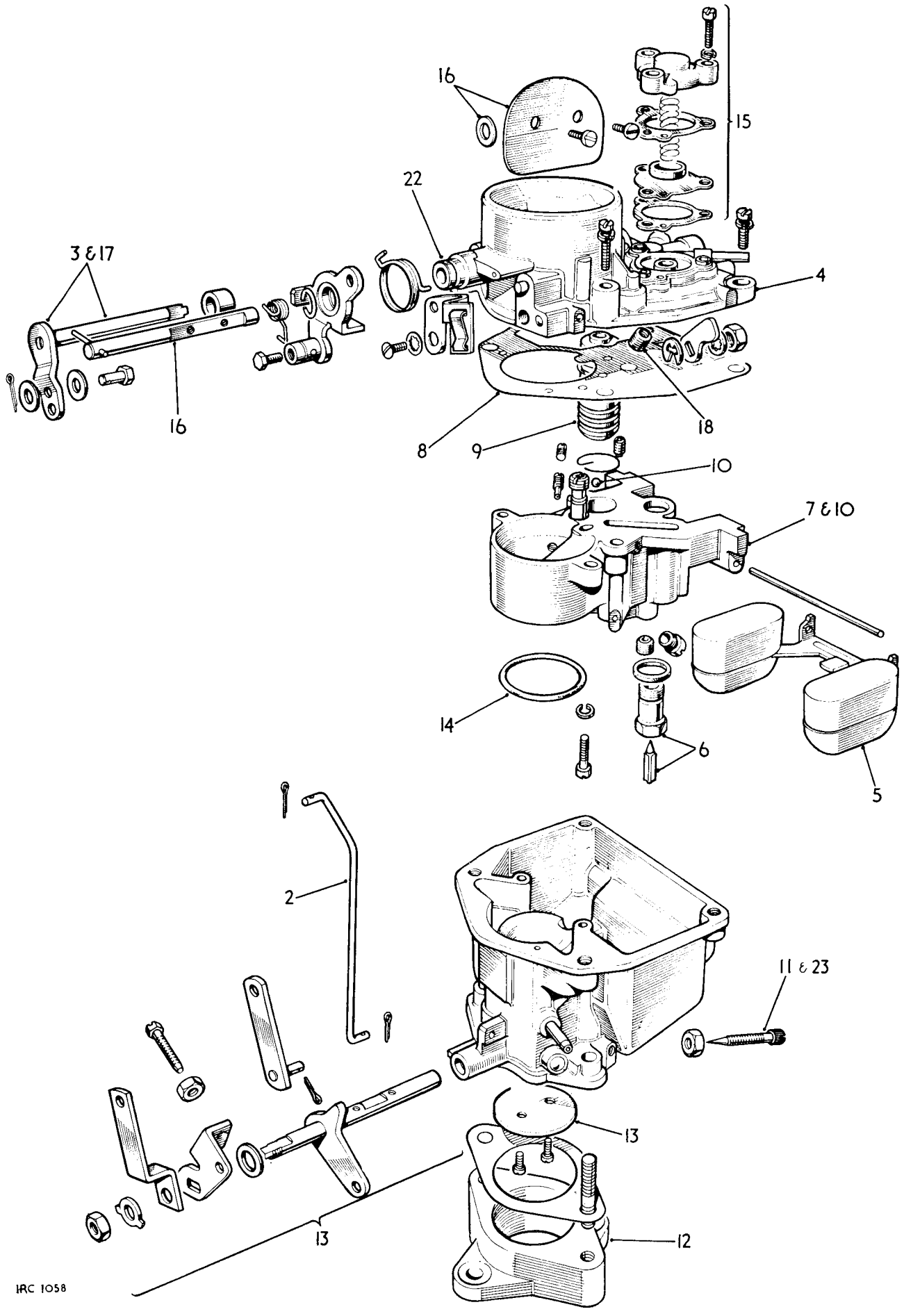
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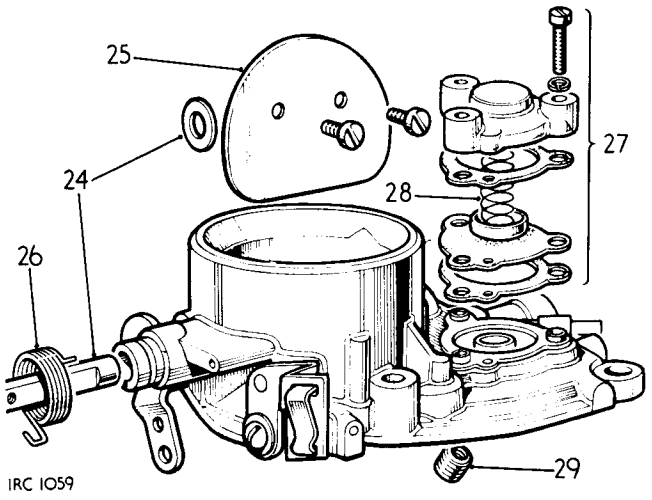
IRC 1058

Inspecting and cleaning

Special Notes

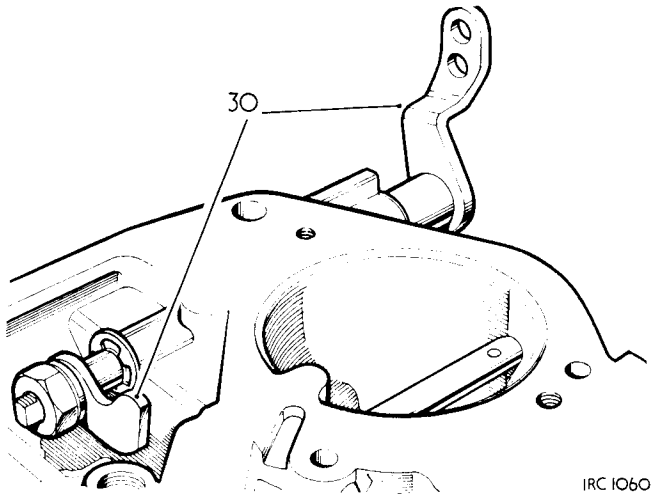
19. **Carburetter cleaning**
When cleaning fuel passages do not use metal tools (files, scrapers, drills, etc.) which could cause dimensional changes in the drillings or jets. Cleaning should be effected using clean fuel and, where necessary, a moisture-free air blast.
20. **Joint faces**
If the joint faces on the emulsion block, top cover or carburetter body show any signs of distortion or the edges are burred, these faces may be reclaimed by flatting, using fine grade abrasive cloth and a surface plate. Examine the faces for deep scores which would lead to leakage taking place when assembled.
21. **Joint gasket and seals**
New gaskets and seals should be used throughout carburetter rebuild. A complete set of gaskets is available for replacement purposes.
22. Examine the throttle spindle bushes for wear, if oval or badly worn replace the carburetter body.
23. Examine the tapered end of the idling volume screw for wear and damage, replace as required.



Re-assembling

Carburetter top cover

24. If previously dismantled, insert the choke spindle into its housing and at the same time refit the thin washer.
25. Locate the choke butterfly on the spindle and loosely retain with the two special screws. Operate the butterfly to centralise it on the spindle, then secure the screws and lock them by peening.
26. Engage the spring end on to the choke swivel lever.
27. Fit the economy valve gasket, diaphragm assembly and a further gasket to the top cover upper face, aligning the holes in the gaskets and diaphragm with the drilling in the top cover face.
28. Locate the spring in the seating on the diaphragm assembly, locate the valve cover spigot on the spring free end and align the drilling in the cover casting with the hole in the gasket. Push down on the cover, keeping it square to the diaphragm, then secure.
29. Fit the ventilation screw to the angled tapping in the top cover lower face.
30. Fit the spindle and lever for accelerator pump as illustrated.



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Zenith type 36IV

Emulsion block, assembling

31. Fit the blanked off jet.
32. Fit the slow running jet.
33. Fit the pump jet, followed by the pump jet tapping plug, to the tapping in the side of the emulsion block.
34. Fit the main jet and the enrichment jet to the emulsion block, the enrichment jet into the vertical tapping and the main jet into the angled tapping.

Fitting the emulsion block to the carburetter top cover

35. Position the gasket on top cover joint face.
36. Apply a thin smear of clean lubricating oil to the accelerator pump piston and assemble, piston first, into its housing bore in the emulsion block.
37. Ensure that the accelerator pump spindle lever is positioned inboard to align with accelerator pump plunger, position emulsion block and accelerator pump assembly on top cover joint face.
38. Ensure that the sealing washer for the needle valve housing is in good condition and fit the washer.
39. Fit the needle valve housing and the securing screws in the emulsion block. Do not fully tighten at this stage.
40. Check that the fuel passage drillings in the top cover are clear and not masked by misalignment of the gasket. Now fully tighten the emulsion block securing screws and needle housing.
41. Fit the needle valve into its seating in the needle valve housing. Check for leakage past the assembly by holding the needle valve on to its seating and blowing air into the fuel inlet pipe.

Fitting the float assembly

42. Position float assembly on to top cover, align pin holes in float carrier and emulsion block flange lugs and secure float carrier with hinge pin.
43. With the needle valve on its seating and the central tongue on the float carrier contacting on the needle valve, measure the distance between the gasket upper face and the highest point on the floats as illustrated.
44. The dimension required is 33 mm (1.3 in). Any adjustment must be made by deflecting the central tongue which abuts the needle valve; adjustment must not be made by bending the float carrier arms.

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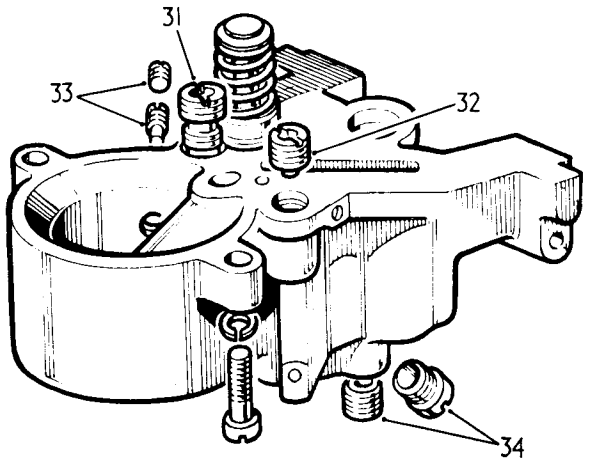

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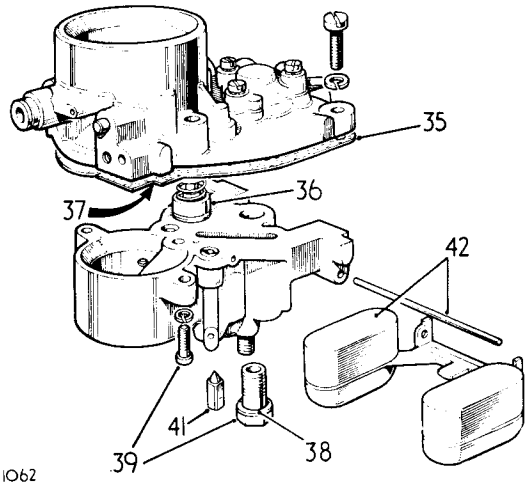

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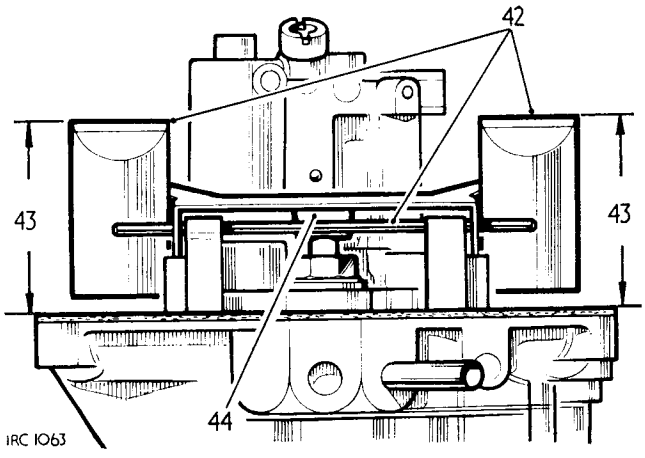
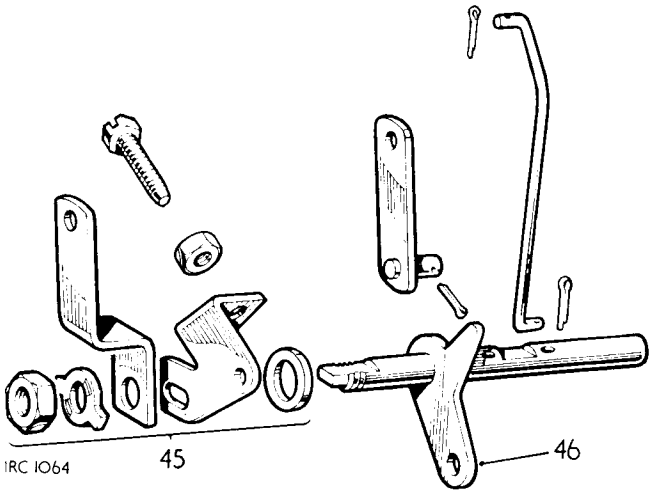


IRC 1063

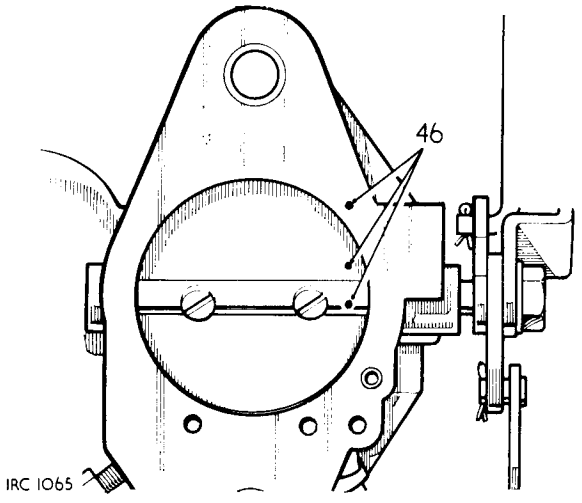
Zenith type 36IV

45. Assemble the throttle linkage to the spindle, insert the floating lever, plain washer, throttle stop, throttle lever, lock tab and securing nut as illustrated.
46. Fit the throttle spindle assembly to the carburetter then insert the butterfly into the spindle, aligning marks previously made, and loosely retain with the two special screws. Operate the butterfly to centralise it on the spindle, then secure the screws and lock them by peening.
47. Fit the carburetter adaptor to the carburetter body using a new gasket and tighten evenly.



Fitting top cover and emulsion block to carburetter body

48. Fit the 'O' ring seal to the seating around the top end of the venturi barrel. Ensure that the 'O' ring is correctly seated. THIS IS VERY IMPORTANT AS POOR JOINTING WOULD CREATE POOR FUEL CONSUMPTION.
49. Offer up the cover and emulsion block assembly to the carburetter body. Check that the 'O' ring seal around the venturi barrel is holding off the emulsion block, indicated by a small gap between the top cover gasket and carburetter body joint faces. This will ensure a compression seal on the 'O' ring when assembled.
50. Secure the assembly, evenly, to the carburetter body. Then replace the idling volume control screw.



Carburetter linkage, reconnect

51. Connect the throttle relay lever to the hole furthest from the fulcrum on the accelerator pump spindle lever, using clevis pin, two plain washers and split pin.
    NOTE: In cold ambient conditions use the hole nearest the fulcrum.

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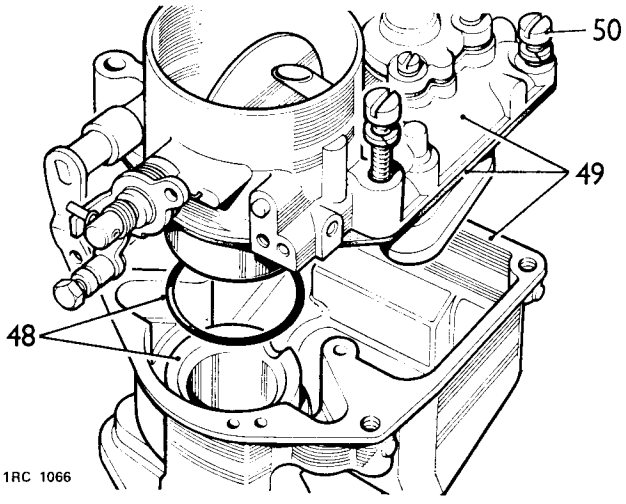


Zenith type 36IV

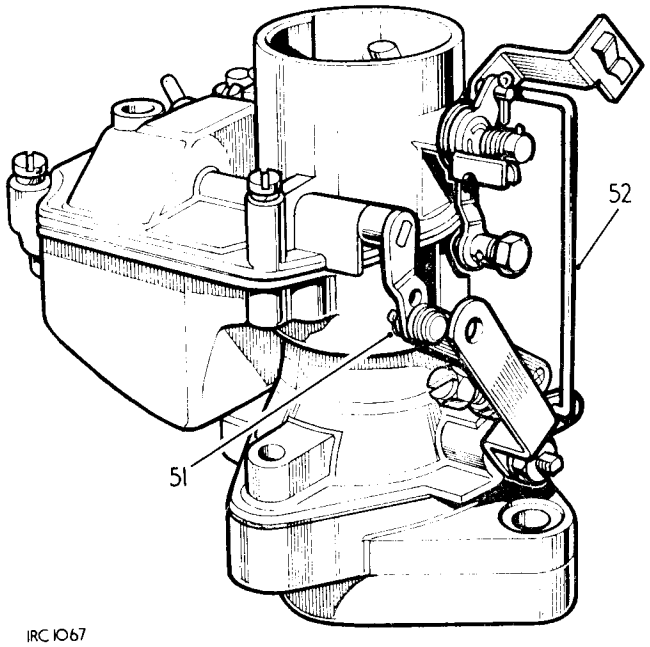
52. Fit the interconnecting link between choke operating tab and the floating lever on the throttle spindle and secure with split pins.

Fast-idle setting

53. Fully close choke butterfly by actuating choke operating tab. It should be possible to slide a 1,40 mm (0.055 in) diameter drill between throttle butterfly edge and the carburetter body. If necessary, bend interconnection link to achieve this condition.
54. Refit the carburetter. 3.1.

Carburetter, to set and adjust

55. Before any attempt is made to set the idling speed, a thorough check should be made to ensure that the throttle linkage between the pedal and the carburetter is free and has no tendency to stick, also ensure full throttle operation.
56. Start engine and run until warm, denoted by thermostat outlet pipe becoming warm to the touch. Continue running for a further five minutes to thoroughly stabilise engine temperature.
57. Adjust the throttle stop screw to obtain engine idling speed of 500 rev/min.
58. Adjust the idling volume control screw until the engine runs smoothly and evenly. Recheck idle speed and correct as necessary. Recheck idling stability. It may be necessary to alternate adjustments between idling volume control screw and throttle stop screw to obtain the required idling setting. The idling volume control screw is then at the setting position required for all engine operating conditions.
    To confirm that the setting position selected is correct, turn the volume control screw in and out respectively from the setting position by approximately one-half turn; at these checking positions the engine note will alter and the engine running will become uneven. After checking, return the volume control screw to the correct setting position selected midway between the checking positions.



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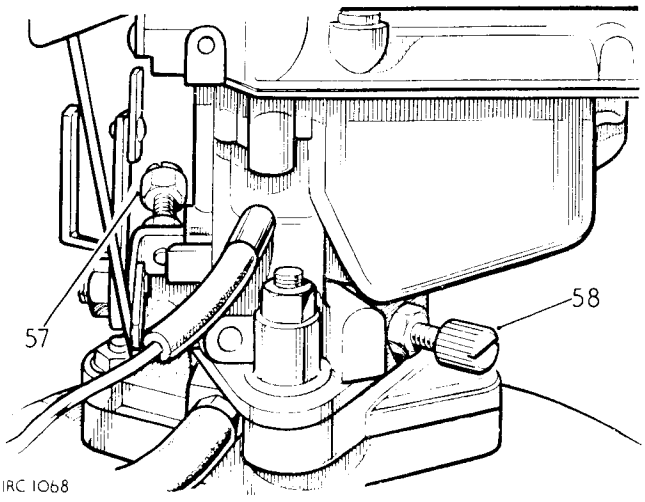


IRC 1068

DATA

Float height setting	33 mm (1.300 in)
Fast-idle setting	1,40 mm (0.055 in) between throttle butterfly edge and carburetter barrel
Idling speed	500 to 550 rev/min

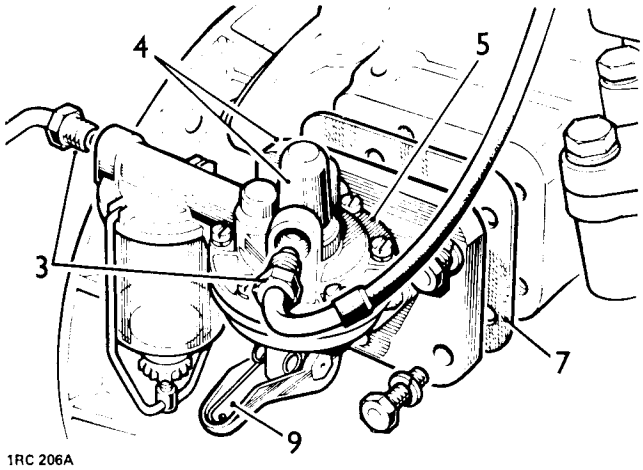
FUEL LIFT PUMP

—Remove and refit 3.3

1. Remove bonnet panel. 17.7.
2. Remove air cleaner. 3.5.
3. Disconnect fuel pipes at fuel pump.
4. Remove the fixings and withdraw the pump and side cover complete.
5. Remove the fuel pump from the side cover.

Refitting

6. Refit pump to cover.
7. Smear general purpose grease on both sides of the joint washer.
8. Refit the fuel pump and joint washer, locating the clutch pipe bracket on to the rear fixing, connect the fuel pipes.
9. Prime the fuel pump by operating the hand prime lever until no resistance is felt.
10. Reverse 1 and 2.



1RC 206A

FUEL LIFT PUMP

—Overhaul **3.4**

Dismantling

1. Remove the lift pump. 3.4.
2. Unscrew the nut at base of sediment bowl, move the retainer aside, and withdraw the bowl, sealing washer and filter gauze. Care should be taken to avoid damage to filter gauze.
3. Mark the upper and lower halves of pump casing to ensure correct alignment on reassembly.
4. Remove top cover fixing screws, and while pressing diaphragm tab against pump body, lift top cover clear.
5. If required, remove the valves retaining staking using a scraper, warm the top cover and withdraw the valves.
   NOTE: Note the valves fitted position before removing.
6. Ease the diaphragm from pump body, slightly depress metal part of diaphragm and turn through 90° in either direction, whereon the diaphragm spring will push diaphragm clear.
7. File the peening marks from the oil seal housing and lever out oil seal and retainer.

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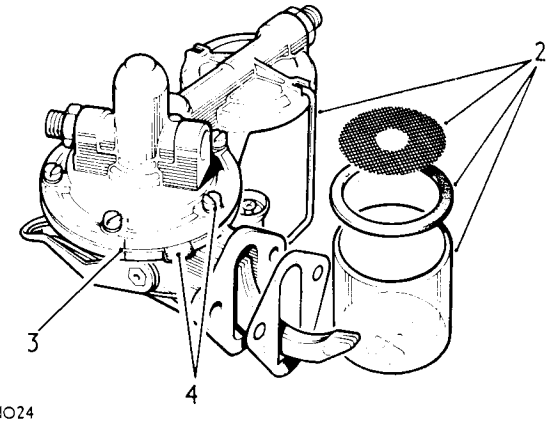

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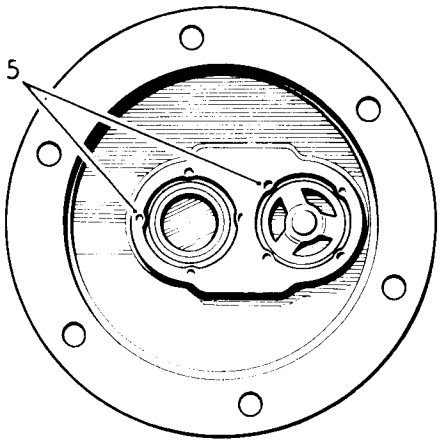

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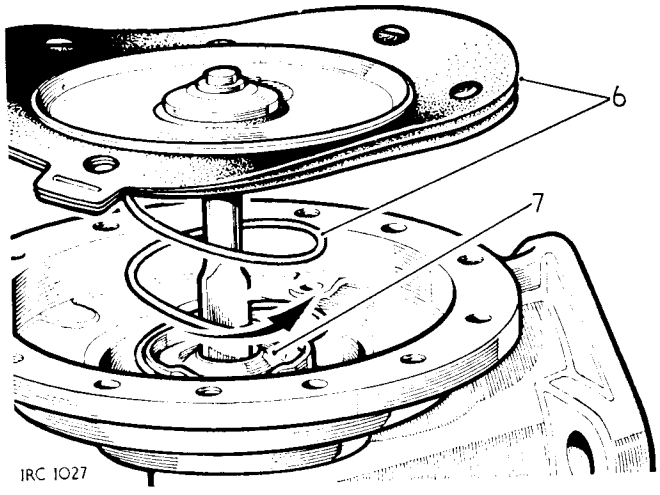
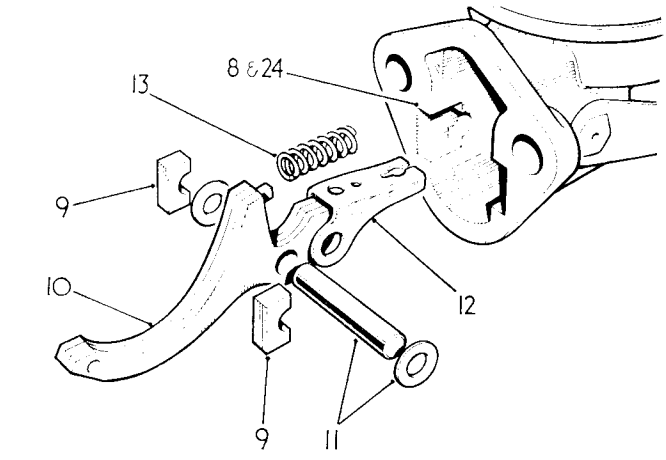


IRC 1027

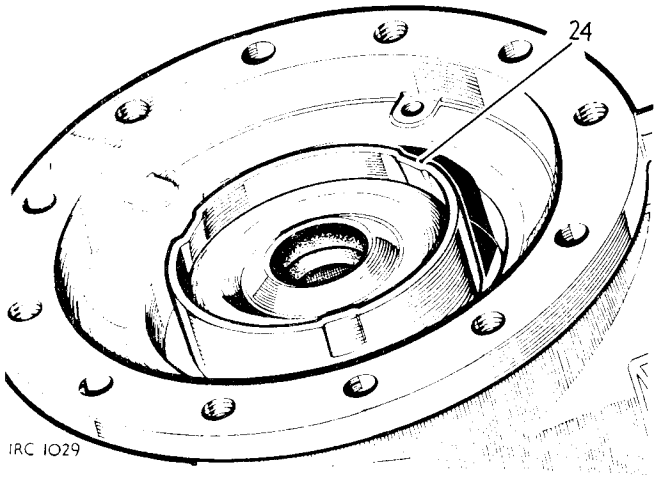
8. Using a small chisel, remove the staking from the rocker arm retainers.
9. Withdraw the retainers.
10. Withdraw the rocker arm.
11. Withdraw the rocker arm pin and washers.
12. Detach the operating link.
13. Withdraw the rocker arm spring.
14. It is extremely unlikely that the hand priming mechanism will ever require replacement, but may be removed by filing the hexagon each side of the operating lever and springing the hand lever clear, withdraw the cork washers and hand rocker.



IRC 1028

Inspecting

15. Clean all parts thoroughly in paraffin.
16. Examine all parts for wear and replace as necessary.
17. Replace all gaskets.
18. Sediment bowl filter disc must be free of damage and fit tightly round inlet neck of upper casing.
19. Renew diaphragm assembly if any sign of hardening, cracking or porosity is present.
20. Only very slight wear should be tolerated at the rocker arm contact face, pivot pin, operating link and diaphragm pull rod slots.
21. Springs should be replaced, ensure correct type are used.
22. Test valves for air tightness, by suction.
23. Check upper and lower casing flanges for distortion, using a straight edge.



IRC 1029

Reassembling

24. Reverse 7 to 13. Re-stake to secure the rocker lever retainers and the oil seal retainer.

continued

25. To refit the diaphragm assembly, hold the pump body with the diaphragm return spring in position, and the rocker arm held outwards. Position the diaphragm over the spring with the flattened end of the pull rod in line with the slot in the operating link. Push the diaphragm inwards and turn to lock.
26. Fit the valve gaskets into the top cover.
27. Fit the inlet and outlet valves and secure by staking.
28. Place top cover assembly in position, aligning the marks made before dismantling. Fit securing screws, but do not tighten at this stage; using hand priming lever, fully depress diaphragm and fully tighten securing screws.

    NOTE: The diaphragm outer edges should be approximately flush with the outer edge of the pump joint faces when fitted, any appreciable protrusion of the diaphragm beyond the joint face edges indicates improper fitment and necessitates the release of the securing screws and refitment in accordance with item 28.
29. Replace filter gauze and neoprene sealing ring, refit retaining clip and position sediment bowl centrally and secure with retaining clip.

    NOTE: Do not overtighten securing nut, to prevent cracking of sediment bowl.

Fuel pump test: without special equipment.

30. Immerse pump in a bath of paraffin and operate rocker arm several times to flush.
31. Hold the pump clear of the bath and continue to operate the rocker arm until the pump is empty, then place a finger over the inlet port and operate rocker arm several times. A distinct suction should be heard when the finger is removed from the inlet port, denoting that a reasonable degree of suction has been developed.
32. Place a finger over the outlet port and again operate the rocker arm. Air pressure should be felt for two to three seconds after rocker movement has ceased. Build up the air pressure in the pump again, and with the finger held firmly over the outlet, submerge the pump completely in the paraffin bath, then observe the joint face edges for signs of air leakage.
33. Reverse 1.

AIR CLEANER

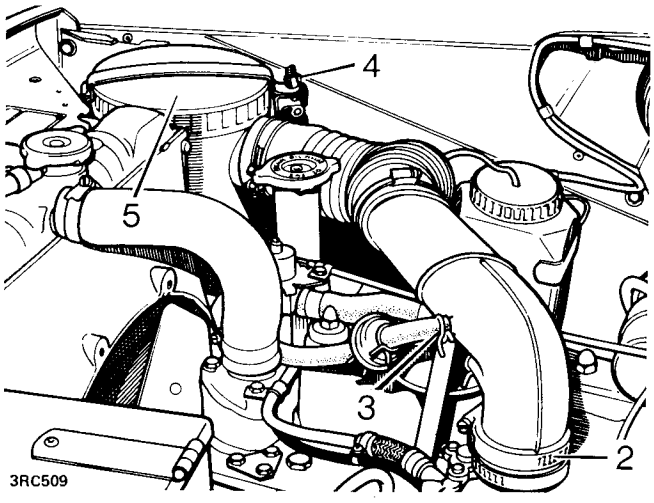
—Remove and refit **3.5**

Removing

1. Lift and prop the bonnet panel.
2. Disconnect the air intake elbow from the carburetter.
3. Disconnect the crankcase emission hose.
4. Slacken the fixings and move aside the retaining strap.
5. Remove air cleaner complete with hose.

Refitting

6. Reverse 1 to 5. Ensure that the oil container hinged clips are clear of the retaining strap supports when fitted.



AIR CLEANER

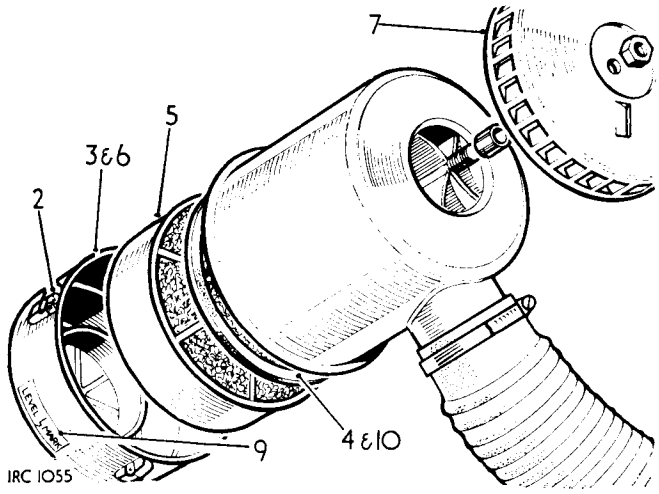
—Clean and refill **3.6**

Dismantling

1. Remove the air cleaner. 3.5.
2. Release the hinged clips.
3. Withdraw the oil container.
4. Withdraw the sealing washer.
5. Lift out the wire mesh element.
6. Drain the oil container.
7. Remove the air intake cap.
8. Wash the metal parts in clean fuel.

Assembling

9. Add clean engine oil to the oil container, fill to the oil level mark.
10. Reverse 1 to 5 and 7, using a new sealing washer.



FUEL TANK, side mounted

—Remove and refit **3.7**

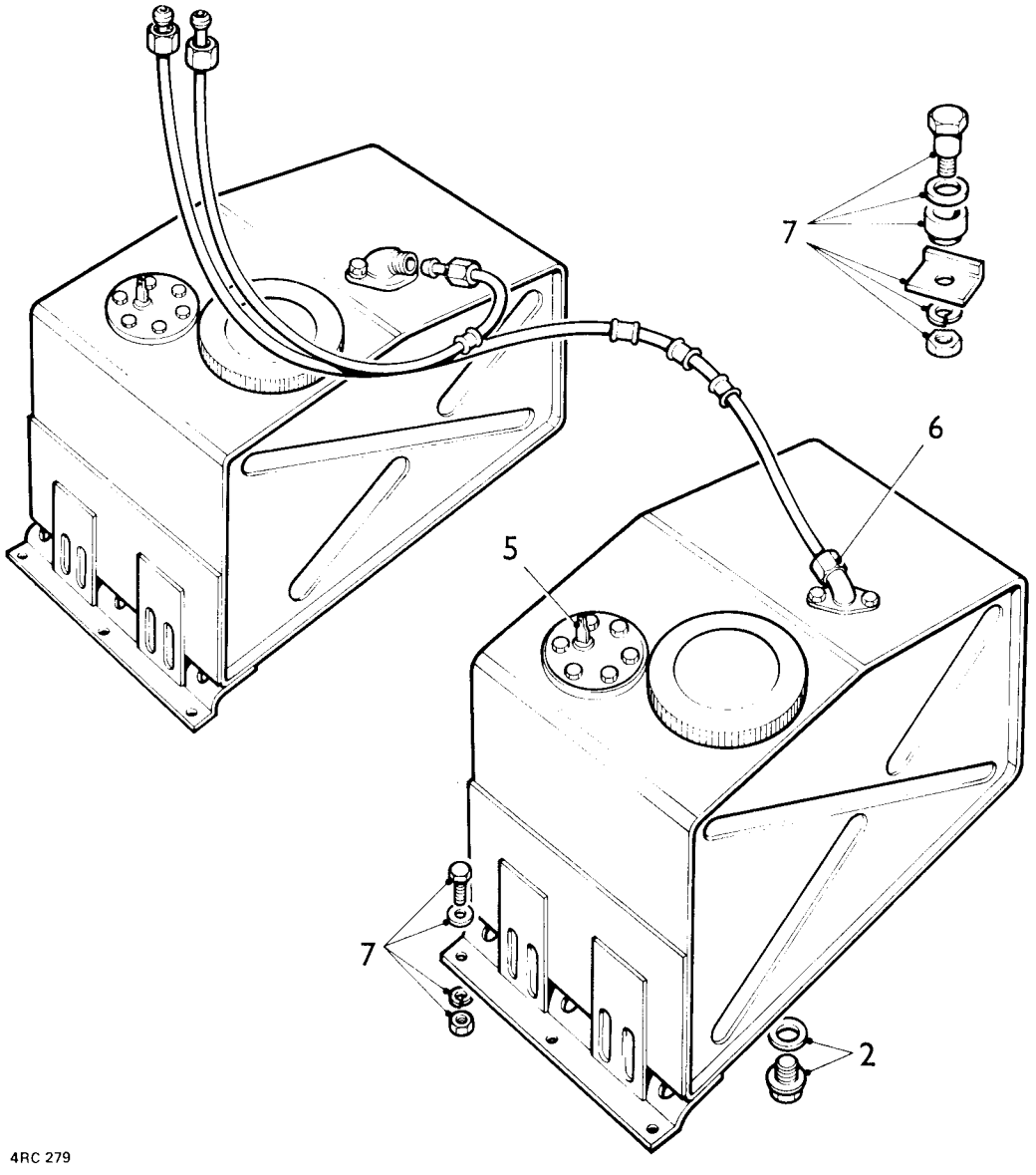
Removing

NOTE: The vehicle is fitted with two fuel tanks, one under the drivers seat and one under the passengers seat. The following instructions apply to either fuel tank.

1. Disconnect the battery earth lead.
2. Drain fuel into a clean container.
3. Remove seat cushion and fold seat squab forward.
4. Remove cover panel for fuel tank.
5. Disconnect wires at gauge unit.
6. Disconnect fuel supply pipe.
7. Support tank and remove tank securing bolts.
8. Lower tank and remove from under the vehicle.

Refitting

9. Reverse 1 to 8.



4RC 279

THROTTLE LINKAGE

—Remove and refit **3.8**

Removing

1. Disconnect the linkage return springs.
2. Disconnect the linkage adjacent to the pedal box.
3. Disconnect the linkage at the carburetter.
4. Remove the RH retaining bracket from the engine compartment dash.
5. Withdraw the throttle linkage complete.

Refitting

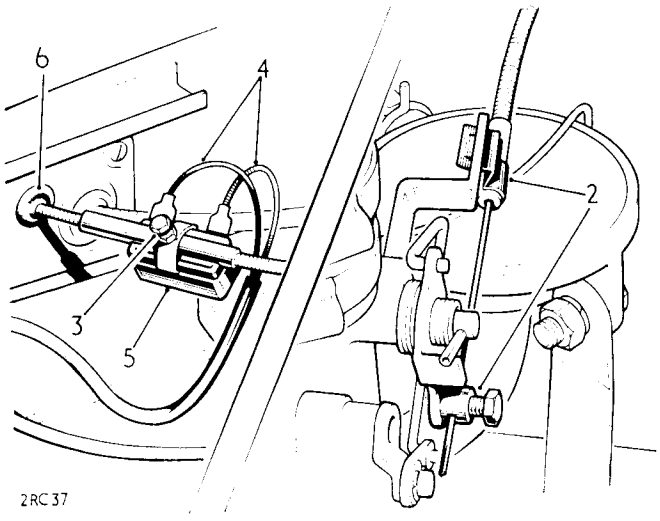
6. Reverse 1 to 6 leaving the pinch bolts loose at this stage.
7. Depress the throttle pedal onto the stop on the toe box floor.
8. Hold the throttle linkage in the fully open position.
9. Tighten the linkage pinch bolts and release the pedal and linkage.
10. If necessary adjust the throttle pedal stop on the toe box floor and the return stop at the toe box to permit full and unrestricted throttle opening.

COLD START CONTROL CABLE

—Remove and refit **3.9**

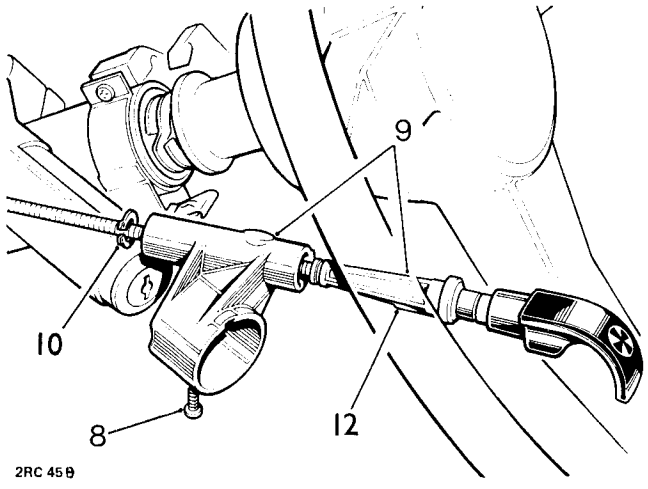
Removing

1. Disconnect the battery earth lead.
2. Disconnect the inner and outer control cables at the carburetter.
3. Slacken the locknut and release the retainer screw fixing the switch unit to the control cable.
4. Disconnect the leads from the switch.
5. Withdraw the switch unit.
6. Withdraw the cable grommet at the engine compartment dash.
7. Remove the fixings and withdraw the steering column upper and lower shrouds.



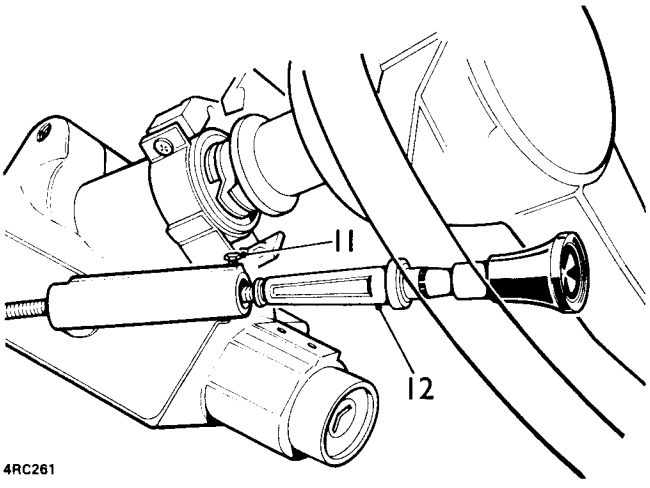
Early models: 8 to 10

8. Remove the cable housing locating screw.
9. Withdraw the control cable and housing complete from the steering column lock.
10. Remove the retaining circlip.



Later models: 11

11. Remove the screw retaining the cable.
12. Withdraw the control cable assembly complete.



Refitting

13. Reverse 1 to 12 and check the control operation.

EXHAUST SYSTEM OPERATIONS

EXHAUST SYSTEM

—Remove and refit

Front exhaust pipe
Removing

1. Remove securing bolts at front exhaust pipe and intermediate pipe joint.
2. Remove nuts and spring washers securing pipe at exhaust manifold.
3. Withdraw the exhaust pipe and joint washer.

Refitting

4. Reverse 1 to 3.

Intermediate exhaust pipe
Removing

5. Remove securing bolts at front exhaust pipe and silencer.
6. Remove supporting clamp and withdraw intermediate exhaust pipe.

Refitting

7. Reverse 5 and 6, leaving the supporting clamps loose until the pipe has been secured firmly to front exhaust pipe and silencer.

Exhaust silencer
Removing

8. Remove bolts securing intermediate pipe to silencer.
9. Keeping the silencer supported, release the supporting strap for silencer right-hand side and saddle clamp on tail pipe, then withdraw silencer assembly.

Refitting

10. Fit the silencer in position and loosely support by means of supporting strap and saddle clamp.
11. Secure the intermediate pipe to silencer.
12. Finally tighten bolts securing support strap and saddle clamp.

COOLING SYSTEM OPERATIONS

COOLANT

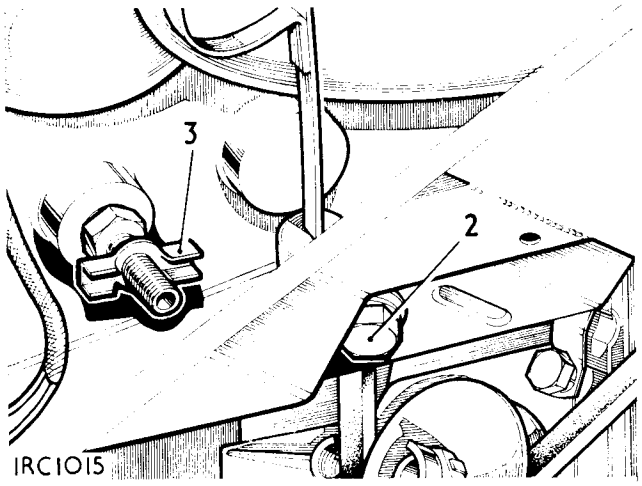
—Drain and refill 5.1

Draining

1. Remove the radiator filler cap.
2. Remove the radiator drain plug, RH side.
3. Open the cylinder block drain tap located at LH side adjacent to dipstick.

Refilling

4. Reverse 2 and 3. If antifreeze solution is to be added, first pour 4,5 litres (8 pints) of water into the system, then add the required quantity of the recommended solution.
5. Top up with water to between 12 mm and 19 mm (0.5 in and 0.75 in) below the bottom of the radiator filler neck.
6. Check and top up after the initial short engine run.
7. Ensure that the expansion tank coolant is maintained at one-quarter full approximately.



EXPANSION TANK

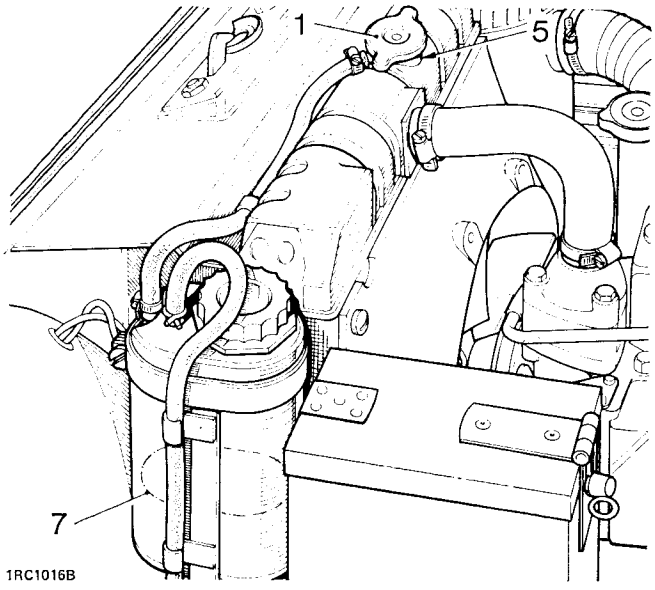
—Remove and refit 5.2

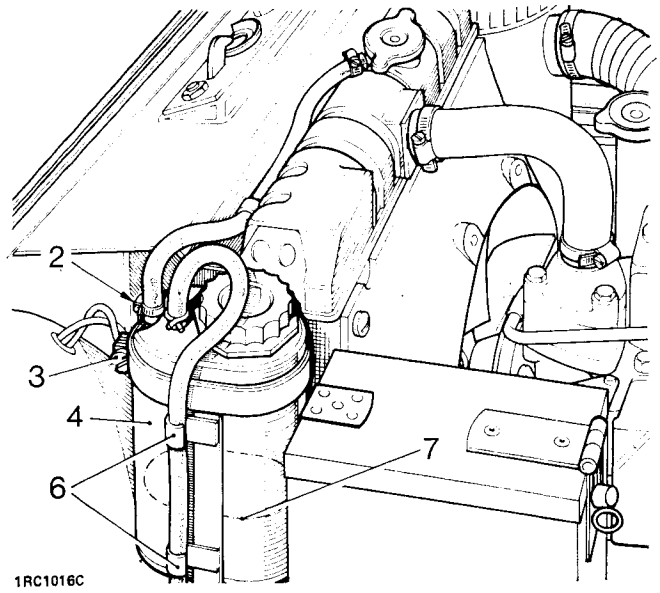
Removing

1. Open and prop the bonnet.
2. Disconnect the radiator overflow hose at the tank.
3. Slacken the tank retainer pinch bolt.
4. Withdraw the expansion tank.

Refitting

5. Reverse 3 and 4.
6. Refit the vent hose into the clips on the tank retainer.
7. Fill the expansion tank one quarter full approximately with coolant.
8. Reverse 1 and 2.





RADIATOR BLOCK

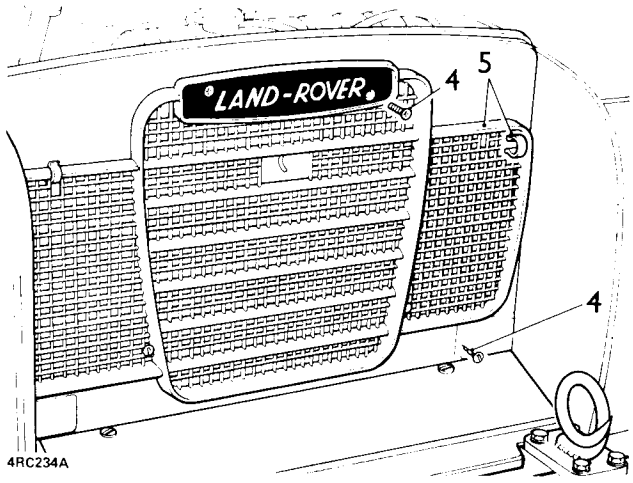
—Remove and refit **5.3**

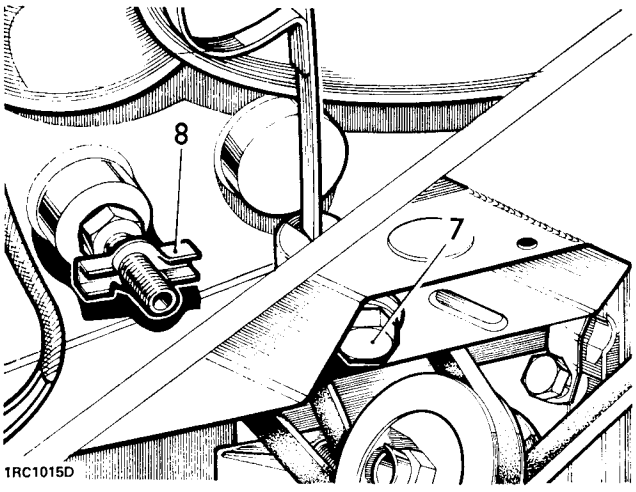
Removing

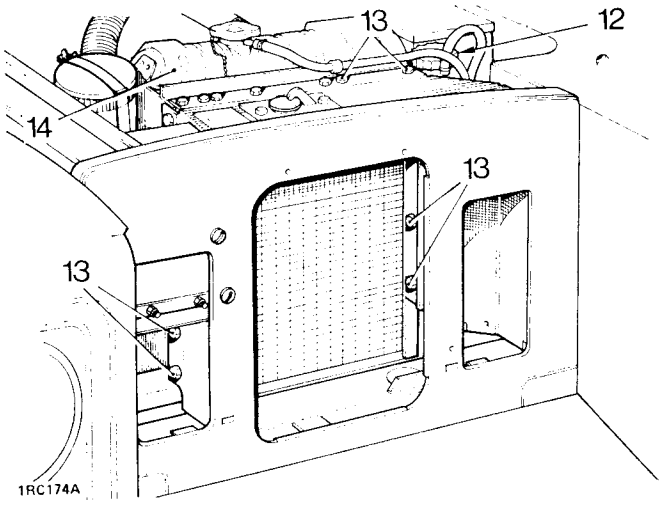
1. Remove bonnet panel. 17.7
2. Disconnect the battery earth lead.
3. Remove the air cleaner. 3.5
4. Remove the four screws from the radiator grille.
5. Withdraw the radiator grille from the retaining clips.
6. Remove the radiator cap.
7. Remove the radiator drain plug.
8. Open the drain tap at the cylinder block LH side.
9. Disconnect the radiator top and bottom hoses.
10. Slacken the idler pulley fixings and release the fan belt.
11. Remove the fan blades and fan pulley.
12. Remove the expansion tank.
13. Remove the fixings, radiator to grille panel.
14. Withdraw the radiator and fan cowl assembly.
15. Remove the fan cowl.

Refitting

16. Reverse 1 to 15, adjusting the fan belt tension to give 8 to 11 mm (0.312 to 0.437 in) free movement when checked midway between the crankshaft and idler pulleys.
17. Run the engine and check for leakages.

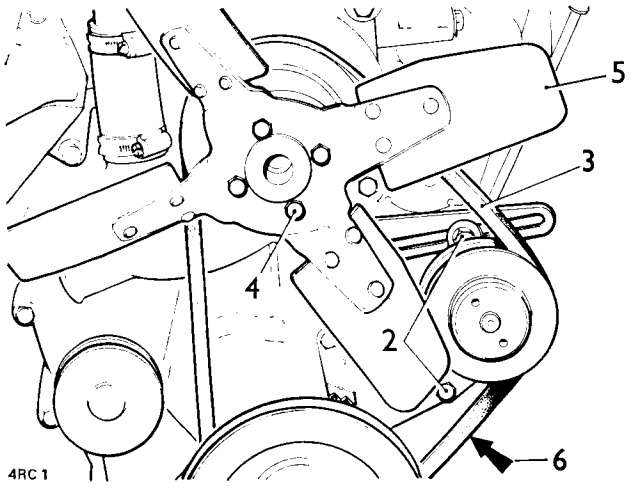






FAN BLADES AND PULLEY

—Remove and refit 5.4



Removing

1. Open and prop the bonnet.
2. Slacken the idler pulley fixings.
3. Release the fan belt.
4. Remove the fixings.
5. Withdraw the fan blades and pulley.

   NOTE: To remove and refit the fan belt, the alternator belt must also be removed and refitted.

Refitting

6. Reverse 3 to 5. Adjust the fan belt to give 8 to 11 mm (0.312 to 0.437 in) free movement when checked midway between the crankshaft and idler pulleys. Then secure the idler pulley fixings.
7. Reverse 1.

IDLER PULLEY HOUSING

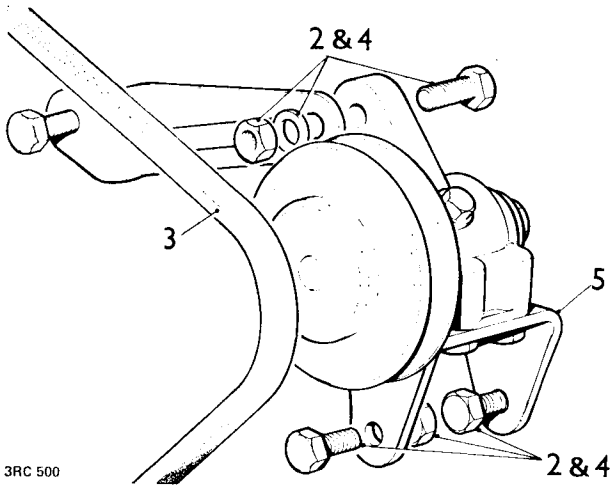
—Remove and refit **5.5**

Removing

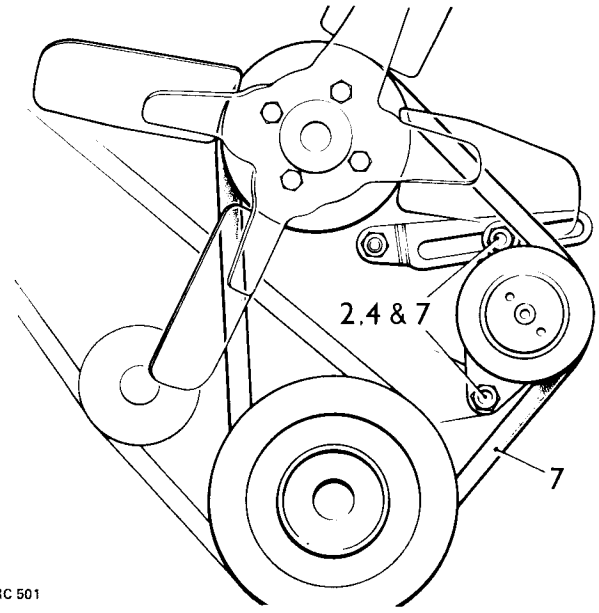
1. Prop open the bonnet.
2. Slacken the fixings at the idler pulley housing and adjustment link.
3. Pivot the idler pulley housing inwards and release the fan belt from the pulley.
4. Remove the fixings from the pivot and adjustment link and withdraw the idler pulley housing.
5. If required, remove the mounting bracket from the idler pulley housing.

Refitting

6. Reverse 3 to 5.
7. Adjust the fan belt to give 8 to 11 mm (0.312 to 0.437 in) free movement when checked midway between the crankshaft and idler pulleys. Then, secure the idler pulley fixings.
8. Close the bonnet.



3RC 500



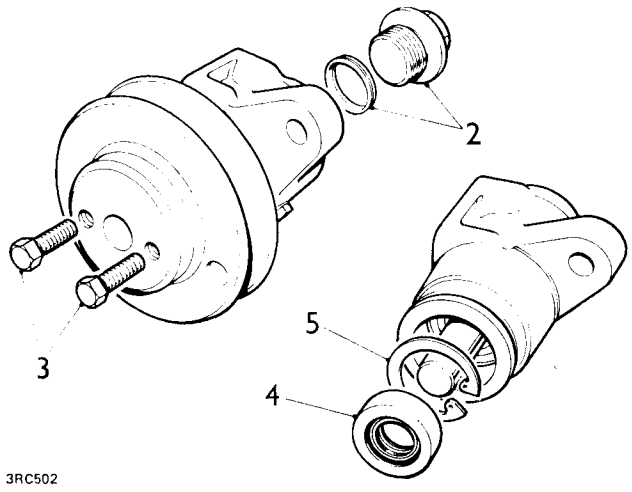
3RC 501

IDLER PULLEY HOUSING

—Overhaul **5.6**

Dismantling

1. Remove the idler pulley housing. 5.5.
2. Remove the plug and washer, and drain the lubricating oil.
3. Screw two bolts, 38 mm (1.500 in) length under head by $\frac{1}{4}$ in UNF thread, in to the tapped holes in the pulley, extract the pulley from the spindle.
4. Prise the oil seal from the housing.
5. Remove the circlip from the groove in the housing.
6. Using a suitable mandrel through the plug hole, press the spindle and bearing assembly from the housing.
7. Remove the circlip and large bearing from the spindle.
8. Extract the small bearing from the spindle.

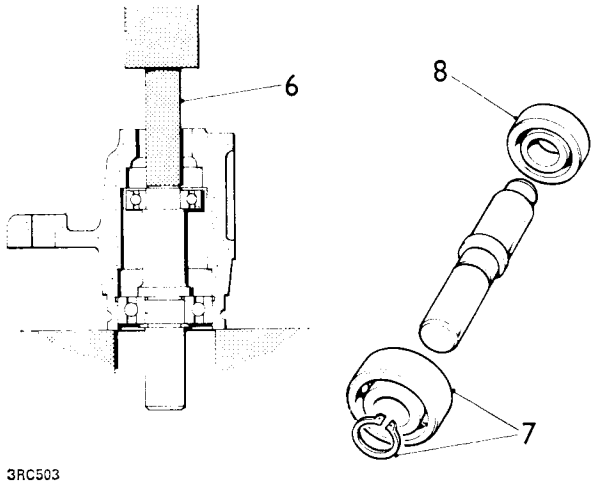


3RC502

Inspecting

9. Obtain a new oil seal, new bearings and a new washer for the plug.
10. Clean and examine the remaining components. Obtain a new replacement for any item that shows obvious signs of wear.

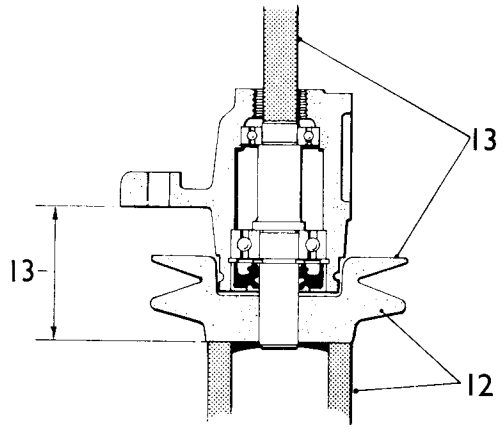
continued



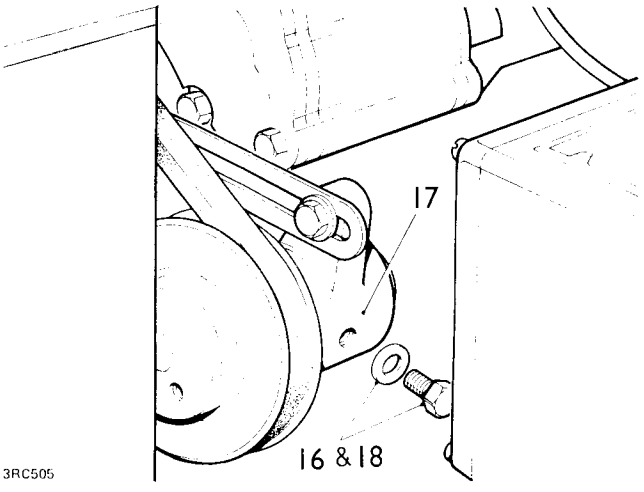
3RC503

Refitting

11. Reverse 4 to 8.
12. Place the pulley, front face down, over a suitable piece of tube on a mandrel press.
13. Position the idle pulley housing above the pulley and, using a suitable mandrel through the plug hole, press the spindle into the pulley until there is a dimension of 50,3 to 51,2 mm (1.984 to 2.016 in) between the front face of the pulley and the front face of the lug for the adjusting link.
14. Fit the plug to the rear of the housing using a new washer.
15. Refit the idler pulley housing. 5.5.
16. Remove the oil filler plug and washer.
17. Using clean engine oil, fill the idler pulley housing.
18. Refit the oil filler plug and washer.



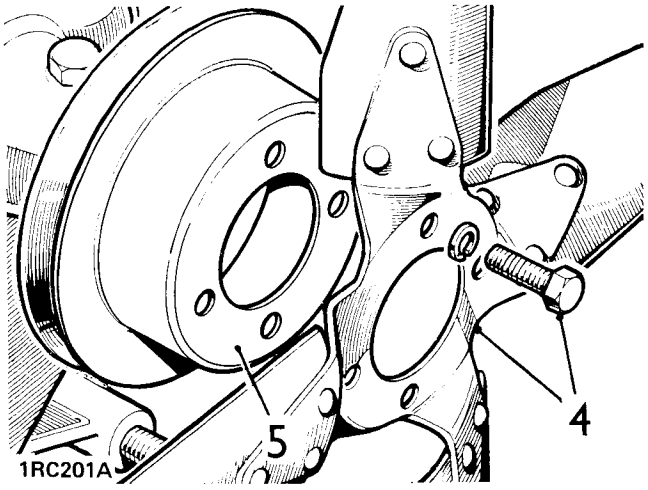
3RC504



3RC505

WATER PUMP

—Remove and refit **5.7**

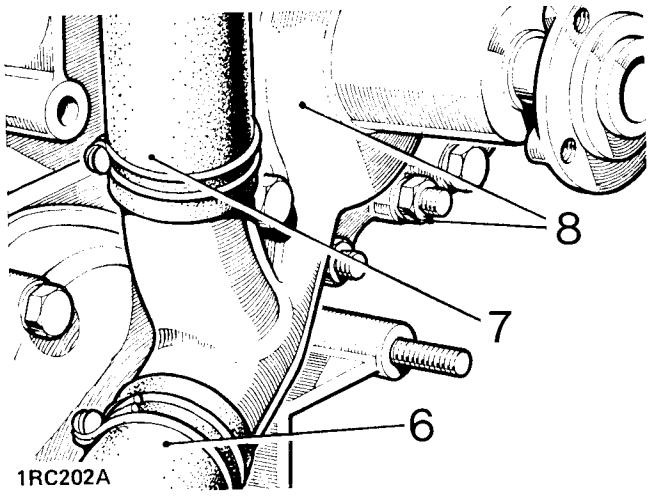


Removing

1. Remove the bonnet. 17.7.
2. Drain the cooling system. 5.1.
3. Slacken the idler pulley fixings and release the fan belt.
4. Remove the fan blades.
5. Withdraw the fan pulley.
6. Disconnect the radiator bottom hose at the water pump.
7. Disconnect the by-pass hose.
8. Remove the water pump.
9. Withdraw the joint washer.

Refitting

10. Smear both sides of a new joint washer with general purpose grease.
11. Reverse 3 to 9, adjusting the fan belt tension to give 8 to 11 mm (0.312 to 0.437 in) free movement when checked midway between the crankshaft and idler pulleys.
12. Reverse 1 and 2.



WATER PUMP

—Overhaul **5.8**

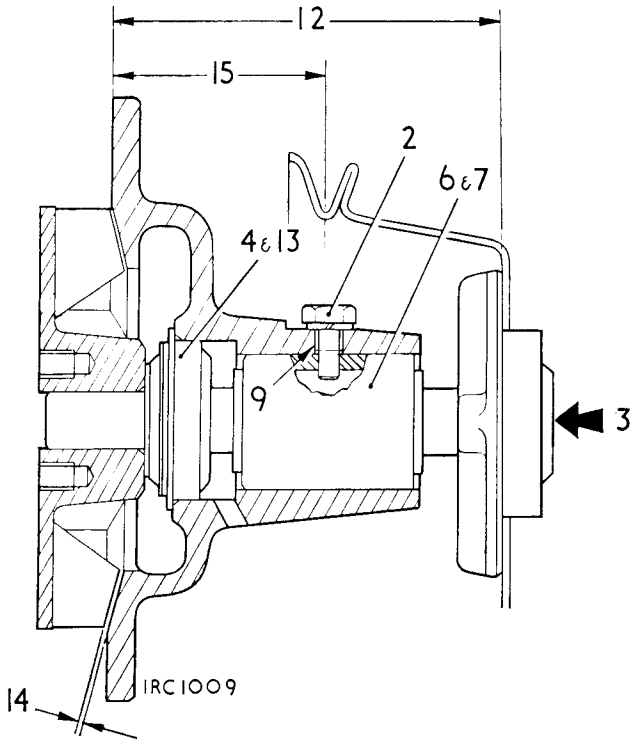
Dismantling

1. Remove the water pump. 5.1.
2. Remove the bearing location bolt.
3. Drift out the impeller, bearing and spindle as an assembly from the pump body and hub.
4. Cut through and remove the seal assembly from the spindle.
5. Insert the spindle into the water pump body, so that the impeller is in the position of the fan pulley.
6. Drift the spindle and bearing assembly from the impeller.

Inspecting

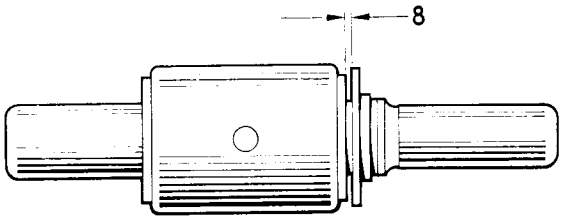
7. Examine the spindle and bearing assembly; it need not be renewed if the bearing is satisfactory and the spindle is free from excessive corrosion.
   Clean any corroded portion of the spindle and paint with a suitable chlorinated rubber primer or, alternatively, with a good quality aluminium paint or other anti-corrosive paint.
   The impeller must be a press fit on the spindle. If the impeller is loose on the spindle, replace either part as necessary.

continued



Re-assembling

8. Where a steel deflector washer is fitted to the pump spindle, check that there is a minimum clearance of 0,46 mm (0.018 in) between the washer and the bearing housing face.
9. Insert a few drops of thick oil in the location hole in the bearing.
10. Suitably mark the spindle bearing housing and the pump body so that the bearing locating screw holes may be easily aligned during assembly.
11. Fit the spindle and bearing to the pump body and fit the locating screw.
12. Press the fan pulley hub on to the spindle to give a dimension of 87,70 mm ± 0,25 mm (3.453 in ± 0.010 in) measured between the front face of the pulley hub and the mounting face of the water pump.
    When pressing on the hub, support the spindle to avoid load falling on the bearing location bolt.
13. Fit the carbon ring and seal assembly to the pump body with the carbon ring outwards.
14. Press the impeller onto the spindle until there is 0,50 mm to 0,63 mm (0.020 in to 0.025 in) clearance between the impeller vanes and the pump body. Check using feeler gauges.
15. Offer the fan pulley to the assembly and check that the fan belt groove position relative to the pump mounting face is 36,90 mm ± 0,25 mm (1.453 in ± 0.010 in).
16. Reverse 1.



IRC 1010

DATA

Dimension from front face of hub to rear (mounting) face of water pump	87,70 mm ± 0,25 mm (3.453 in ± 0.010 in)
Clearance between impeller vanes and pump body	0,50 mm to 0,63 mm (0.020 in to 0.025 in)
Dimension from fan belt groove in pulley to rear (mounting) face of water pump	36,90 mm ± 0,25 mm (1.453 in ± 0.010 in)

THERMOSTAT

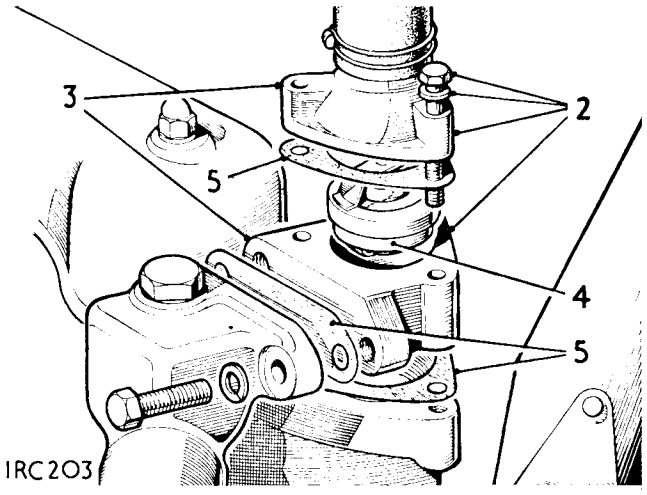
—Remove and refit **5.9**

Removing

1. Remove the radiator cap and partially drain the coolant.
2. Remove the outlet pipe and thermostat housing fixings.
3. Withdraw the pipe and housing complete.
4. Separate the pipe from the housing and withdraw the thermostat and 'O' ring seal.
5. Withdraw and discard the joint washers.

Refitting

6. Smear both sides of the new joint washers with a small quantity of general purpose grease.
7. Ensure that the thermostat bleed hole is clear to prevent air locks when refilling.
8. Reverse 1 to 5.



DATA

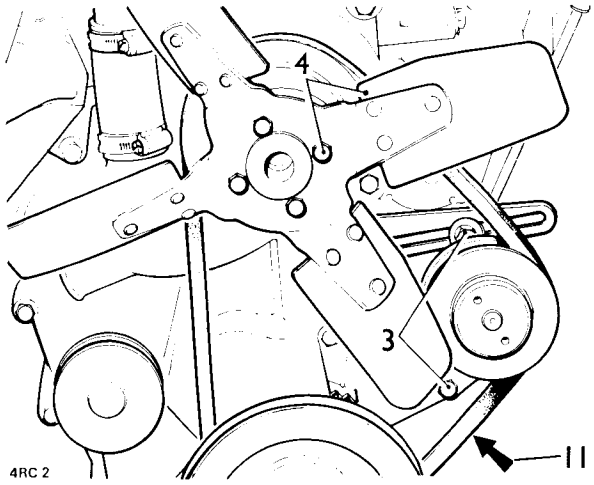
Thermostat opening temperature 70.5°C to 75.5°C

THERMOSTAT

—Test **5.10**

Testing

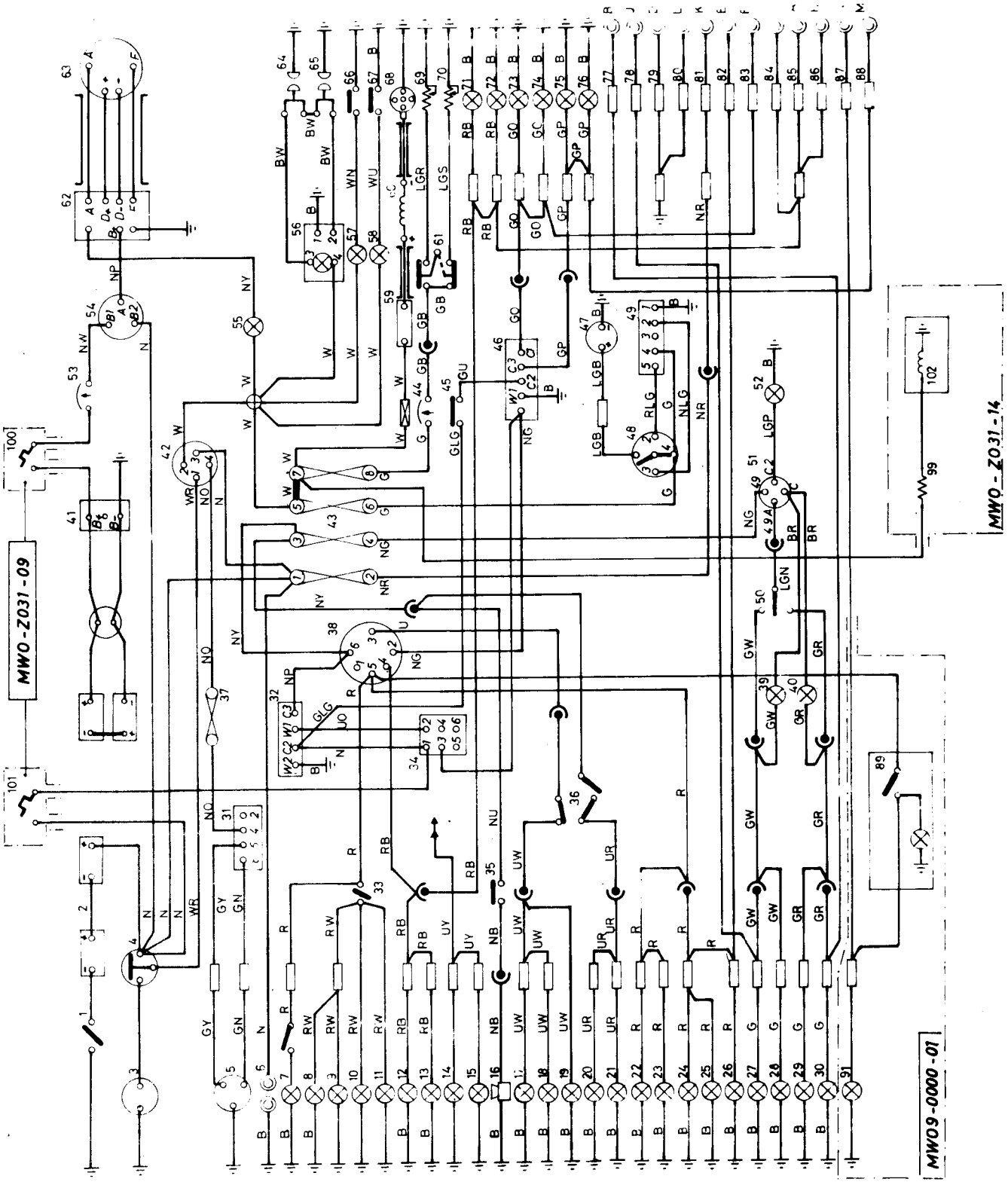
1. Remove the thermostat. 5.9.
2. Immerse the thermostat in water in a suitable container.
3. Heat the water and note the temperature at which the thermostat commences to open; this should be within the range 70.5°C to 75.5°C.
4. The thermostat is not adjustable or serviceable; repair is by replacement.
5. Reverse 1.



ELECTRICAL OPERATIONS

continued

ELECTRICAL OPERATIONS



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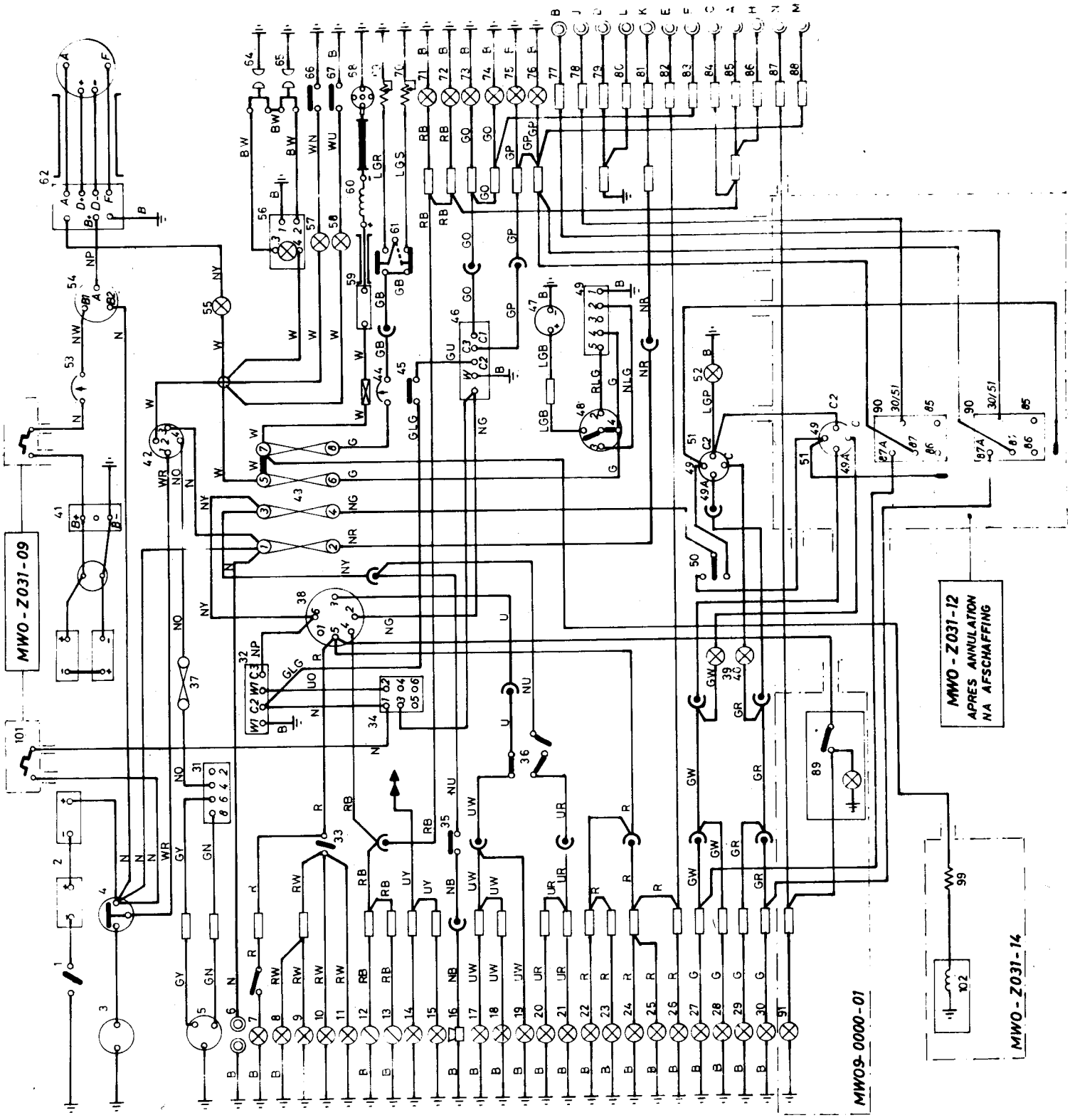
- AANH: 1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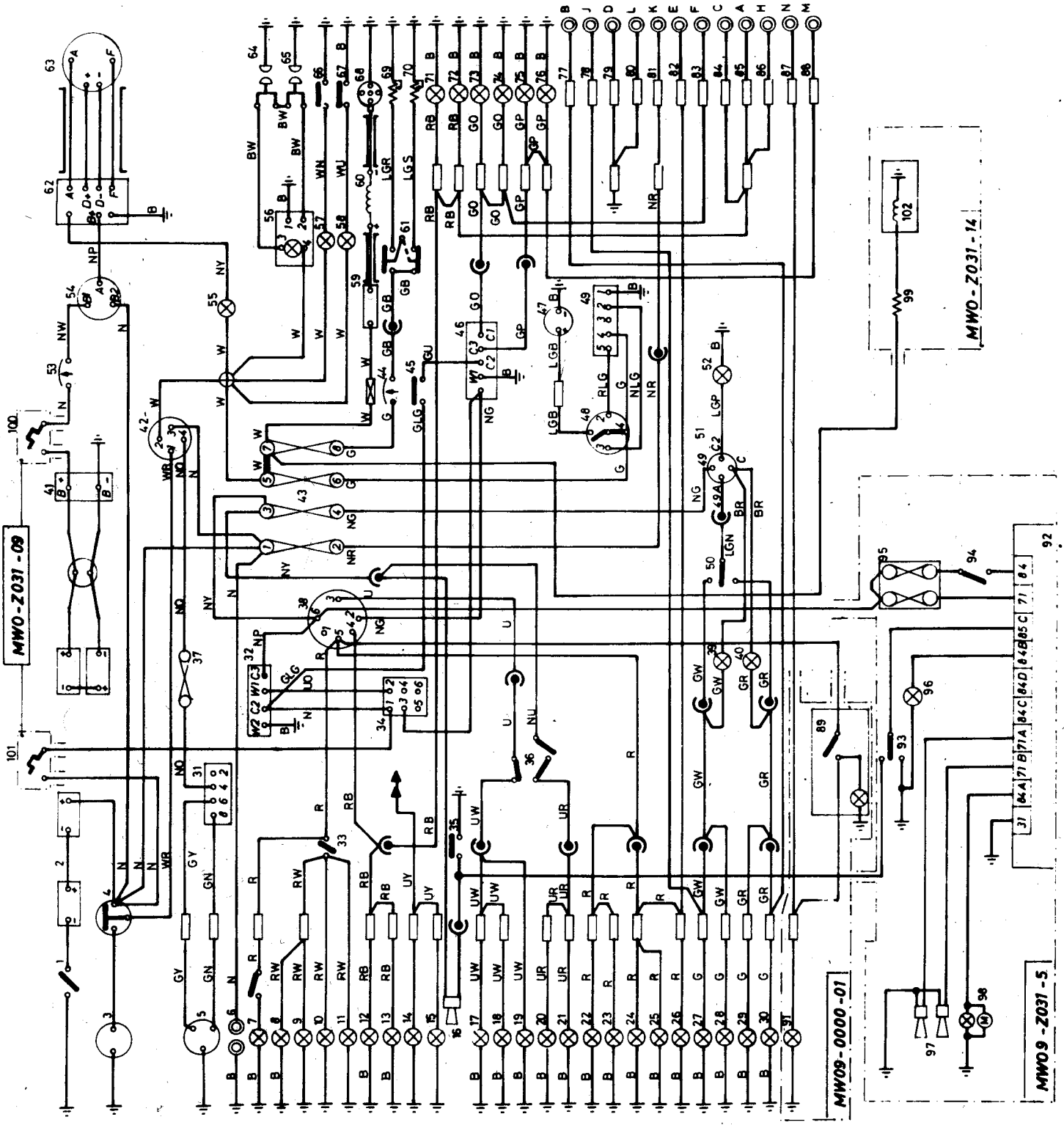
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MW09-Z031-5

Légende du schéma de cablage (mise à jour)
Verklaring van het bedradingsschema (verbetering)

A Repères changés

77	Clignoteur gauche	B
78	" droit	J
79	Masse	D
80	"	L
81	Courant direct	K
82	Feux normaux	E
83	Stop black-out	F
84	Black-out arrière	C
85	" " "	A
86	" " avant	H
87	Feu de brouillard arrière	N
88	Stop normal	M

PRISE NATO, BORNES :

A Gewijzigde merknummers

77	Knipperlicht links	B
78	" rechts	J
79	Aarding	D
80	"	L
81	Stroom	K
82	Normale lichten	E
83	Stop black-out	F
84	Black-out achterkant	C
85	" " "	A
86	" " voorkant	H
87	Achtermistlicht	N
88	Normale stop	M

NATOSTEKKER, POLEN :

B: Nouveaux repères

89	Interrupteur anti-brouillard	
90	Relais pour prise NATO	
91	Anti-brouillard arrière	
92	Boitier electronique du bitonal	
93	Inverseur de commande du bitonal	
94	Interrupteur du feu tournant	
95	Fusible	
96	Lampe témoin	
97	Avertisseur bitonale	
98	Feu tournant	
99	Résistance	
100	Disjoncteur automatique	15 A
101	" "	25 A
102	Solénoide du carburateur	
46	Relais d'inversion de feu stop	

B Nieuwe merknummers

89	Achtermistlicht schakelaar	
90	Relais voor Natostekker	
91	Achtermistlicht	
92	Elektronische doos van tweeklankshoorn	
93	Omkeerschakelaar van "	
94	Schakelaar van draailicht	
95	Smeltveiligheid	
96	Verklikkerlamp	
97	Tweeklankshoorn	
98	Draailicht	
99	Weerstand	
100	Automatische schakelaar	15 A
101	" "	25 A
102	Solenoide van de vergasser	
46	Wisselingsrelais van stoplicht	

C Symboles Symbolen

Mise à la masse par fil
Massa-aansluitingen via kabel

Mise à la masse par vis
Massa-aansluitingen via bevestigingsbouten

Connecteur snap
Klemaansluitingen

Connection en ligne
In-lijn aansluitingen

Prise et fiche moulée
Gegoten stekker en contrastekker

Ampoule electrique
Lamp

Connexion fixe
Vaste klemaansluitingen

Avertisseur
Hoorn

ELECTRICAL EQUIPMENT

IMPORTANT

The electrical system is Negative earth, and it is most important to ensure correct polarity of the electrical connections at all times. Any incorrect connections made when reconnecting cables may cause irreparable damage to the semiconductor devices used in the alternator and regulator. Incorrect polarity would also seriously damage any transistorised equipment such as radio and tachometer etc.

Before carrying out any repairs or maintenance to an electrical component, always disconnect the battery.

The V-drive fan belt used with alternators is not the same as that used with d.c. machines. Only use the correct Rover replacement fan belt. Occasionally check that the engine and alternator pulleys are accurately aligned.

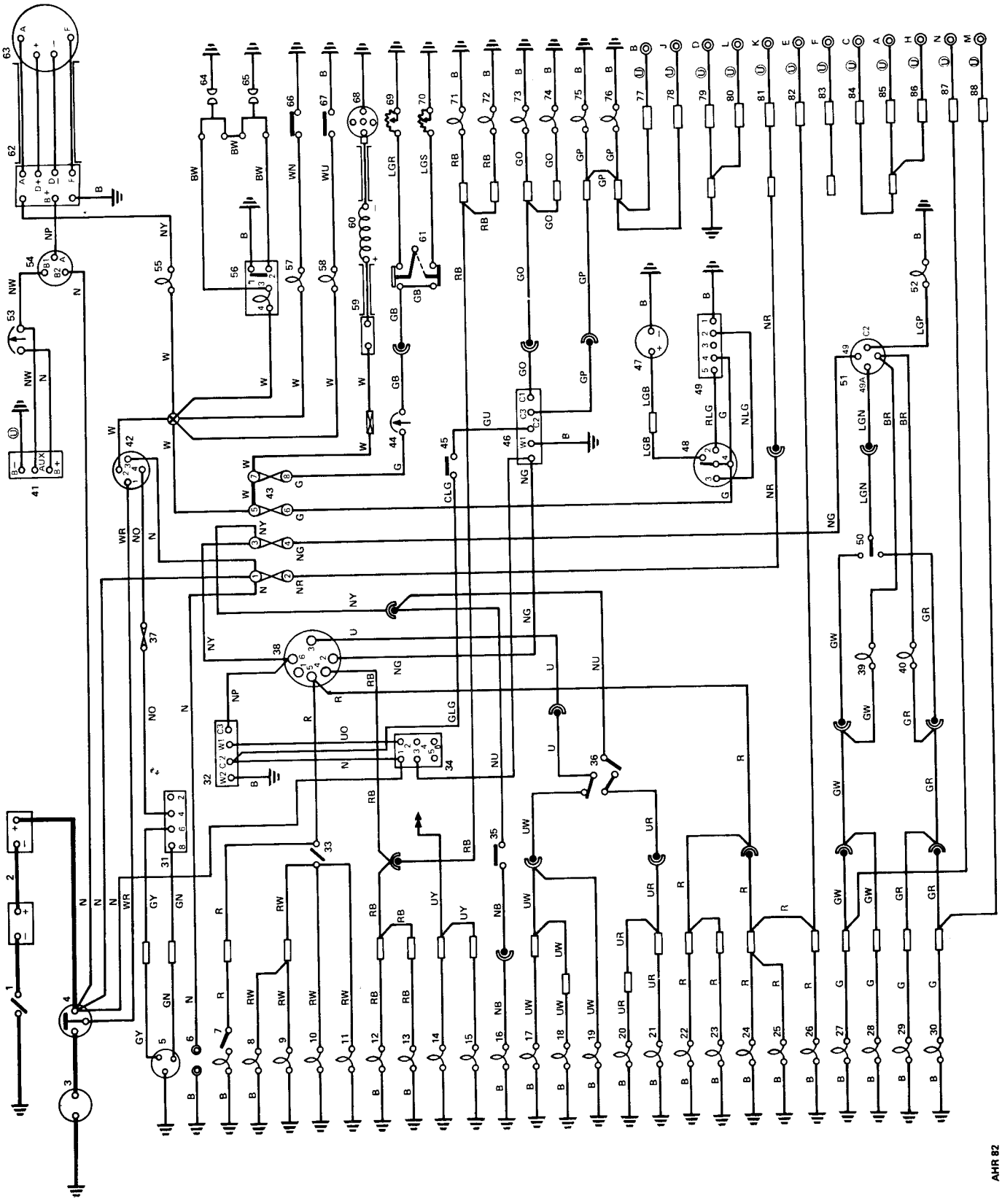
It is essential that good electrical connections are maintained at all times. Of particular importance are those in the charging circuit (including those at the battery) which should be occasionally inspected to see that they are clean and tight. In this way any significant increase in circuit resistance can be prevented.

Do not disconnect battery cables while the engine is running or damage to the semi-conductor devices may occur. It is also inadvisable to break or make any connections in the alternator charging and control circuits while the engine is running.

The electronic voltage regulator employs micro-circuit techniques resulting in improved performance under difficult service conditions. The transistors, diodes and resistors are fixed on a printed circuit base in sealed aluminium case which is suitably finned for maximum heat dissipation.

The regulating voltage is set during manufacture to give the required regulating voltage, and no adjustment is necessary. The only maintenance needed is the occasional check on terminal connections and wiping with a clean dry cloth.

When using rapid charge equipment to re-charge the battery, the battery must be disconnected from the vehicle.



AHR 82

Key to cable colours

B—Black	L—Light	P—Purple	U—Blue
G—Green	N—Brown	R—Red	W—White
K—Pink	O—Orange	S—Slate	Y—Yellow

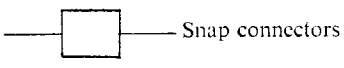
When cables have two code letters, the first is the main colour and the second the tracer, i.e. RG — Red with Green.

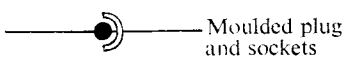
Note: The symbol ⓤ refers to the 'Unipren' make of special cable.

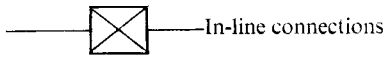
Key to circuit diagram

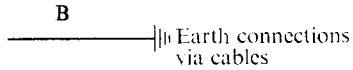
1 Battery master switch
2 Vehicle batteries—two 12 volt
3 Starter motor
4 Starter motor solenoid
5 Heater motor
6 Inspection lamp sockets
7 Map lamp and switch
8 Ammeter illumination
9 Oil pressure gauge illumination
10 Instrument illumination
11 Speedometer illumination
12 Blackout lamp, RH front
13 Blackout lamp, LH front
14 Infra-red headlamp } when fitted
15 Infra-red headlamp }
16 Horn
17 Headlamp main beam, RH
18 Headlamp main beam, LH
19 Warning light, headlamp main beam
20 Headlamp dip, LH
21 Headlamp dip, RH
22 Side lamp, RH
23 Side lamp, LH
24 Tail lamp, RH
25 Number plate illumination
26 Tail lamp, LH
27 Turnlamp, rear RH
28 Turnlamp, front RH
29 Turnlamp, front LH
30 Turnlamp, rear LH
31 Heater motor switch
32 Relay for blackout master switch
33 Switch for instrument illumination
34 Blackout master switch
35 Horn switch
36 Headlamp flash and dip switch
37 In-line fuse for heater motor
38 Lighting switch, 6-way
39 Warning light, LH turnlamp
40 Warning light, RH turnlamp
41 Terminal bracket
42 Ignition and steering column lock switch
43 Fuses
44 Fuel gauge
45 Switch, stop lamps
46 Changeover relay for lamps
47 Screen washer pump
48 Switch, screen wiper/washer
49 Screen wiper motor
50 Turnlamp switch
51 Turnlamp indicator unit
52 Warning light, trailer
53 Auxiliary ammeter
54 Diode for split charge system
55 Warning light, ignition
56 Brake system warning light and test button switch
57 Warning light, oil pressure
58 Warning light, cold start
59 Filter unit for ignition coil
60 Ignition coil
61 Fuel change-over switch
62 Control box
63 Alternator
64 Braking system shuttle valve
65 Brake servo vacuum loss switch
66 Switch, oil pressure
67 Switch, cold start
68 Distributor
69 Unit, RH fuel tank
70 Unit, LH fuel tank
71 Blackout tail lamp, RH
72 Blackout tail lamp, LH
73 Blackout stop lamp, RH
74 Blackout stop lamp, LH
75 Stop lamp, RH
76 Stop lamp, LH
77 Stop lamp
78 Stop lamp
79 Earth
80 Earth
81 Auxiliary
82 Tail
83 Spare
84 Convoy
85 Convoy
86 Convoy
87 Trailer turnlight, RH
88 Trailer turnlight, LH

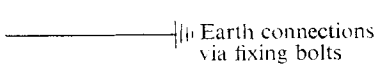
} NATO trailer socket, 12-pin

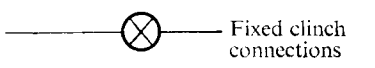




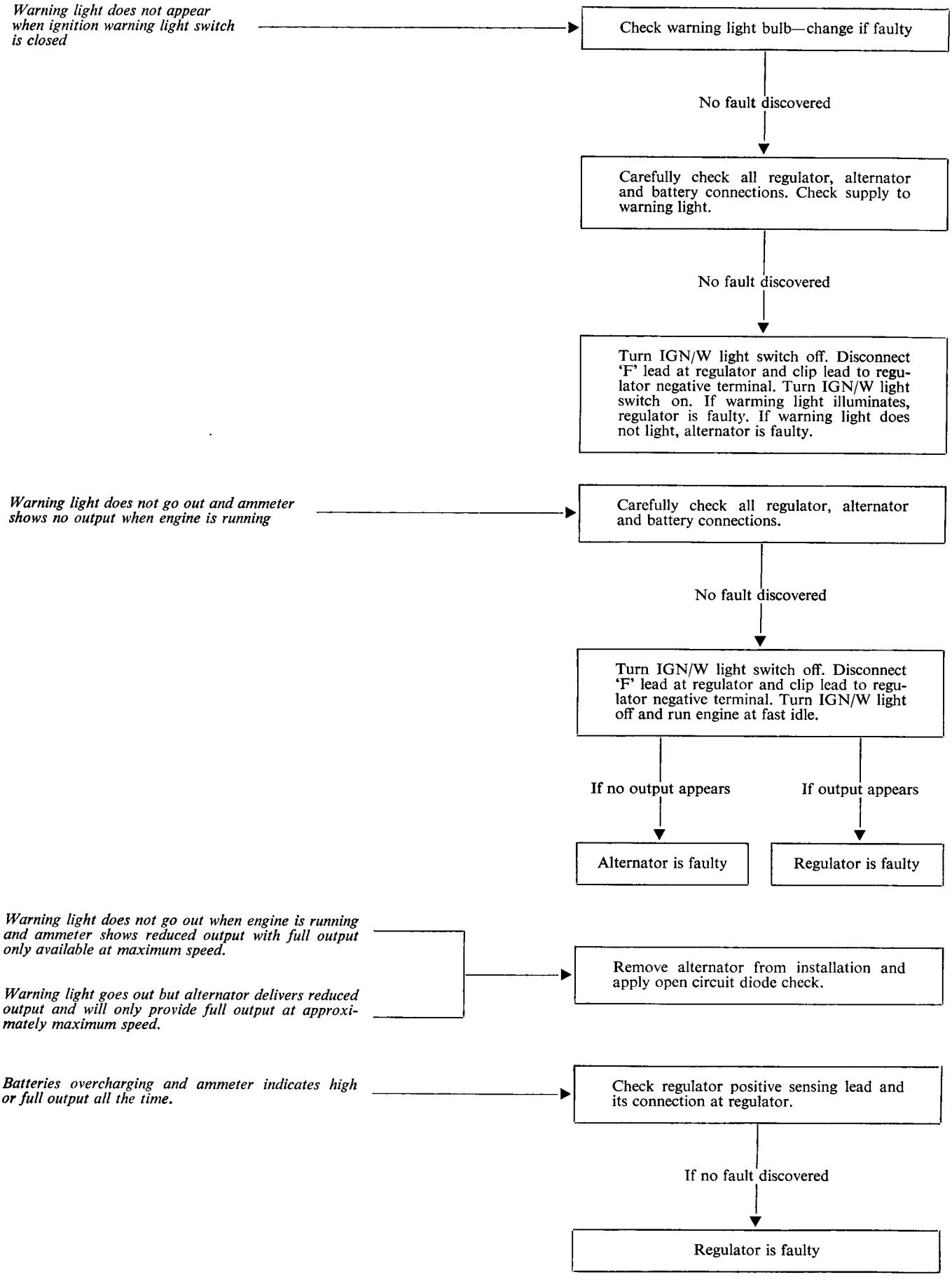








FAULT DIAGNOSIS—ALTERNATOR SYSTEM



ALTERNATOR

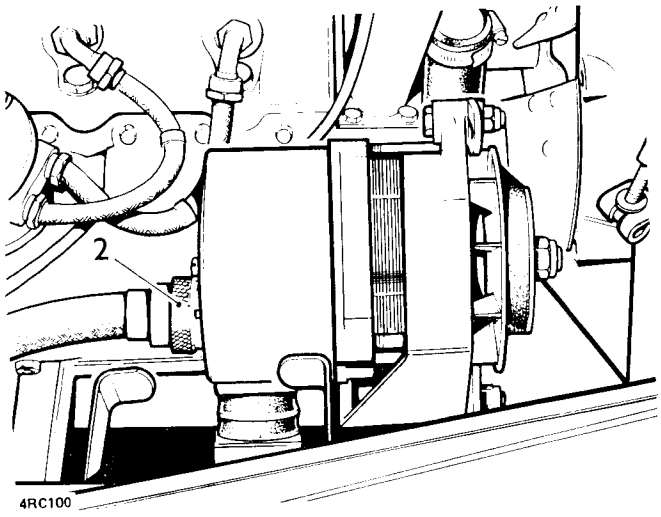
—Remove and refit **6.1**

Removing

1. Disconnect the battery earth lead.
2. Disconnect the electrical cable from the alternator.
3. Slacken the alternator fixings.
4. Pivot the alternator inwards and release the drive belt from the pulley.
5. Remove the alternator.

Refitting

6. Fit the alternator, locating the drive belt over the pulley, but do not tighten the fixings at this stage.
7. Adjust the drive belt to give 12 to 19 mm (0.500 to 0.750 in) free movement when checked midway between the crankshaft and alternator pulleys, then secure the alternator fixings.
8. Reverse 1 and 2.



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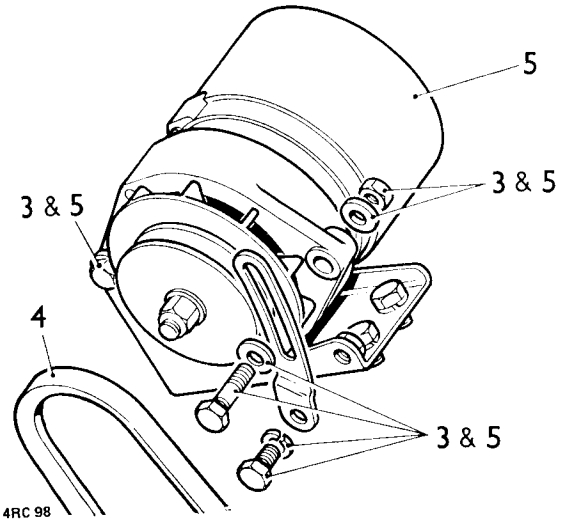

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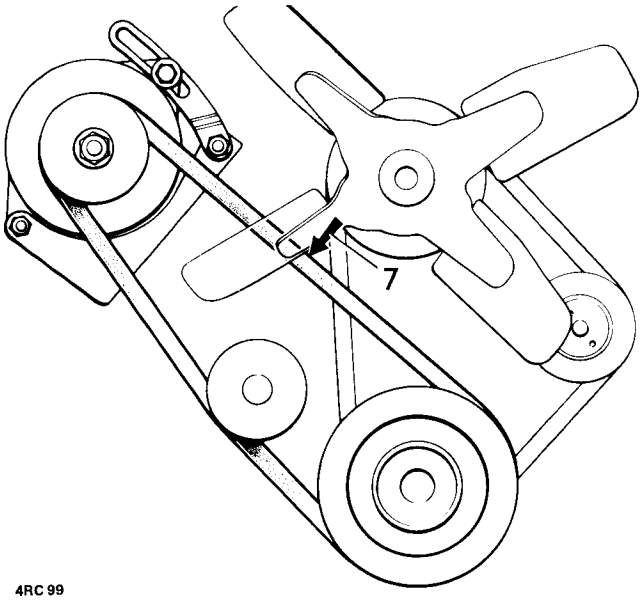

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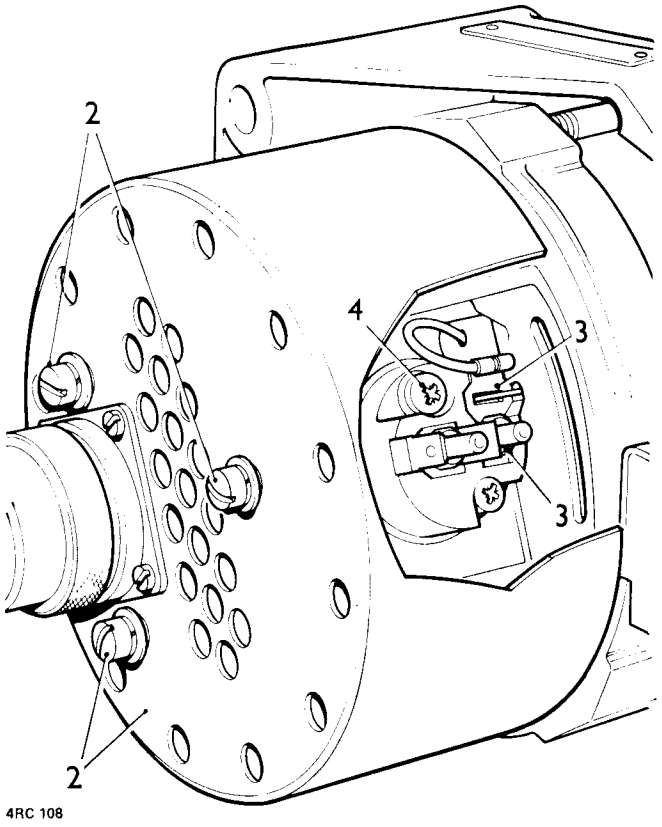
ALTERNATOR

—Overhaul 6.2

The AC5 type alternator is a three phase machine of the revolving field and stationary armature type and is self limiting in current output. Rectification of the three phase a.c. output into direct current is provided by means of six silicon diodes connected in a three phase bridge circuit between the stator and output terminals. A second rectifier bridge is formed by using three auxiliary diodes in conjunction with three of the six main diodes and this supplies the energy for the alternator field coil via the slip rings and brushes. This arrangement of auxiliary diodes prevents the battery from discharging through the field coil when the alternator is stationary. All the diodes are mounted in heat sinks which are secured to the slip ring end shield.

The rotor is supported by sealed ball bearings housed in the two end shields which are themselves secured to the stator by three 'through' bolts. A moulded brush box containing the two brushes is positioned in a sealed compartment in the slip ring end shield. Cooling is carried out by air flow through the generator induced by a radial fan mounted on the rotor shaft at the drive end. The heat sinks in which diodes are fitted are finned to assist heat dissipation.

Limited protection against the entry of foreign matter is provided by a cowl at the slip ring end of the machine. The cowl also prevents the emission of radio frequency interference, the connecting cables being taken through screening braid that is terminated at a rubber sealing gland fitted to the cowl.



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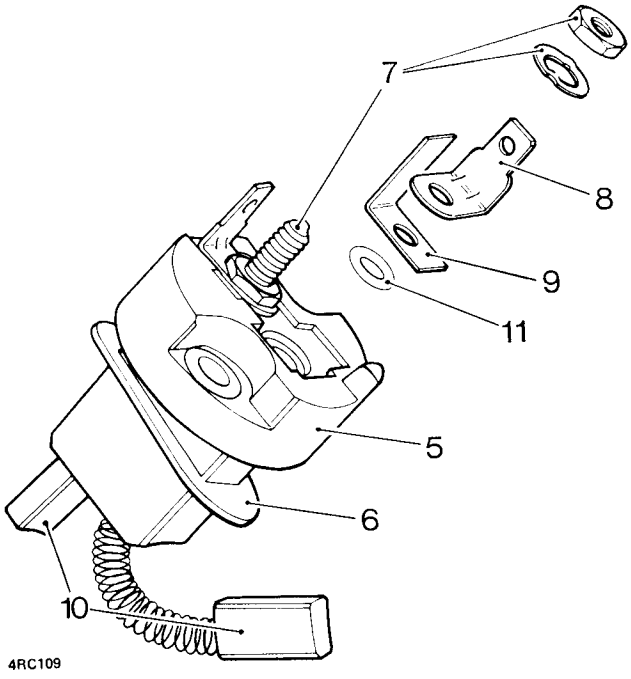

4RC109

Dismantling

1. Remove the alternator. 6.1.

Brushgear

2. Remove the three screws and washers and withdraw the cowl.
3. Remove the field terminal nut and crinkle washer from terminal 'A' of the brush box, and lift off the lead and tag.
4. Remove two screws together with spring washers and plain washers.
5. Withdraw the brush box complete with brushes.
6. Remove the gasket.
7. Remove the nut and crinkle washer from each of the two terminals.
8. Lift off the two 'Lucar' blades.
9. Withdraw the insulators.
10. Withdraw both brushes.
11. Lever out and discard both sealing rings.

continued

Rotor

12. Scribe a line lightly across both end shields and stator to facilitate realignment when assembling.
13. Remove the pulley securing nut and washer and withdraw the pulley.
14. Remove the fan.
15. Withdraw the 'Woodruff' key.
16. Remove the three through bolts and spring washers.
17. Using a hide mallet, tap the drive end shield away from the stator.
18. Withdraw the drive end shield complete with the rotor. Use care to prevent damage to the slip rings.
19. Place the drive end shield over a suitable large diameter cylinder as shown so that the rotor is encased within the cylinder and the end of the cylinder seats squarely against the three end shield webs.
20. Screw the nut on to the shaft to prevent the rotor from dropping on to the slip rings.
21. Press the rotor shaft from the drive end shield bearing.
22. Remove the cylinder from the press and remove the nut to separate the rotor from the drive end shield.

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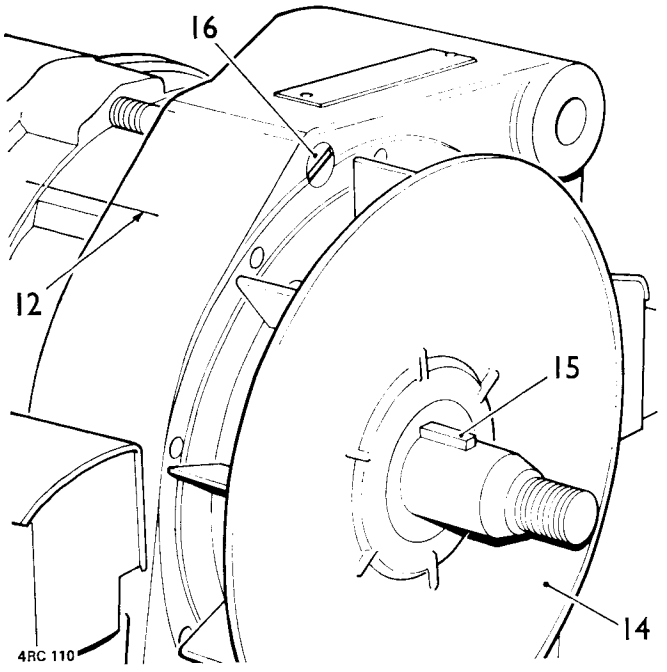
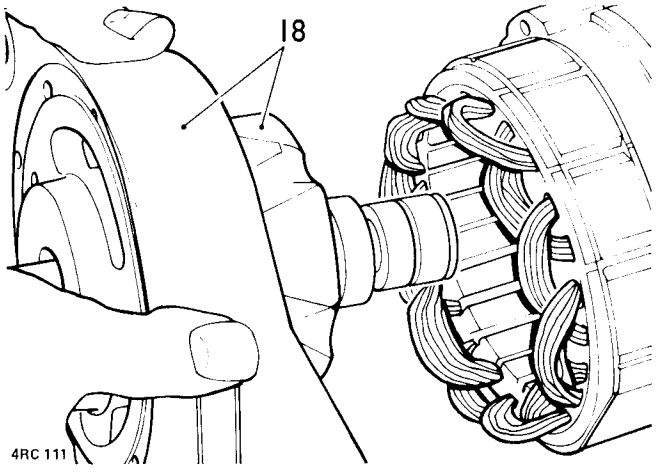
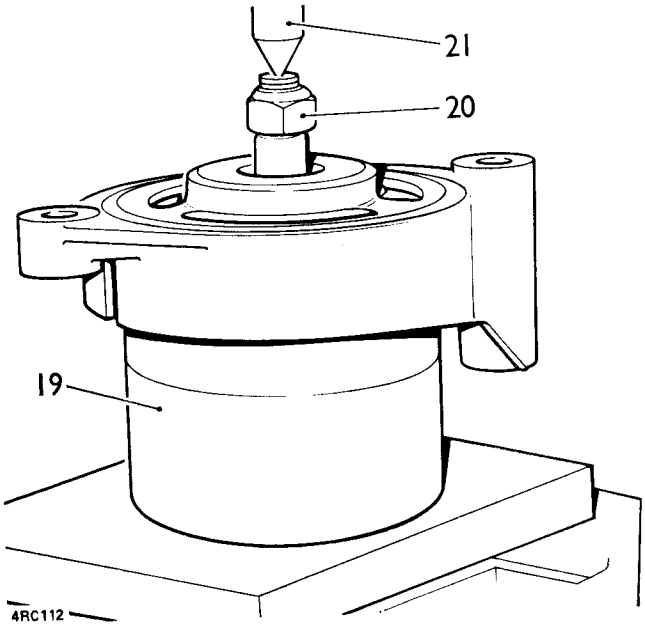


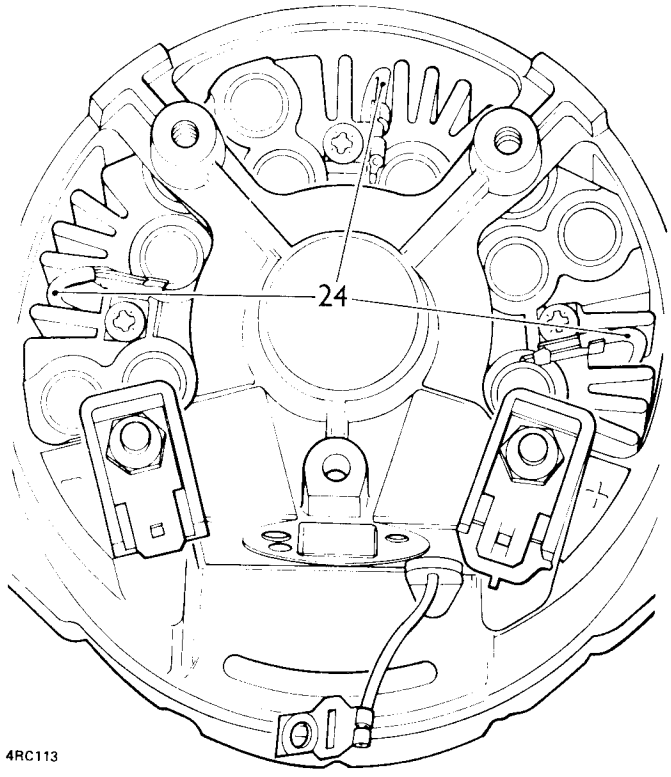




Stator

23. Place stator and slip ring end shield assembly on the bench with the end shield uppermost. Take care when lifting that the weight of the stator is not taken by the three stator leads.
24. Unsolder the three stator leads from the heat sink terminal tags. DO NOT remove the tags from the heat sinks.
25. Separate the slip ring end shield from the stator, if necessary using a hide faced mallet.
26. If fitted, remove and discard the 'O' ring from the groove inside the bearing housing.

    NOTE: It is not necessary to remove the diode assembly from the end shield unless it is established that there is a fault in one or more of the diodes.



Inspecting

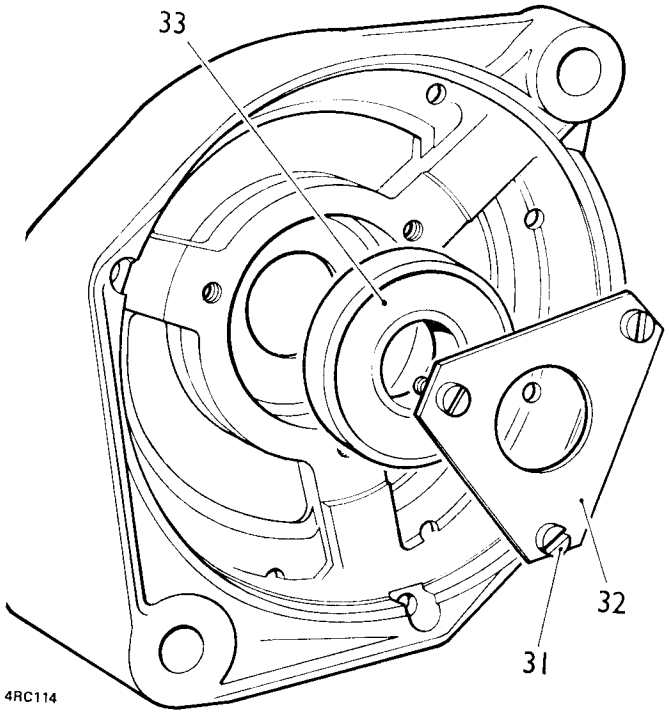
27. All components should be thoroughly cleaned with an approved cleansing agent before examination. The stator frame and rotor shaft should be wiped clean using a non-fluffy rag moistened with white spirit, care being taken to avoid the spirit coming into contact with the winding insulation and stator leads.
28. Examine all components visually for signs of cracking, corrosion, local discolouration and any other signs of damage or excessive wear. Check all internal and external threads; the 'Nyloc' pulley securing nut can be used again provided that the nylon insert is in reasonable condition.
29. It is essential to remove all traces of carbon dust with a compressed air line before carrying out any insulation tests. Do NOT 'spin' the bearings with compressed air as this can cause damage to the balls and tracks.

Bearings

30. Examine each bearing for excessive play, then spin it BY HAND to ensure that it runs smoothly. If it is in any way defective it must be renewed. Since the bearing is sealed and cannot be lubricated, it must be renewed if it is found to be running dry.

Drive end bearing

31. Unscrew and remove the three screws and spring washers. Should the screws be difficult to remove due to the thread locking compound used, heat the complete end shield assembly to approximately 100°C.
32. Lift out the clamping plate.
33. Extract the bearing.
34. Press the new bearing into the housing, ensuring that it enters squarely, then place the clamping plate in position and secure it with the three screws and spring washers tightened to the correct torque value of 1,70 to 2,26 N m (170 to 230 g m or 15 to 20 lb in).



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Slip ring end bearing

Renewal of the slip ring end bearing will necessitate removing the slip ring assembly—see under heading 'Slip Ring & Bearing Renewal'.

Slip ring end shield

35. Examine the internal bore of the bearing housing for any signs of wear caused by the bearing outer race having been revolving. The end shield must be renewed if this situation has occurred.
36. Offer up the slip ring bearing to the housing and ensure that it will be a tight press-in fit when fully home. Failure to meet this requirement will necessitate renewal of the end shield.

    NOTE: Certain factory re-conditioned end shields will be found to contain a steel sleeve in the bearing housing.

Brushgear

37. Examine the brush box visually for cracks or any other form of damage. Ensure that the brushes are undamaged and can slide freely in their slots. Renew brushes if they are worn to a length of less than 8 mm (0,312 in).
38. It is recommended that new brushes are fitted when a complete overhaul is being undertaken.

Stator

39. Examine the windings visually to ensure that they are properly secured and that the insulation is undamaged.
40. Check that the three leads are mechanically sound and that the insulating sleeving is intact. Should a lead be damaged or broken off short, cut it back and join on a suitable length of flexible cable. The join should be soldered and a length of glass fibre sleeving slid over the join. The sleeving should be slid past the join far enough so that it can be tied neatly to the stator windings at the point where the original lashing was located.
41. Using the 100V insulation tester measure the resistance between each lead and the frame. A minimum resistance of 10 Megohm should be obtained.
42. Connect one terminal of a 24 volt battery to any one of the stator leads.
43. Connect an ON/OFF switch to the other battery terminal.
44. Connect a variable resistor to the ON/OFF switch.
45. Connect an ammeter between the variable resistor and either one of the other stator leads.
46. Connect a voltmeter across the two stator leads in the test circuit.
47. Close the switch and adjust the variable resistor until a current of 20 ampere is indicated on the ammeter. Note the reading on the voltmeter, then open the switch.

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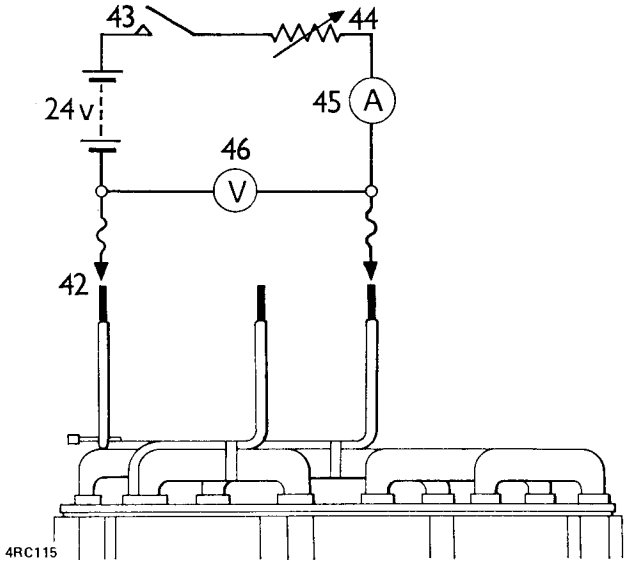
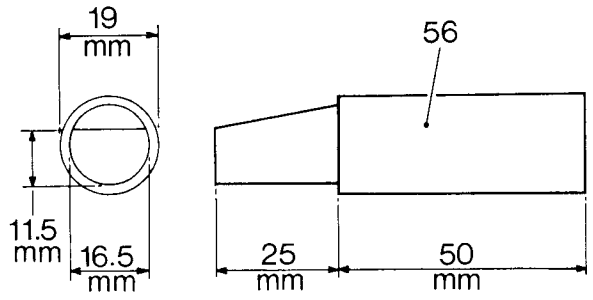


48. Transfer the test circuit to each remaining pair of stator leads in turn and repeat the procedure, noting the voltage reading each time.
49. Each of the three voltage readings should be the same, that is, 8 volts.

Rotor

50. Check the rotor visually for any sign of damage or rubbing.
51. Examine the field windings for damage or deterioration to the insulation and ensure that they are held securely in place.
52. Using the insulation tester, check the insulation between each slip ring and the rotor shaft. A minimum reading of 10 Megohm should be obtained.
53. Set the test meter to the lowest resistance range and measure the resistance between the two slip rings; a reading of 9,4 to 9,8 ohms should be obtained:-
54. Failure to conform to either the insulation or resistance specification will necessitate renewal of the rotor assembly.
55. Examine the slip ring surfaces for any pitting, scoring or other type of damage. If necessary, they may be skimmed down to a minimum diameter of 28,85 mm (1.136 in)—refer to the end of the section 'Slip Ring and Bearing Renewal' for specific details of the correct method to be employed.



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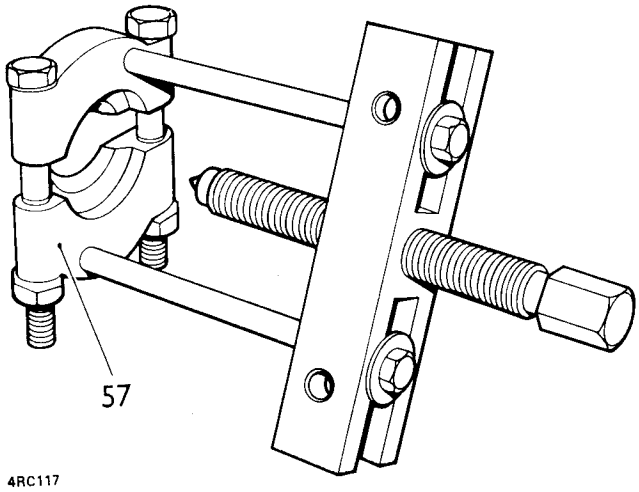
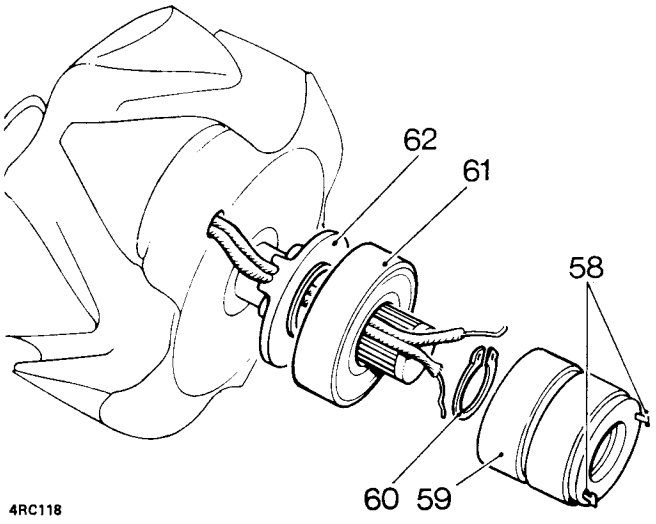


4RC117

Slip ring and bearing removal

56. A special press tool will be required when fitting the new slip rings. A suitable tool should be made locally from mild steel, as illustrated.
57. A 'Sykes' race extractor of the type shown will be necessary to remove both the slip ring assembly and the slip ring end rotor bearing. Should any difficulty be experienced in obtaining one of these tools, they are available direct from the manufacturers, J. F. Sykes (St. Annes) Ltd, Lytham St. Annes, Lancashire, England.
58. Unsolder and remove the two field coil leads from the slip ring terminals.
59. Using a 'Sykes' type of race puller, withdraw the slip ring assembly from the rotor shaft. Removal of the slip ring assembly will make it unserviceable for future use and a new one must be fitted.
60. Remove the circlip retaining the bearing.
61. Locate the extractor between the outer race of the bearing and the bearing spacer, and extract the bearing.
62. Remove bearing spacer, clean out its grooves and inspect it for cracks or distortion. If it is defective in any way, it must be renewed.



4RC118

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63. Carefully examine the insulation of the field leads and look for any signs of mechanical stress. Pay particular attention to the ends where they were attached to the slip ring terminals. Should the leads or their insulation be defective in any way, they should be renewed in the following manner.
64. Cut the leads where indicated so that the subsequent joints will be staggered.
65. Taking each lead in turn, trim back a short length of the glass fibre sleeving and clean off the covering of the wire to expose the copper surface.
66. Lightly twist a new length of 21 s.w.g. 'Lumex' copper wire to the existing wire and solder the joint together.
67. Snip off any excess wire.
68. Apply a liberal coating of insulating varnish, then slide a short length of 2 mm glass-fibre sleeving over the join so that it slides inside the existing sleeve.
69. Apply a further coating of varnish and slide on a new length of 3 mm glass-fibre sleeving to abut the original sleeve. Apply a final coat of varnish to the outside.
70. Place the rotor (drive end downwards) into a suitable press fixture so that the weight is supported on the rotor claws.
71. Refit the bearing spacer over the rotor shaft so that the moulded grooves are in the correct position to contain the field leads from the rotor.
72. Press the bearing fully onto the rotor shaft.
73. Fit a new circlip, ensuring that it is fully seated and is a tight fit in its groove.
74. Pass the two field leads through the bore of a new slip-ring assembly and position the slip rings so that the terminals are positioned at 90° relative to the shaft lead slot as shown.
75. Position slip ring press tool so that the spigot registers in the bore of the slip rings with cut-away portion of the tool in line with the field leads.
76. Gently press the slip ring down until the press tool spigot abuts the end of the rotor shaft, feeding the field leads past the cut-away portion of the press tool as they appear.
77. If new leads have been fitted, trim off the ends of the glass-fibre sleeve to leave approximately 6 mm (0.250 in) projecting beyond the rotor shaft. This will prevent the field leads from shorting to the shaft. Wrap the inner wire of each lead around one of the slip ring terminals, cut them to length, and solder them in position.
78. Mount the drive end shaft of the rotor in a lathe and support the outer race of the slip ring bearing in a 'steady'. Use a diamond or tungsten carbide tipped tool to obtain the fine finish required. Remove just enough metal from the slip rings to ensure that they are concentric with the rotor shaft to within 0,05 mm (0.002 in).

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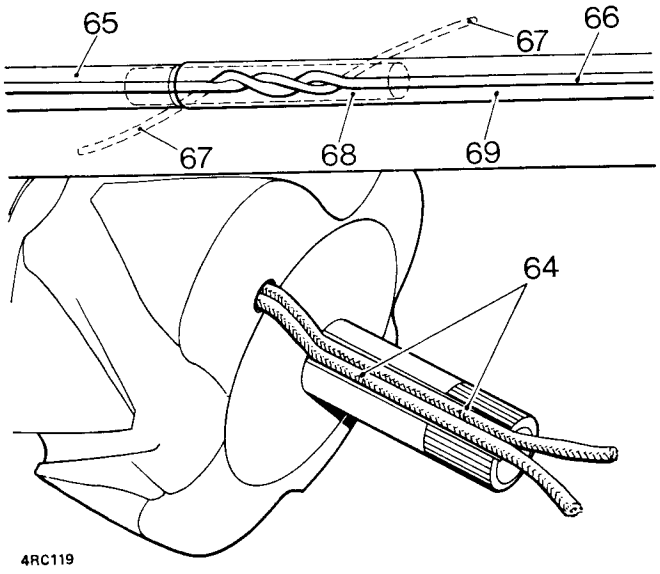

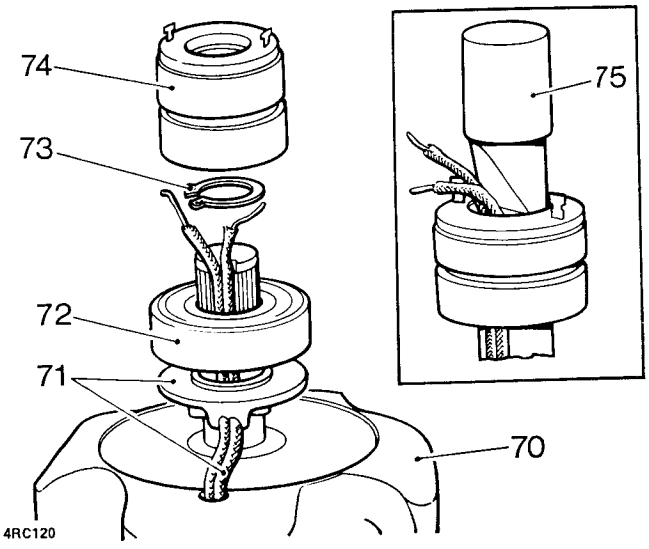

79. Plug with 'Silcoset' 151 any gap that appears between the bearing spacer and the rotor claws where the field leads enter the spacer. Wipe off any surplus 'Silcoset'.

    NOTE: 'Silcoset' 151 is obtainable from Ciba Ltd, Duxford, Cambridge, England.

Diodes

NOTE: Using the following method, all the diodes can be tested while the three heat sinks are still assembled in the slip ring end shield.

80. Connect a 24 volt 44/48 watt lamp in series between a test probe and the positive terminal of the 24 volt test battery. Connect a second test probe to the negative terminal of the battery. Carry out all the tests detailed in the following table.

Test	Position of Test Probes		Test Lamp Indication
	Positive Probe	Negative Probe	
i	Each Heat Sink in Turn	Terminal +	ON
ii	Terminal +	Each Heat Sink in Turn	OFF
iii	Terminal —	Each Heat Sink in Turn	ON
iv	Each Heat Sink in Turn	Terminal —	OFF
v	Each Heat Sink in Turn	'A' Lead	ON
vi	'A' Lead	Each Heat Sink in Turn	OFF

81. Should a lamp indication be obtained that does not agree with the table, then the heat sink being tested contains a faulty diode. Since it is not possible to change individual diodes, the complete heat sink must be renewed—see under the following heading 'Heat Sink Renewal'.

    NOTE: A broken lead or a high resistance solder joint between a diode and its termination could show symptoms similar to a faulty diode. Check for either of these faults before removing a heat sink.

Heat sink removal

82. Unscrew and remove the main terminal nuts, spring washers and 'Lucar' blades.
83. Remove the round, slotted nuts, spring washers and plain washers.
84. Lift off the nylon terminal shrouds.
85. Working from the other side of the end shield, slide the grommet out of its slot, and withdraw the lead and tag through the slot.

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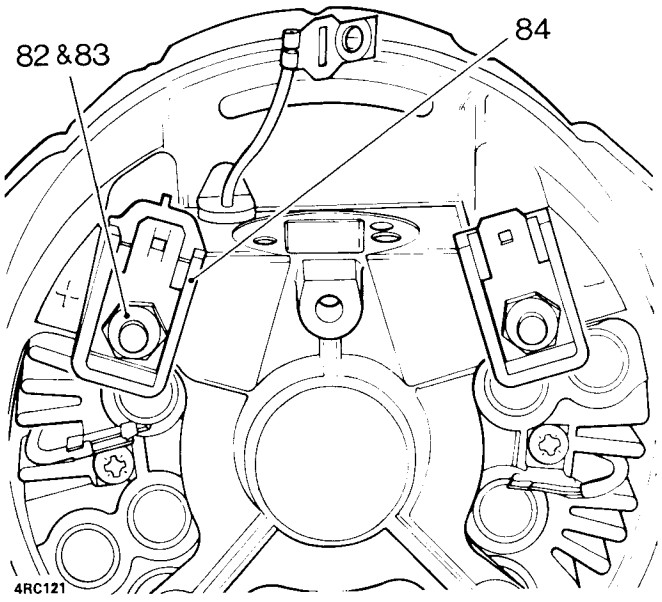

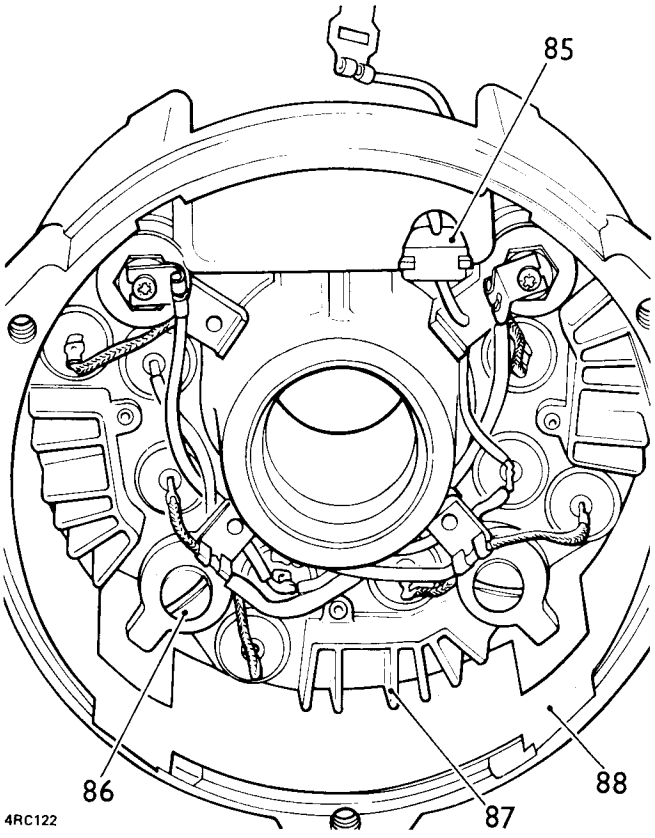

86. Remove the two screws, spring washers and plain washers.
87. Withdraw the complete heat sink assembly.
88. Take out the insulating strip.
89. To remove the faulty sink from the complete assembly, cut the braided copper leads from two of its diodes close to their respective right angled solder tags. Unsolder and detach the insulated leads from the third diode, remove the relevant nylon washers and lift out the heat sink.
90. Place the new heat sink in position so that the complete assembly takes the form shown. Ensure that a nylon insulating washer is assembled onto each of the locators so that it separates the two heat sinks.
91. Place one insulating washer onto each locator.
92. Place one insulating washer onto each of the two main terminal locators.
93. Solder the copper braid from each diode to the correct right angled solder tag—the length of the braids are such that they will not reach the wrong terminal. Solder the insulated leads onto the top connection of the third diode, while gripping the top connection below the joint with a pair of long nosed pliers. This will prevent excessive heat from damaging the diode. As a further precaution, carry out the soldering operation as quickly as possible.
94. Carry out the lamp test as previously detailed under the heading 'Diodes' to ensure that all the diodes are functioning correctly.
95. Position the complete heat sink assembly in the slip ring end shield, as illustrated.
96. Pass the tag and lead through the slot.
97. Slide the grommet into position.
98. Secure the complete assembly with the two screws, spring washers and plain washers.
99. Place the insulating bond in position.
100. Assemble the terminal shrouds onto the main terminals, ensuring that the longer one is fitted to the positive terminal.
101. Secure each shroud with a plain washer, spring washer and round slotted nut.
102. Place each of the two 'Lucar' blades in position and secure with a spring washer and nut.

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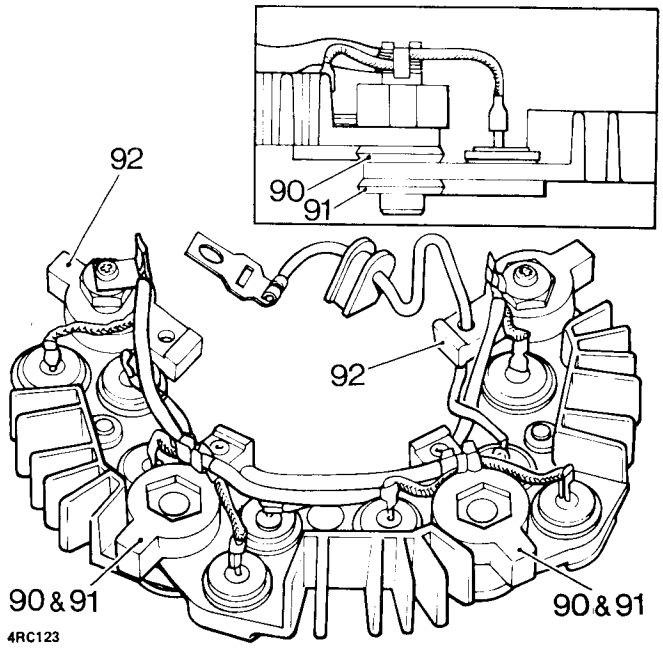

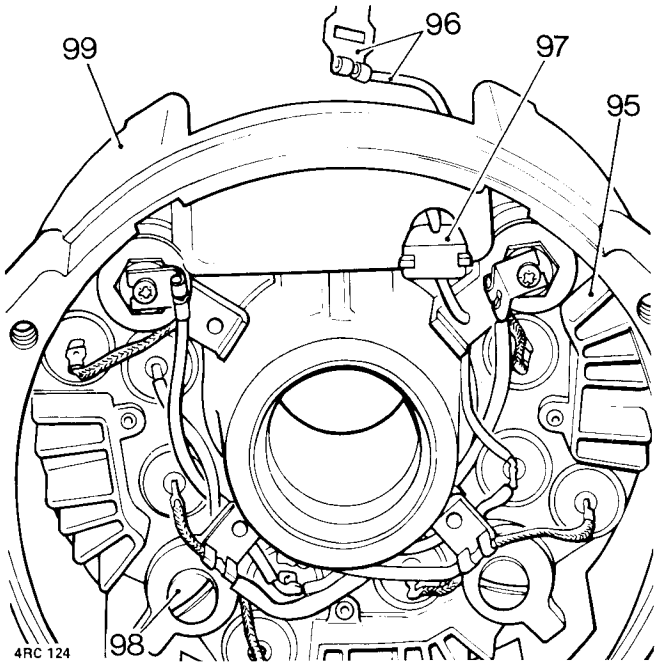

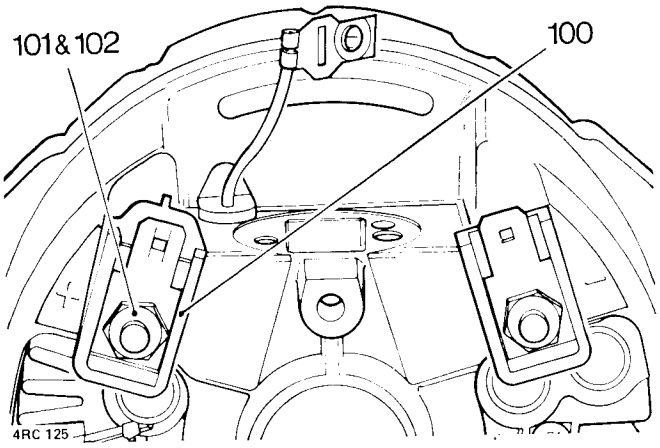

Reassembling

103. Place the stator on the bench with the three leads pointing upwards. Hold the slip ring end shield over the stator so that the lines scribed when dismantling align. Lower the end shield onto the stator, ensuring that the stator leads pass through the three wide gaps in the heat sink finning.
104. Insert the end of each lead into its tag and solder it in place.
105. Place the bearing spacer on the rotor shaft and insert the shaft into the bearing in the drive end shield.
106. Support the bearing housing of the drive end shield on a suitable mandrel press fixture as shown. The fixture must have a hole large enough to admit the rotor shaft.
107. Press the rotor shaft fully into the bearing taking great care not to damage the slip rings, slip ring terminals or field coil leads. A truncated cone shaped tool similar to the one illustrated will locate on the end of the rotor shaft and will clear the field leads and terminals.
108. Insert a new 'O' ring into the groove inside the bearing housing of the slip ring end shield. Smear the inside of the 'O' ring with a light grease to assist bearing entry and to prevent damage to the 'O' ring.
109. Support the rotor and drive end shield assembly as shown, then pass the rotor through the stator so that the slip ring end bearing enters the housing in the slip ring end shield. Great care must be taken not to damage the slip rings when inserting them into the bearing housing.

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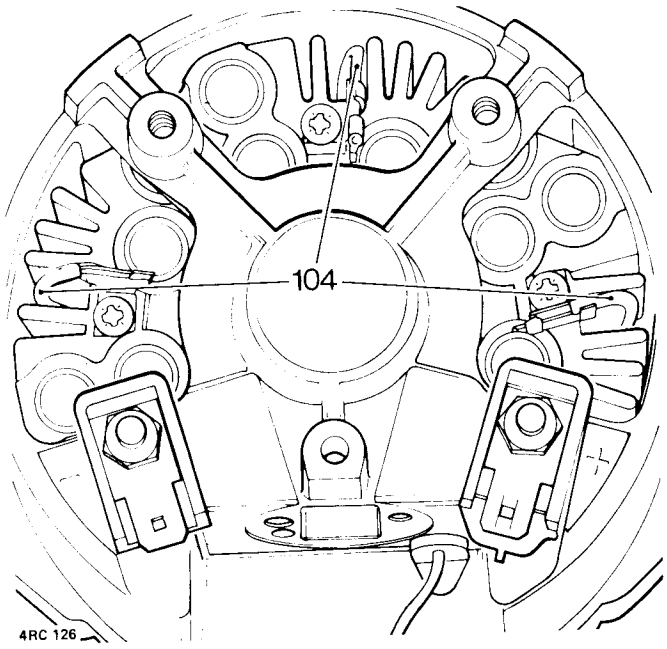
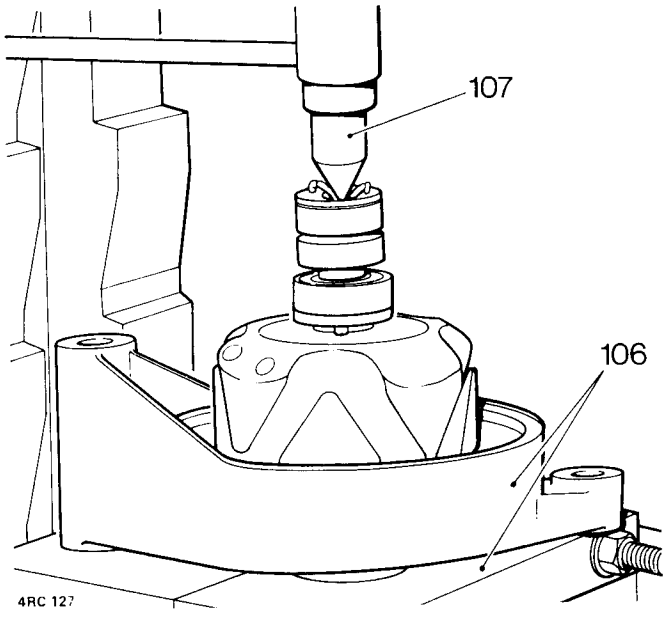
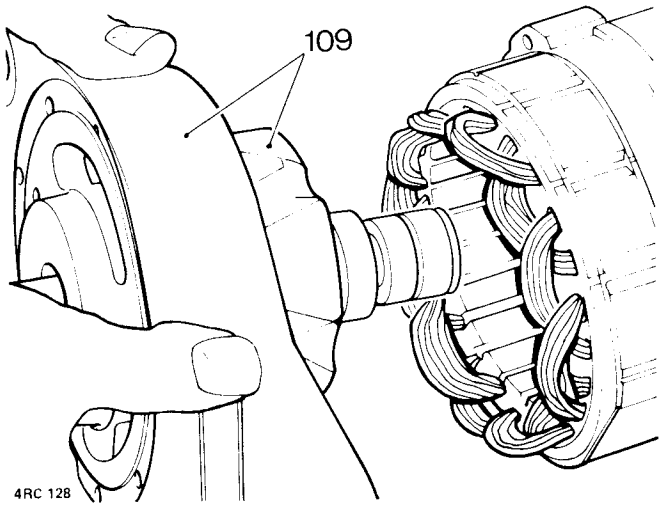
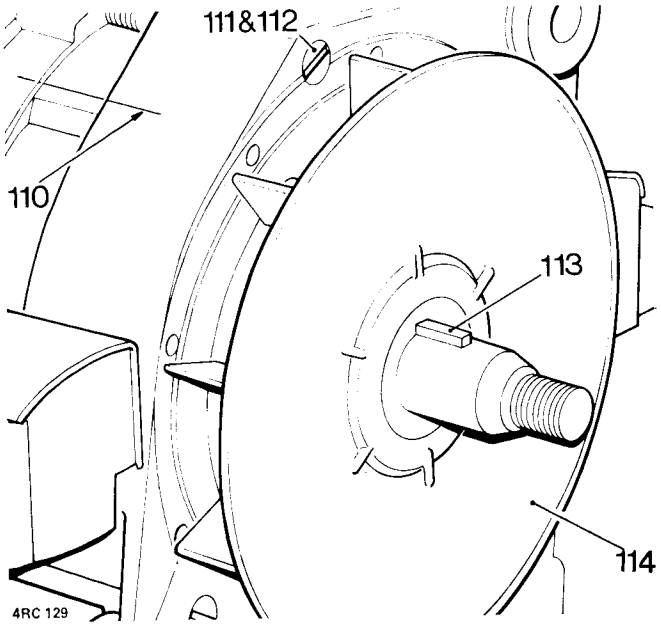
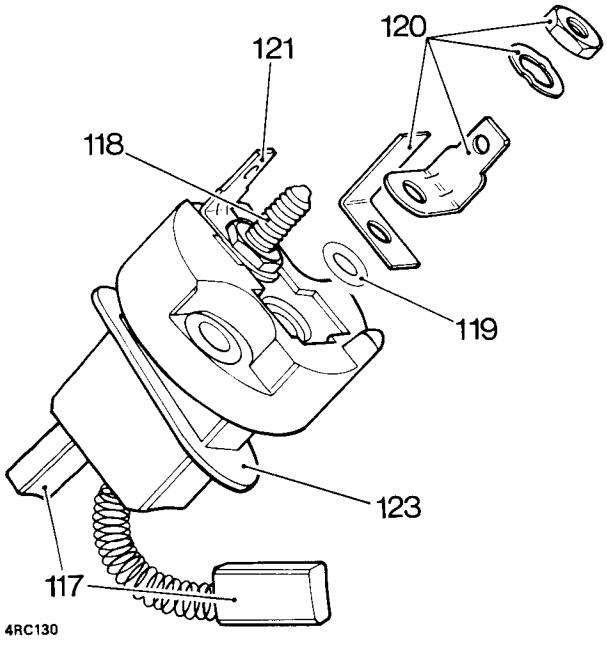


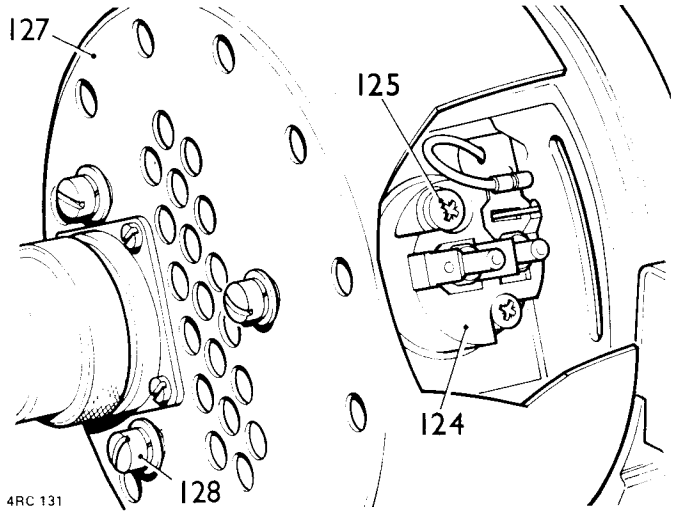




110. Align the scribed lines on the stator and slip ring end shield, then press the end shield up to the stator by hand as far as it will go.
111. Fit a locking washer on to each of the three through bolts, then coat the threads of each one with 'Loctite grade A' before inserting them through the drive end shield.
112. Clamp the assembled alternator lightly in a soft jawed vice. Tighten each bolt progressively in turn to pull the two end shields together while tapping the slip ring end shield with a hide faced mallet. The correct tightening torque is 6,80 to 7,90 N m (720 to 800 g m or 60 to 70 lb in).
113. Fit the 'Woodruff' key to the rotor shaft.
114. Slide the fan into position.
115. Fit the pulley onto the shaft and secure with a 'Nyloc' self-locking nut. Tightening torque: 54,2 N m (5,3 kg m or 40 lb ft).
116. Tap the end of the rotor shaft with a hide mallet, then spin the rotor to ensure that it rotates freely.
117. Insert both brushes into the brush box.
118. Pull on the terminals to ensure that they are fully home.
119. Place a new sealing ring over each terminal and ensure that it is fully seated into its counterbore in the brush box.
120. Assemble onto the A terminal in the following sequence:- an insulator, 'Lucar' blade, crinkle washer and a nut.
121. Assemble onto the F terminal, a 'Lucar' blade, crinkle washer and a nut.
122. Tighten both terminal nuts to a torque of 0,90 to 1,13 N m (90 to 120 g m or 8 to 10 lb in).
123. Place a new gasket in position on the brush box.
124. Assemble the brush box to the slip ring end shield, correct positioning is ensured by a dowel pin.
125. Secure the brush box with two screws, spring washers and plain washers. Tighten the screws to a torque of 1,70 to 2,26 N m (170 to 230 g m or 15 to 20 lb in).
126. If facilities are available, before fitting the cowl, bench test the alternator. 6.3.
127. Place the cowl in position.
128. Secure the cowl with three screws and spring washers. Tighten the screws to a torque of 2,8 to 3,4 N m (285 to 345 g m or 25 to 30 lb in).
129. Refit the alternator. 6.1.







ALTERNATOR

—Bench test 6.3

Equipment required

Test machine with variable speed control capable of driving the alternator at speeds of up to 4,000 rpm.
Fully charged 24 volt battery.
Carbon pile or similar variable electrical load capable of carrying a current of 60 ampere at system voltage.
Type 440A Regulator.
100 volt 'Megohm' insulation tester or similar non-destructive 'Flash' tester.
'Avometer' or similar multi-test meter.
First grade moving coil dc voltmeter with a range of 0 to 50 volt.
First grade moving coil dc ammeter with a range of 0 to 100 ampere.
24 volt warning lamp of not less than 2 watt rating.
Single pole ON/OFF switch.
3 ampere fuse and holder.

Static tests

1. Test the complete alternator for insulation faults with the 100V insulation tester. Secure one of the test leads to the alternator housing and connect the other test lead to each terminal in turn. If a 'Megohm' tester is being used, a minimum resistance of 10 Megohms should be indicated in each case. Do NOT apply this test between any two terminals or serious damage will be caused to the diodes.
2. Check for field coil circuit continuity with the 'Avometer' or multi-test meter. Select lowest resistance range, then attach probes to terminals A and F. A low resistance should be indicated, that varies slightly when rotor is turned slowly by hand. Large variations usually mean sticking brushes or dirty slip rings.
3. Rectify any faults before proceeding with further tests.

Performance testing

Checking cutting in speed

4. Mount the alternator on the test machine and connect the F terminal to the main negative terminal through the 3 ampere fuse. Connect the test meter across the two main terminals + and — and select a high voltage range.
5. Start up the test machine and slowly increase speed until the alternator cut in speed of 1,250 rev/min is reached. The voltage at this speed should be 28 V.

continued

6. If no voltage output is obtained, it will be necessary to polarize the rotor. To do this, connect a battery of the correct voltage across the field terminal; ensure that battery negative is connected to terminal F and that battery positive is connected to terminal A. Observe that the correct voltage is indicated, then disconnect the battery. The voltage reading should remain at the correct figure.
7. Stop the test machine, disconnect the test meter and remove the fused link from terminals — and F.

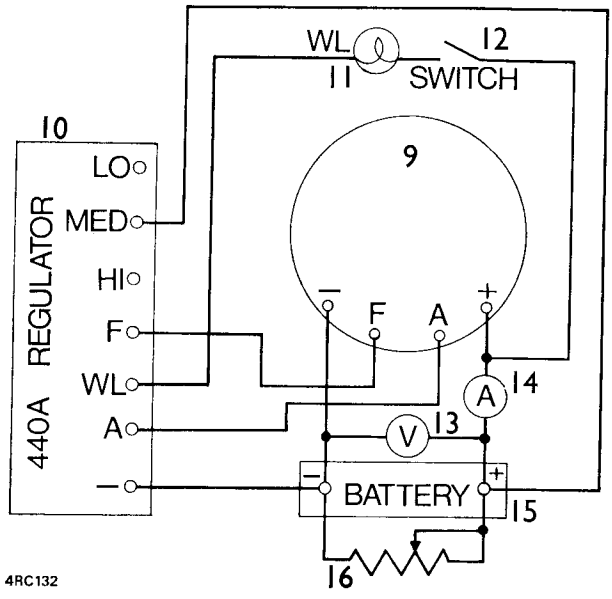
Checking alternator output

8. Connect the following components (9 to 16) into the output test circuit in accordance with the accompanying diagram. The warning lamp switch should be in the OFF position initially.
9. Type AC5 alternator.
10. Type 440A regulator.
11. Warning lamp.
12. ON/OFF switch.
13. Voltmeter.
14. Ammeter.
15. Battery, 24 V.
16. Variable resistance.
17. The adjustable load must be set so that the battery is discharged sufficiently to allow the alternator to develop its full output; if the battery is in a fully charged condition, the voltage regulator will taper off the alternator output and prevent the following test from being carried out correctly.
18. Close the warning lamp switch, then run the machine at the following speeds and compare the alternator current output with the figures given:-

Alternator speed	Current output
2000 rev/min	16,5 amps
3000 rev/min	25,5 amps
4000 rev/min	29,0 amps

NOTE: Some variation from the stated outputs is permissible, but failure to reach within 10% of the required figure indicates a faulty alternator. Do not continue with the testing until the fault has been found and rectified.

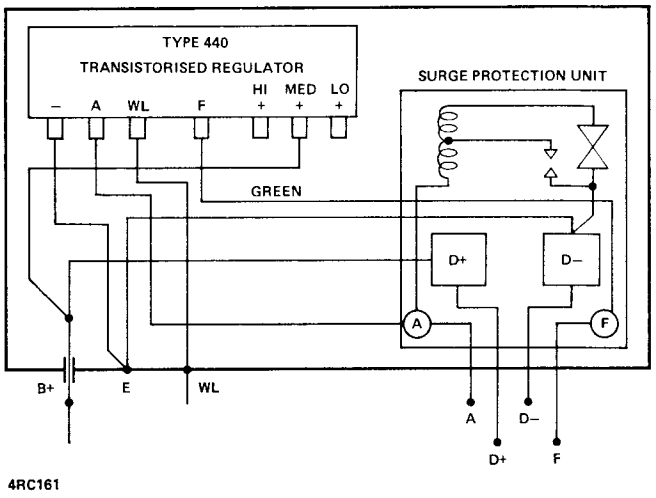
CAUTION: Do not remove any connections while the alternator is running.



CONTROL BOX

—Remove and refit 6.4

NOTE: The alternator control box contains a Type 440 Transistorised Regulator and a Surge Protection Unit. The accompanying illustration of the control box circuit is provided for reference.

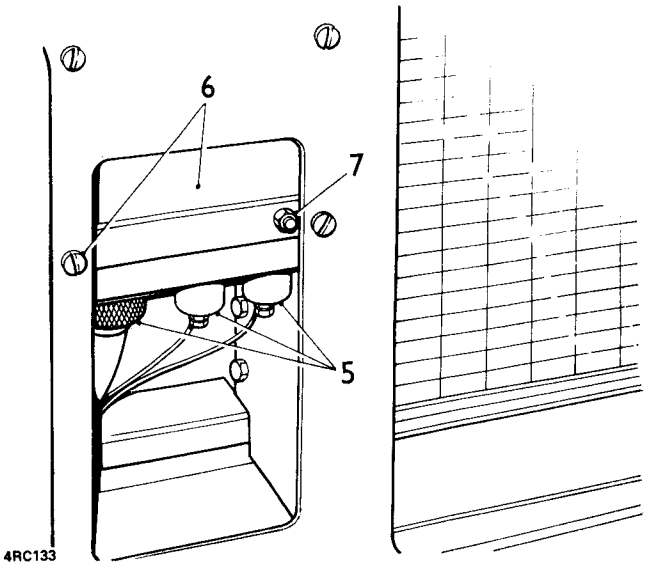


Removing

1. Disconnect the battery earth lead.
2. Remove the radiator grille.
3. Prop open the bonnet.
4. Remove the air cleaner.
5. Disconnect the cables and leads from the control box.
6. Remove the control box from the radiator grille panel.
7. If required, remove the mounting brackets.

Refitting

8. Reverse 1 to 7.



SPLIT CHARGE DIODE

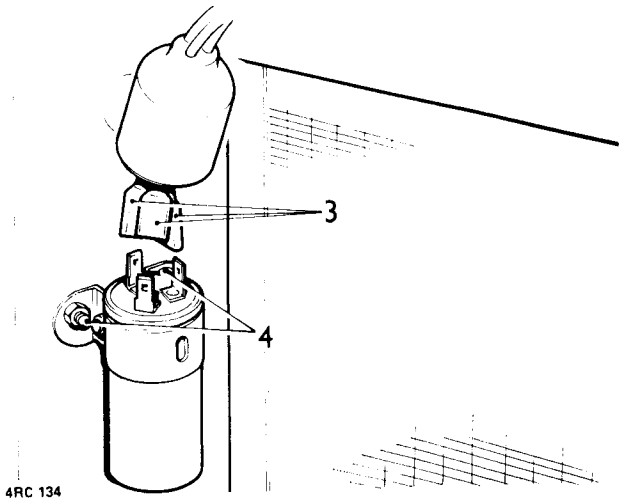
—Remove and refit 6.5

Removing

1. Disconnect the battery earth lead.
2. Remove the radiator grille.
3. Disconnect the leads from the diode.
4. Remove the diode.

Refitting

5. Reverse 1 to 4.



SPLIT CHARGE TERMINAL BOX

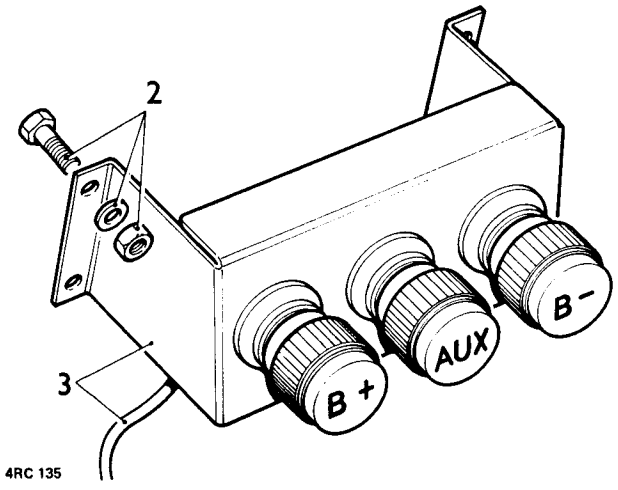
—Remove and refit 6.6

Removing

1. Disconnect the battery earth lead.
2. Release the fixings securing the terminal box.
3. Withdraw the terminal box and disconnect the leads.

Refitting

4. Reverse 1 to 3.



STARTER MOTOR

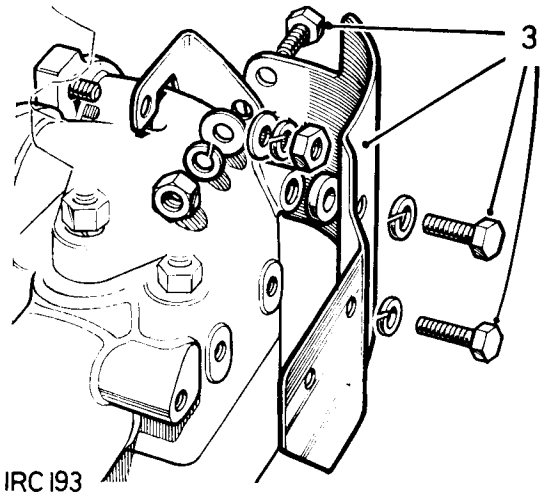
—Remove and refit **6.7**

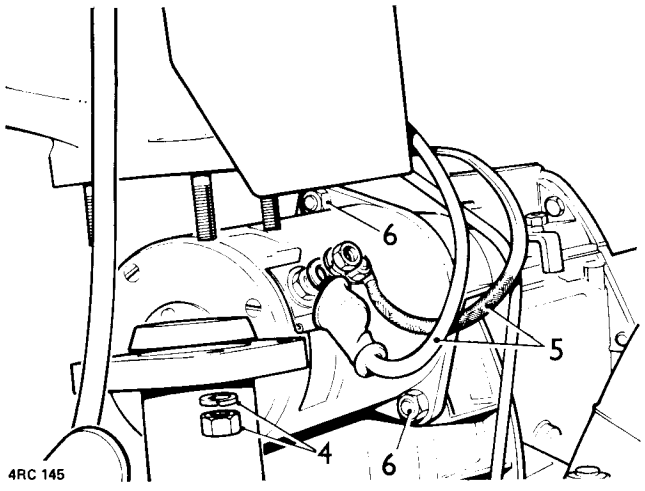
Removing

1. Remove the bonnet. 17.7.
2. Disconnect the battery earth lead.
3. Remove the exhaust heat shield.
4. Disconnect the front exhaust pipe at the manifold.
5. Disconnect the electrical leads from the starter motor.
6. Remove the starter motor.

Refitting

7. Reverse 1 to 6.





STARTER SOLENOID

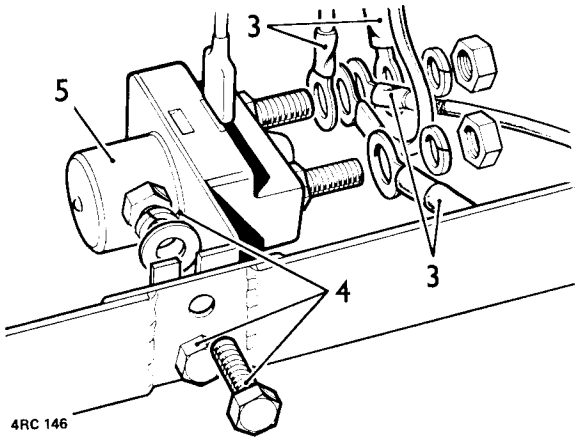
—Remove and refit **6.8**

Removing

1. Disconnect the battery earth lead.
2. Prop open the bonnet.
3. Disconnect the leads from the solenoid.
4. Remove the solenoid fixings.
5. Lift the solenoid clear.

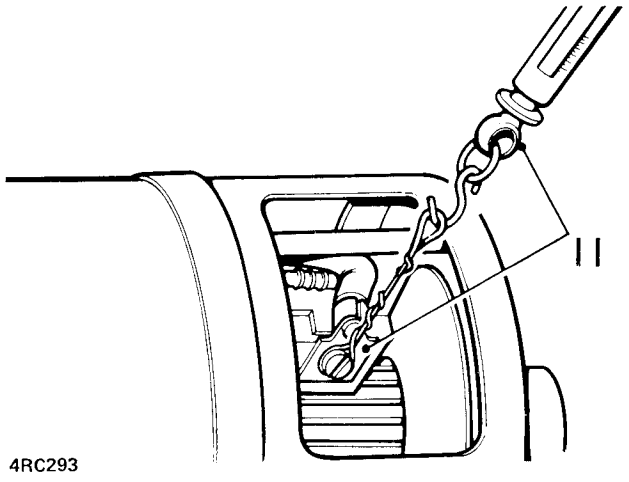
Refitting

6. Reverse 1 to 5. Connect the electrical leads in accordance with the circuit diagram.



STARTER MOTOR

—Overhaul 6.9



Dismantling

1. Remove the starter motor. 6.7.
2. Remove the split pin and the shaft nut from the armature shaft.
3. Remove the main spring, buffer washer, screwed sleeve and pinion, collar, restraining spring and sleeve and the distance washer.
4. Remove the commutator end cover band.
5. Unscrew the two through bolts and carefully withdraw the armature and end shield.
6. Make a note of the number and disposition of the thrust washers on the commutator end of the shaft and withdraw them.
7. Withdraw the end shield from the armature, followed by the distance washer.
8. The commutator end shield may be withdrawn from the yoke after releasing the brush holder connections.
9. Remove the armature.

Brushes, check

10. Check that the brushes move freely in their holders by holding back the brush springs and pulling gently on the flexible connectors. If the movement is sluggish, remove the brush from the holder and ease the sides by lightly polishing with a smooth file, then replace in its original position. If the brushes are worn so that they do not bear on the commutator, or if the flexible connectors are exposed on the running face, the brushes must be removed.
11. Check the tension of the brush springs by measuring the brush pressure with a spring balance. The correct pressure is 840 to 1120 g (30 to 40 oz), and new springs should be fitted if the tension is low.

continued

Commutator, recondition

12. A commutator in good condition will be smooth and free from pits and burned spots. Clean the commutator with a petrol-moistened cloth. If this is ineffective, carefully polish with a strip of fine glass paper, while rotating the armature. To remedy a badly worn commutator, mount the armature in a lathe, rotate at a high speed, and take a light cut with a very sharp tool. Do not remove any more metal than is necessary. Finally, polish with very fine glass paper. The insulators between the commutator segments *must not be undercut.*

Armature, test

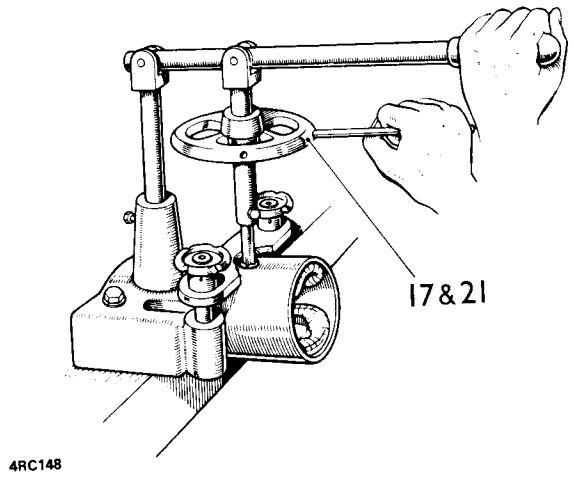
13. Examination of the armature may reveal a cause of failure, e.g. conductors lifted from the commutator due to the starter being engaged while the engine is running and causing the armature to be rotated at an excessive speed. A damaged armature must in all cases be replaced. No attempt should be made to machine the armature core or to true a distorted armature shaft.

Field coils, test

14. Test the field coils for continuity by connecting a 24-volt battery with a 24-volt lamp in series between the tapping points of the field at which the brushes are connected. Failure of the lamp to light indicates an open circuit in the wiring of the field coils. If the lamp lights, it does not necessarily mean that the field coils are in order, as it is possible that one of them may be earthed to a pole shoe or to the yoke. This may be checked with a test lamp connected from the supply mains, the leads being connected to one of the field coil tapping points, and to a clean part of the yoke. Should the lamp light, it indicates that the field coils are earthed to the yoke. In either case, unless a replacement starter is available, the field coils must be replaced. To do this, carry out the procedure outlined below, using pole shoe expander and a wheel-operated screwdriver.

continued

15. Remove the insulation piece which is provided to prevent the intercoil connectors contacting with the yoke.
16. Mark the yoke and pole shoes in order that they are replaced in the same position.
17. Unscrew the four-pole shoe retaining screws by means of the wheel-operated screwdriver.
18. Draw the pole shoes and coils out of the yoke and lift off the coil.
19. Fit the new field coils over the pole shoes and place them in position inside the yoke. Ensure that the taping of the field coils is not trapped between the pole shoes and the yoke. Locate the pole shoes and field coils by lightly tightening the fixing screws.
20. Insert the pole expander, open it, and tighten the screws.
21. Fully tighten the screws by means of the wheel-operated screwdriver.
22. Replace the insulation piece between the field coil connections and the yoke.



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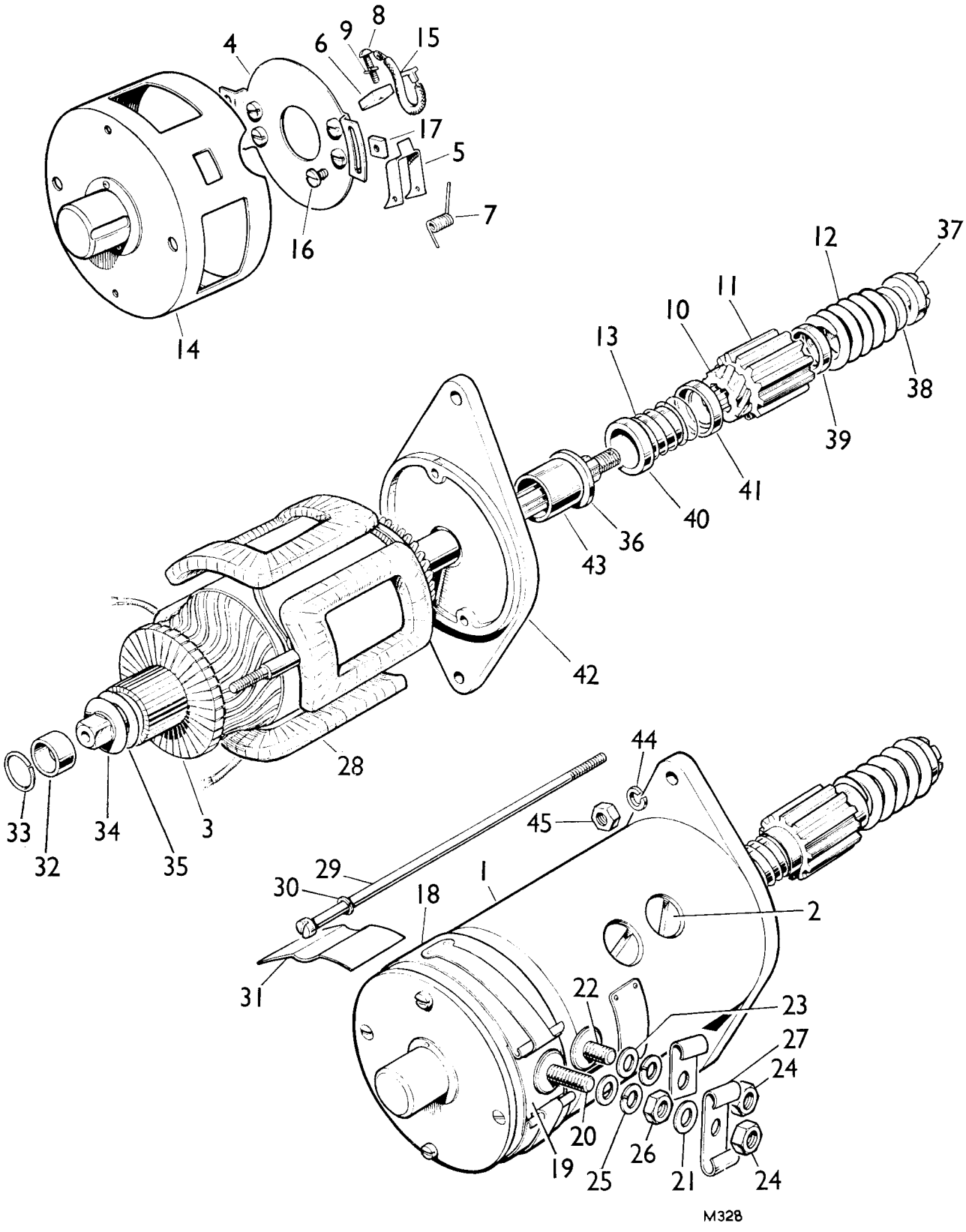
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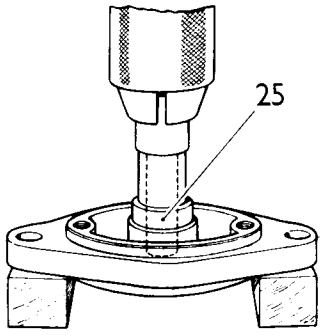
M328

Key to starter motor and fixings

1 Starter motor, 24 volt
2 Screw, $\frac{3}{8}$ in BSW
3 Armature, starter
4 Holder, brush gear
5 Holder, brush
6 Brush set
7 Spring, brush
8 Screw, 2 BA x $\frac{9}{16}$ in, fixing brush
9 Spring washer
10 Sleeve, screwed
11 Pinion, starter
12 Spring, main
13 Spring, pinion retaining
14 End shield, commutator end
15 Lead for brush
16 Screw, 2 BA x $\frac{1}{4}$ in, fixing brush gear
17 Nut, 2 BA
18 Cover, brush access
19 Clip plate, fixing cover
20 Stud, terminal positive
21 Plain washer
22 Stud, terminal negative
23 Plain washer
24 S/L nut, $\frac{3}{8}$ in BSF
25 Spring washer
26 Nut, $\frac{3}{8}$ in BSF
27 Clamp, terminal
28 Coil, field
29 Bolt, through fixing
30 Spring washer
31 Insulator plate
32 Bearing sleeve
33 Packing ring
34 Thrust washer, brass
35 Thrust washer, steel
36 Thrust washer
37 Nut, armature shaft
38 Distance piece
39 Buffer, drive
40 Spring seating
41 Cup for spring
42 End shield
43 Bearing, drive end
44 Spring washer } Fixing
45 Nut $\frac{3}{8}$ in UNF } starter motor

Bearing bushes, renew

23. Bearing bushes which are worn to such an extent that they allow excessive side play of the armature shaft must be replaced. Proceed as follows:
24. Press the bush out of the end bracket.
25. Press in the new bush, using a highly polished shouldered mandrel of the same diameter as the shaft which is to fit the bush.
26. Porous bronze bushes must not be opened out by reaming after fitting, or the porosity of the brush may be impaired. Before fitting a new porous bronze bush it should be completely immersed for 24 hours in clean thin engine oil. In cases of extreme urgency this period may be shortened by heating the oil to 100 deg C, when the time of immersion may be reduced to two hours.



4RC149

Reassembling

27. Reverse 1 to 9.

DISTRIBUTOR—2¼ litre 4-cylinder Petrol Engines

—Remove and refit **6.10**

Removing

1. Prop open the bonnet.
2. Rotate the crankshaft until both valves on No. 1 cylinder are fully closed.
3. Check the position of the timing mark on the crankshaft pulley, and align it with the appropriate tongue on the timing pointer, as follows 4 and 5.
4. TDC (longest pointer) when using 90 octane fuel.
5. 3° ATDC when using 85 octane fuel.
   NOTE: The timing pointer may not have a 3° ATDC point but it can be calculated, as it is the same distance past the TDC point as the preceding, centre, point.
6. Disconnect the battery earth lead.
7. Disconnect the distributor leads from the coil.
8. Withdraw the leads from the sparking plugs.
9. Remove the distributor.
10. Withdraw the oil seal.

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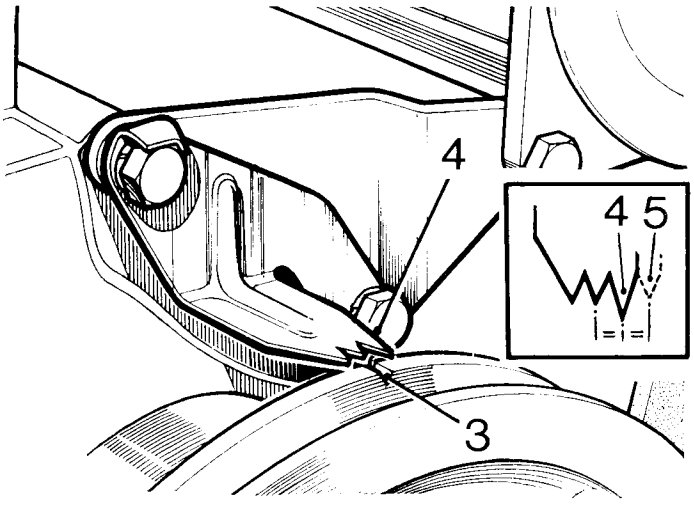

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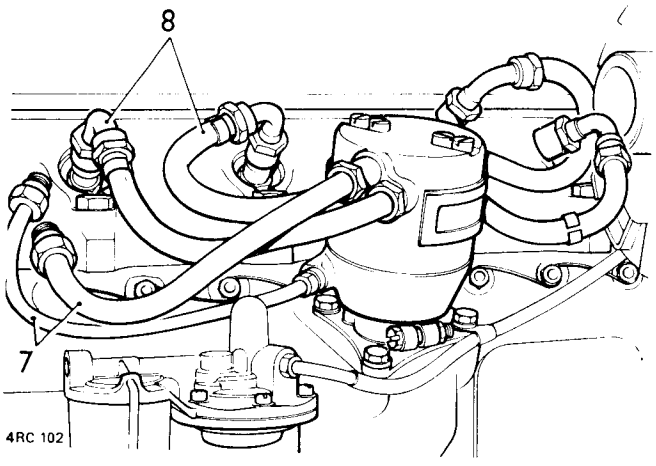

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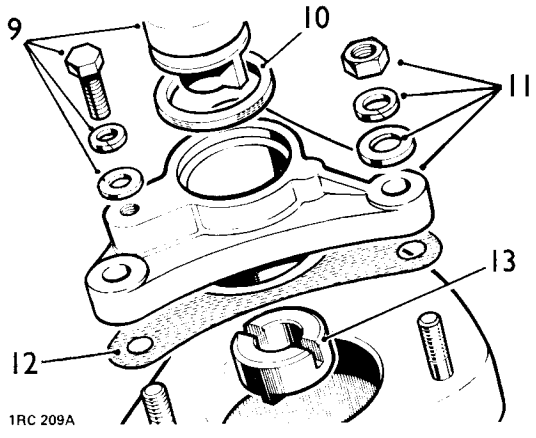
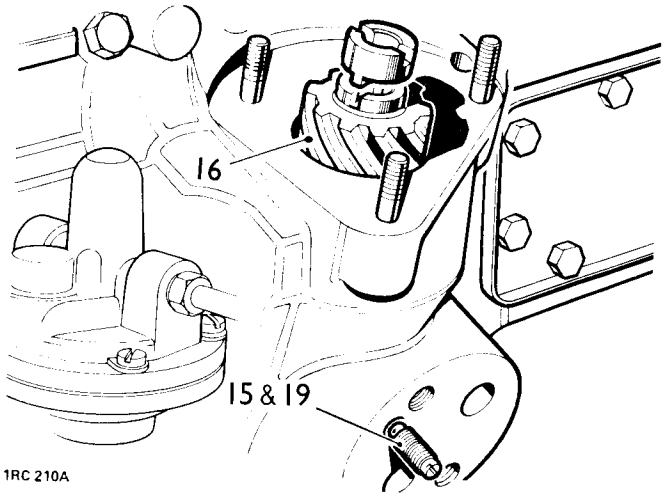


1RC 209A

If required, remove the distributor drive gear 14 to 19.

11. Remove the adaptor plate.
12. Withdraw the joint washer.
13. Withdraw the drive shaft coupling.
14. Remove the external oil filter. 1.13.
15. Remove the grub screw from the oil filter location face.
16. Withdraw the distributor drive gear.

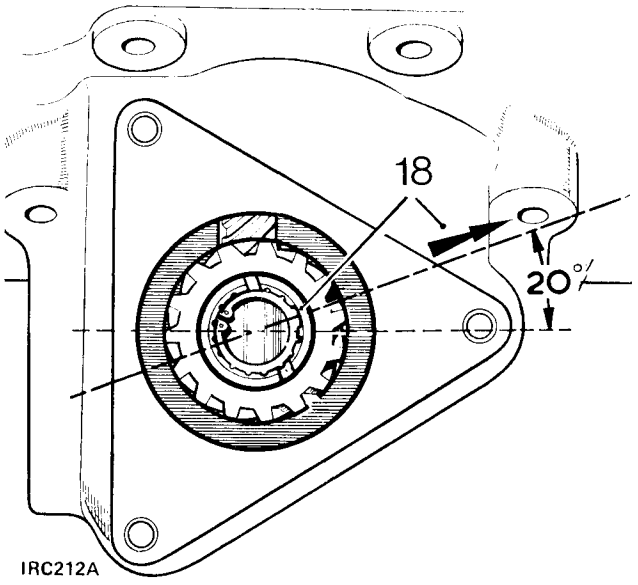


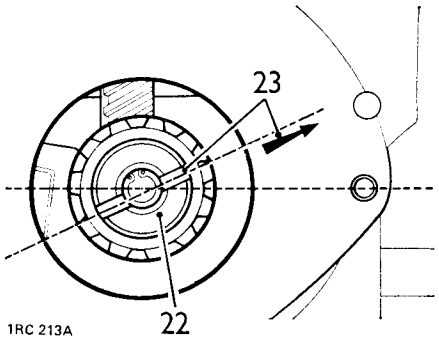
Refitting

If the distributor drive gear has been removed proceed from item 17. If the distributor only has been removed carry out item 17 and then proceed from item 25.

17. Ensure that the engine setting is correct, as described in items 2 to 5.
18. Insert the distributor drive gear so that when fully engaged, the master spline is pointing towards No. 1 cylinder.
19. Locate the small hole in the distributor drive gear bush through the oil filter location face, and fit the grub screw.
20. Fit the external oil filter. 1.13.
21. Fit the drive shaft coupling to the drive gear as follows. 22 and 23.
22. The narrow segment towards the RH side of the engine.
23. The slot towards No. 1 cylinder.
24. Reverse 11 and 12.

continued

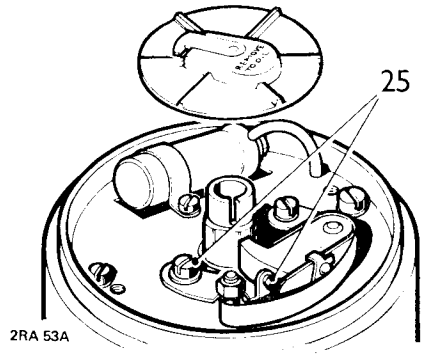




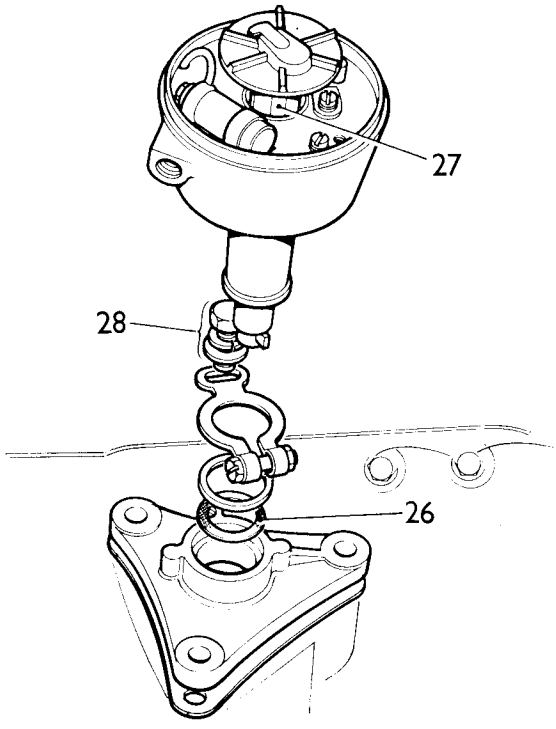
25. Adjust the distributor contact breaker gap to 0,25 to 0,30 mm (0.010 to 0.012 in).
26. Fit a new 'O' ring seal to the distributor drive shaft.
27. Offer up the distributor to the engine with the rotor arm in the No. 1 cylinder firing position. The narrow segment of the distributor shaft should be toward the RH side of the vehicle and the dog pointing toward No. 1 cylinder. The drive shaft will then engage correctly with the drive shaft coupling at engine.
28. Set the distributor adjustment so that the retaining bolt is central between the 'A' and 'R' marks on the calibrated scale.
29. Slacken the pinch bolt in base of distributor body and rotate the distributor until the contact breaker points are just opening with the cam follower on the leading side of the cam. Re-tighten the pinch bolt.
30. Connect one lead of a 24 volt test lamp to the moving contact spring and the other one to a good earth on engine. Switch ignition 'on' and turn the crankshaft two revolutions in direction of rotation. The bulb should light on the firing stroke as the timing pointer comes into alignment with the appropriate mark. See items 4 and 5.
31. Adjust as required by slackening the pinch bolt and turning the distributor bodily.
32. When satisfactory, remove the test lamp and leads.
33. Fit the distributor cap.
34. Reverse 6 to 8.
35. Close the bonnet.
36. If the external oil filter has been removed, check the engine sump oil level after a short run and top up as necessary to the 'high' mark on the oil level dipstick.

DATA

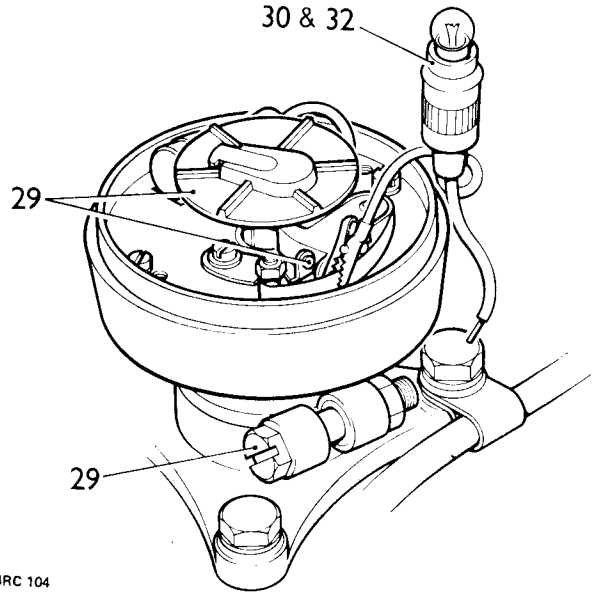
Distributor contact breaker gap	0,25 mm to 0,30 mm (0.010 in to 0.012 in)



2RA 53A



4RC 103



4RC 104

DISTRIBUTOR

—Overhaul 6.11

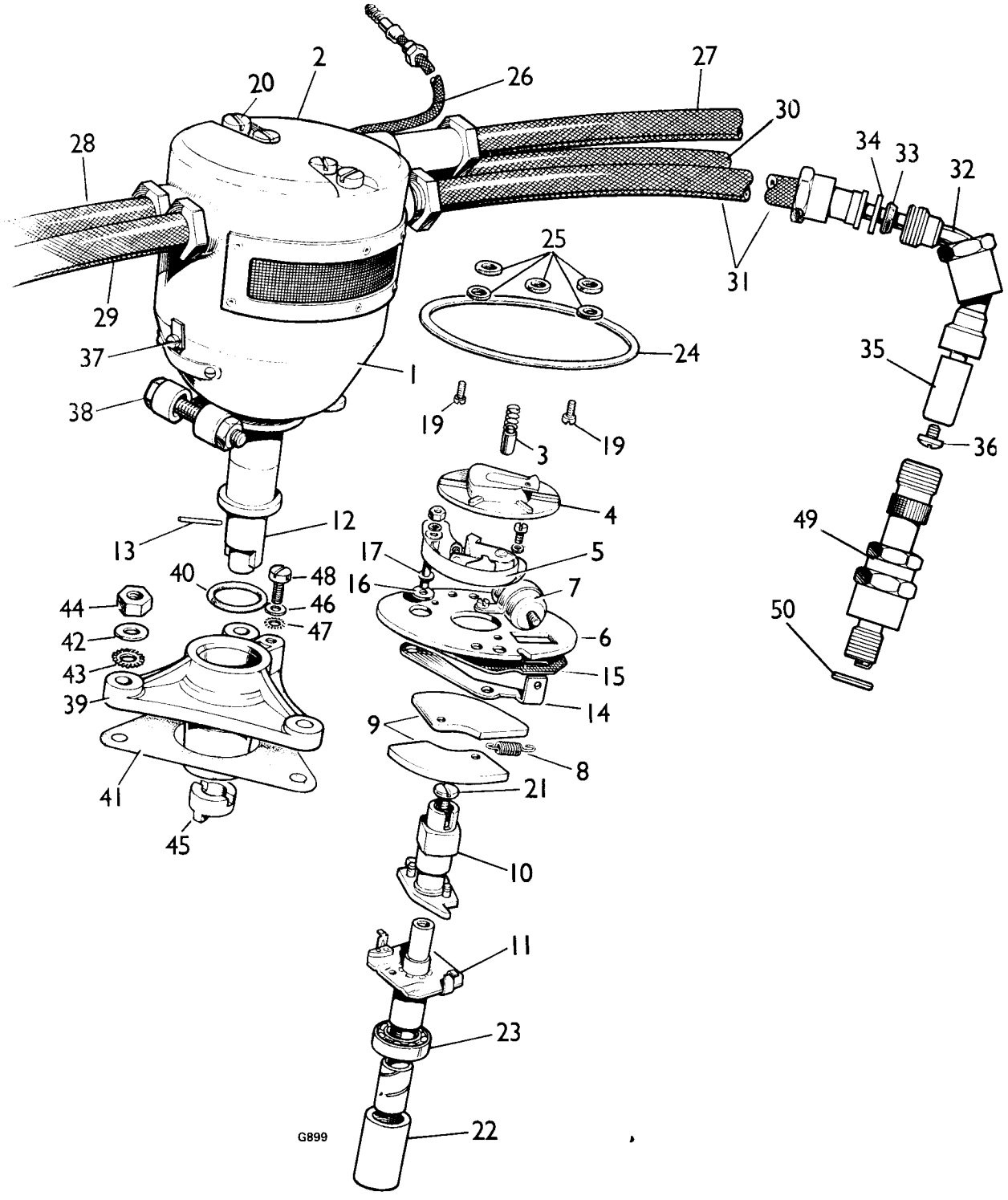
Dismantling

1. Remove the distributor.
2. Slacken the two outer screws securing the distributor cover to the body and withdraw the cover assembly.
3. Release the wire locking and knurled screws, and remove the interior moulding.
4. Withdraw the rotor.
5. Disconnect the low tension cable from the condenser terminal.
6. Remove the contact breaker base plate.
7. Remove the contact breaker lever and fibre washer.
8. Remove the fixed contact plate.
9. Remove the condenser.
10. Drive out the pin securing the driving dog and withdraw the dog and washer.
11. Remove the action plate and shaft.
12. Withdraw the distance collar.
13. Remove the clamping plate.

continued

Key to distributor and fixings

1 Distributor
2 Distributor cover
3 Brush and spring for distributor cover
4 Rotor arm
5 Contact set
6 Contact breaker base
7 High temperature condenser
8 Auto-advance distributor springs
9 Auto-advance weight
10 Distributor cam
11 Shaft and action plate
12 Driving dog
13 Pin for driving dog
14 Contact breaker base connector
15 Contact breaker base insulator
16 Insulating bush for contact breaker base
17 Spring pillar for contact breaker base
19 Screw securing cable
20 Screw fixing moulding
21 Screw fixing cam
22 Sleeve bearing, bronze
23 Ball bearing
24 Rubber sealing washer for distributor cover
25 Sealing washer
26 LT cable, coil to distributor
27 HT cable, coil to distributor
28 HT cable, No. 1
29 HT cable, No. 2
30 HT cable, No. 3
31 HT cable, No. 4
32 Plug elbow for screened ignition
33 Rubber grommet
34 Steel washer for retaining grommet
35 Steatite sleeve
36 Contact grip screw
37 Screw fixing distributor cover
38 Clamp screw and nut assembly
39 Distributor adaptor
40 Oil seal for distributor housing
41 Joint washer, aluminium, for distributor housing
42 Plain washer, steel } Fixing
43 Fan disc washer, } adaptor
44 Nut } to block
45 Driving shaft for distributor top
46 Plain washer } Fixing
47 Special disc washer } distributor
48 Screw (UNC) } to adaptor
49 Sparking plug
50 Copper and asbestos washer



Ignition Distributor and fixings

continued

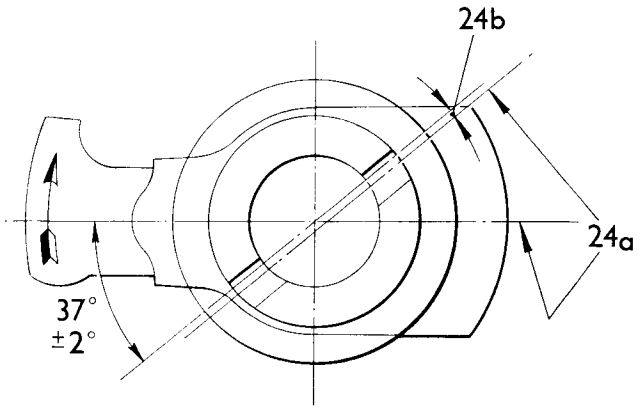
NOTE: Before dismantling the centrifugal timing control, note that the flats on the cam foot are not symetrical and that the projection stamped '25' is the one that abuts against the range stop in the fully advanced position. This arrangement must be maintained during reassembly.

14. Withdraw the springs from the centrifugal advance unit.
15. Remove the screw from inside the cam, and withdraw the cam and cam foot.
16. Remove the two weights.
17. Extract the ball bearing.
18. Press out the bush.

Reassembling

NOTE: Prior to fitting, a new bush must be allowed to stand completely immersed in clean, thin, engine oil for at least 24 hours.

19. Pack the new ball bearing with high melting point grease.
20. Thread the metal collar onto the bottom of the shaft then press on the ball bearing.
21. Press a new bush into position, using a shouldered polished mandrel of the same diameter as the shaft.
22. Reverse 3 to 16 noting the following:
23. Ensure that the distributor drive shaft rotates freely in the bush.
24. When refitting the driving dog, the following alignment is important.
    a. Position of centre line of tongue relative to centre line of distributor.
    b. Tongue off-set relative to centre line.
25. When fitting the centrifugal advance unit springs, care must be used not to over stretch them.
26. When fully assembled, adjust the contact points gap to 0,25 to 0,30 mm (0.010 to 0.012 in).
27. Reverse 1 and 2.



4RC 106

IGNITION COIL

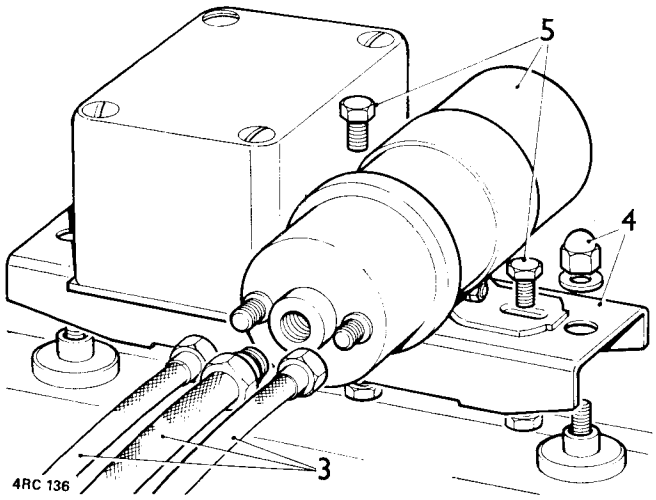
—Remove and refit **6.12**

Removing

1. Disconnect the battery earth lead.
2. Prop open the bonnet.
3. Disconnect the leads from the ignition coil.
4. Release the coil and filter assembly from the engine top cover.
5. Remove the ignition coil.

Refitting

6. Reverse 1 to 5.



IGNITION FILTER

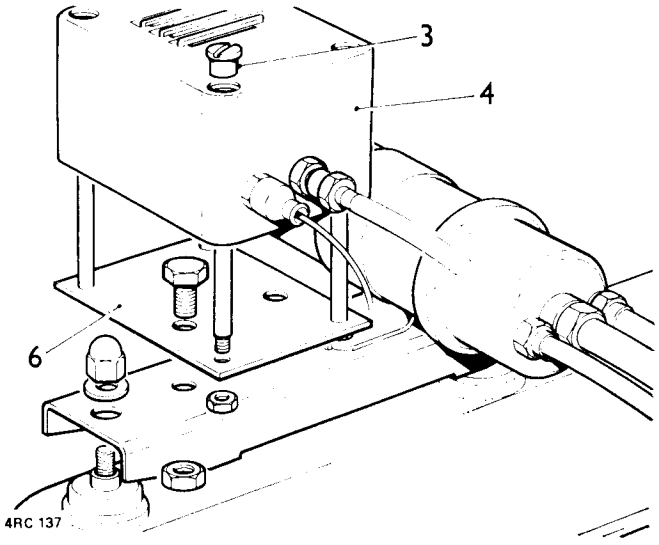
—Remove and refit **6.13**

Removing

1. Disconnect the battery earth lead.
2. Disconnect the lead from the ignition filter.
3. Remove the four through fixings.
4. Withdraw the filter.
5. If required, release the filter and coil mounting bracket from the engine top cover.
6. Remove the filter base plate.

Refitting

7. Reverse 1 to 6.



INSTRUMENT PANEL

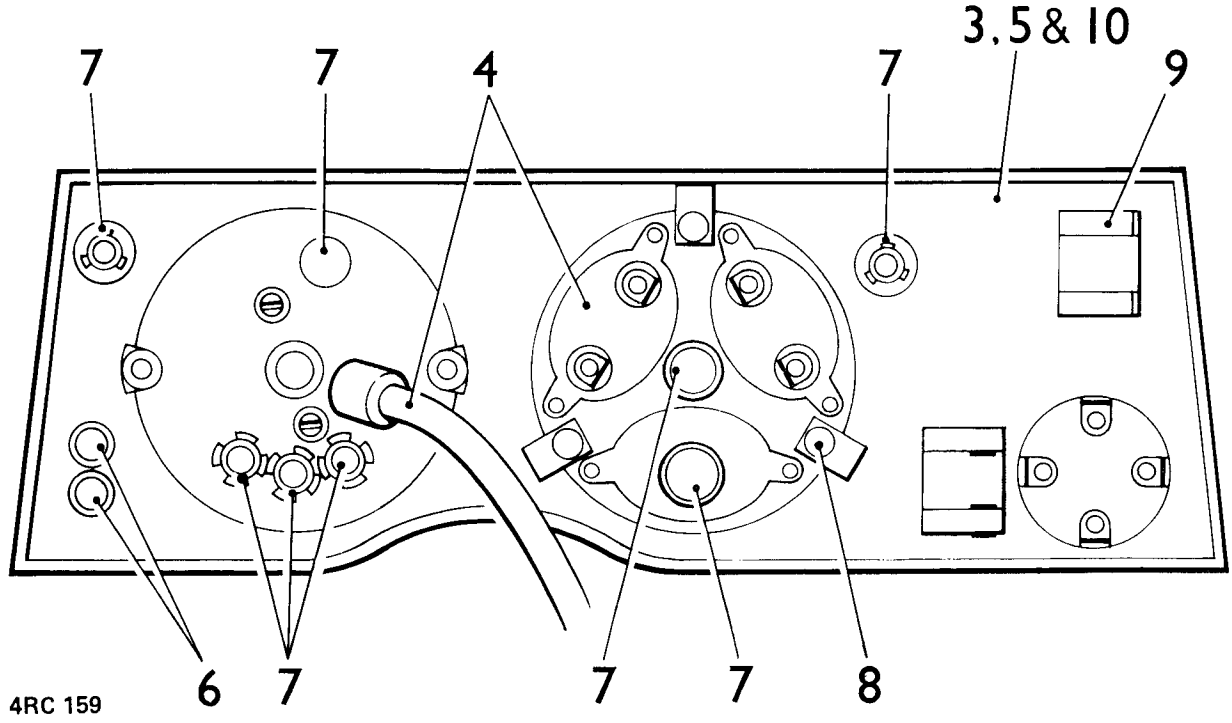
—Remove and refit **6.14**

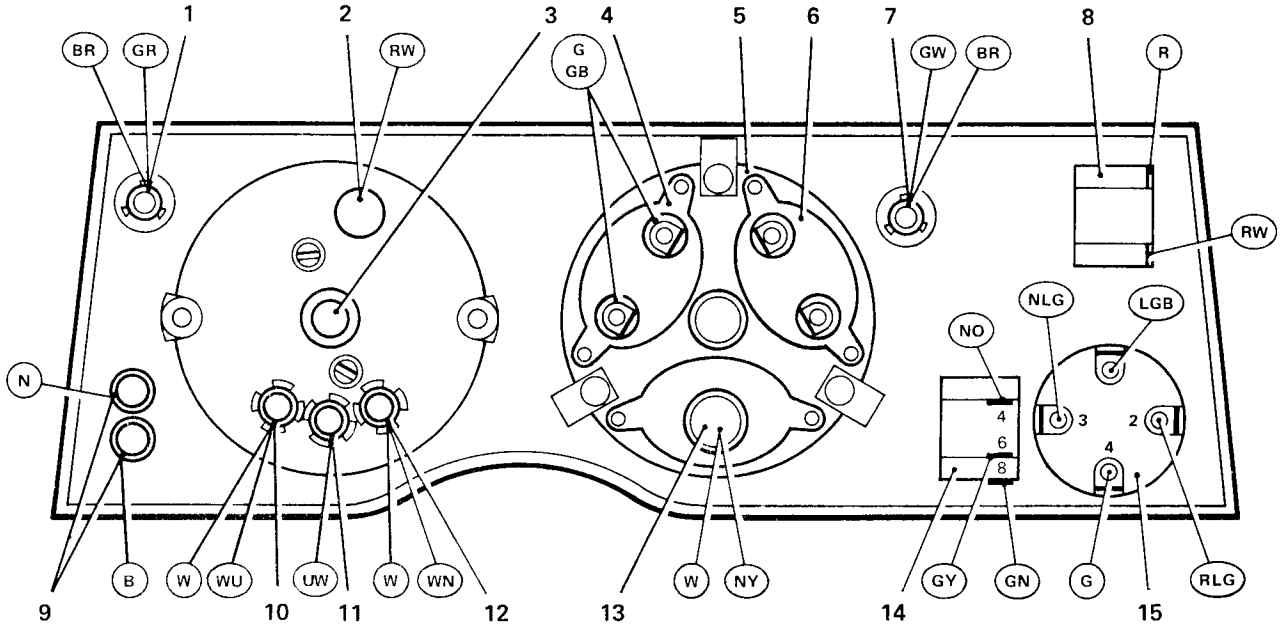
Removing

1. Disconnect the battery earth lead.
2. Remove the instrument panel fixings.
3. Withdraw the instrument panel clear of the dash. If necessary, remove the steering wheel.
4. Depress the spring clip and withdraw the cable assembly from the speedometer. If necessary, disconnect the pipe from the coolant temperature gauge.
5. Withdraw the instrument panel sufficient to gain access to the wiring connections.
6. Remove the inspection lamp socket leads.
7. Withdraw all warning and illumination lamp leads and bulbs complete with holders.
8. Disconnect the earth lead terminals at the knurled nuts on the grouped instrument.
9. Disconnect all 'Lucar' connectors.
10. Withdraw the instrument panel and instruments complete.

Refitting

11. Reverse 1 to 10, refer as necessary to the wiring diagram on Sheet 2.





4RC162

Key to view of instrument panel and wiring

1 R.H. turn indicator warning light
2 Panel illumination light
3 Speedometer
4 Fuel contents gauge
5 Ground instruments
6 Coolant temperature gauge
7 L.H. turn indicator warning light
8 Panel light switch
9 Inspection lamp sockets
10 Cold start warning light
11 Headlamp main beam warning light
12 Oil pressure warning light
13 Battery charge warning light
14 Heater switch
15 Wiper/washer switch

Key to electrical cable colours

Where cables have two-colour code letters, the first denotes the main colour and the latter denotes the tracer colour.

B Black
U Blue
N Brown
Y Yellow
G Green
O Orange
P Purple
D Dark
R Red
S Slate
W White
L Light

AMMETER

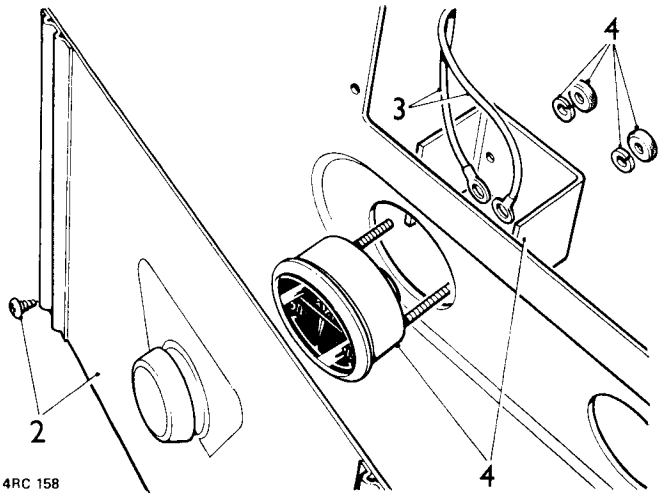
—Remove and refit **6.15**

Removing

1. Disconnect the battery earth lead.
2. Remove the auxiliary panel from the centre of the dash.
3. Disconnect the electrical leads from the ammeter.
4. Remove the retaining bracket and withdraw the ammeter from the front of the facia.

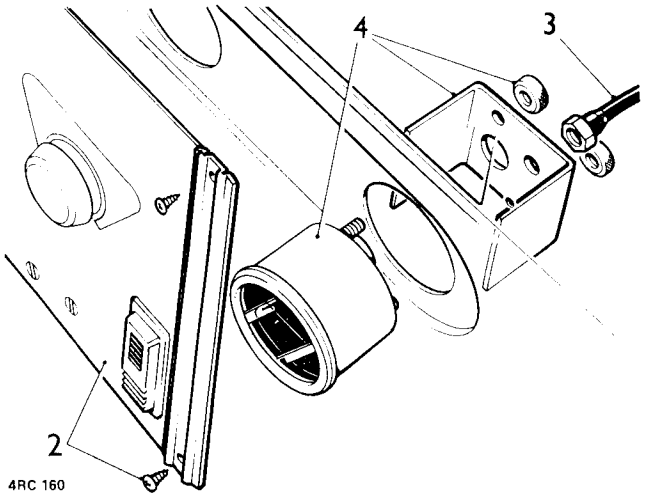
Refitting

5. Reverse 1 to 4. Connect the leads in accordance with the circuit diagram.



OIL GAUGE

—Remove and refit **6.16**



Removing

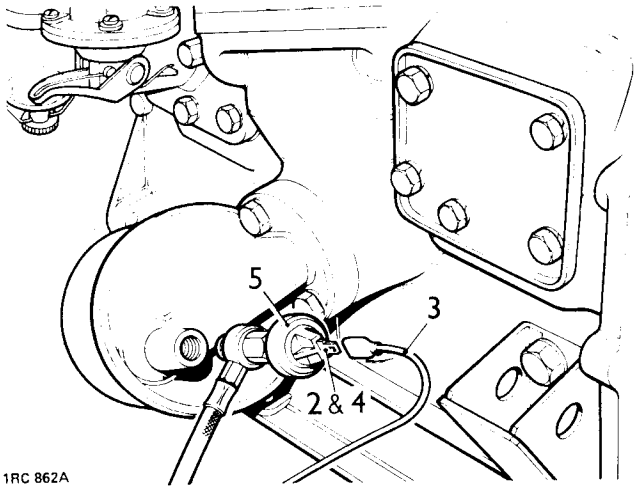
1. Disconnect the battery earth lead.
2. Remove the auxiliary switch panel from the centre of the dash.
3. Disconnect the oil feed pipe from the oil pressure gauge.
4. Remove the retaining bracket and withdraw the oil pressure gauge from the front of the facia.

Refitting

5. Reverse 1 to 4.

OIL PRESSURE WARNING SWITCH

—Remove and refit **6.17**



Removing

1. Prop open the bonnet.
2. Locate the switch at the oil filter, R.H. side of the engine.
3. Disconnect the electrical lead.
4. Unscrew the switch.
5. Withdraw the joint washer.

Refitting

6. Reverse 1 to 5 as applicable.

COOLANT TEMPERATURE GAUGE

—Remove and refit **6.18**

Removing

1. Withdraw the instrument panel. 6.14. (Items 1 to 5) and locate the coolant temperature gauge (illustrated on page 6.14, Sheet 2).
2. Remove the three knurled nuts at the grouped instrument clamp brackets.
3. Withdraw the three earth lead eyelets and shake-proof washers from the clamp studs.
4. Withdraw the grouped instrument clear of the instrument panel.
5. Disconnect the pipe from the coolant temperature gauge.
6. Remove the fixing screws and withdraw the coolant temperature gauge.

Refitting

7. Reverse 1 to 6.

FUEL CONTENTS GAUGE

—Remove and refit **6.19**

Removing

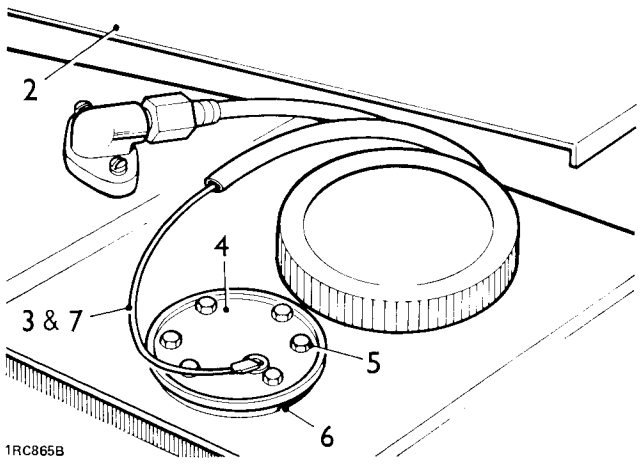
1. Withdraw the instrument panel. 6.14 (items 1 to 5) and locate the fuel contents gauge (illustrated on page 6.14, Sheet 2).
2. Remove the three knurled nuts at the grouped instrument clamp brackets.
3. Withdraw the three earth lead eyelets and shake-proof washers.
4. Withdraw the grouped instrument clear of the instrument panel.
5. Disconnect the 'Lucar' connectors.
6. Remove the fixing screws and withdraw the fuel contents gauge.

Refitting

7. Reverse 1 to 6. Fit the 'Lucar' connectors either way round.

FUEL TANK GAUGE UNIT (Side mounted tank)

—Remove and refit **6.20**



Removing

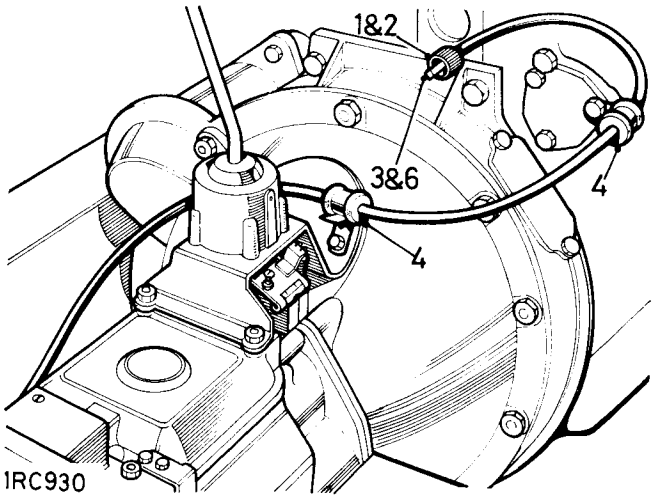
1. Disconnect the battery earth lead.
2. Remove the seat cushion and tank cover panel.
3. Disconnect the electrical lead/s at the gauge unit.
4. Mark the gauge unit position in relation to the tank.
5. Remove the fixings and withdraw the gauge unit.

Refitting

6. Fit the gauge unit, using a suitable fuel resistant jointing compound ('Osotite' or similar) on the new joint washer.
7. Connect the electrical lead.
   The gauge unit is earthed through the tank-to-chassis fixings.
8. Reverse 1 to 3.

SPEEDOMETER

—Remove and refit **6.21**



Removing

1. Withdraw the instrument panel. 6.14 (items 1 to 5).
2. Remove the knurled nuts at the speedometer clamp brackets.
3. Withdraw the earth lead eyelets and shakeproof washers from the clamp studs.
4. Withdraw the speedometer clear of the instrument panel.
5. Withdraw the warning lamps and illumination lamp bulb holders and withdraw the speedometer.

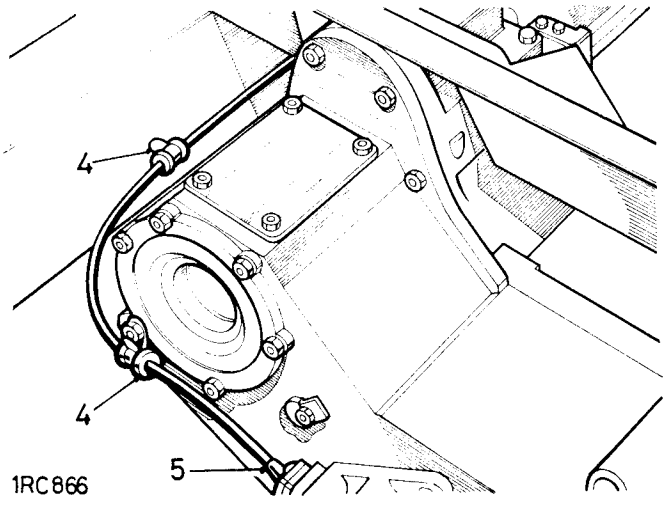
Refitting

6. Reverse 1 to 5, referring to the illustration, page 6.14, Sheet 2, if necessary, for warning lamp bulbs correct location.

SPEEDOMETER CABLE

—Remove and refit

Cable complete, items 1, 2, 4, 5 and 6 **6.22**
Inner cable, items 1, 2, 3 and 6 **6.23**



Removing

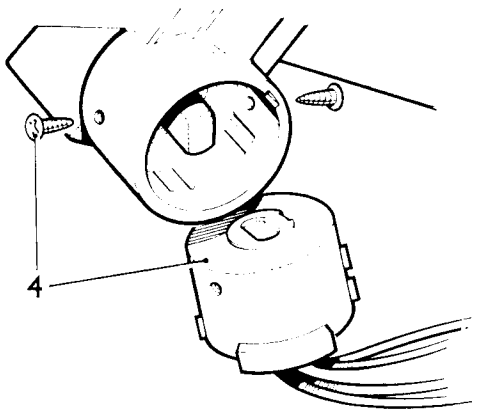
1. Withdraw the instrument panel and disconnect the speedometer cable. 6.14. (items 1 to 4).
2. Withdraw the speedometer cable end into the engine compartment.
3. Withdraw the inner cable from the outer.
4. Detach the speedometer cable grommets from the securing clips at the engine, flywheel housing, chassis sidemember and transfer gearbox.
5. Disconnect the cable at the gearbox.

Refitting

6. Reverse items 1 to 5 as applicable. When replacing the inner cable, grease sparingly with general purpose grease. Ensure that the inner cable is engaged in the drive slot at the gearbox.

IGNITION STARTER SWITCH

—Remove and refit **6.24**



4RC 150

Removing

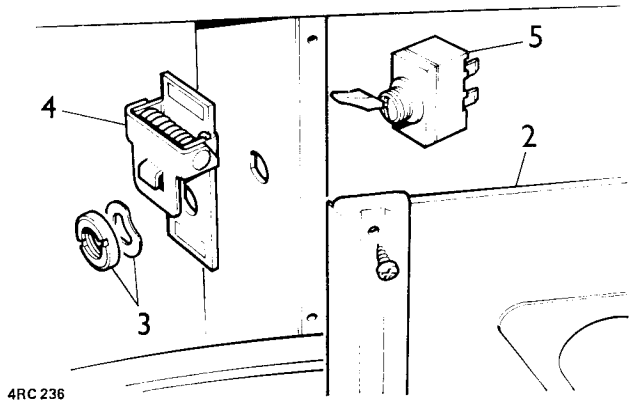
1. Disconnect the battery earth lead.
2. Remove the upper half of the switch shroud from the steering column.
3. Disconnect the leads from the ignition switch.
4. Remove the screw locating the switch in the housing and withdraw the switch.

Refitting

5. Reverse 1 to 4, connecting the switch leads in accordance with the circuit diagram.

BLACKOUT MASTER SWITCH

—Remove and refit **6.25**



4RC 236

Removing

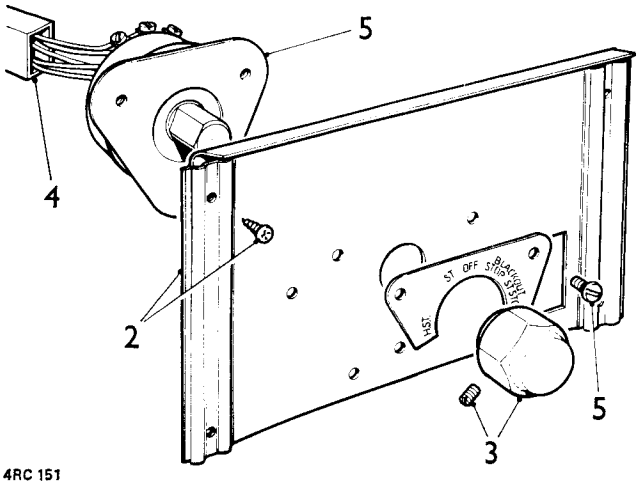
1. Disconnect the battery earth lead.
2. Remove the auxiliary switch panel from the centre of the dash.
3. Unscrew the locking ring and wave washer from the switch knob.
4. Withdraw the switch inhibiter.
5. Disconnect the leads and withdraw the switch.

Refitting

6. Reverse 1 to 5. Refer to the circuit diagram for the lead connections.

LIGHTING SWITCH

—Remove and refit **6.26**



4RC 151

Removing

1. Disconnect the battery earth lead.
2. Remove the auxiliary switch panel from the centre of the dash.
3. Remove the grub screw and withdraw the switch knob.
4. Disconnect the lighting switch leads at the plug connector.
5. Remove the three screws and withdraw the lighting switch from the panel.

Refitting

6. Reverse 1 to 5, connecting the switch leads in accordance with the circuit diagram.

PANEL LIGHT SWITCH

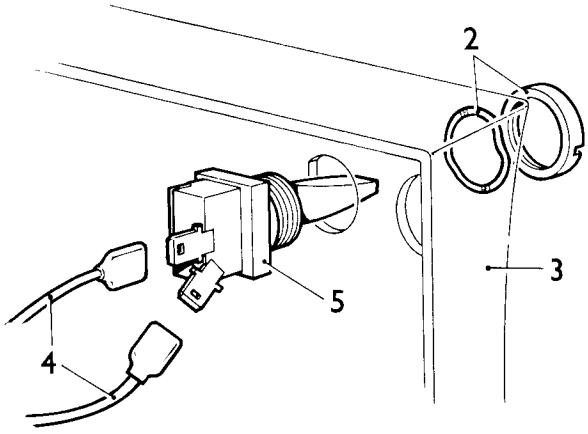
—Remove and refit **6.27**

Removing

1. Disconnect the battery earth lead.
2. Unscrew the locking ring and wave washer from the switch knob.
3. Withdraw the instrument panel clear of the dash. 6.14 (items 1 to 5).
4. Disconnect the leads from the back of the switch.
5. Withdraw the panel light switch.

Refitting

6. Reverse 1 to 5. Connect the leads in accordance with the circuit diagram.



4RC 152

WINDSCREEN WIPER/WASHER SWITCH

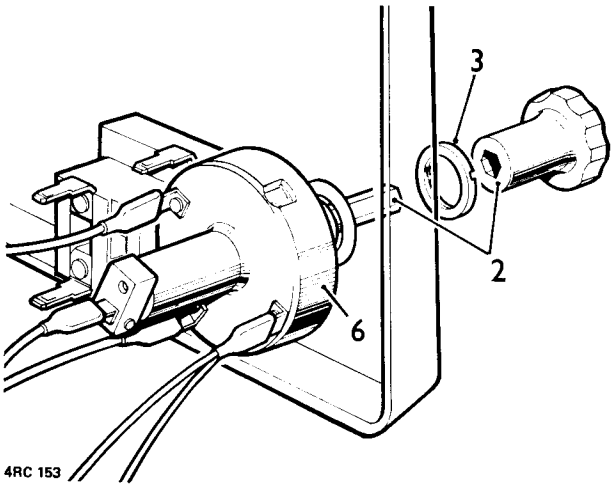
—Remove and refit **6.28**

Removing

1. Disconnect the battery earth lead.
2. Depress the plunger and withdraw the switch knob.
3. Unscrew the locking ring.
4. Withdraw the instrument panel clear of the dash. 6.14 (items 1 to 5).
5. Disconnect the leads from the back of the switch.
6. Withdraw the windscreen wiper/washer switch.

Refitting

7. Reverse 1 to 6. Connect the leads in accordance with the circuit diagram.



4RC 153

BRAKE WARNING TEST SWITCH

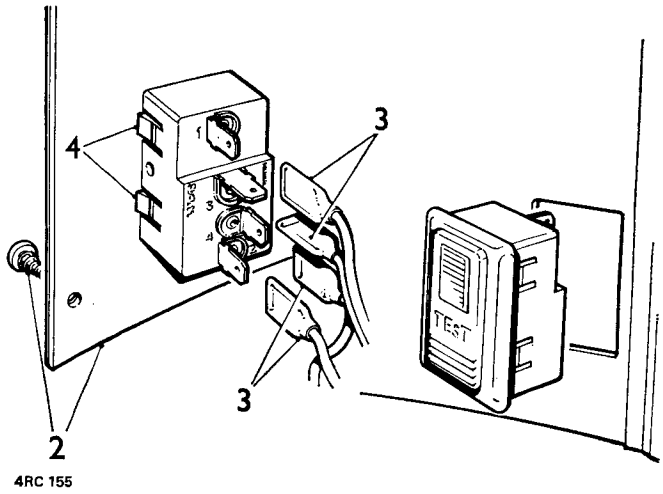
—Remove and refit **6.29**

Removing

1. Disconnect the battery earth lead.
2. Remove the auxiliary switch panel from the centre of the dash.
3. Disconnect the leads from the brake warning test switch.
4. Compress the switch retainers and pass the switch through the front of the panel.

Refitting

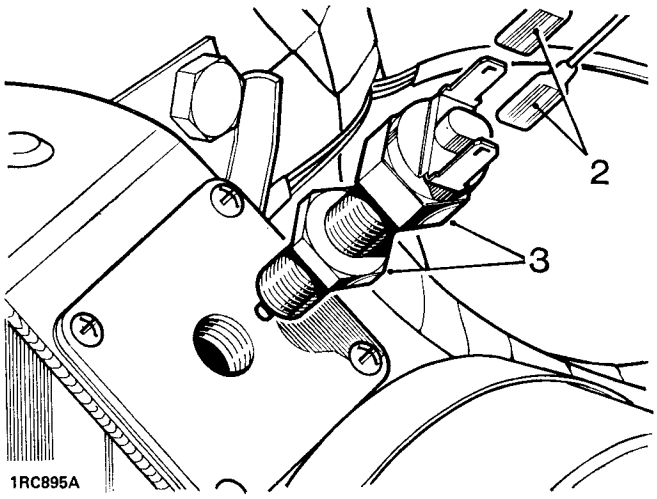
5. Reverse 1 to 4.



4RC 155

STOP LIGHT SWITCH

—Remove and refit **6.30**



Removing

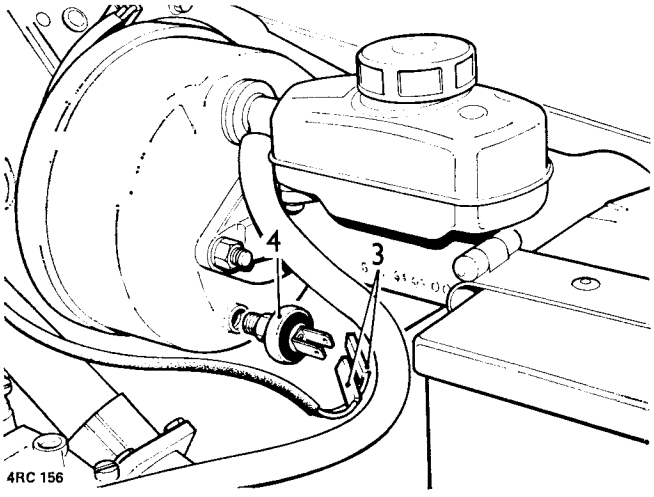
1. Disconnect the battery earth lead.
2. Disconnect the leads from the stop lamp switch.
3. Release the locknut and unscrew the switch from the brake pedal bracket.

Refitting

4. Reverse 1 to 3.
5. Check, and if necessary adjust, the stop lamp switch to operate at 19 to 25 mm (0.750 to 1.000 in) of pedal movement.

VACUUM LOSS WARNING SWITCH

—Remove and refit **6.31**



Removing

1. Disconnect the battery earth lead.
2. Prop open the bonnet.
3. Disconnect the leads from the vacuum loss warning switch.
4. Unscrew the switch from the brake servo.

Refitting

5. Reverse 1 to 4.

CHOKE WARNING LIGHT SWITCH

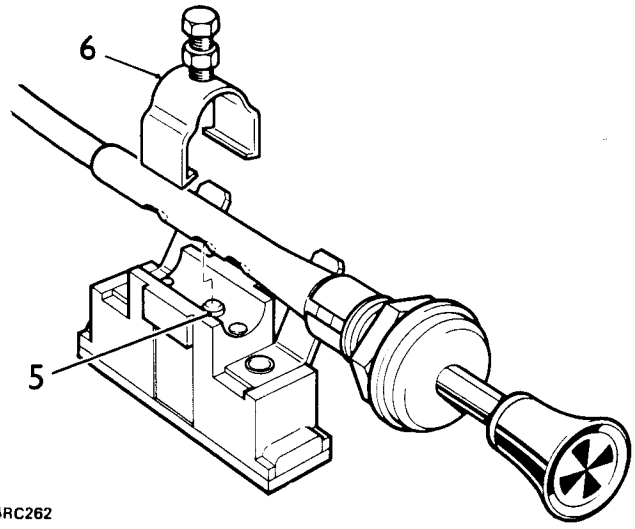
—Remove and refit **6.32**

Removing

1. Disconnect the battery earth lead.
2. Disconnect the electrical leads from the switch.
3. Remove the clip securing the switch to the choke cable.
4. Remove the switch.

Refitting

5. Pull the choke control out and locate the switch operating plunger in the centre hole in the choke cable outer sleeve.
6. Refit the switch taking care not to jam the plunger by overtightening the retaining clip fixing bolt.
7. Reverse 1 and 2.



COMBINED DIRECTION INDICATOR, HEADLIGHT AND HORN SWITCH

—Remove and refit **6.33**

Removing

1. Disconnect the battery earth lead.
2. Remove the both halves of the switch shroud from the steering column.
3. Release the combined switch from the steering column.
4. Withdraw the combined switch sufficient to disconnect the main harness at the plug connector.
5. Withdraw the instrument panel clear of the dash. 6.14 (items 1 to 5).
6. Disconnect the switch leads from the flasher unit, lighting switch, fuse box and ignition switch.
7. Withdraw the combined switch.

Refitting

8. Reverse 1 to 7. Connect the leads in accordance with the circuit diagram.

HEADLAMP ASSEMBLY

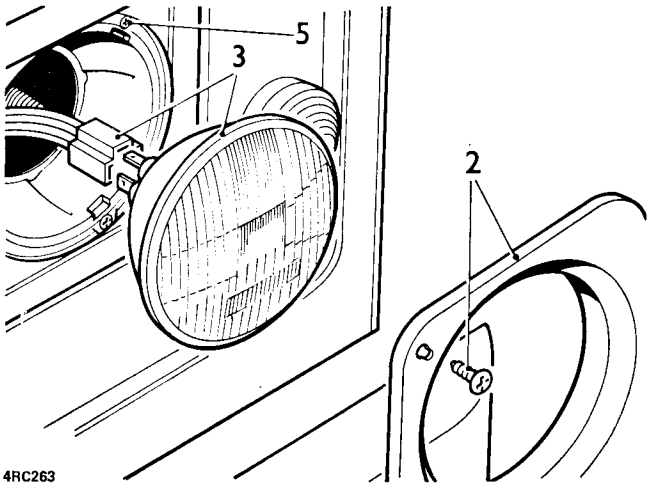
—Remove and refit **6.34**

Removing

1. Disconnect the battery earth lead.
2. Remove the headlamp bezel.
3. Disconnect the headlamp leads at the plug connector and withdraw the light unit.

Refitting

4. Reverse 1 to 3.
5. Check and, if necessary, adjust the headlamp, using suitable beam setting equipment.



FRONT SIDE AND FLASHER LAMPS

—Remove and refit

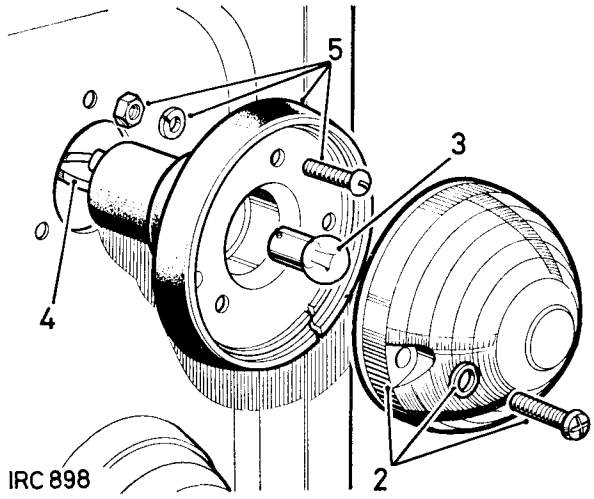
Front side lamp	**6.35**
Front flasher lamp	**6.36**

Removing

1. Disconnect the battery earth lead.
2. Remove the lamp lens.
3. If required, remove the bulb.
4. Disconnect the lamp leads at the snap connectors in the engine compartment.
5. Remove the lamp body.

Refitting

6. Reverse 1 to 5.



REAR FLASHER AND TAIL LAMPS

—Remove and refit

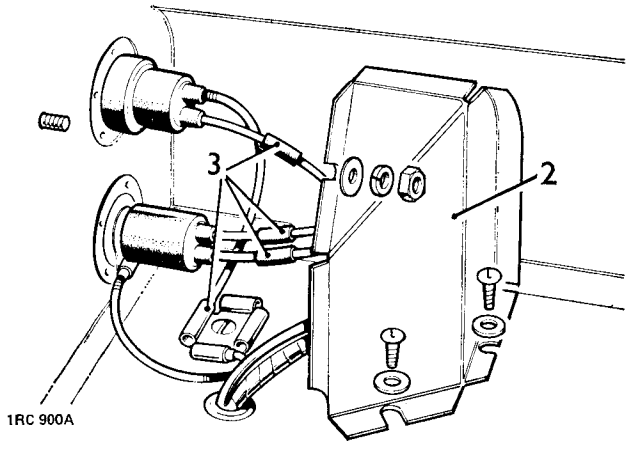
Rear flasher lamp	**6.37**
Tail lamp	**6.38**

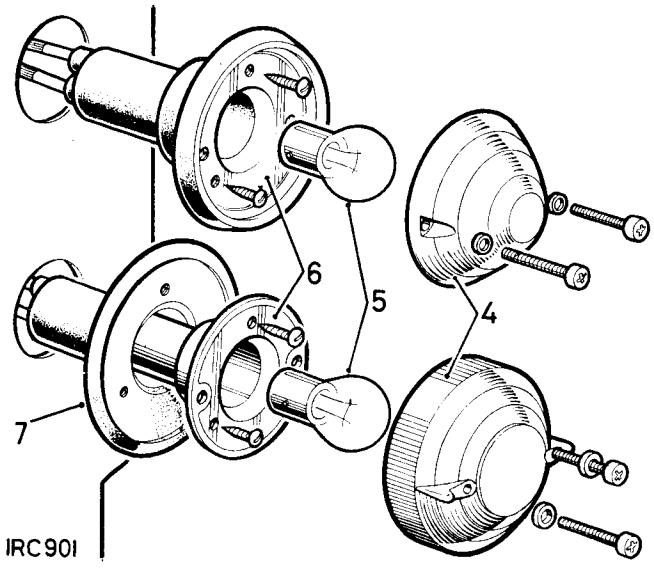
Removing

1. Disconnect the battery earth lead.
2. Remove the rear lamp cover plate from inside the vehicle.
3. Disconnect the lamp leads.
4. Remove the lamp lens.
5. If required, remove the bulb.
6. Remove the lamp body.
7. Withdraw the rubber mounting for the tail lamp.

Refitting

8. Reverse 1 to 7.





BLACKOUT LAMPS

—Remove and refit

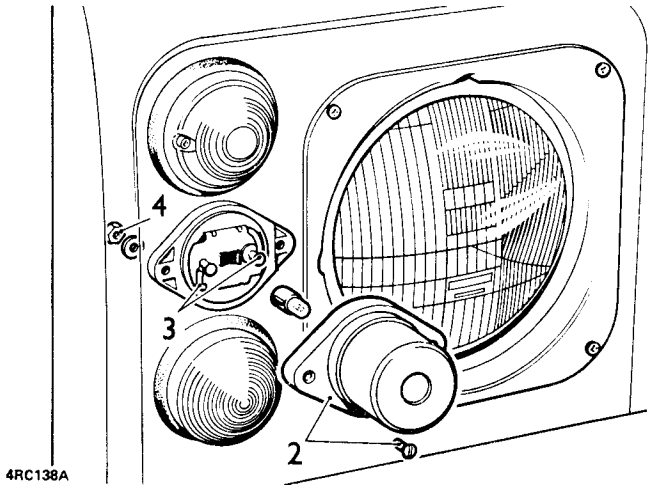
Front	**6.39**
Rear	**6.40**

Removing

1. Disconnect the battery earth lead.
2. Remove the lamp cover.
3. Disconnect the leads.
4. Remove the lamp fixings from under the wing.

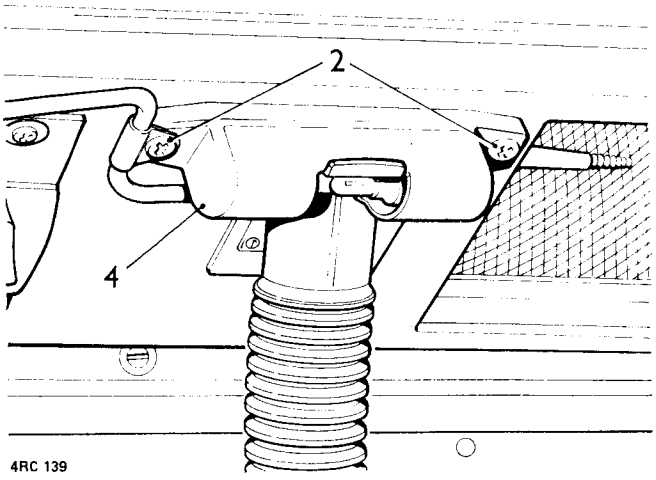
Refitting

5. Reverse 1 to 4.



MAP LAMP ASSEMBLY

—Remove and refit **6.41**



Removing

1. Disconnect the battery earth lead.
2. Remove the two screws securing the map lamp to the dash.
3. Disconnect the electrical leads from the rear of the lamp.
4. Withdraw the map lamp assembly.

Refitting

5. Reverse 1 to 4.

PANEL ILLUMINATION LAMP OR WARNING LAMP BULB

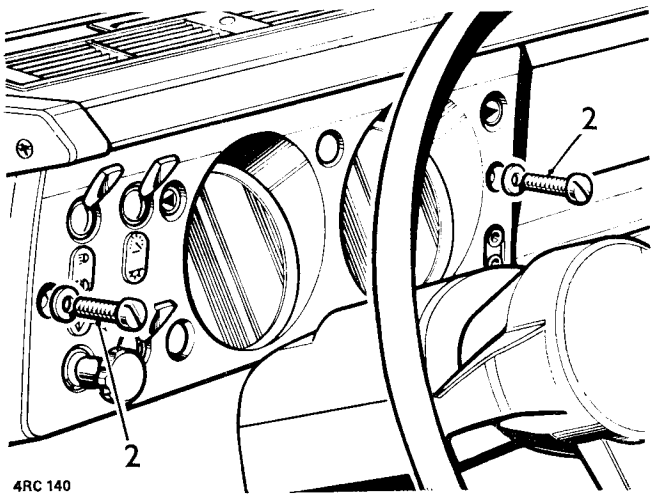
—Remove and refit **6.42**

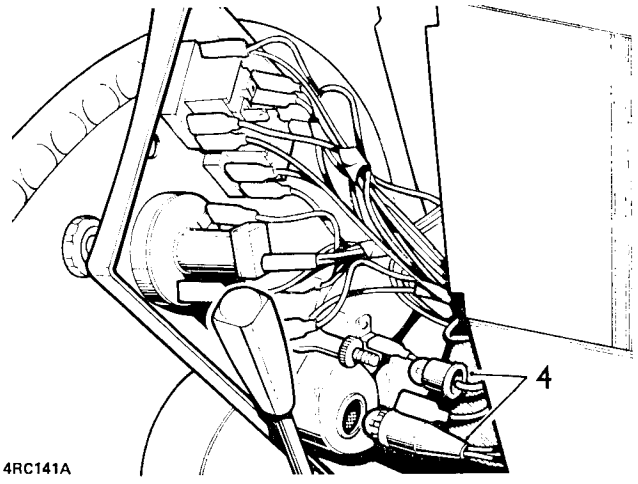
Removing

1. Disconnect the battery earth lead.
2. Remove the two screws retaining the instrument panel.
3. Withdraw the instrument panel clear of the dash.
4. Withdraw the bulb holder and change the bulb as necessary.

Refitting

5. Reverse 1 to 4.





INSPECTION SOCKETS

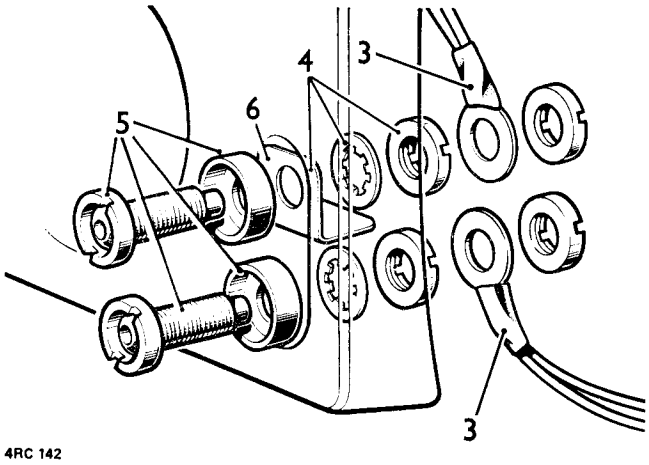
—Remove and refit **6.43**

Removing

1. Disconnect the battery earth lead.
2. Withdraw the instrument panel clear of the dash. 6.14 (items 1 to 5).
3. Disconnect the electrical leads from the sockets.
4. Remove the screw lock rings, shakeproof washers and insulation tab.
5. Withdraw the sockets.

Refitting

6. Reverse 1 to 5, ensuring that the insulation tab is central between the two sockets.



BATTERIES

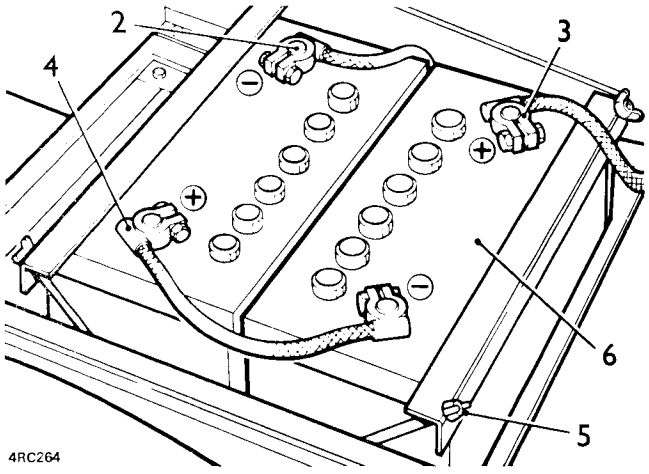
—Remove and refit **6.44**

Removing

1. From the driving compartment, remove the battery cover.
2. Disconnect the battery earth lead.
3. Disconnect the battery main lead.
4. Disconnect the interconnecting lead.
5. Remove the wing nuts and battery retaining frame.
6. Remove the batteries.

Refitting

7. Reverse 1 to 6. Ensure that the batteries are connected NEGATIVE EARTH.



HORN

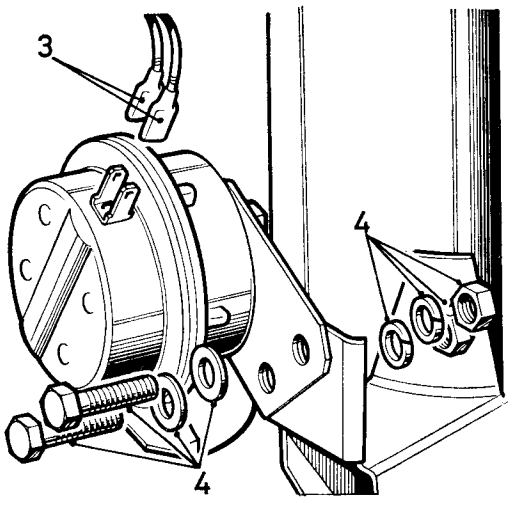
—Remove and refit **6.45**

Removing

1. Disconnect the battery earth lead.
2. Remove the radiator grille.
3. Disconnect the leads from the horn.
4. Remove the horn.

Refitting

5. Reverse 1 to 4.



FLASHER UNIT

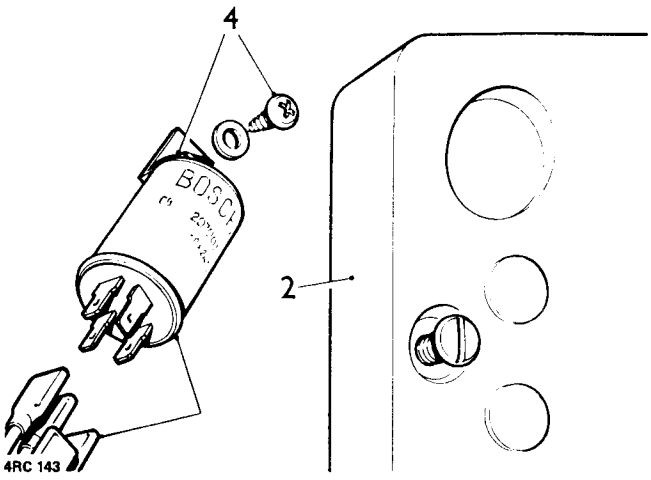
—Remove and refit **6.46**

Removing

1. Disconnect the battery earth lead.
2. Withdraw the instrument panel clear of the dash. 6.14 (items 1 to 5).
3. Disconnect the leads from the flasher unit.
4. Remove the flasher unit.

Refitting

5. Reverse 1 to 4.



STOP LAMP RELAY

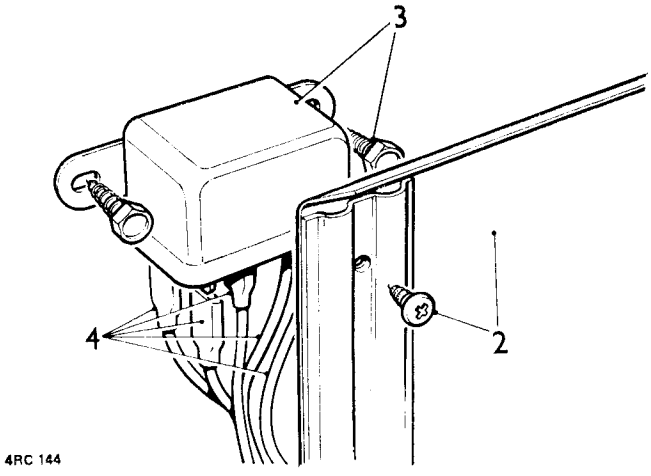
—Remove and refit **6.47**

Removing

1. Disconnect the battery earth lead.
2. Remove the auxiliary switch panel from the centre of the dash.
3. Remove the fixings and withdraw the relay.
4. Disconnect the leads from the relay and lift it clear.

Refitting

5. Reverse 1 to 4. Refer to the circuit diagram for lead connections.



BLACKOUT LIGHTING RELAY

—Remove and refit **6.48**

Removing

1. Disconnect the battery earth lead.
2. Remove the auxiliary switch panel from the centre of the dash.
3. Remove the fixings and withdraw the relay (located on right-hand side of auxiliary switch compartment).
4. Disconnect the leads from the relay and lift it clear.

Refitting

5. Reverse 1 to 4. Refer to the circuit diagram for the lead connections.

FUSE BOX

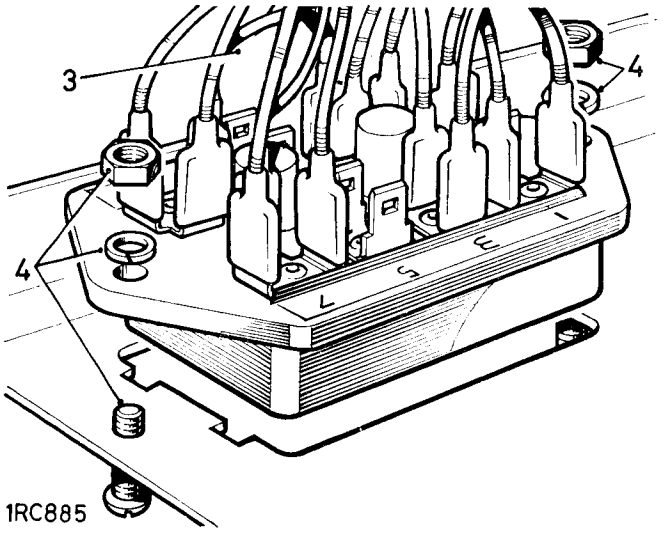
—Remove and refit **6.49**

Removing

1. Disconnect the battery earth lead.
2. Remove the upper half of the switch shroud from the steering column.
3. Disconnect the leads from the fuse box.
4. Remove the fuse box.

Refitting

5. Reverse 1 to 4 connecting the leads in accordance with the circuit diagram.



TRAILER SOCKET

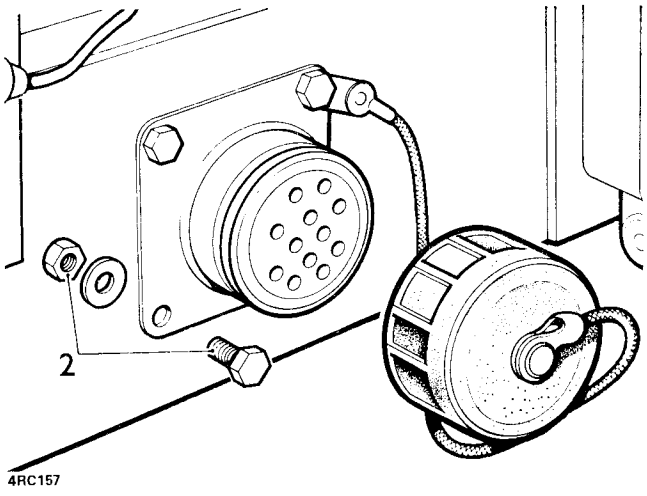
—Remove and refit **6.50**

Removing

1. Disconnect the battery earth lead.
2. Remove the fixings and withdraw the trailer socket.
3. Disconnect the leads and lift the socket clear.

Refitting

4. Reverse 1 to 3. Connect the leads in accordance with the circuit diagram.



GEARBOX OPERATIONS

BELL HOUSING

—Remove and refit **7.1**

Removing

1. Remove the front floor. 17.4.
2. Drain the gearbox lubricating oil.
3. Remove the gearbox assembly complete. 7.10.
4. Remove the gearchange lever. 7.5.
5. Remove the clutch withdrawal unit. 2.12.
6. Fully adjust the transmission brake to lock 'hard on'.
7. Remove the primary pinion cover and oil seal assembly.
8. Withdraw the joint washer.

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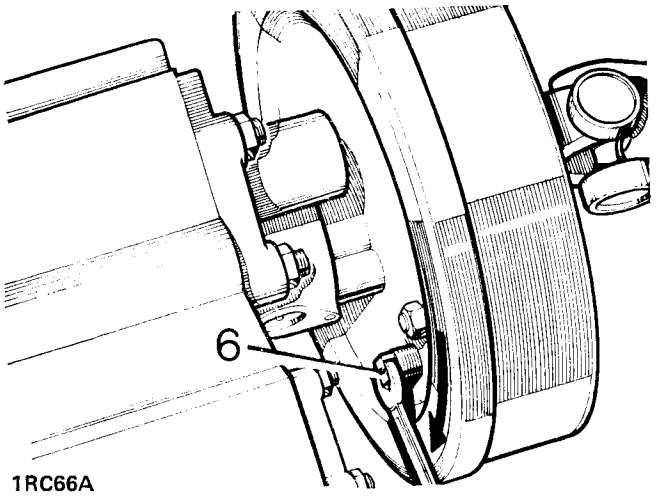
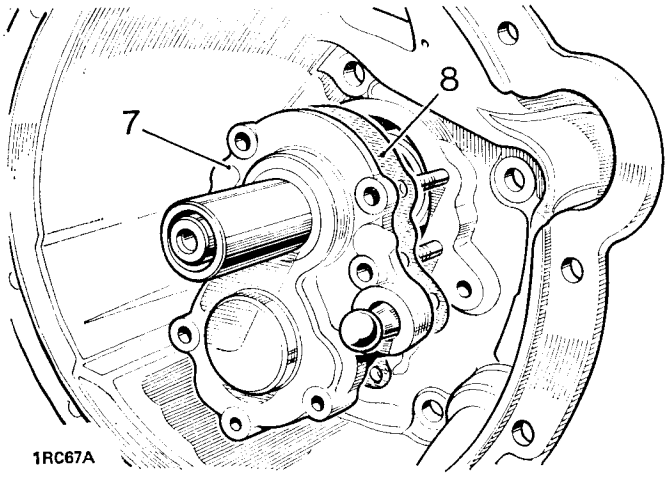
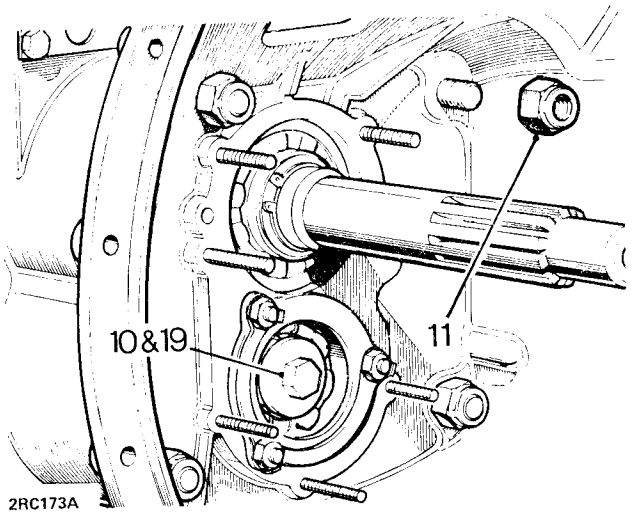




9. Select any gear.
10. Remove the layshaft securing bolt and washer. DO NOT remove the circlip from the primary pinion.
11. Remove the bell housing fixings.
12. Retain the constant gear and conical distance piece which are released during the following procedure.
13. Hold the layshaft depressed fully rearwards and ease the housing from the gearbox.

Refitting

14. Two of the bell housing to gearbox fixings are special fitted bolts, and must be positioned diagonally opposite each other.
15. Smear both sides of the joint washer with a general purpose grease and place in position on the gearbox.
16. Ensure that the roller bearing for the primary pinion is in position.
17. Locate the conical distance piece and constant gear in place, in mesh with the primary pinion, on the rear face of the bell housing.
18. Retain the constant gear and conical distance piece in position, by holding through the layshaft bearing, from the inside of the bell housing, then offer the bell housing to the gearbox, using special care to align the constant gear with the splines on the layshaft.
19. Complete the reassembly by reversing 1 to 11. The layshaft securing bolt must be tightened to a torque figure of 8,5 kgf m (60 lbf ft).
20. Check and replenish the gearbox lubricating oil.
21. Adjust the transmission brake. 12.2.



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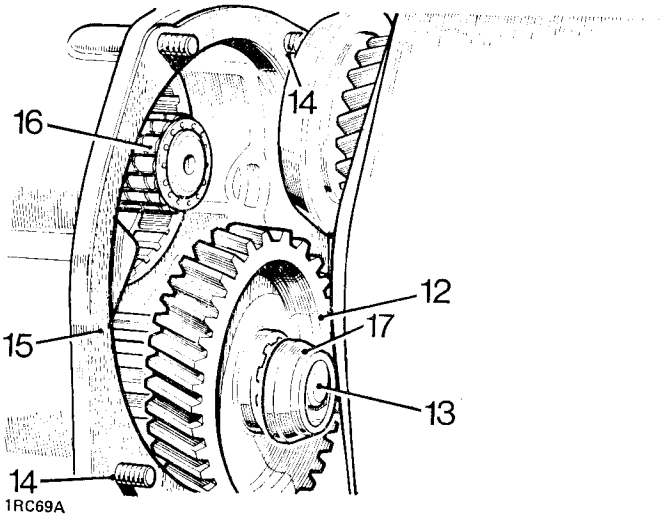


1RC69A

BELL HOUSING

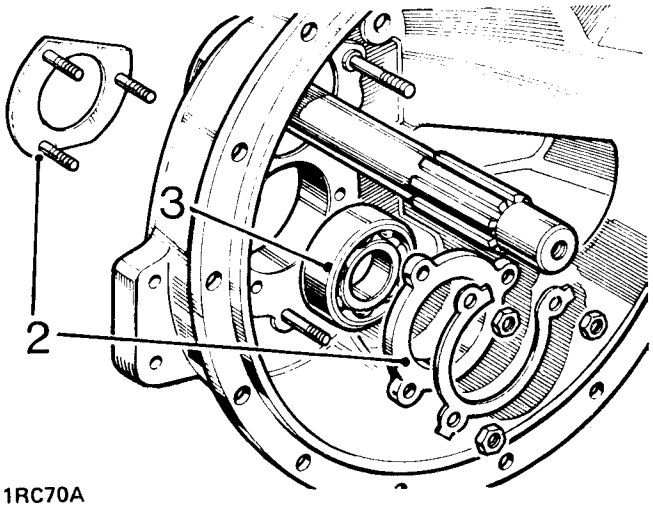
—Overhaul 7.2

Dismantling

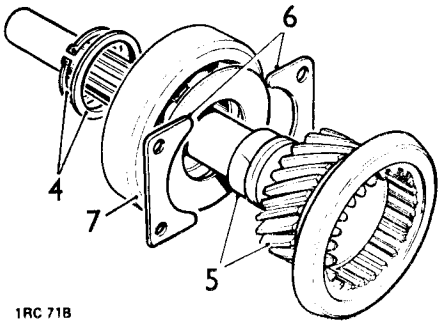
1. Remove the bell housing. 7.1.
2. Remove the layshaft bearing retainer and bearing plate.
3. Press the layshaft bearing from the bell housing.
4. Remove the circlip and distance washer.
5. Press out the primary pinion.
6. Remove the bearing retaining plates.
7. Press out the primary pinion bearing.

Assembling

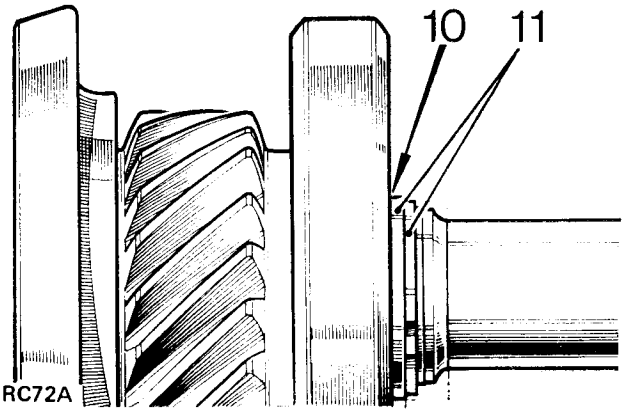
8. Reverse 5 to 7.
9. Fit the distance washer and position a new circlip in the retaining groove.
10. Check the end-float between the primary pinion and the distance washer. End-float must be the minimum obtainable, selecting a suitable distance washer from the range available.
11. Fit the selected distance washer and circlip.
12. Reverse 1 to 3.



1RC70A



1RC 71B

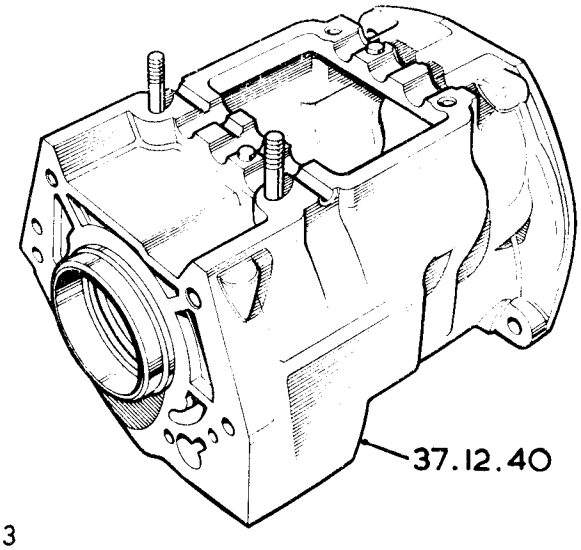


1RC72A

GEARBOX MAIN CASING

—Remove and refit 7.3

NOTE: If it is required to change the rear main oil seal only, it is not necessary to completely dismantle the gearbox. The oil seal is accessible after removing the intermediate gear and the mainshaft gear from the transfer box, see 8.3 and 7.14 for details.



1RC73

Removing

1. Remove the front floor. 17.4.
2. Drain the gearbox lubricating oil.
3. Remove the gearbox assembly complete. 7.10.
4. Remove the transmission brake. 12.3.
5. Remove the transfer box. 8.3.
6. Remove the gear change lever. 7.5.
7. Remove the clutch withdrawal unit. 2.12.
8. Remove the bell housing. 7.1.
9. Remove the selector shafts. 7.8.
10. Remove the layshaft. 7.13.
11. Remove the mainshaft. 7.14.
12. When 1 to 11 are complete the gearbox main casing is released and can be dismantled as described under 'Overhaul', 7.4.

Refitting

13. Reverse 1 to 11.

GEARBOX MAIN CASE

—Overhaul **7.4**

Dismantling

1. Remove the gearbox main case. 7.3.
2. Prise the oil seal from the rear of the mainshaft bearing housing.
3. Remove the circlip retaining the bearing housing to the rear face of the gearbox.
4. Press out the housing, complete with bearing, in a forward direction.
5. Remove the circlip.
6. Press the mainshaft rear bearing from the housing.
7. With the case warm, drive out the layshaft bearing outer race, using a suitable drift applied through the two extractor holes provided in the case rear face. (See also item 8).
8. An alternative method is to use a mandrel, approximately 300 mm (12 in) long by 43,50 mm (1.687 in) diameter, so that it is a tight fit in the outer race. Warm the gearbox case and outer race, keep the mandrel as cool as possible. With the casing warm, insert the mandrel into the outer race which will shrink on to the mandrel and withdraw easily.
9. The remaining oil drain and filler plugs, studs, dowels and retaining plate for selector shaft oil seals, can be removed as required. See 7.11 for removal of reverse idler gear and shaft if required.

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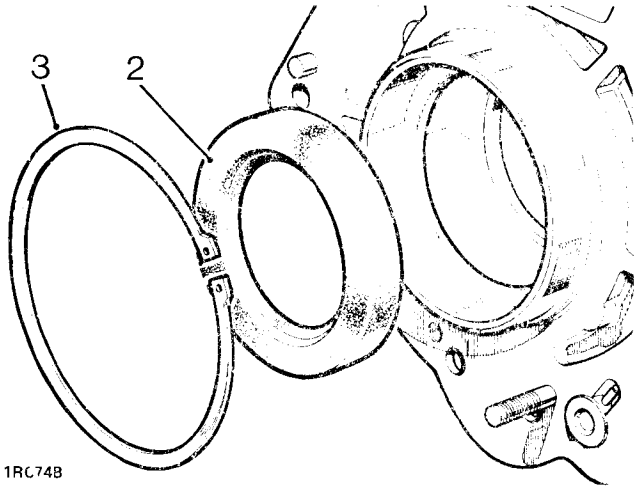
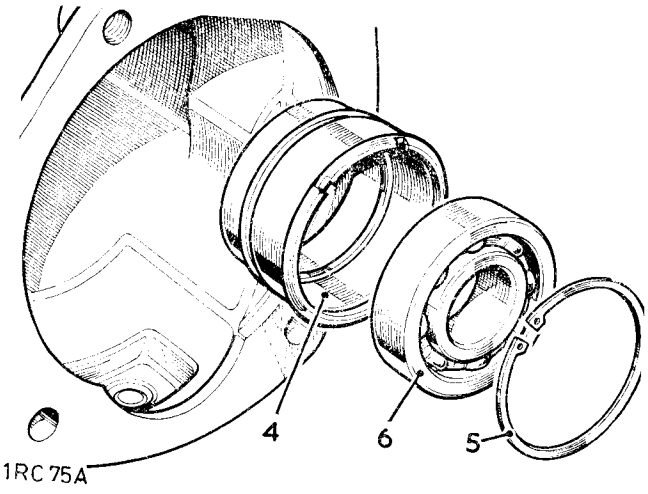
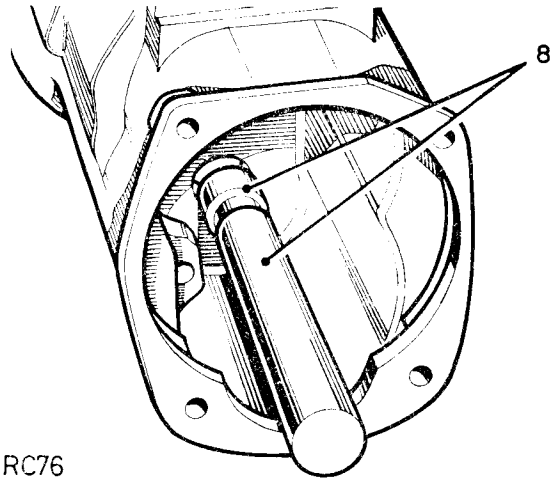






Inspecting

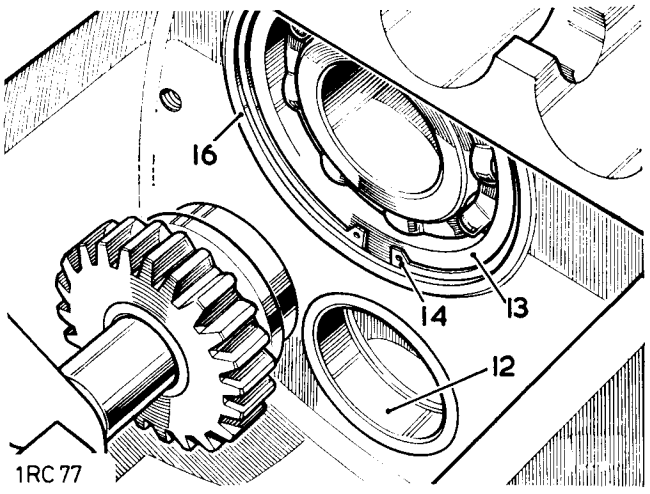
10. Check all components for wear and damage.
11. Ensure that the two dowels in the gearbox top face, and the two dowels in the rear face, are secure.

Assembling

12. Press the layshaft rear bearing outer race, lipped edge first, into the gearbox case.
13. Press the mainshaft rear bearing into the housing.
14. Retain with a circlip.
15. Fit the main shaft rear oil seal, lipped side first, into the bearing housing.
16. Smear the outside diameter of the bearing housing with Loctite Retaining Compound (Grade AVV), Part No. 600303 and press it into position.

    NOTE: The gearbox should not be filled with lubricating oil or used for twenty-four hours, to allow the Loctite to fully cure.

17. Fit the retaining circlip to the groove in the bearing housing where it protrudes through the rear face of the gearbox.
18. Refit the gearbox main case. 7.3.



MAIN GEARCHANGE LEVER

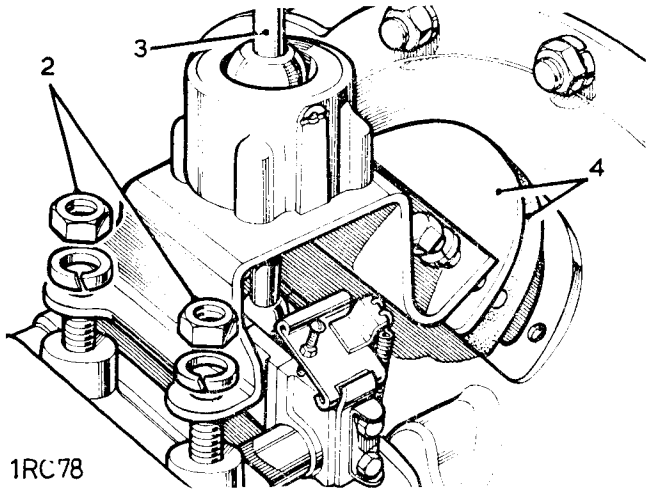
—Remove and refit 7.5

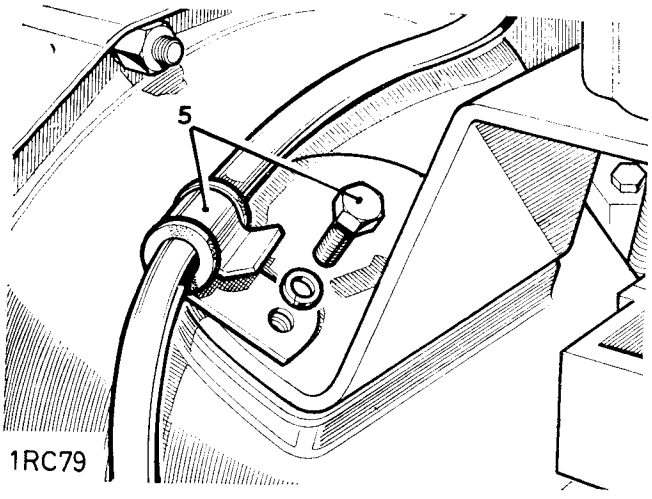
Removing

1. Remove the front floor. 17.4.
2. Remove the fixings.
3. Remove the main gear change lever complete.
4. To prevent loss, lift off the top cover plate and rubber seal from the bell housing.

Refitting

5. Reverse 1 to 4, noting that a retaining clip for the speedometer cable locates under the head of the front left hand gearchange lever securing bolt.



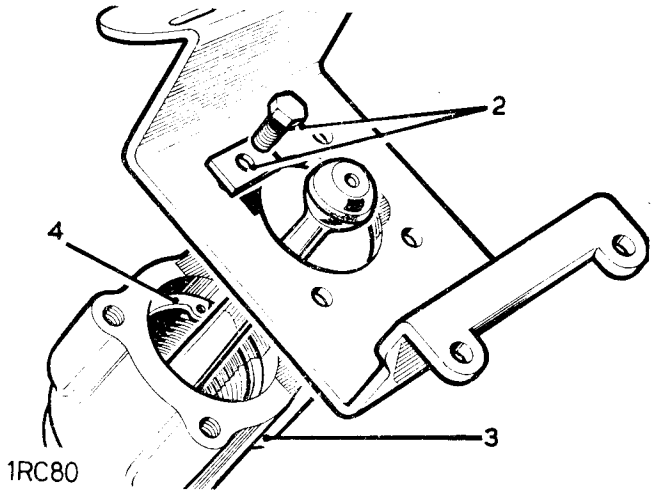


MAIN GEARCHANGE LEVER

—Overhaul 7.6

Dismantling

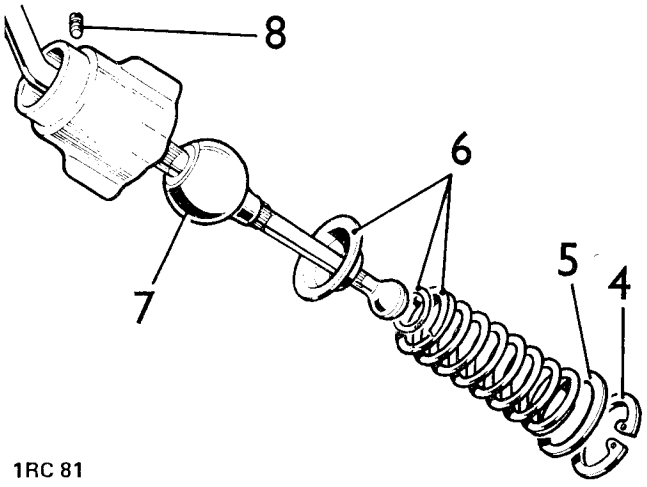
1. Remove the gearchange lever. 7.5.
2. Remove the fixings at the mounting plate.
3. Remove the lever housing from the mounting plate.
4. Remove the lever housing circlip.
5. Withdraw the retaining plate.
6. Withdraw the spring, rubber 'O' ring (early models) and spherical seat.
7. Lift out the gearchange lever.
8. Withdraw the lever ball locating pin.
9. Examine the components visually and renew any that show obvious wear or damage.



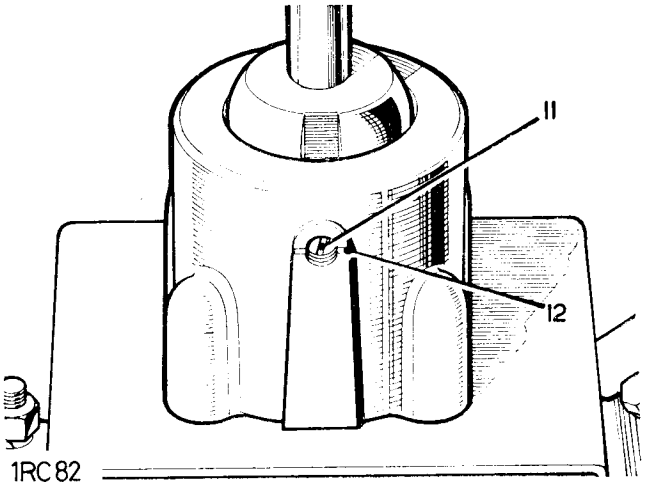
1RC80

Assembling

10. Reverse 2 to 8.
11. Ensure that the lever locating pin engages the slot in the lever ball.
12. Secure the pin by peening.
13. Refit the gearchange lever. 7.5.



1RC 81



1RC82

REVERSE STOP FOR MAIN GEARCHANGE LEVER

—Remove, refit and adjust 7.7

Removing

1. Remove the front floor. 17.4.
2. Remove the hinge adjuster.
3. Remove the hinge and bracket from the reverse selector shaft.
4. Detach the two springs.

Refitting

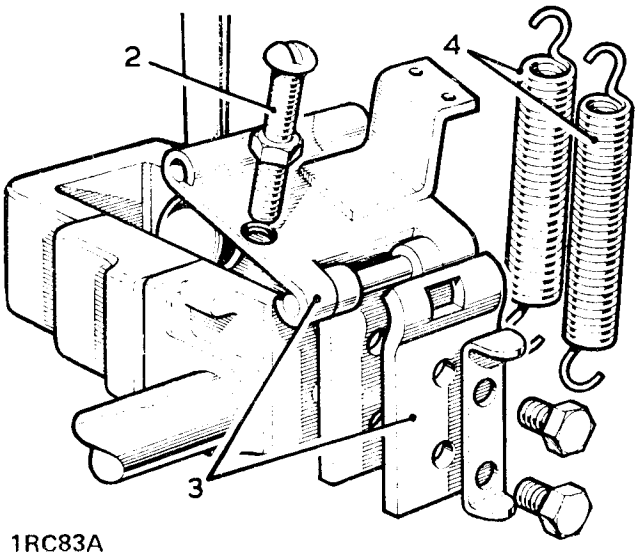
5. Reverse 1 to 4. Adjust the reverse stop before fitting the front floor, items 6 to 9.

Adjusting

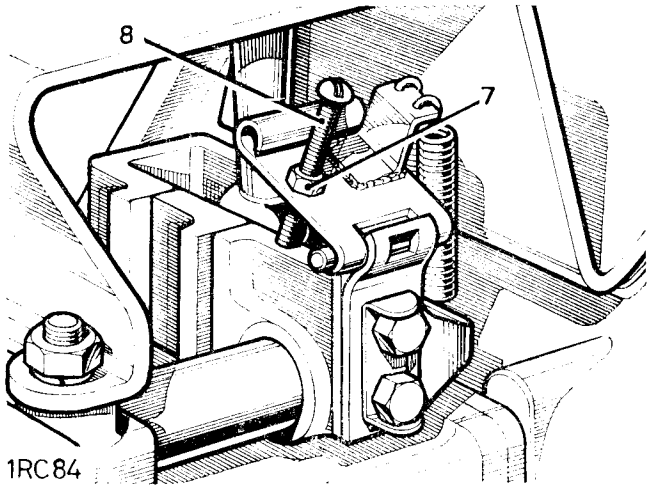
6. Remove the reverse stop inspection cover.

   NOTE: If the gearbox cover does not incorporate an inspection cover, then the adjustment must be carried out before the gearbox cover is fitted.

7. Slacken the adjusting screw locknut.
8. Adjust the screw so that the hinge rides easily up the gear lever when reverse gear is selected, while at the same time appreciable resistance is felt on moving the gear lever to the reverse position.
9. Ensure that 1st gear engages correctly, if there is any tendency to simultaneously engage reverse gear, readjust the reverse stop.



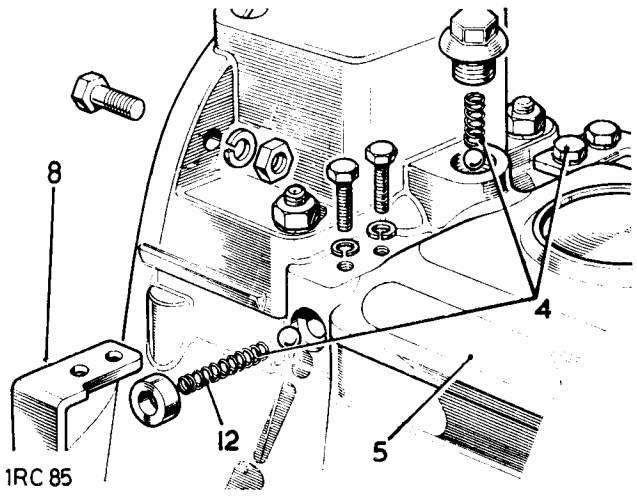
1RC83A



1RC84

MAIN GEARCHANGE SELECTORS

—Remove and refit **7.8**



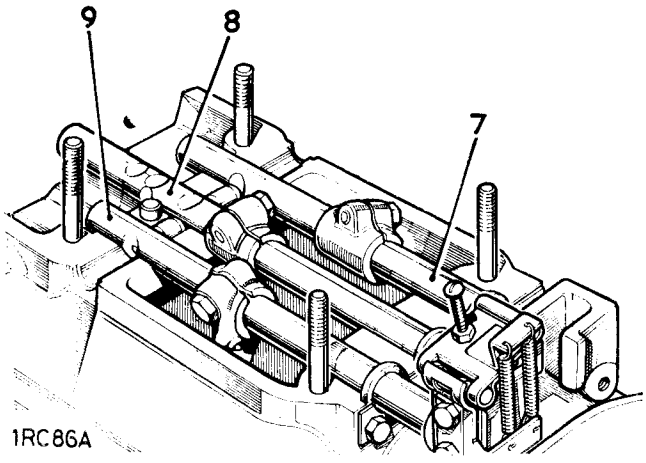
Removing

1. Remove the front floor. 17.4.
2. Remove the seat base. 18.1.
3. Remove the main gearchange lever. 7.5.
4. Remove the three selector springs and pack the drillings in the top cover with grease, to retain the selector balls when the cover is removed.
5. Remove the top cover from the gearbox and collect the three selector balls.
6. Select third gear.
7. Lift, turn and withdraw the third/fourth selector shaft.
8. Withdraw the first/second selector shaft.
9. Withdraw the reverse selector shaft.

Refitting

10. Reverse 3 to 9.

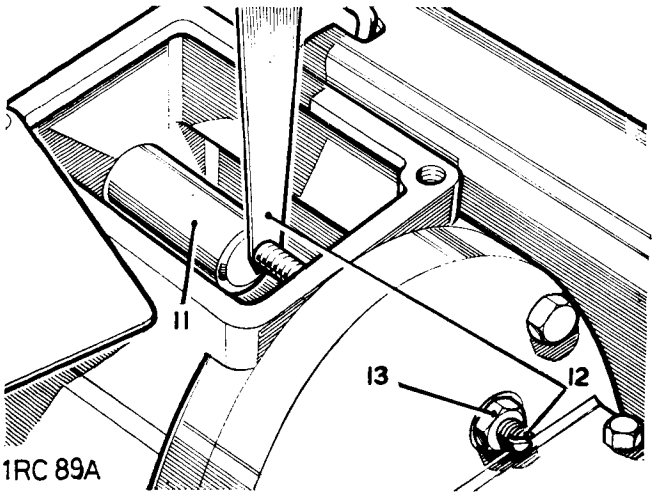
continued



11. Select reverse gear.
12. Adjust the reverse gear stop bolt so that there is 0,5 mm (0.020 in) clearance between the selector shaft and the end of the bolt.
13. Tighten the locknut.

    NOTE: If the transfer box has been removed from the main gearbox, the foregoing adjustment must be carried out after the transfer box has been refitted.

14. Reverse 1 and 2.



DATA

Reverse gear selector shaft stop setting	0,5 mm (0.020 in) clearance between shaft and stop

MAIN GEARCHANGE SELECTORS

—Overhaul **7.9**

Dismantling

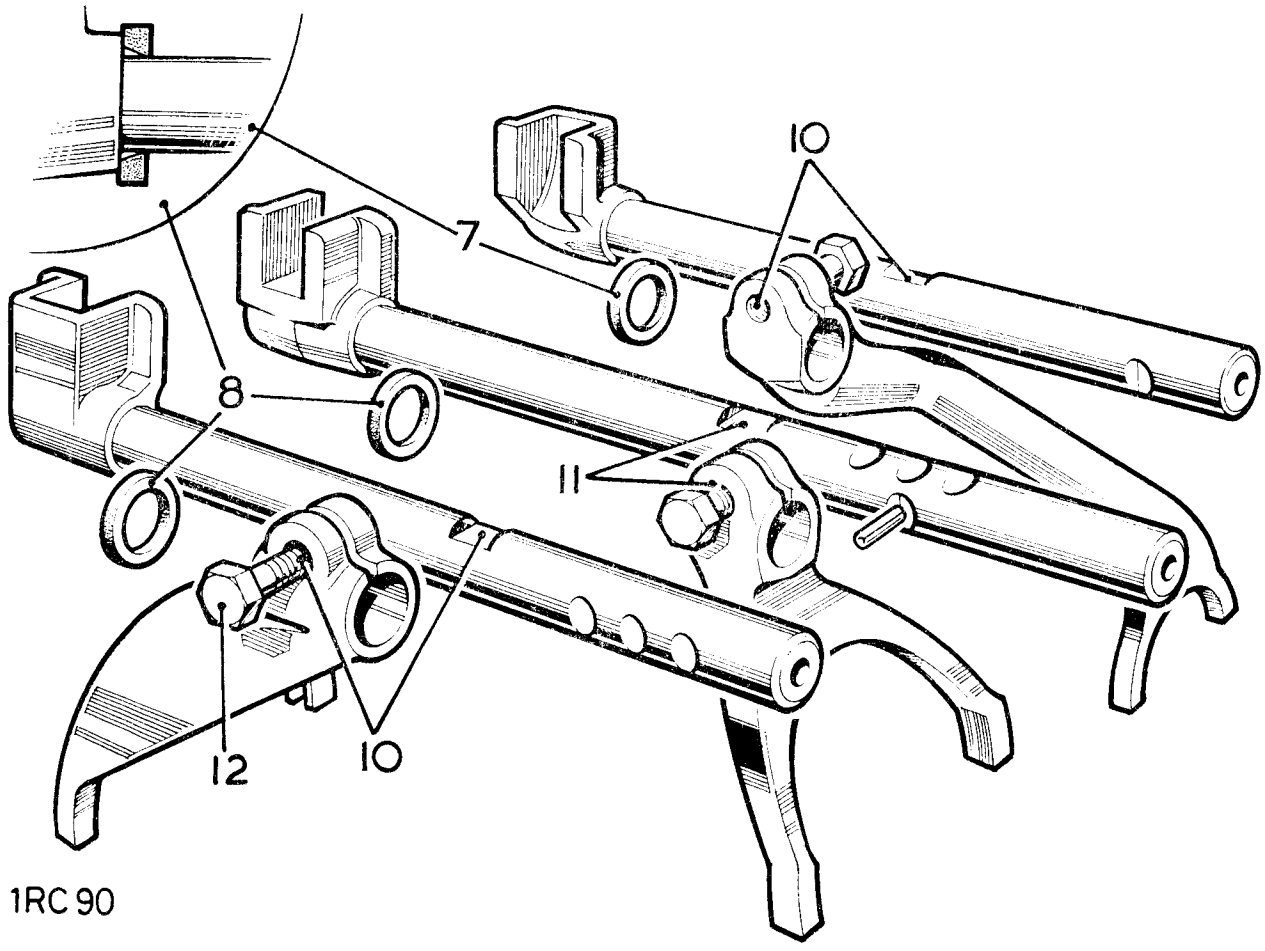
1. Remove the gearchange selectors. 7.8.
2. Remove the reverse selector stop. 7.7.
3. Remove the pinch bolts.
4. Withdraw the selector forks.
5. Withdraw the seals.

Inspecting

6. Examine the components visually and replace worn or damaged items.

Assembling

7. Fit the larger diameter tapered seal to the reverse shaft with the thinner edge of the seal toward the front of the shaft.
8. Fit the two remaining tapered seals, thinner edges toward the front of the shafts.
9. Position the selector forks on the shafts.
10. Align the pinch bolt holes with the grooves on top of the shafts.
11. On the first/second gear selector, the groove required is the one nearest to the front of the shaft.
12. Fit the pinch bolts. There is radial movement between the selector fork and shaft before the pinch bolt is tightened, and the fork should be secured in the mid-position.
13. Reverse 1 and 2.



GEARBOX COMPLETE ASSEMBLY

—Remove and refit **7.10**

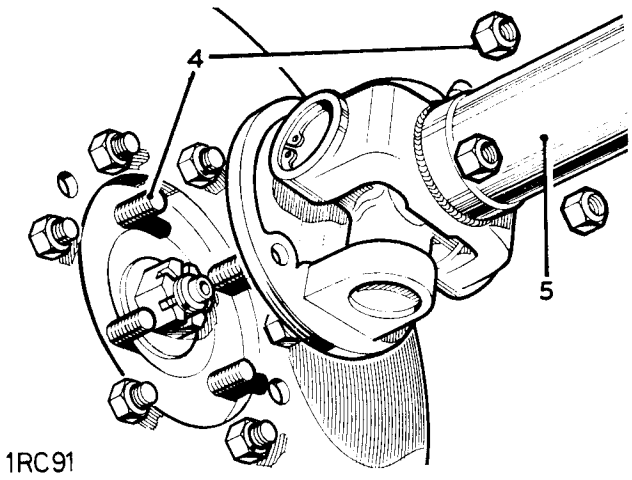
Removing

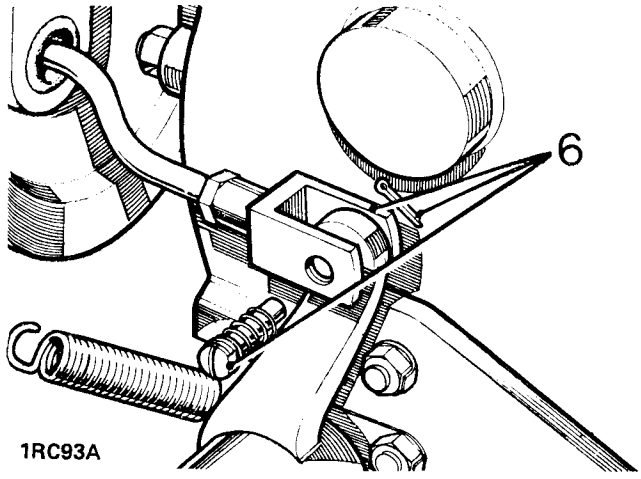
1. Remove the front floor. 17.4.
2. Remove the gearbox undershield.
3. Drain the gearbox lubricating oil.
4. Remove the rear propeller shaft fixings at the transmission brake.
5. Move aside the shaft.

   NOTE: If the vehicle is fitted with any optional equipment driven from the gearbox, it must be disconnected at the gearbox.

6. Disconnect the handbrake expander rod from the relay lever.

continued



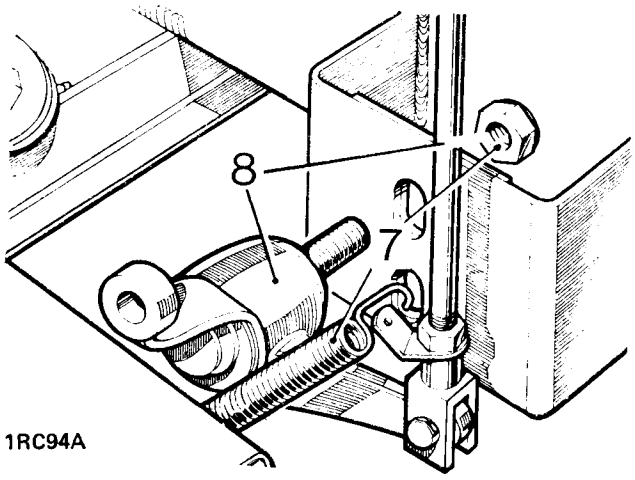


7. Remove the brake lever and relay fixings.
8. Remove the brake lever and relay mechanism.
9. Remove the brake lever cross-shaft.
10. Disconnect the speedometer cable from the gearbox.

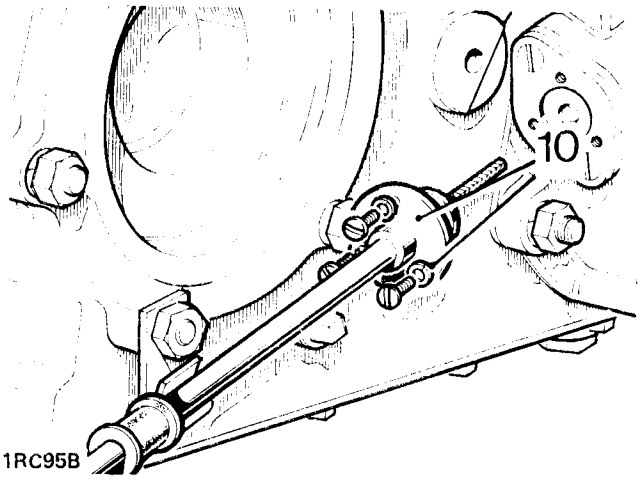
    NOTE: On certain models, the engine exhaust pipe is located above the gearbox left hand rear mounting, and where applicable, the exhaust pipe must be moved clear. Also check the location of the engine earth strap, on certain models it is fitted between the gearbox and chassis and must therefore be disconnected.

11. Remove the fixings from two rear mountings for the gearbox.

continued



1RC94A



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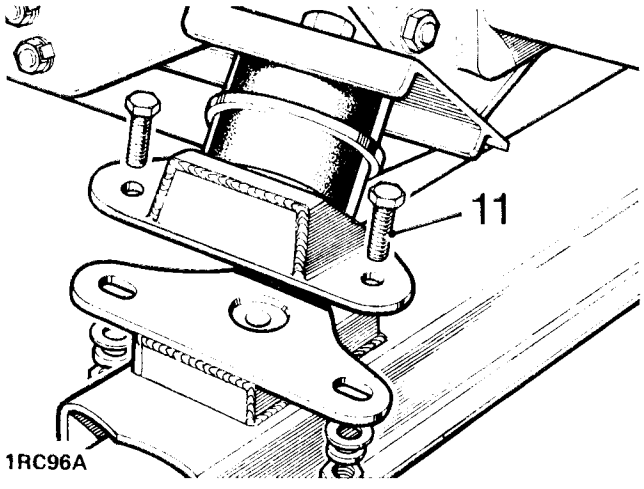
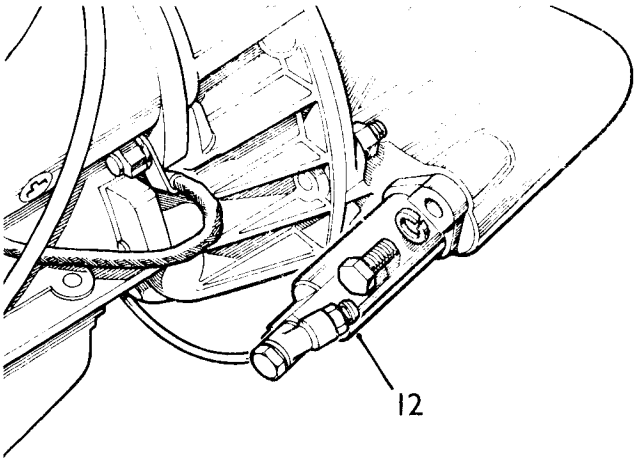


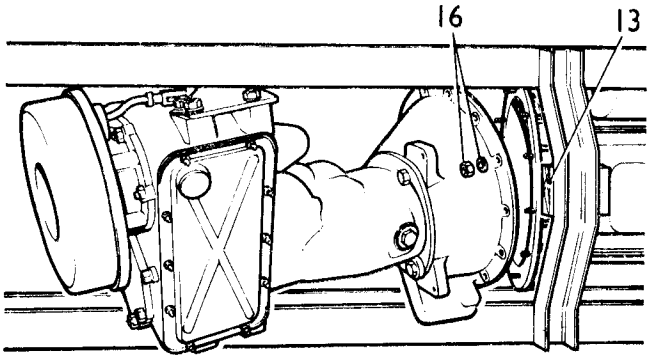
1RC96A

12. Remove the clutch slave cylinder from the bell housing.
13. Jack up the rear of the engine sufficient to insert a 25 mm (1 in) thick block of wood between the flywheel housing and chassis, to retain the engine position when the gearbox is removed.
14. Place a suitable support under the gearbox and tension it sufficient to take the weight.
15. Remove the detachable cross-member from the chassis.
16. Remove the remaining fixings securing the bell housing to the flywheel housing.
17. Carefully withdraw the gearbox rearwards clear of the clutch and lift from the vehicle.

continued



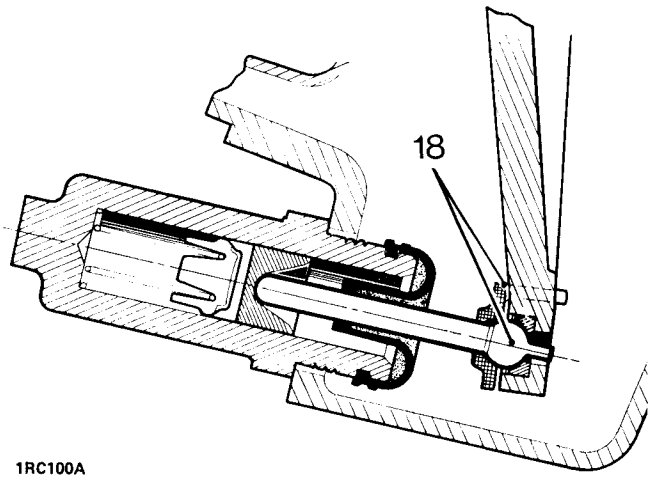
1RC98B



4RC 3

Refitting

18. Reverse 1 to 17. Before fitting the gearbox, ensure that the clutch slave cylinder push rod is retained by the nylon clip.
19. Bleed the clutch hydraulic system as necessary. 2.7.



1RC100A

REVERSE IDLER GEAR AND SHAFT

Removing

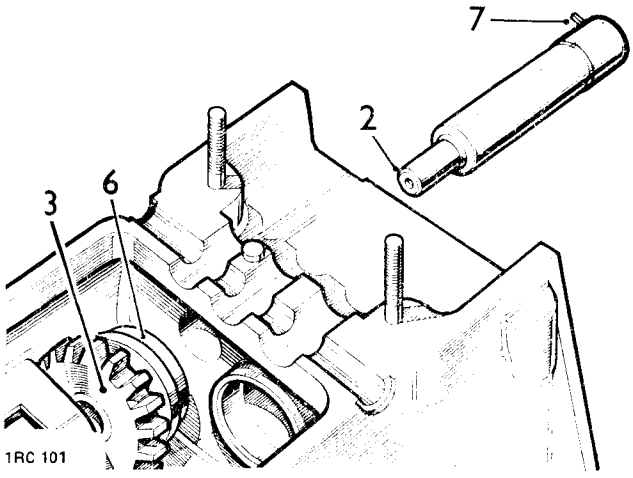
1. Remove the gearbox main case. 7.3.
2. Warm the gearbox case and drive out the reverse gear idler shaft from inside the case.
3. Lift out the reverse wheel assembly.

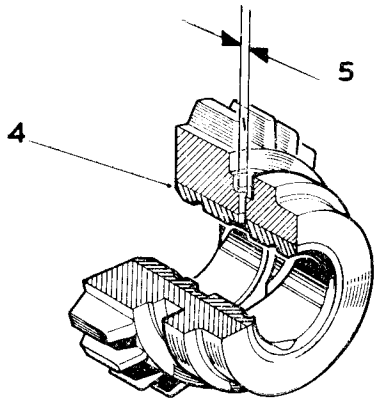
Overhauling

4. Check the bush in the reverse wheel assembly. If a new bush is required it must be secured by peening after being pressed into position, and then reamed to 20,637 mm + 0,025 mm (0.8125 in + 0.001 in) diameter.
5. After reaming and peening as already described, drill a 3,18 mm (0.125 in) diameter hole through the bush, using the existing hole in the gear as a pilot. Afterwards remove all fraze from the bore.

Refitting

6. Fit the reverse wheel assembly with the plain side to the rear of the gearbox.
7. Press in the reverse shaft until flush with gearbox rear face, aligning the spring pin with the slot provided in the rear face.
8. Reverse 1.





1RC102

DATA

Bush for reverse gear wheel	20,637 mm to 20,662 mm (0.8125 to 0.8135 in) reamed diameter
Lubrication hole in bush	3,18 mm (0.125 in) drilled diameter

LAYSHAFT

—Remove and refit **7.13**

Removing

1. Remove the front floor. 17.4.
2. Drain the gearbox lubricating oil.
3. Remove the gearbox assembly complete. 7.10.
4. Remove the gearchange lever. 7.5.
5. Remove the clutch withdrawal unit. 2.12.
6. Remove the bell housing. 7.1.
7. Manoeuvre the layshaft forward and downwards to clear the mainshaft.
8. Withdraw the layshaft.
9. The first, second and third gears are integral with the layshaft and cannot be removed.
10. If required, press the rear bearing inner race from the layshaft.
11. If required, refer to 7.4 for removal of layshaft rear bearing outer race.

Refitting

12. Reverse 11 as necessary.
13. Reverse 10 as necessary.
14. Fit the layshaft and rear inner bearing member assembly.

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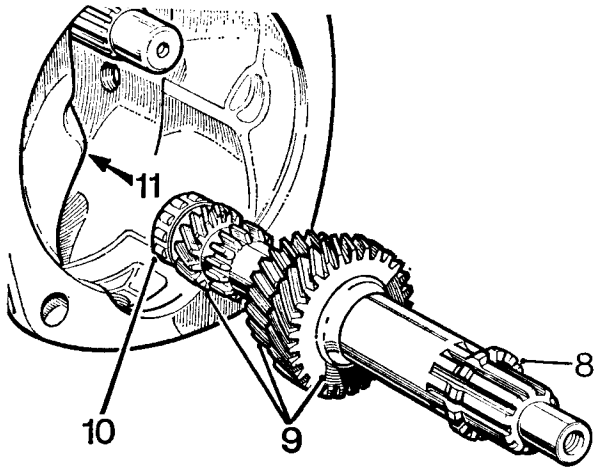
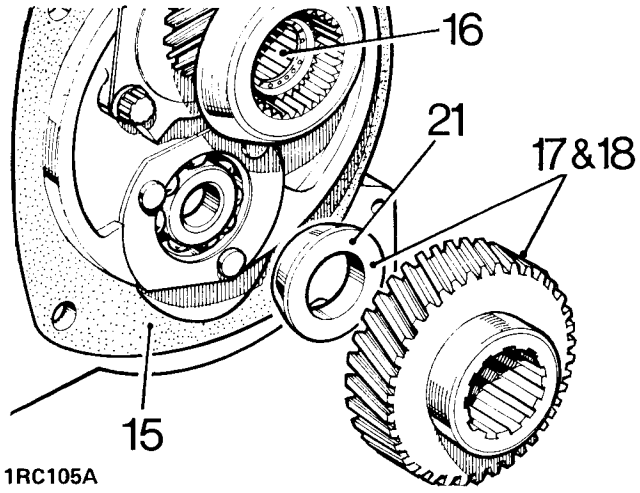


1RC103C

15. Place the bell housing joint washer in position.
16. Ensure that the roller bearing for the primary pinion is in position.
17. Locate the conical distance piece and constant gear in place, in mesh with the primary pinion, on the rear face of the bell housing.
18. Retain the constant gear and conical distance piece in position, by holding from inside the bell housing, then offer the bell housing to the gearbox, aligning the constant gear with the splines on the layshaft.
19. Fit the bell housing fixings.
20. Loosely fit the layshaft securing bolt and washer and check that the layshaft has definite but minimum end-float.
21. To adjust, replace the conical distance piece, available in a range of thicknesses.
22. Tighten the layshaft securing bolt, torque loading 8,5 kgf m (60 lbf ft).
23. Reverse 1 to 5.



1RC105A

MAINSHAFT ASSEMBLY

—Remove and refit **7.14**

Service tool: 600300, tool for mainshaft nut
RO1013 Adaptor for torque wrench

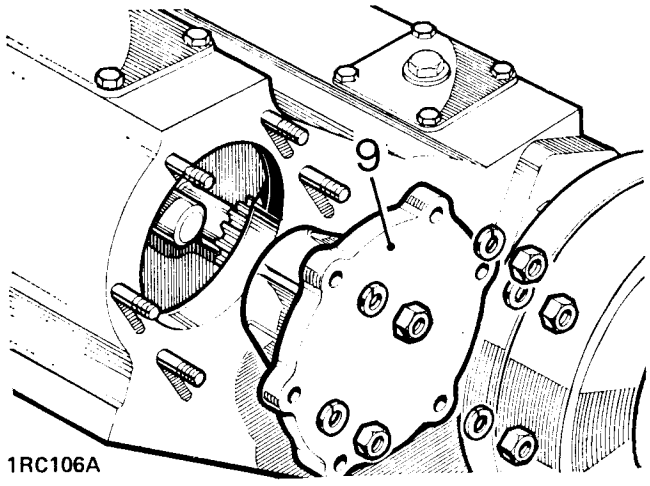
Removing

1. Remove the front floor. 17.4.
2. Drain the gearbox lubricating oil.
3. Remove the gearbox assembly complete. 7.10.
4. Remove the gearchange lever. 7.5.
5. Remove the clutch withdrawal unit. 2.12.
6. Remove the bell housing. 7.1.
7. Remove the selector shafts. 7.8.
8. Remove the layshaft. 7.13.
9. Remove the rear bearing housing from the transfer box.
10. Open the tab washer.
11. Remove the mainshaft nut. 600300.
12. Withdraw the tab washer and shim washer.
13. Withdraw the mainshaft transfer gear.
14. Remove the oil thrower.
15. Drive out the mainshaft from the gearbox.

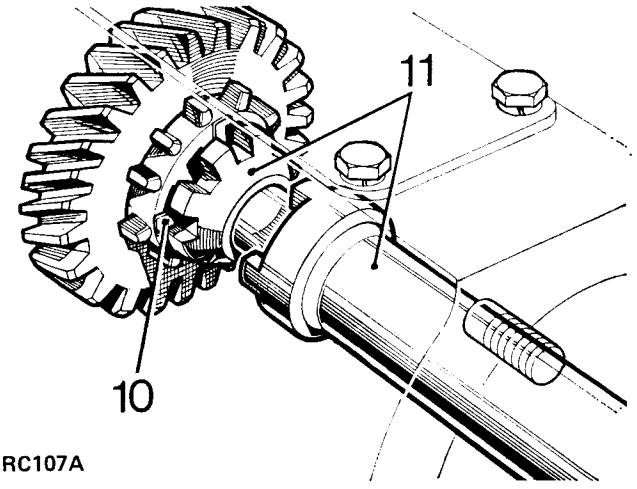
Refitting

NOTE: If any mainshaft components have been renewed, the checks described under 'Mainshaft overhaul' 7.15 must be carried out.

16. Reverse 1 to 15. Using 600300 and RO1013 in conjunction with a torque wrench, tighten the mainshaft nut to 12,5 kgf.m.



1RC106A



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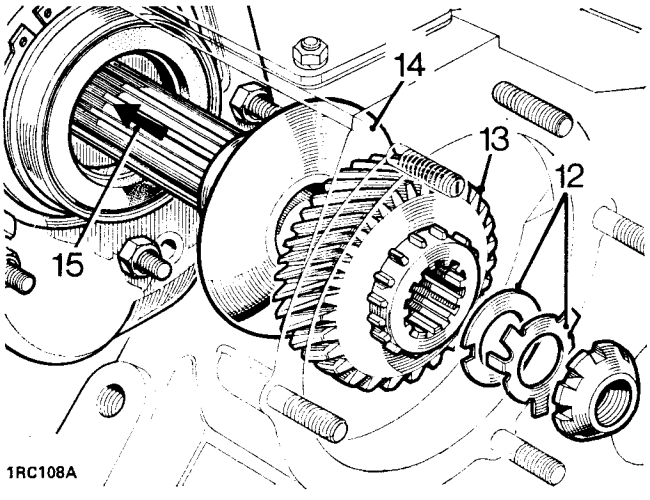


1RC108A

MAINSHAFT ASSEMBLY

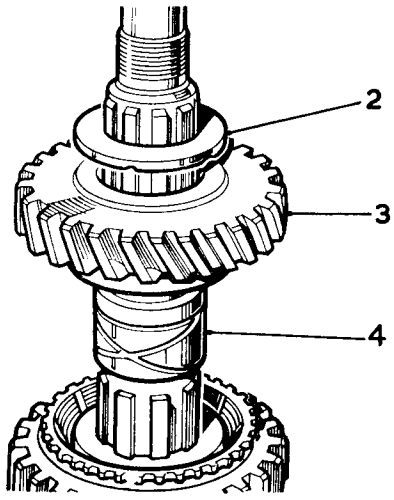
—Overhaul **7.15**

Dismantling

1. Remove the mainshaft. 7.14.

Mainshaft rear end

2. Withdraw the thrust washer.
3. Lift off the first speed gear.
4. Withdraw the bush for the first speed gear.
5. Withdraw the synchroniser rear cone.
6. Lift off complete the first/second speed synchroniser unit.
7. Withdraw the synchroniser front cone.

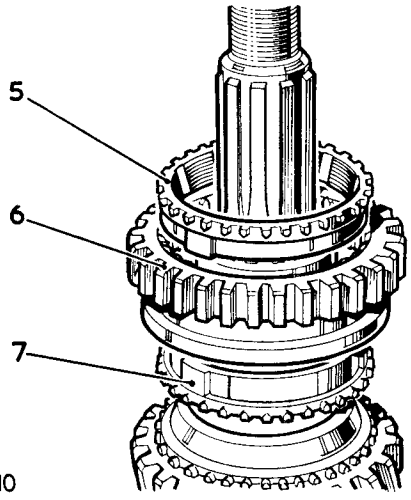


1RC 109

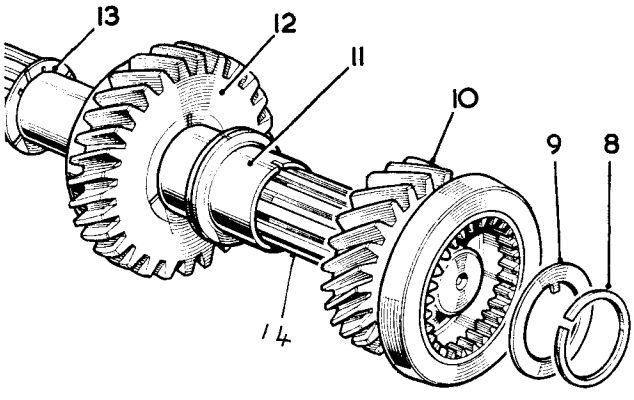
Mainshaft front end

8. Remove the retainer ring from the groove in the mainshaft.
9. Withdraw the thrust washer, then the following items:
10. Third speed gear.
11. Distance sleeve.
12. Second speed gear.

continued



1RC110



1RC111

13. If it is required to remove the thrust washer for the second speed gear, first remove the locating peg for the distance sleeve; the peg is a press fit in the mainshaft.

First/second speed synchroniser

14. Before dismantling, take precautions to avoid the loss of components as they are released. Three springs, balls and sliding blocks are retained in the unit under spring pressure.
15. Dismantle the synchroniser assembly, first pushing down the sliding blocks to free the balls from the retaining grooves in the outer member.

Inspecting

16. Examine all components for wear and damage.
17. Discard the mainshaft spring ring. Use a new replacement on assembly.
18. Check the synchronising clutch for third/fourth gears for wear, the detent springs can be replaced if required. A load of 6,5 to 9 kg (15 to 20 lb) should be required to actuate the clutch against the combined detent springs pressure.

Assembling
First/second speed synchroniser

19. Note the position of the longer splines on the inner member, formed by the offset groove.
20. Align the detent spring bores in the inner member with the ball retaining grooves in the outer member.
21. Fit the inner member to the outer member, entering the longer splines on the inner member at the gear teeth side of the outer member.
22. Repeat 20 and 21 in alternative positions and select the best position for easy slide fit.
23. Position the sliding blocks on the inner member, radiused faces outward.
24. Locate the springs through the sliding blocks and into the housing bores in the inner member.
25. Position the balls on the spring ends; press home in sequence and retain by hand.
26. Lift the outer member to retain the balls. Continue lifting until the balls spring home into the retainer grooves.

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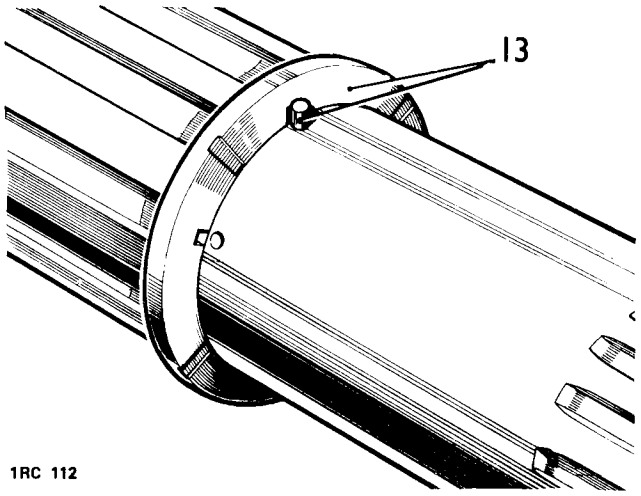
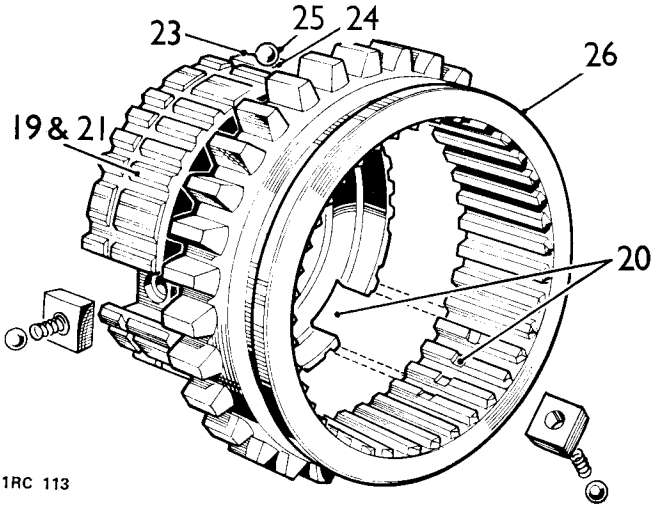


1RC 112



1RC 113

Mainshaft, front end

27. If the thrust washer for the second speed gear has been removed from the mainshaft, place the washer in position chamfered face first, engaging it over its locating peg. Do not fit the locating peg for the distance sleeve at this stage.
28. Fit the second speed gear, coned face last, to the end of the distance sleeve with the **larger** slot.
29. Slide the gear and sleeve assembly on to the mainshaft to abut with the thrust washer.
30. Holding the sleeve hard against the thrust washer, check the end float of the second speed gear, this must be 0,10 to 0,18 mm (0.004 to 0.007 in).
31. The end-float of the second and the third speed gears is controlled by the length of the distance sleeve. With a new sleeve, the clearance may be excessive and can be corrected by rubbing down the applicable end face of the sleeve on a face plate and emery cloth. In the event of insufficient clearance, a new sleeve must be fitted.
32. Retain the second speed gear and distance sleeve on the mainshaft.
33. Fit the third speed gear and thrust washer.
34. Hold the thrust washer hard against the sleeve and check the end-float of the third speed gear, this must be 0,10 to 0,18 mm (0.004 to 0.007 in).
    End-float adjustment is as already described in item 31.

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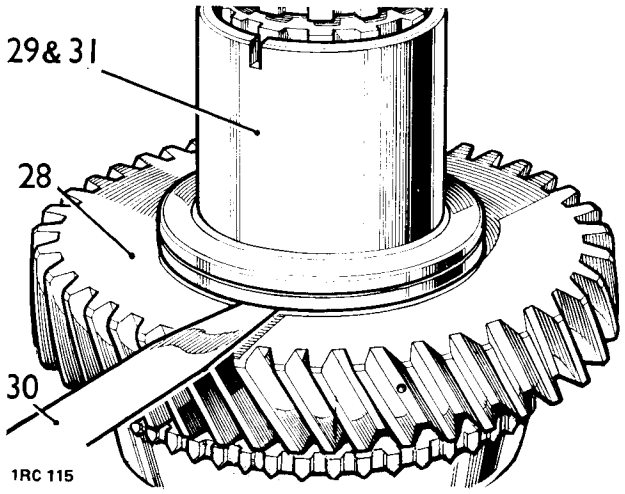
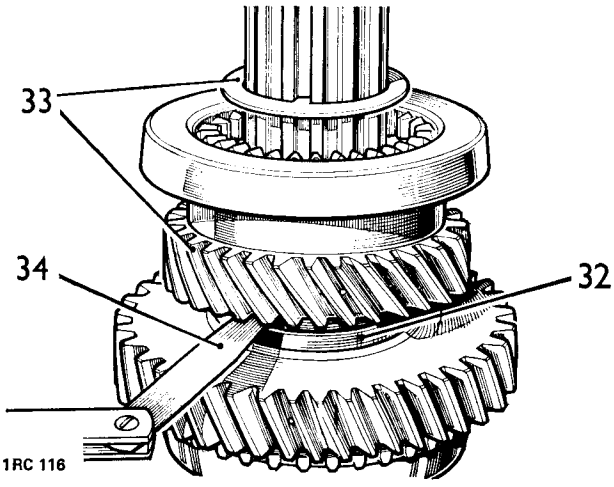
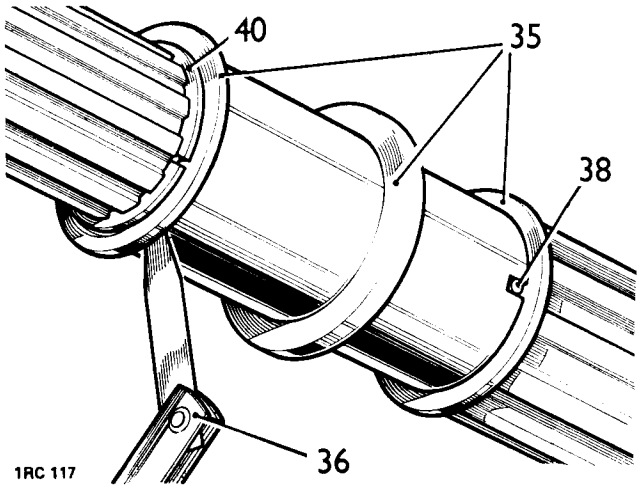




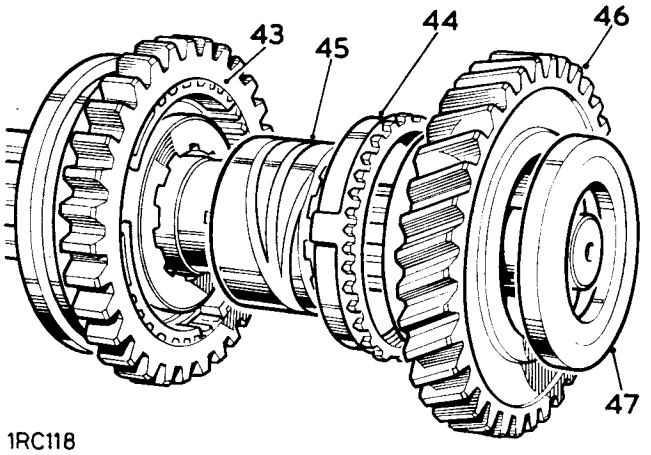
35. Remove the gears and distance sleeve from the mainshaft and refit the thrust washers and distance sleeve only, retain in position with the old spring ring.
36. Check the end-float of the distance sleeve, this must be 0,03 to 0,20 mm (0.001 to 0.008 in).
    Adjustment is made by changing either of the thrust washers which are available in a range of thicknesses.
37. When the end-float of the mainshaft gears and distance piece are correct, remove the spring ring, thrust washer for third speed gear and the distance sleeve.
38. If removed, fit the distance sleeve locating peg to the mainshaft, ensuring that the thrust washer for the second speed gear is engaged on its locating peg.
39. Fit the second speed gear, distance sleeve, third speed gear and thrust washer to the mainshaft.
40. Retain with a new spring ring.



1RC 117

Main shaft rear end

41. Position the mainshaft with the rear end uppermost.
42. Position a synchroniser cone on to the second speed gear.
43. Fit the first/second synchroniser unit to the shaft, reverse gear side uppermost.
44. Position a synchroniser cone on to the synchroniser inner member.
45. Fit the bush for first speed gear with the circular oil groove end uppermost. Ensure that the bush rear face is 0,05 to 0,18 mm (0.002 to 0.007 in) below the end of the mainshaft splines; check by temporarily fitting the thrust washer, stepped face uppermost, and measuring the clearance between the bush and the thrust washer.
46. Fit the first speed gear.
47. Fit the thrust washer, stepped face uppermost.
48. Refit the mainshaft assembly and third/fourth synchroniser unit as described in 7.14.



1RC118

DATA

Third/fourth gear synchronising clutch load	6,5 kg to 9 kg (15 lb to 20 lb)
End float of second speed gear	0,10 mm to 0,18 mm (0.004 in to 0.007 in)
End float of third speed gear	0,10 mm to 0,18 mm (0.004 in to 0.007 in)
End float of distance sleeve	0,03 mm to 0,20 mm (0.001 in to 0.008 in)
End float of first speed gear	0,10 mm to 0,20 mm (0.004 in to 0.008 in)
Clearance between first gear bush rear face and thrust washer	0,05 mm to 0,18 mm (0.002 in to 0.007 in); adjust bush length to suit

TRANSFER BOX OPERATIONS

SPEEDOMETER DRIVE HOUSING

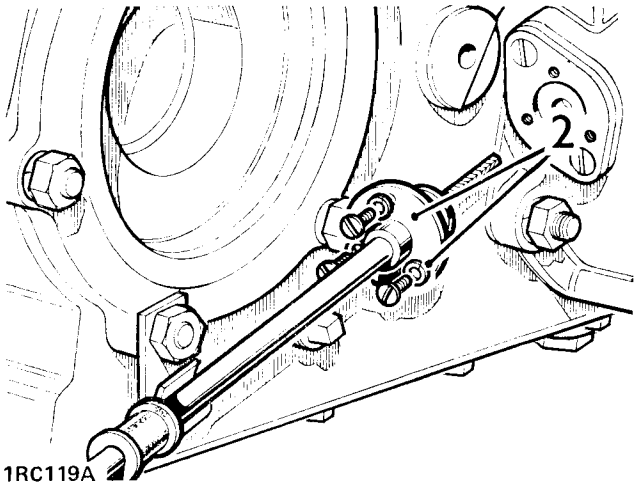
—Remove and refit **8.1**

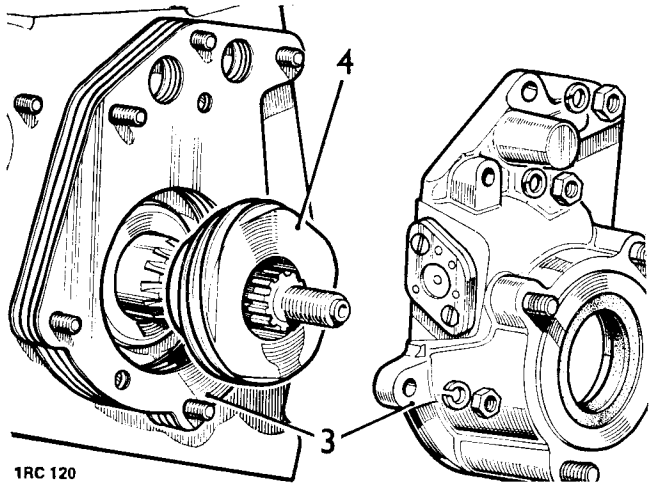
Removing

1. Remove the transmission brake. 12.3.
2. Disconnect the speedometer cable from the gearbox.
3. Remove the speedometer drive housing complete with shims.
4. Withdraw the speedometer drive worm.

Refitting

5. Reverse 1 to 4. If necessary, replenish the gearbox lubricating oil.





SPEEDOMETER DRIVE HOUSING

—Overhaul **8.2**

Dismantling

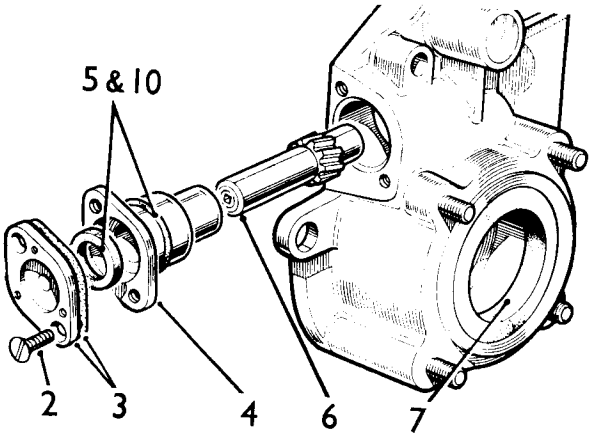
1. Remove the speedometer drive housing. 8.1.
2. Remove the pinion retainer fixings.
3. Withdraw the retainer and gasket.
4. Withdraw the pinion sleeve.
5. Remove the oil seal and 'O' ring.
6. Withdraw the speedometer pinion.
7. Remove the output shaft oil seal from the speedometer housing.

Inspecting

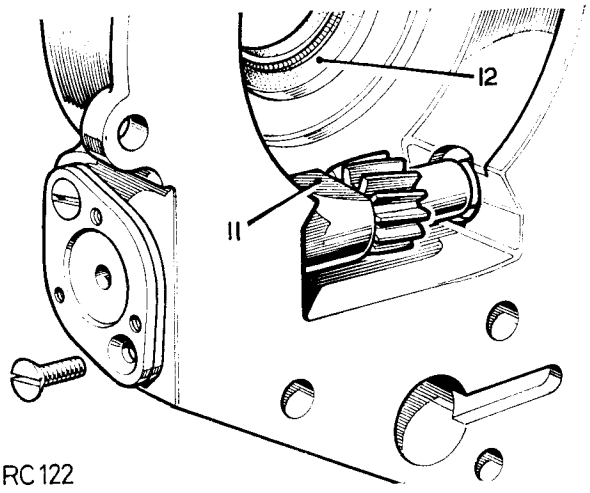
8. Examine the pinion teeth and the speedometer drive worm for wear.
9. Check the sleeve which should be a slide fit on the pinion.

Assembling

10. Fit the oil seal, lipped side inwards, and 'O' ring to the sleeve.
11. Fit the pinion and sleeve, ensuring that the relieved face on the sleeve will be towards the speedometer drive worm when assembled.
12. Fit the output shaft oil seal, lipped side inward, using jointing compound on the seal outer diameter. The housing may be warmed to facilitate assembly.
13. Refit the drive housing. 8.1.



1RC 121



1RC 122

TRANSFER GEARBOX

—Remove and refit **8.3**

Service tool: 605862, intermediate shaft extractor

Removing

1. Remove the front floor. 17.4.
2. Remove the seat base. 18.1.
3. Drain the gearbox lubricating oil.
4. Remove the gearbox undershield.
5. Remove the transmission brake. 12.3.

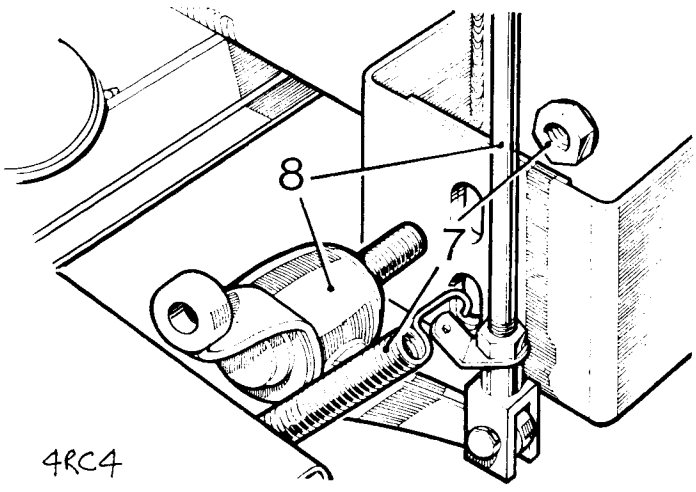
   NOTE: If the vehicle is fitted with any optional equipment driven from the transfer box, it must be disconnected at the transfer box.

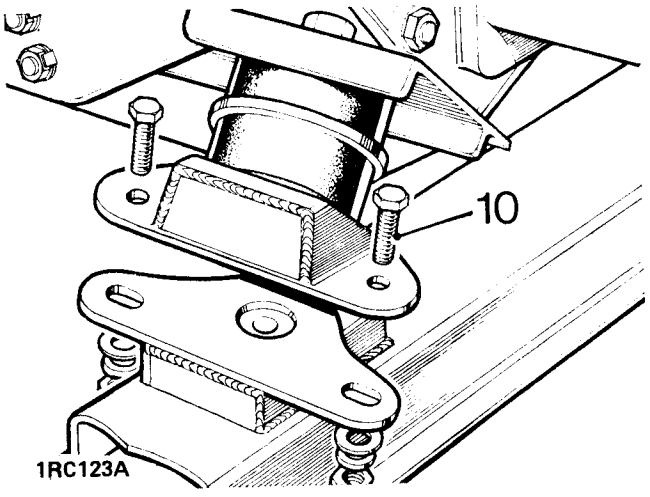
6. Disconnect the speedometer cable from the gearbox.
7. Remove the brake lever and relay fixings.
8. Remove the hand brake lever and relay mechanism.
9. Remove the hand brake cross-shaft.

   NOTE: On certain models, the engine exhaust pipe is located above the gearbox, left hand rear mounting, and where applicable, the exhaust pipe must be moved clear. Also check the location of the engine earth strap, on certain models it is fitted between the gearbox and chassis and must therefore be disconnected.

10. Remove the fixings from the two rear mountings for the gearbox.

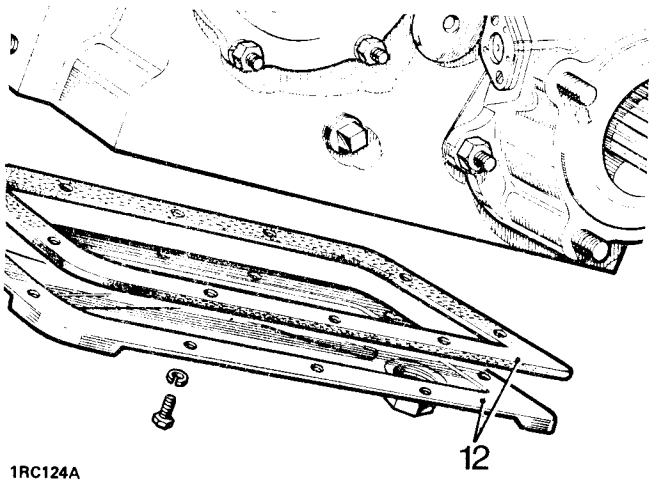
continued



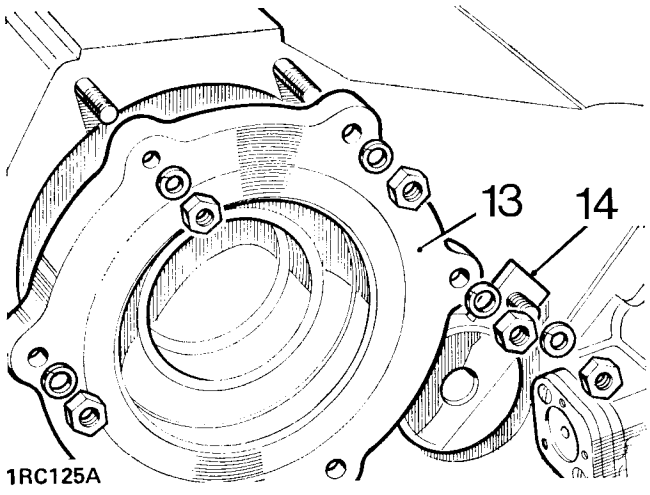


11. Jack-up the rear of the engine sufficient to insert a 25 mm (1 in) thick block of wood between the flywheel housing and the chassis to support the gearbox.
12. Remove the bottom cover plate and gasket from the transfer box.
13. Remove the mainshaft rear bearing housing, or if fitted, the power take off drive unit.
14. Remove the fixings from the retaining plate for the intermediate shaft.
15. Support the intermediate gear by hand while using Service tool 605862 to withdraw the intermediate shaft complete with retaining plate and oil seal 'O' ring. Withdraw the intermediate gear and roller bearings through the bottom of the casing.

continued



1RC124A



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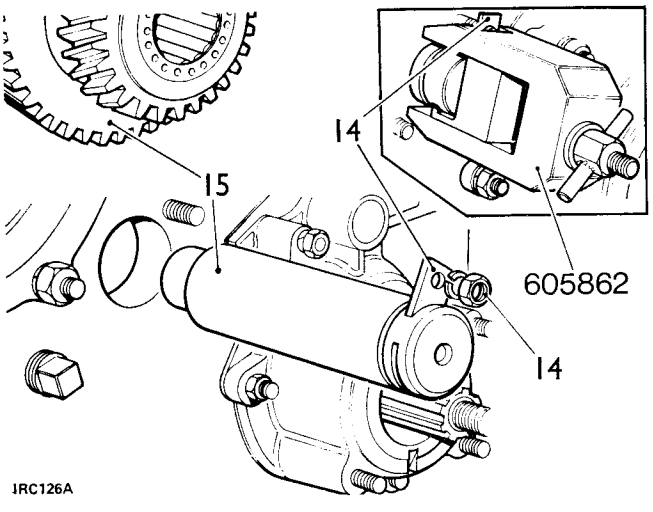
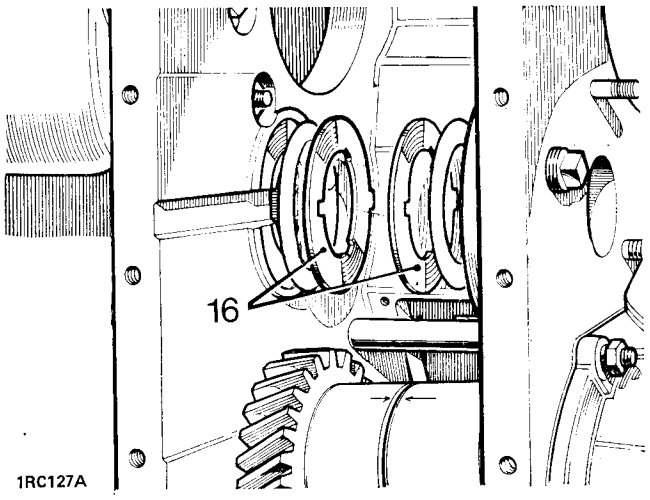


1RC126A

16. Remove the thrust washers and if fitted, shims located between each end of the intermediate gear and casing.
17. Remove the internal fixings.
18. Remove the external fixings.
19. Withdraw the transfer gearbox and joint washer from the main gearbox.

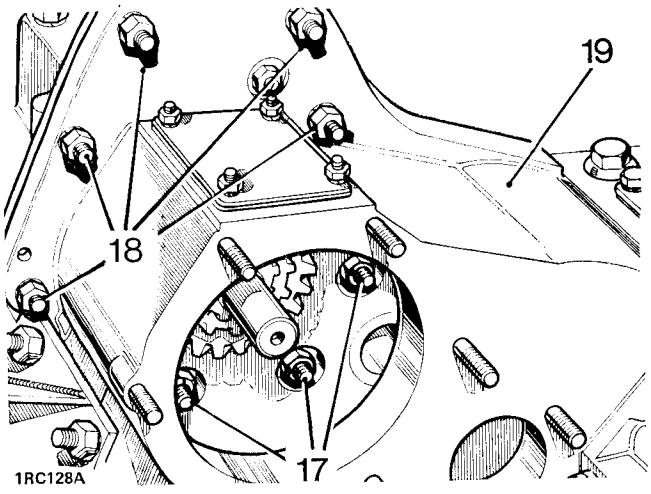


Refitting

20. Smear both sides of the joint washer with general purpose grease and place it in position on the main gearbox.
21. Fit the transfer box to the main gearbox, engaging the dowel locations.
22. Fit any shims for the intermediate gear, between the thrust washers and the casing, ensuring that the thrust washer bronze faces are towards the intermediate gear. Use a little general purpose grease to retain in position.

    NOTE: If the intermediate gear, bearings or thrust washers have been renewed, the gear end-float must be checked and adjusted, as described under 'Transfer box overhaul'. 8.4.

23. Locate the intermediate gear, complete with roller bearings, in position in mesh with the output shaft gear.
24. Fit the intermediate shaft, together with its oil seal 'O' ring and retaining plate, through the casing, shims, thrust washers and intermediate gear, tapping it lightly home when the spigotted end of the shaft engages its location in the front of the casing. The shaft **must** be a light tap fit.
25. Reverse 1 to 14. When refitting the bottom cover plate gasket, smear both sides with jointing compound.



TRANSFER GEARBOX (HELICAL AND SPUR GEAR TYPE)

—Overhaul **8.4**

Service tool: 243241, thread protector

Dismantling

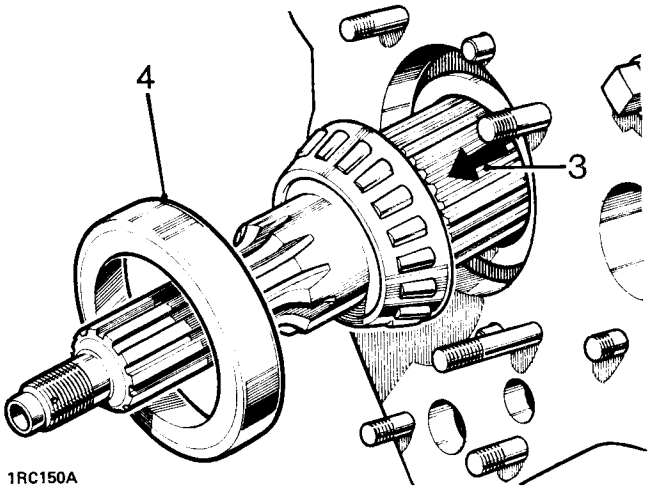
General

1. Remove the transfer gearbox. 8.3.
2. Remove the speedometer drive housing. 8.1.
3. Using a mallet, drive the output shaft rearwards.
4. Withdraw the rear bearing outer race when released from the casing.
5. Fit protection cap 243241, over the threaded end of the output shaft, and drive the shaft forward as far as possible.
6. Slide the shaft to the rear and insert a suitable packing piece between the rollers of the front bearing and the outer race.

   NOTE: A packing piece can be made from a scrap bearing outer race, with the outer diameter reduced to give clearance in the transfer box and suitably slotted to fit over the shaft.

7. Remove the circlip retaining the front bearing outer race.
8. With the packing piece in position, drive the shaft forward.
9. Withdraw the front bearing outer race.

continued



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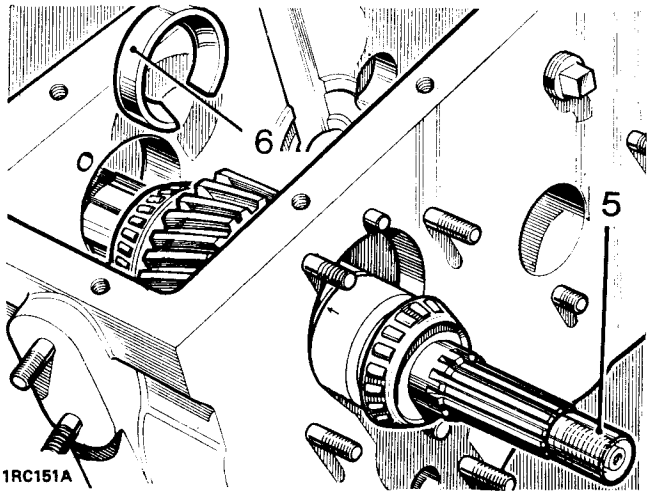

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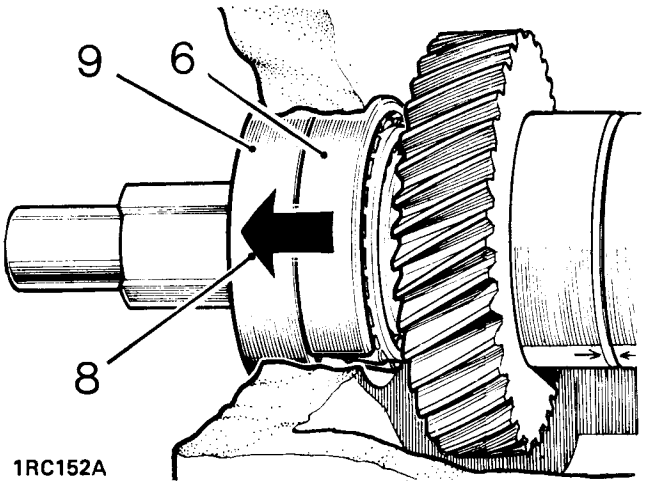
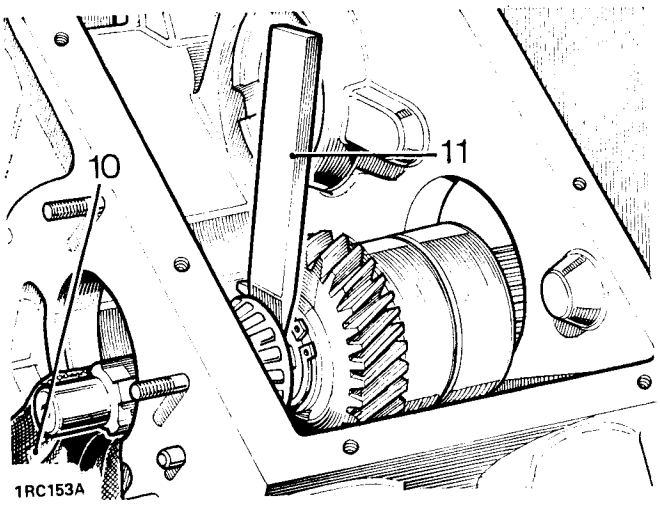


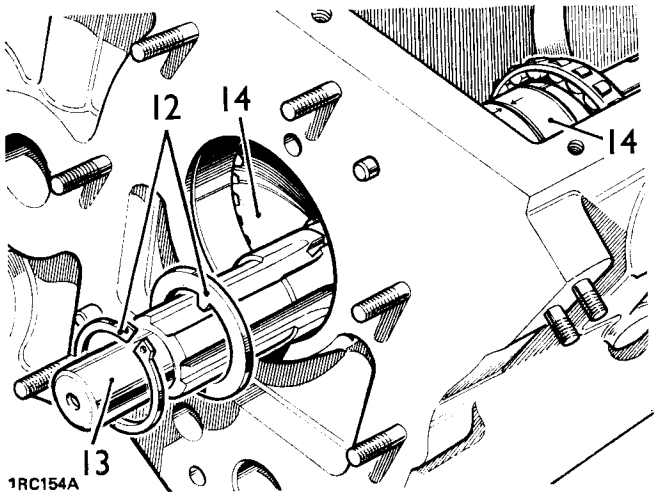
1RC152A

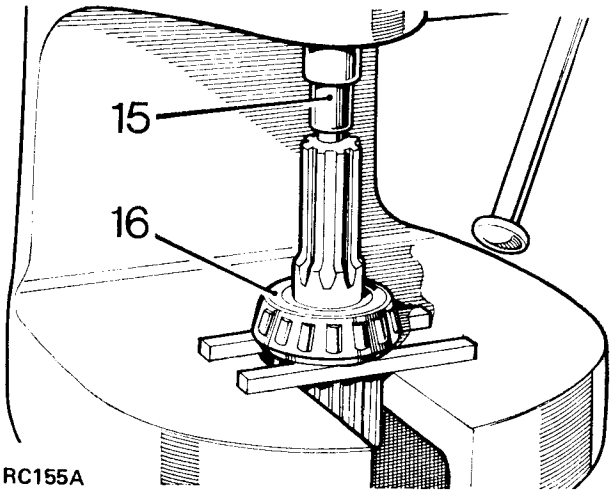
(HELICAL AND SPUR GEAR TYPE)

10. Place pads of rag in position to protect the transfer box bearing bores during the following operations.
11. Using a suitable mild steel bar with a chisel end, drive the front bearing from the output shaft.
12. Remove the circlip and thrust washer from the output shaft.
13. Withdraw the shaft.
14. Remove the gear and driving sleeves.
15. Retain the protector 243241 on the shaft threads.
16. Extract or press the rear bearing from the output shaft.

continued

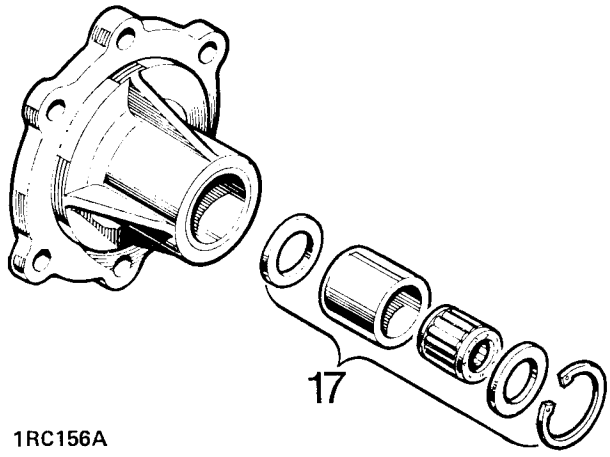






(HELICAL AND SPUR GEAR TYPE)

17. Remove the circlip, retaining plate and roller bearing from the mainshaft rear bearing housing.
18. Remove the fixings, flange to brake drum.
19. Withdraw the coupling flange.
20. Prise off the mud shield.
21. Remove the retaining circlip from the propeller shaft bolts.
22. Withdraw the bolts and retainer plate.



1RC156A

Inspecting

23. Renew any components which show obvious wear or damage.
    Examine the sleeve of the output flange for damage which could cause failure of the oil seal.

Pre-assembly check, items 24 to 29.

24. Fit the driving gear wheel on to the output shaft.
25. Fit the thrust washer.
26. Fit the circlip.
27. Place a suitable piece of tube over the shaft and push the circlip towards the gear to produce minimum gear end-float.
28. Maintaining this condition, check the end-float between the gear and the shaft, this must be 0,15 mm to 0,20 mm (0.006 in to 0.008 in) under these conditions.
29. Adjustment of the driving gear wheel end-float is made by reducing the thickness of the thrust washer, or fitting a new thrust washer, as required. If fitting a new thrust washer fails to reduce the end-float to the required limits, replace the shaft and/or gear.

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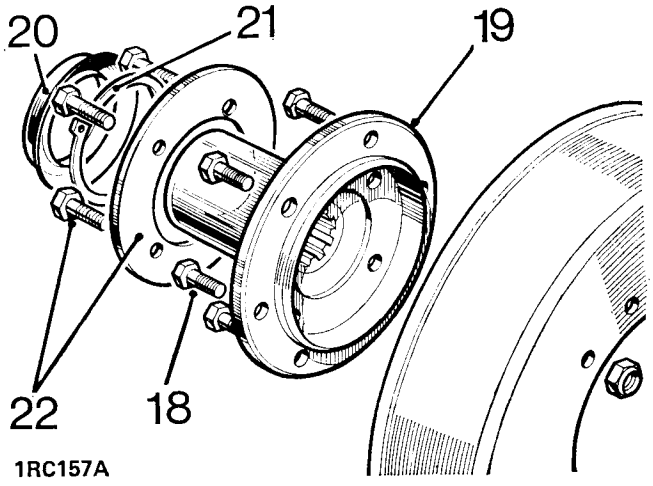

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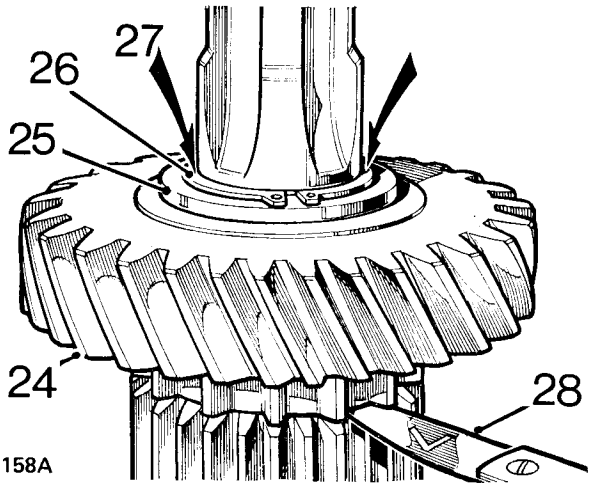
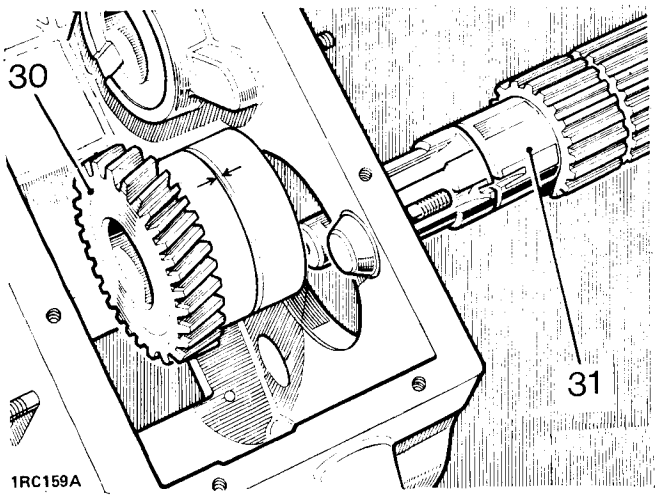


1RC158A

(HELICAL AND SPUR GEAR TYPE)

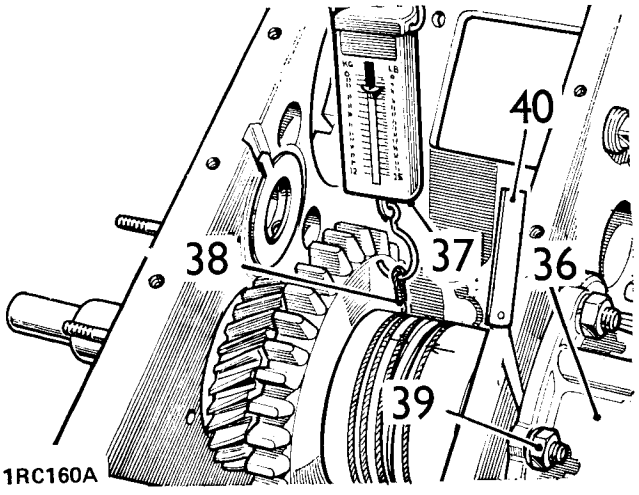
Assembling

30. Position the driving gear and two sleeves in the transfer box, ensuring that the etched arrows on the sleeves are aligned.
31. Fit the output shaft, from the rear of the box, to engage the driving sleeves and gear.
32. Fit the thrust washer, determined during the pre-assembly check, to the output shaft and secure, using a new circlip.
33. Use pads of rag to protect the transfer box bearing bores, and drive the two roller bearings on to the output shaft. Fit the front bearing outer race and secure with a circlip.
34. Fit the rear bearing outer race.
35. Using the protection cap 243241 over the threaded end of the output shaft, drive the shaft forward until the front bearing is hard against the circlip. Then lightly tap the rear bearing outer race further in to remove all end-float from the output shaft without introducing pre-load.



Setting the output shaft bearing pre-load, items 36 to 42

36. Fit the speedometer housing, without any shims, and loosely retain with nuts and spring washers.
37. Measure the rolling resistance of the output shaft, using a cord attached to a spring balance. Coil the cord around the driving sleeves and note the measurement recorded on the spring balance required to rotate the output shaft after having overcome inertia.
38. Ensure that the cord does not slip, giving a false reading.
39. Bearing pre-load is correct when a figure of 0,5 to 1,0 kg (1 to 2 lbs) is recorded on the spring balance. Adjustment is made by tightening the speedometer housing securing nuts, progressively and evenly.
40. When the bearing pre-load is correct, ensure that the clearance between the speedometer housing and the transfer box is evenly disposed, using feeler gauges. The measured clearance obtained is equal to the thickness of shims required for subsequent assembly between the speedometer housing and transfer box to maintain correct bearing pre-load.



continued

(HELICAL AND SPUR GEAR TYPE)

41. Withdraw the spring balance and cord from the driving sleeve, and remove the speedometer housing from the transfer box.
42. Using the determined thickness of shims, fit the speedometer drive worm and housing.

Determining the intermediate gear end-float, items 43 to 47

43. Place the two thrust washers for the intermediate gear in position in the transfer box and retain with a film of grease. The washers must be fitted with the bronze faces inward and located in the casing by their tabs.
44. Locate the intermediate gear, complete with roller bearings, in position in mesh with the high and low gear wheels.
45. Fit the intermediate shaft through the casing, thrust washers and intermediate gear, tapping it lightly home when the spigotted end of the shaft engages its location in the front of the casing. The shaft must be a light tap fit.
46. Using feeler gauges, check the end-float of the intermediate gear, this must be 0,10 mm to 0,20 mm (0.004 in to 0.008 in).
47. Adjustment is made by grinding the steel face of the thrust washers to increase end-float, or by fitting shims, available in 0,25 mm (0.010 in) thickness, between the thrust washers and the casing to reduce end-float.

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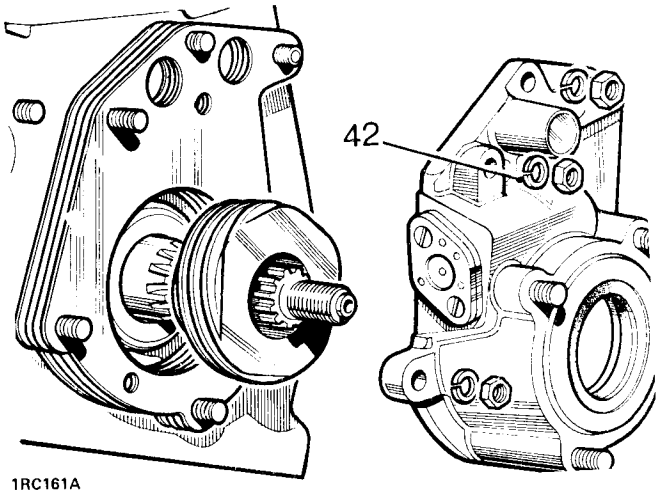

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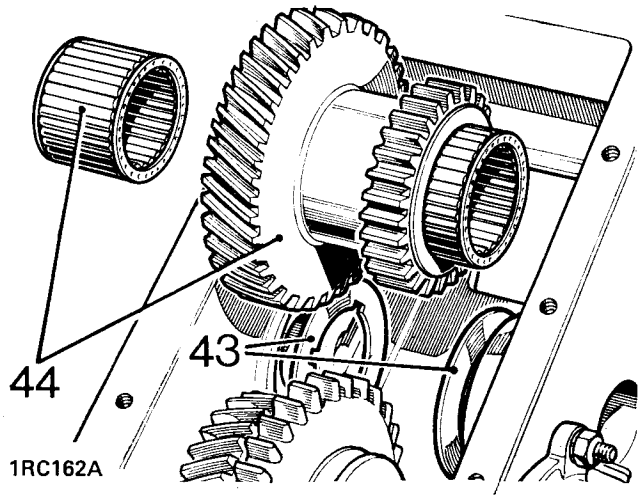

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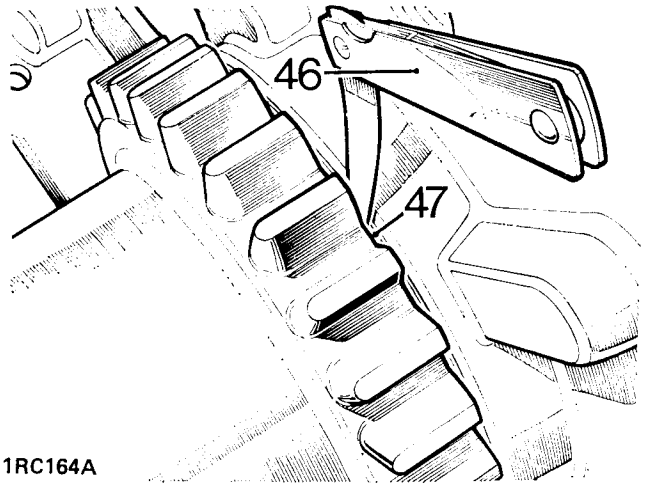
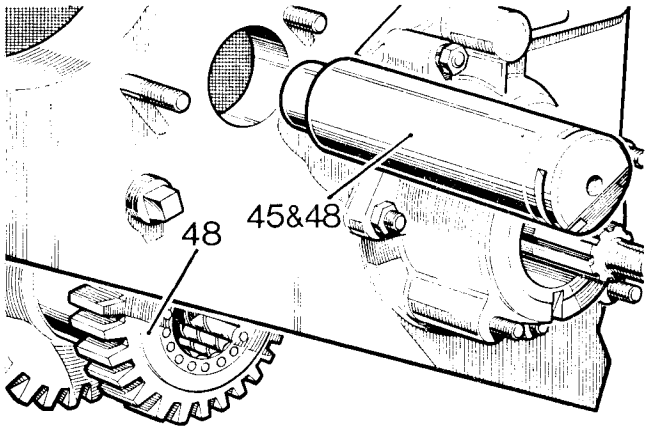


1RC164A

(HELICAL AND SPUR GEAR TYPE)

48. When the intermediate gear end-float is correct, remove the intermediate shaft and gear, and place aside for subsequent assembly after the transfer box has been fitted to the main gearbox.
49. Re-assemble the rear bearing housing and the output drive flange by reversing the removal procedure.
50. Refit the transfer gearbox. 8.3.



1RC163A

DATA

High gear end-float	0,15 mm to 0,20 mm (0.006 in to 0.008 in)
Intermediate gear end-float	0,10 mm to 0,20 mm (0.004 in to 0.008 in)
Output shaft bearing pre-load	0,5 kg to 1,0 kg (1 lb to 2 lb) measured with spring balance cord coiled around the driving sleeve

PROPELLER SHAFT OPERATIONS

PROPELLER SHAFT

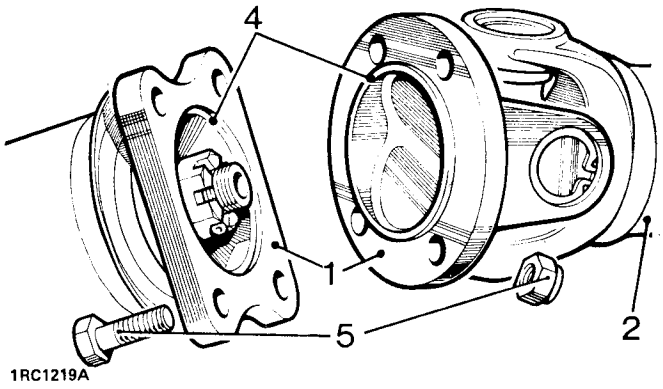
—Remove and refit **9.1**

Removing

1. Disconnect the coupling flanges.
2. Withdraw the propeller shaft.

Refitting

3. Locate the shaft in position with the sleeve end towards the gearbox.
4. Ensure that the registers on the coupling flanges engage.
5. Secure the coupling flange fixings.



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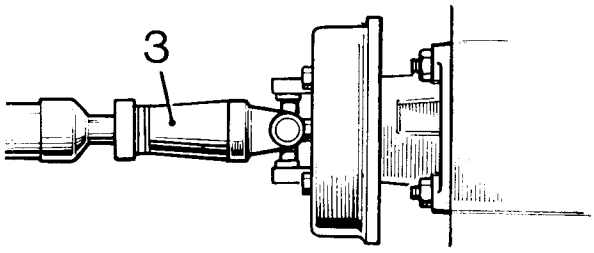

4RC7

PROPELLER SHAFT

—Overhaul 9.2

Dismantling

1. Remove the propeller shaft. 9.1.
2. Check that the alignment marks on the splined sleeve and the splined shaft are clearly visible. If necessary, make new alignment marks.
3. Unscrew the dust cap.
4. Withdraw the sliding joint.
5. Clean the splined shaft and the splined sleeve.
6. Temporarily locate the splined shaft into the sleeve, maintaining the marked alignment.
7. Secure the shaft in a vice.
8. Mount a dial test indicator to read off the outside diameter of the shaft splines.
9. Check the circumferential movement between the sleeve and shaft. If the movement exceeds 0,1 mm (0.004 in) fit a new propeller shaft complete.

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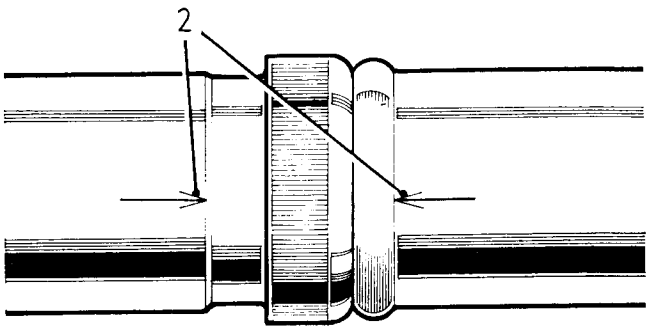

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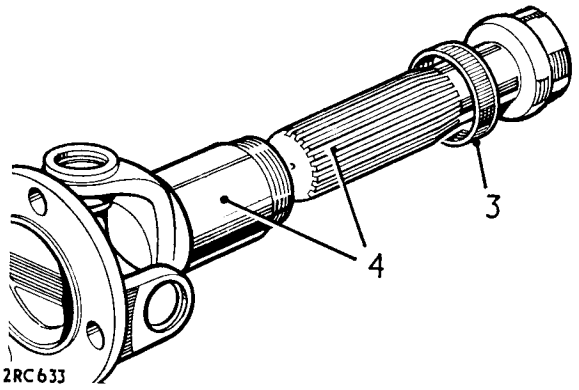

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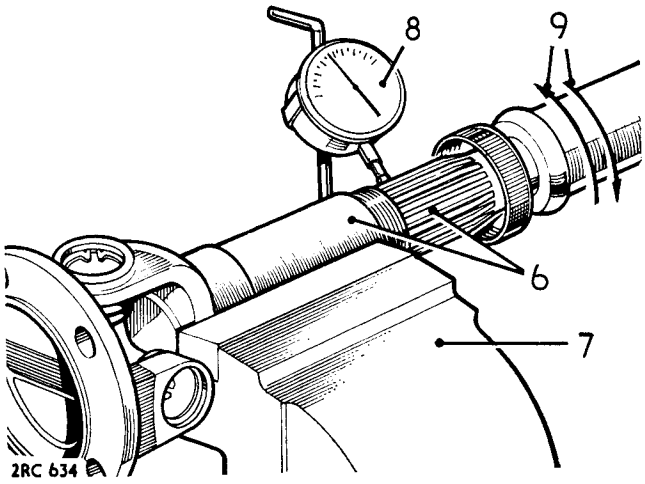

2RC 634

10. Clean any dirt and enamel from the circlips and the tops of the bearing races.
11. Remove the circlips.
12. Remove the grease nipple from the universal joint.
13. Locate the yoke of the splined sleeve onto a suitable piece of tube which has a slightly larger internal diameter than the journal bearing.
14. Using a brass drift, drive the universal joint downward until it is just clear of the lower yoke.
15. Lift the sleeve clear of the tube and withdraw the bearing downward to avoid dropping the needle rollers.
16. Repeat items 13 to 15 for the opposite bearing.

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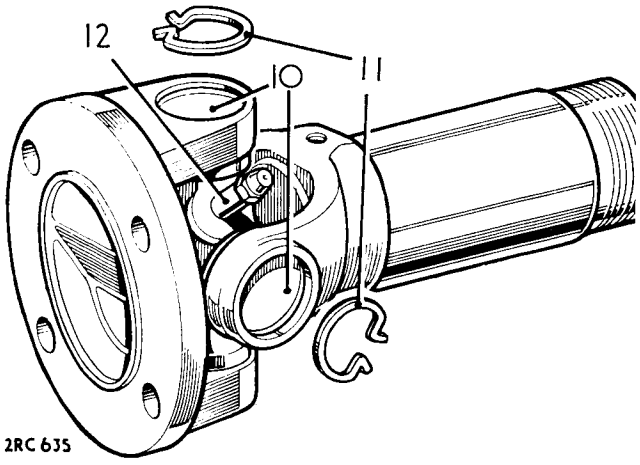

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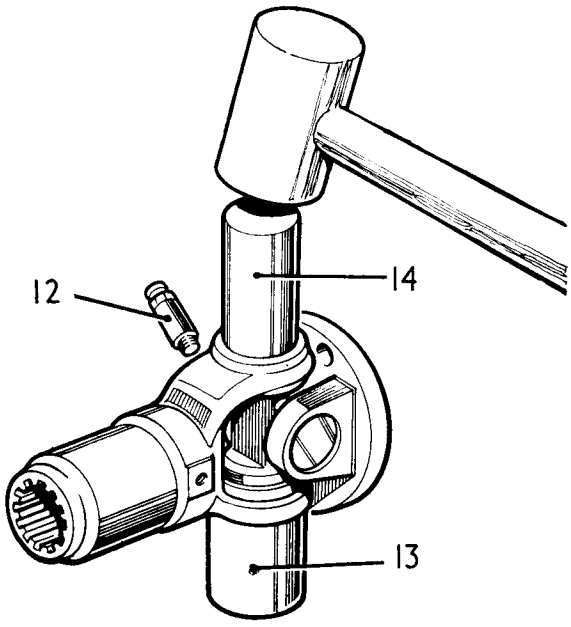

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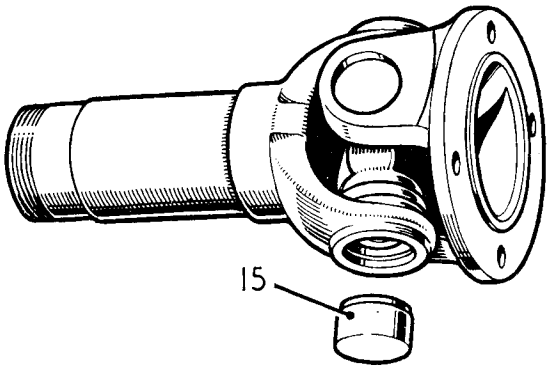

2RC 637

17. Withdraw the splined sleeve from the flanged yoke.
18. Remove the bearings from the flanged yoke in the manner already described.
19. Repeat items 13 to 18 for the splined shaft.

Inspecting

20. Examine all components for obvious wear or damage.
21. If the journal or bearings for the universal joints show any signs of wear, load markings or distortion, they must be replaced complete. Replacement journal assemblies comprise a spider complete with oil seals and bearings.
22. In the event of wear in any of the eight yoke cross holes, rendering them oval, a new propeller shaft complete must be fitted.

Reassembling

23. Assemble the needle rollers in the bearing races, if necessary using a smear of vaseline to retain them in place. About half-fill the races with a recommended grease.
24. Insert the journal, complete with seals, into the flange yoke holes with the grease nipple tapping pointing away from the flange.
25. Place the flanged yoke on a suitable flat support.
26. Place the first bearing in position.
27. Using a brass drift, slightly smaller in diameter than the hole in the yoke, tap the bearing into position.

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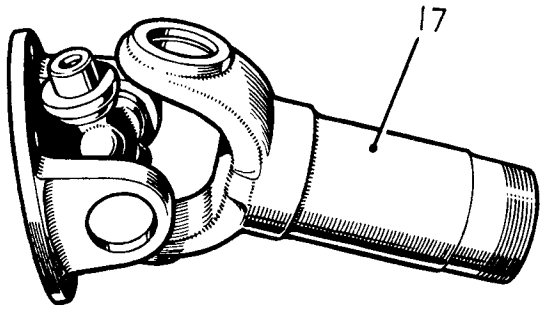

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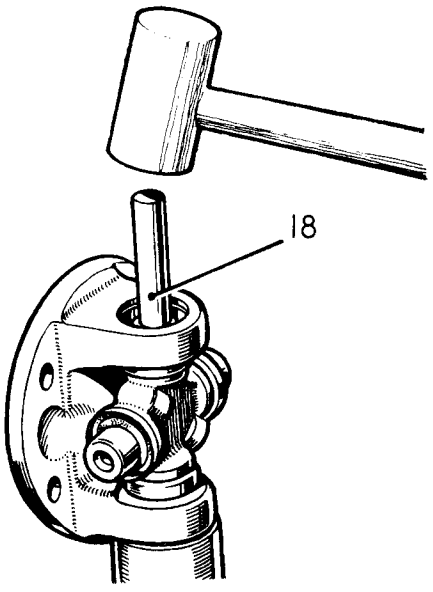

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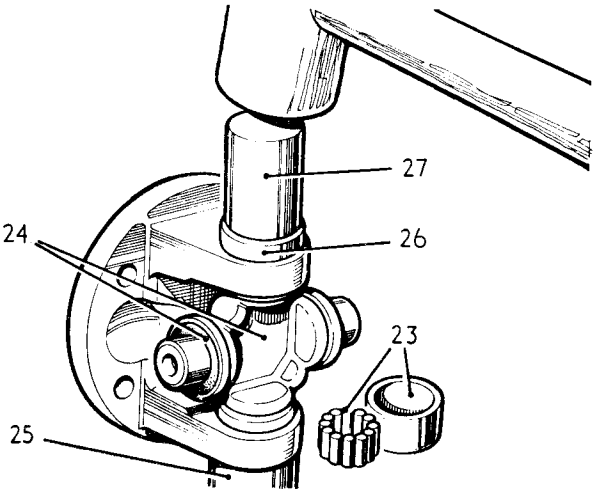


2RC 640

28. Fit the circlip to retain the bearing.

    NOTE: The bearing outer races must be a drive fit, otherwise fit a new propeller shaft complete.

29. Repeat 25 to 28 for the other three bearings comprising the universal joint.
30. Ensure that all four circlips are firmly located in their grooves. If the joint appears to bind, tap the yoke ears lightly with a soft mallet.
31. Repeat 23 to 30 for the other universal joint.
32. Liberally smear the splines of the shaft and sleeve with the recommended grease.
33. Assemble the splined shaft and sleeve maintaining the marked alignment.
34. Fit the grease nipple to the universal joint.
35. Lubricate the propeller shaft at the grease points.

    CAUTION: Do not fill the sliding joint with grease, use sufficient to lubricate the splines only, otherwise hydraulicing will result.

36. Refit the propeller shaft. 9.1.

FRONT AXLE OPERATIONS

FRONT AXLE ASSEMBLY

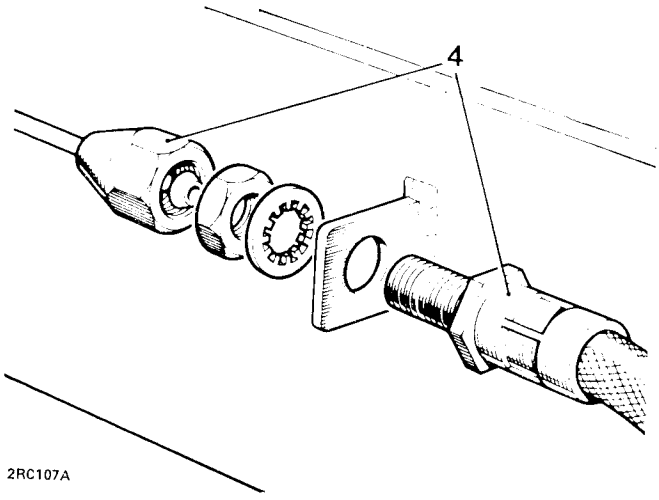
—Remove and refit **10.1**

Service tool: 601763 Ball joint extractor

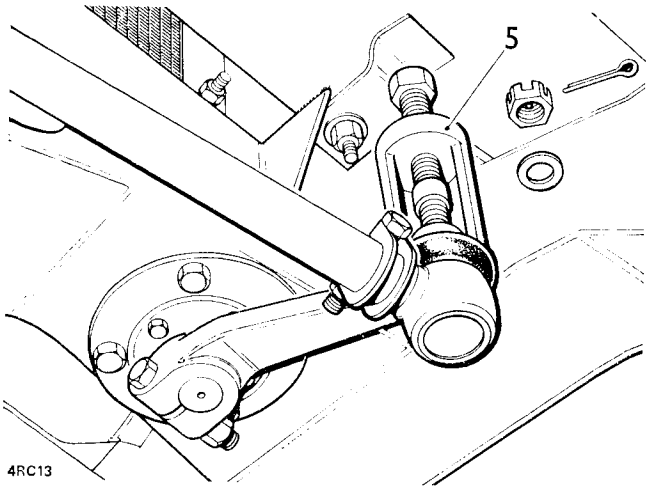
Removing

1. Slacken the fixings at both front road wheels.
2. Jack up the front of the vehicle and support on stands.
3. Remove both front road wheels.
4. Disconnect the front brake pipes at their connections with the flexible pipes each side of the vehicle, and withdraw the flexible pipes from the chassis brackets. Depress and wedge the brake pedal, to prevent further leakage of brake fluid.
5. Disconnect the steering drag link from the lower relay lever, using 601763 to extract the ball joints.
6. Disconnect the lower ends of the shock absorbers from the road spring bottom plates.

continued



2RC107A



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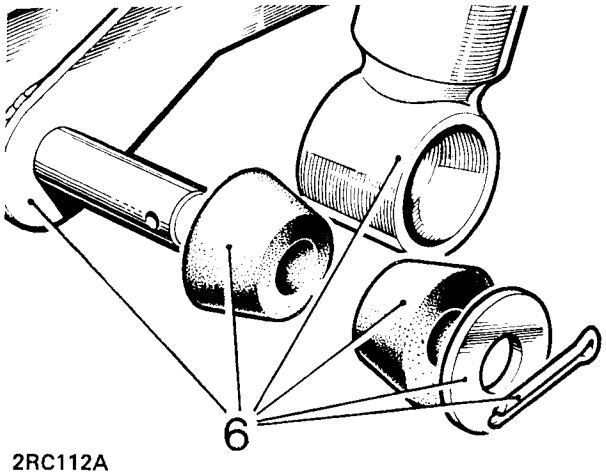


2RC112A

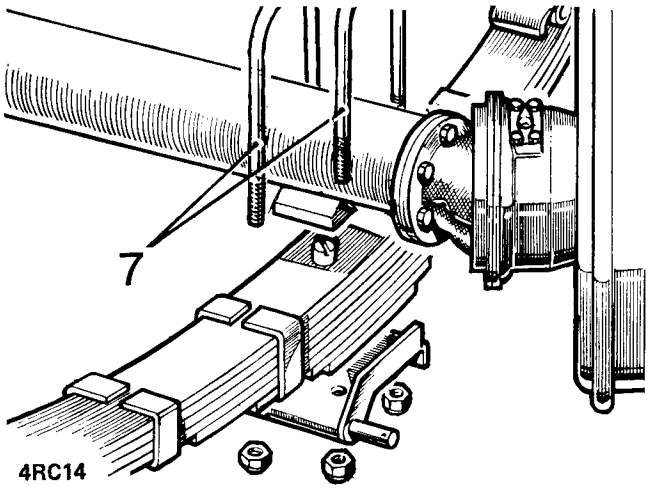
7. Remove the four 'U'-bolts from the axle.
8. Support the front axle with a jack, slacken all six shackle pins at the front road springs, then remove the two front pins.
9. Lower the jack and withdraw the axle.

Refitting

10. Reverse 9.
11. Using a second jack, raise each road spring in turn and connect the front ends of the springs to the chassis, but DO NOT tighten the shackle pins and locknuts at this stage.
12. Fit the axle 'U'-bolts and engage the lock plates.
13. Reverse 6.
14. Reverse 5. Torque load 4,0 kg fm (30 lbf ft).
15. Reverse 4.
16. Reverse 3.
17. Lower the vehicle to the ground and move vehicle bodily backward and forward to settle the springs, then tighten all six shackle pins and locknuts.

    NOTE: If the shackle pins and locknuts are tightened prior to lowering the vehicle to the ground, premature failure of the spring bushes may occur.

18. Bleed and adjust the brakes. 12.34, 12.6.
19. Check, and if necessary, replenish the lubricating oil in the swivel pin housings.
20. Check, and if necessary, adjust the steering stop. 14.18.



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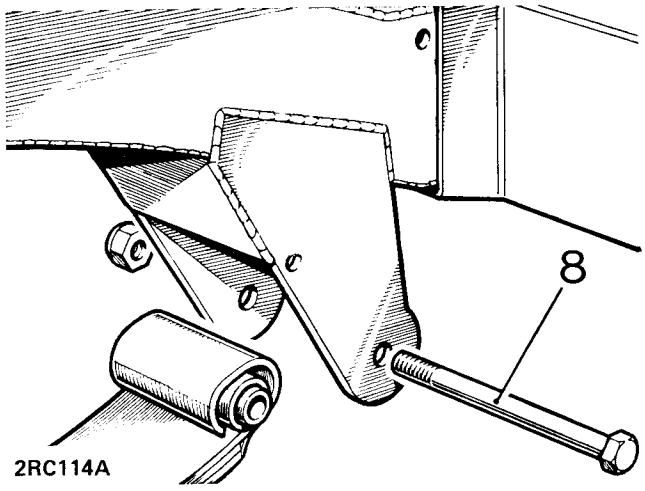


2RC114A

FRONT HUB ASSEMBLY

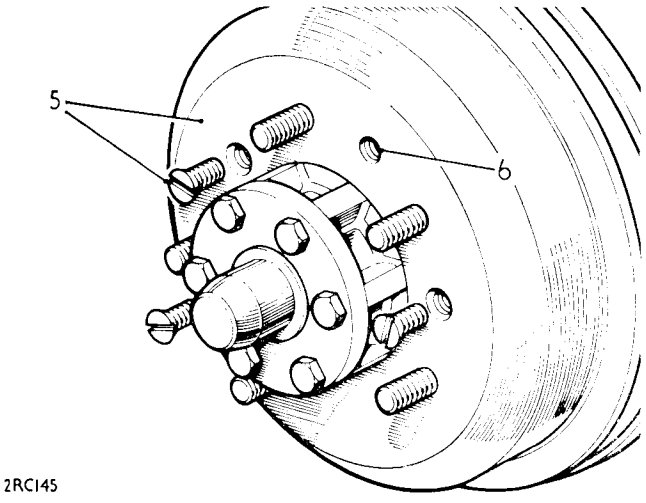
—Remove and refit **10.2**

Removing

1. Drain the swivel housing lubricating oil.
2. Jack up the front of the vehicle.
3. Remove the road wheel.
4. Slack off the brake shoe adjuster/s.
5. Remove the brake drum, noting the provision of an extractor tapping, item 6.
6. If difficulty is experienced in removing the drum, fit one of the drum fixing screws into the extractor tapping provided and turn in the screw whilst using a mallet to dislodge the drum.
7. Prise off the hub cap.
8. Remove the driving member from the axle stub shaft and hub.
9. Remove the hub fixings.
10. Hold in position the outer roller bearing.
11. Withdraw the hub and bearing.

Refitting

12. Lubricate the bearings, using the recommended grease. Do not pack the hubs with grease.
13. Reverse 9 to 11 and adjust the hub bearing end float. 10.4 refers.
14. Fit the driving member with the felt and plastic oil seal fitted with the plastic side facing outwards. Torque load for driving member fixing bolts is 3,9 kgf m (28 lbf ft). Torque load for stub shaft to driving member nut is 1,4 to 2,0 kgf m (10 to 15 lbf ft).
15. Reverse 4 to 7 and adjust the brakes.
16. Reverse 1 to 3.



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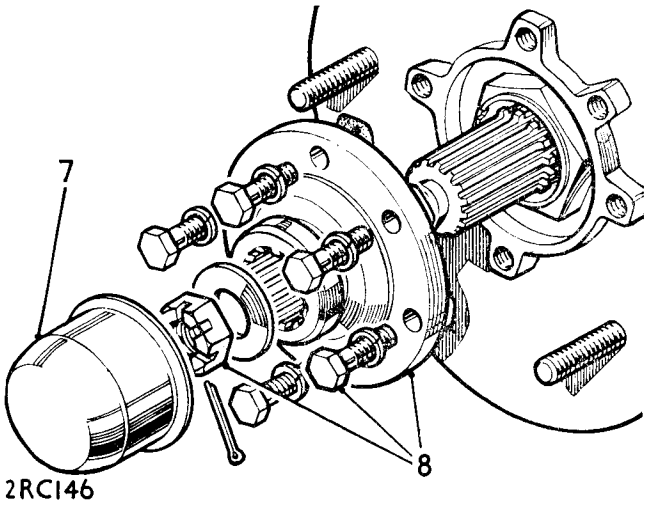

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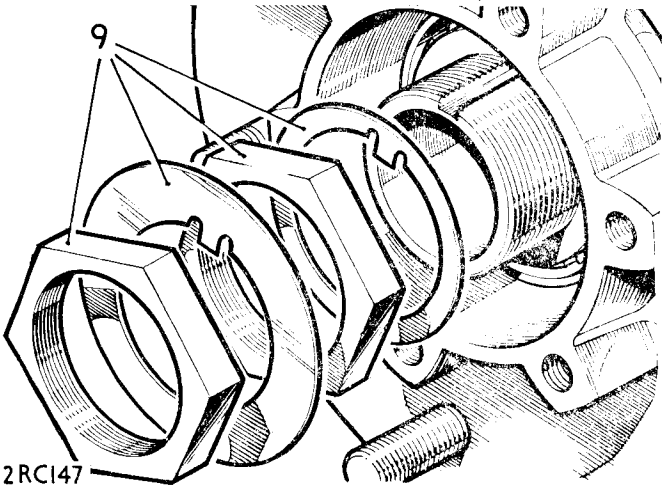


2RC147

FRONT HUB ASSEMBLY

—Overhaul **10.3**

Dismantling

1. Remove the front hub. 10.2.
2. Withdraw the outer roller bearing.
3. Prise out the oil seal.
4. Withdraw the inner roller bearing.
5. Press the bearing outer races from the hub.

Inspection

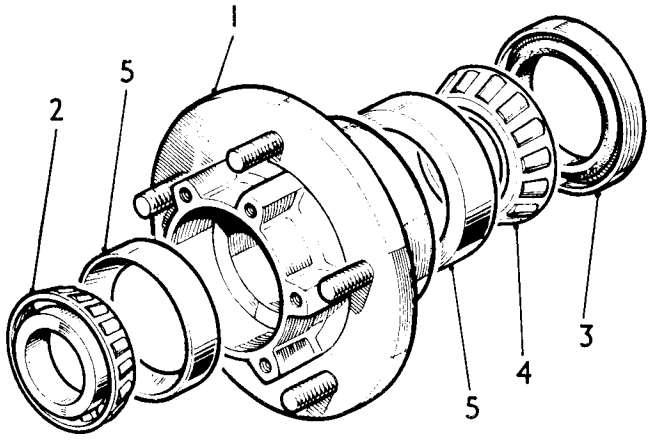
6. Examine all components for obvious wear or damage.
7. Examine the outside diameter of the inner bearing distance piece which is pressed on to the exposed stub axle. The diameter forms the inner seat for the hub oil seal and must be free from scores, damage and roughness. To replace the distance piece, 10.6 refers.
8. The hub bearings must be a sliding fit on the stub axle and a press fit in the hub.

Reassembling

9. Press the bearing outer races, wide side first, into the hub, ensuring that they abut the locating shoulders.
10. Grease and fit the inner roller bearings. Do not pack the hub centre with grease.
11. Coat the outside diameter of the oil seal with Bostik 772, Stag A or Hylomar jointing compound, ensuring that the compound is kept clear of the seal lip.
12. Fit the oil seal flush with, and not below, the rear face of the hub.

    NOTE: If the seal is made of leather, the lip should be smeared with Molytone (MTC) grease.

13. Reverse 1 and 2.



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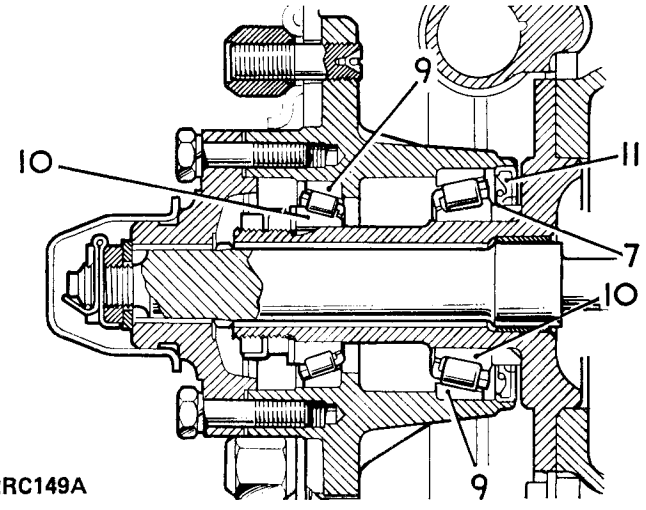


2RC149A

FRONT HUB BEARINGS END FLOAT

—Check and adjust **10.4**

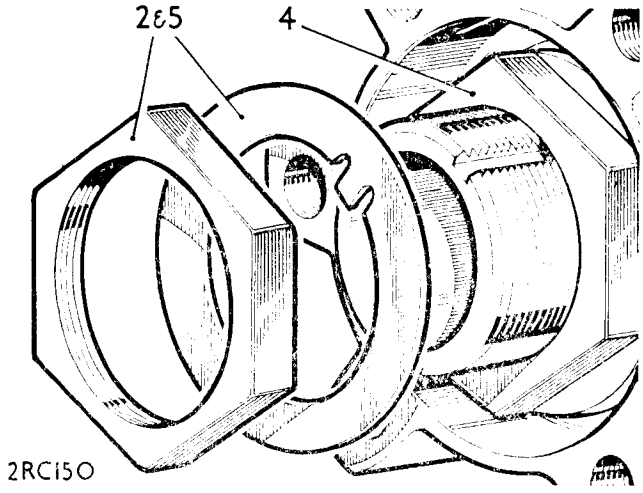
Service tool: 606435, Spanner for hub bearing nuts

Procedure

1. Carry out items 1 to 8 of operation 10.2 to remove the brake drum and hub driving member.
2. Remove the locknut and lock washer from the hub.
3. Spin the hub vigorously, causing the bearing rollers to settle in the tapered races, producing maximum end-float conditions.
4. Tighten the adjuster nut sufficient only to take up any obvious end-float.

   NOTE: It is necessary to spin the hub every time before checking the end-float, as moving the hub laterally will resettle the rollers, affecting the measurable end-float.

5. Fit the lockwasher and nut, tighten the nut but do not engage the lockwasher.
6. Using a dial test indicator, check the end-float of the hub, which must be 0,05 to 0,10 mm (0.002 to 0.004 in).
7. If the hub end-float is not within the permitted limits, remove the locknut and washer, and re-adjust the inner nut. Fit the lockwasher, tighten the locknut and recheck the end-float.
8. When the end-float is correct, engage the lock-washer.
9. Reverse 1.



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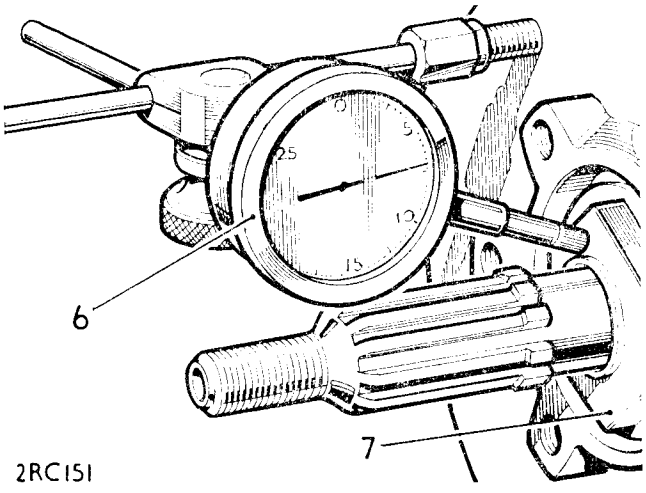


2RC151

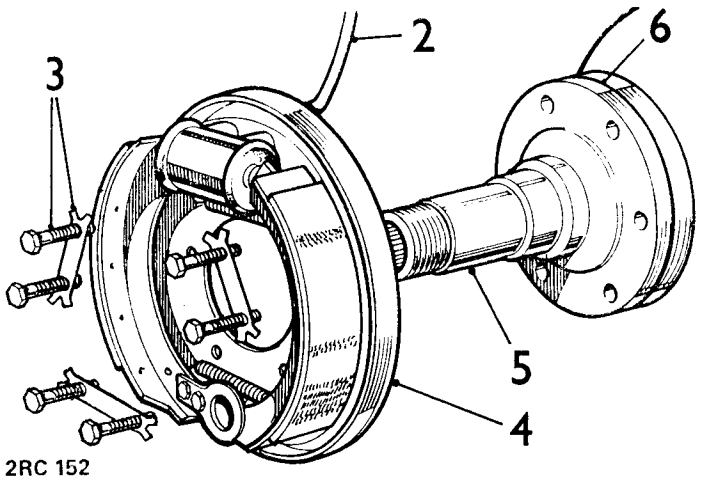
DATA

Bearing end-float	0,05 mm to 0,10 mm (0.002 in to 0.004 in)

FRONT STUB AXLE

Removing

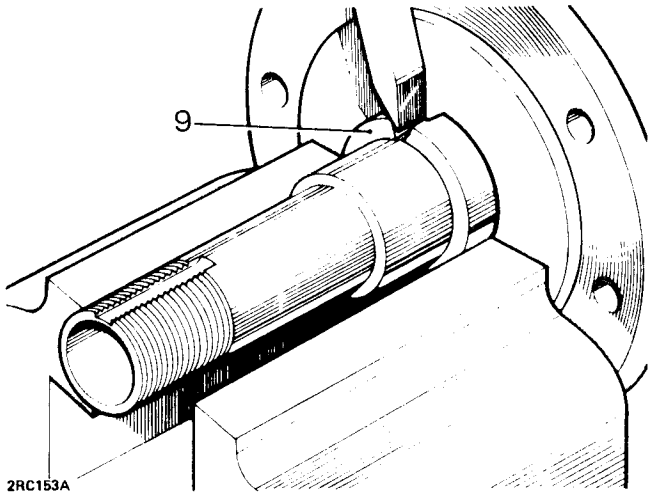
1. Remove the front hub. 10.2.
2. Release the brake pipe from the retaining bracket at the upper swivel pin.
3. Remove the brake anchor plate and stub axle fixings.
4. Suspend aside the anchor plate assembly.
5. Withdraw the stub axle.
6. Withdraw the joint washer.



2RC 152

Overhauling

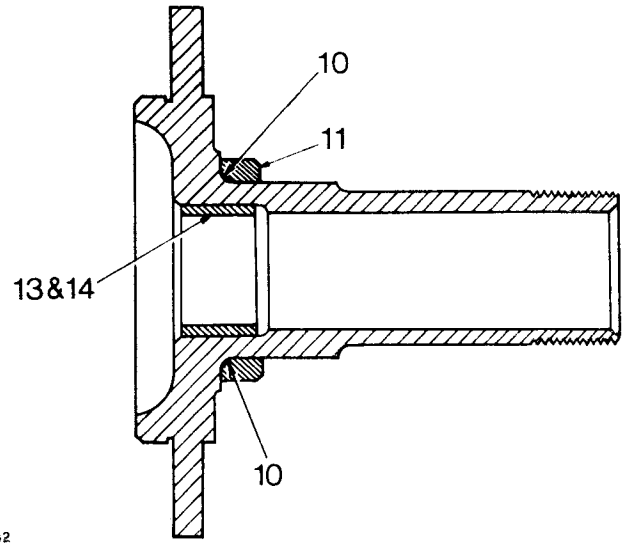
7. Examine for obvious wear or damage.
8. Check the outside diameter of the inner bearing distance piece, this must not show any signs of damage or roughness as it forms the inner seat for the oil seal. The distance piece should be a *press fit* and sealed on the stub axle. Any clearance between these two parts will allow oil to leak past on to the brake linings.
9. If it is required to remove the inner bearing distance piece from the stub axle, it must be shattered, using extreme care to avoid damaging the axle.
10. Smear Bostik 772 sealing compound all round the radiused corner on the stub axle where the inner bearing distance piece will seat.
11. Press on the replacement distance piece.



2RC153A

Refitting

12. Remove all visible traces of sealing compound.
13. Examine the bush inside the stub axle for wear or damage.
14. If required, fit a new bush. Check the internal diameter after fitting, this should be 31,72 to 31,85 mm (1.249 to 1.254 in).
15. Grease and fit the joint washer.
16. Reverse 1 to 5.



4RC42

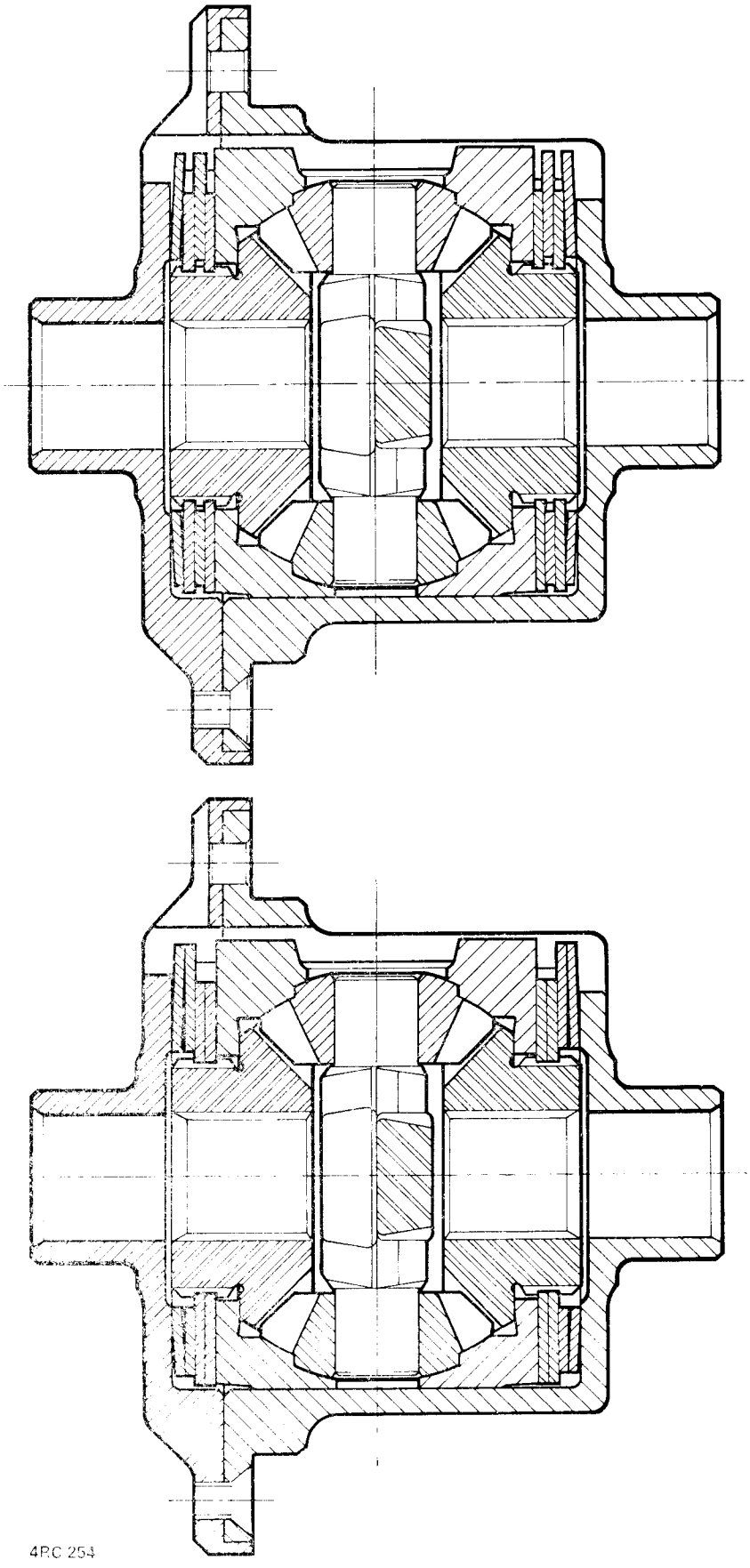
REAR AXLE AND FINAL DRIVE OPERATIONS

Rear hub assembly
—remove and refit
—overhaul

Rear hub bearings end-float—check and adjust

Rear stub axle
—remove and refit
—overhaul

} The procedures for these items are similar to those for the Front Axle, therefore, refer to Division 10 for particulars



Cross-section views of Powr-Lock Limited slip differential showing alternative arrangements of clutch plates and discs

SALISBURY 'POWR-LOCK' LIMITED SLIP DIFFERENTIAL

Description

The Powr-Lock assembly is a self contained unit within the rear axle final drive housing, and is basically a conventional bevel gear differential with free action partially inhibited by multi-plate clutches that are loaded initially by Belleville springs and then in proportion to the torque transmitted.

The two piece differential case is mounted on taper roller bearings in the final drive housing, and contains two separate sets of clutch plates, clutch discs, side gears and side gear rings that are divided by a set of four differential pinions mounted on two cross pins.

The differential case is joined at the crown wheel mounting flange and incorporates a cylindrical internal form with four rectangular cast grooves designed to accommodate the lugs on the clutch plates and side gear rings.

The two sets of clutch plates and discs each contain two plates and two discs. The plates incorporate lugs that engage in slots in the differential case to hold them stationary relative to the case, and the outer plate in each set is formed as a Belleville (dished) spring. The clutch discs are a splined fit on the hubs of the side gears and rotate together with the side gears. This arrangement of spring loaded stationary plates and rotating discs provides the clutches for the limited slip action. The order of assembly of the clutch plates and discs can be altered to increase or reduce the number of friction faces and, thus the performance of the limited slip action accordingly.

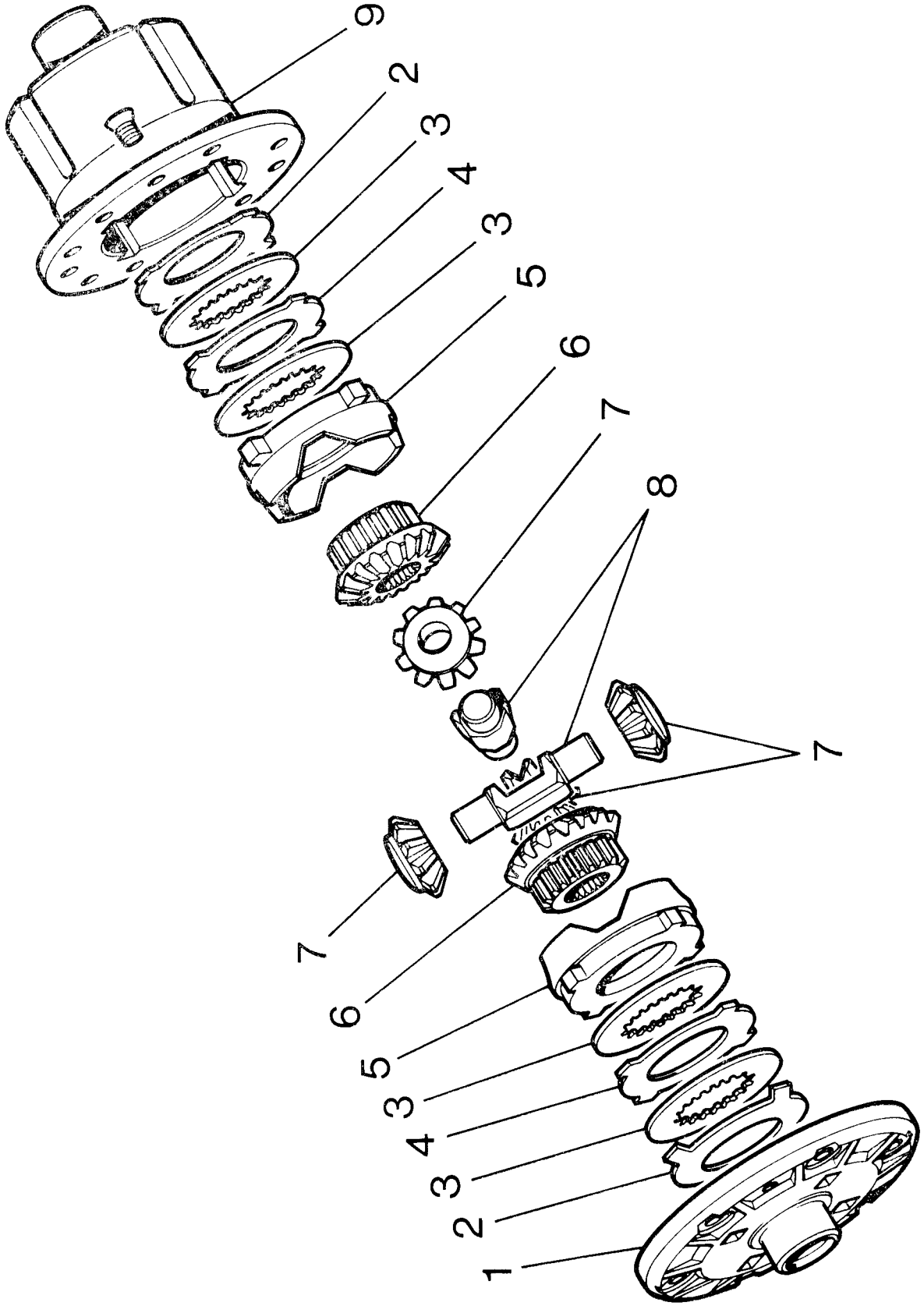
The side gear rings have plain bores that support the side gears and incorporate vee cam grooves in which the shoulders of the differential pinions locate. The bevel tooth side gears mate with four bevel pinions, mounted on two crosspins, to form the differential that allows the side gears to rotate independently.

In order to minimise, as far as is practicable, the lubricant sensitivity of the device, the clutch plates have a low coefficient of friction. The necessary frictional torque restraint is achieved with a small number of plates as a consequence of the loading obtained through the normal separating forces of the differential gears being supplemented by axial forces imposed by cam action obtained by the location of the differential pinions in the vee cam grooves in the side gear rings.

Operation

The drive from the gearbox is transmitted by the propeller shaft and coupling flanges to the bevel pinion in the final drive housing. The bevel pinion meshes with a matching bevelled crownwheel that is secured to the flange of the Powr-Lock differential casing. The drive is then transmitted from the differential casing to the side gear rings then through the differential pinions to the side gears and thus the axle shafts.

The pre-loading of the Powr-Lock clutches by Belleville spring plates inhibits normal differential function at low torque, to ensure that both rear wheels are driven and provide greater traction under extreme conditions when one driving wheel is off the ground, as may occur under off highway conditions. As torque increases, although differential inhibition also increases due to mechanical forces, the clutch plates commence slipping, allowing partial normal differential action.



Layout of Powr-Lock limited slip differential

Key to layout of Powr-Lock limited slip differential

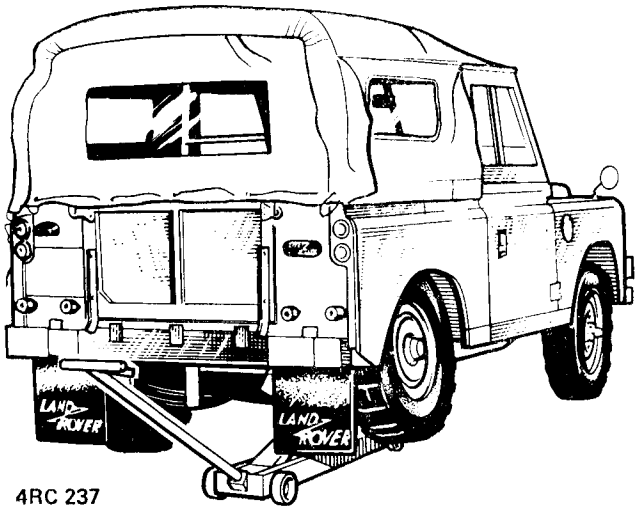
1 Differential case half, small
2 Clutch plate — Belleville (dished)
3 Clutch disc
4 Clutch plate (flat)
5 Ring for side gear
6 Side gear
7 Pinions, differential
8 Crosspins, differential
9 Differential case half, large

Limited slip differential—Functional check **11.1**

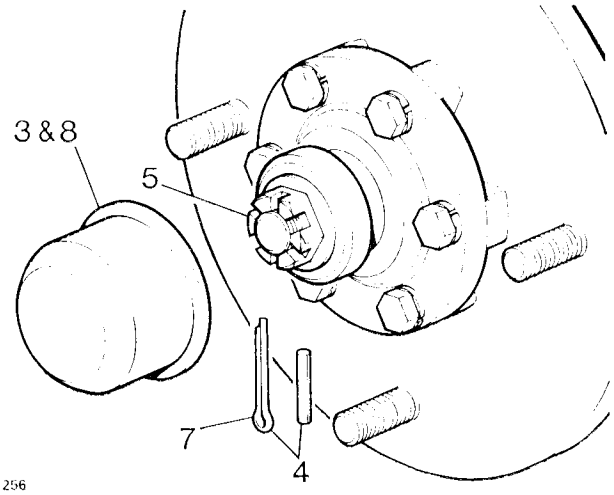
The spring loaded clutch arrangement in the limited slip differential inhibits normal differential function at low torque, to ensure that both rear wheels are driven and provide greater traction under extreme conditions when one driving wheel is off the ground, as may occur under off highway conditions.

Testing

1. Using a trolley jack positioned under one side of the rear axle, raise the jack until the one rear wheel is clear of the ground.
2. Release the handbrake and ensure that the gear lever is in neutral.
3. Prise off the hub cap from the raised rear wheel.
4. Remove the split pin from the slotted nut and fit a suitable silver steel pin in its place.
5. Fit a torque spanner to the slotted nut and note the torque required to turn the wheel, this must be a minimum of 4,2 kgf.m (30 lbf.ft).
6. If the torque to turn the wheel is less than the specified minimum, remove the differential assembly for investigation and overhaul.
7. On completion of the test, remove the silver steel pin and fit a new split pin to the slotted nut.
8. Refit the hub cap.
9. Remove the trolley jack.



4RC 237



4RC 256

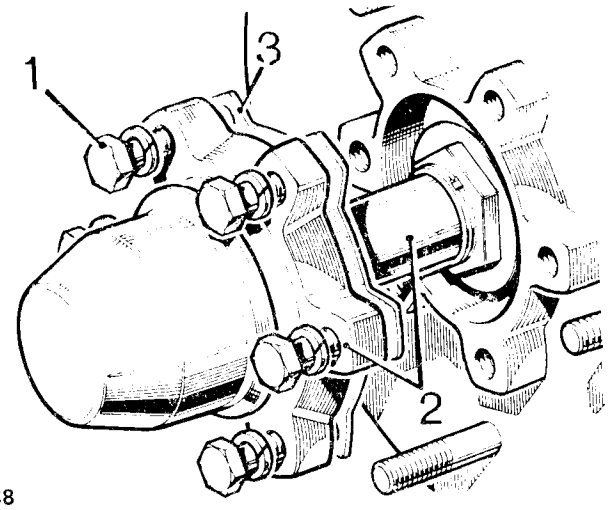
AXLE SHAFT

—Remove and refit **11.2**

Removing

1. Remove the fixings from the hub driving member.
2. Withdraw the driving member and axle shaft complete.

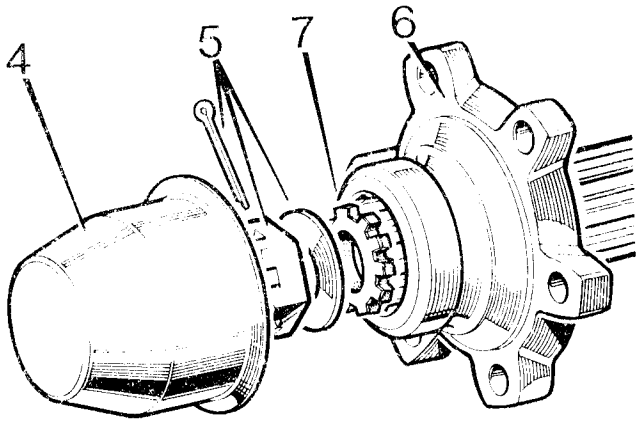
   NOTE: The driving member is spigoted into the hub and may be initially tight.
3. Withdraw the joint washer
4. Prise off the hub cap.
5. Remove the fixings from the axle shaft.
6. Withdraw the driving member from the shaft.
7. Withdraw the oil seal from the driving member.



4RC8

Refitting

8. Fit the driving member to the axle shaft.
9. Fit the oil seal with the plastic side facing outward.
10. Fit the plain washer and nut.
    Torque: 1,4 to 2,0 kgf.m (10 to 15 lbf.ft).
11. Fit a new split pin.
12. Smear both sides of the joint washer with general purpose grease and place it in position on the hub.
13. Pack the space in the end of the hub driving member with clean grease of the recommended type.
14. Fit the axle shaft, engaging the splines into the differential, and secure the fixings.
    Torque: 3,9 kgf.m (28 lbf.ft).
15. Check and, if necessary, replenish the rear axle lubricating oil.



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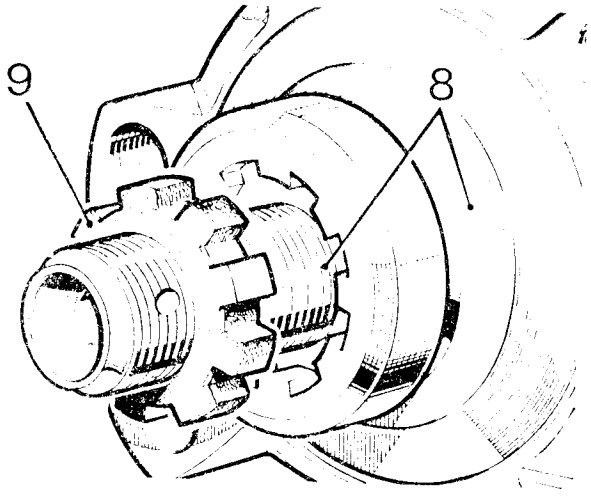


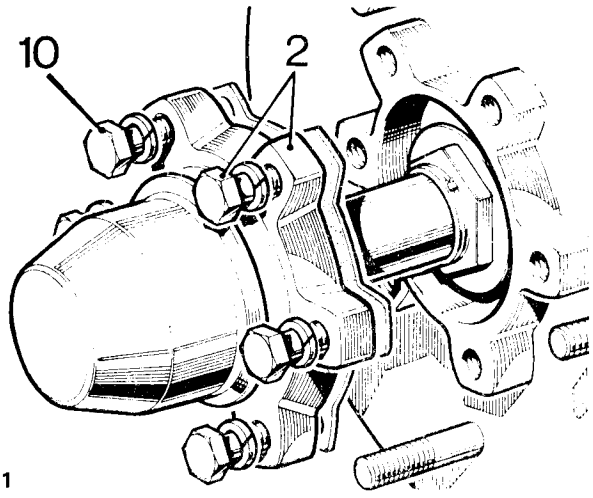
4RC10

DIFFERENTIAL ASSEMBLY

—Remove and refit **11.3**

Removing

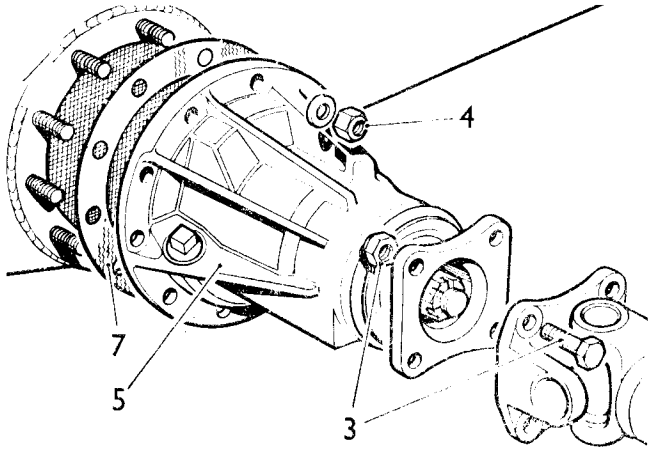
1. Remove the drain and filler plugs and allow all the oil to drain.
2. Remove the fixings from the rear hub driving members and withdraw the axle shafts sufficient to clear the differential.
3. Disconnect the propeller shaft from the differential.
4. Remove the fixings securing the differential to the axle case.
5. Withdraw the differential assembly.
6. Withdraw the joint washer.



4RC11

Refitting

7. Smear general purpose grease on both sides of the joint washer for the differential and place it in position on the axle case.
8. Fit the differential assembly and secure the fixings. Torque: 4,8 kgf.m (35 lbf.ft).
9. Reconnect the propeller shaft.
10. Refit the axle shafts and secure the hub driving members. Torque: 3,9 kgf.m (28 lbf.ft).
11. Refit the axle case drain plug.
12. Replenish the rear axle lubricating oil.
13. Refit the oil filler plug.



4RC12

DIFFERENTIAL ASSEMBLY

—Overhaul **11.4**

Service tools:

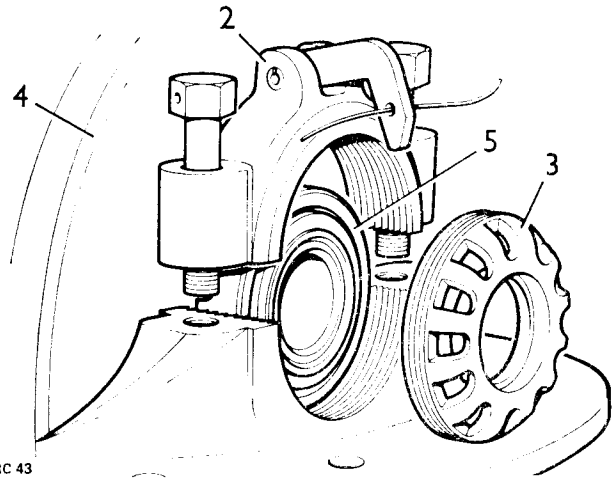
262757	Bearing Extractor
262757-1	Bearing replacer
530105	Differential spanner
262761, 600299, 601998, 605004	Height gauge for differential pinion. 1 off, as required (see text)
530106	Bracket for Dial Test Indicator

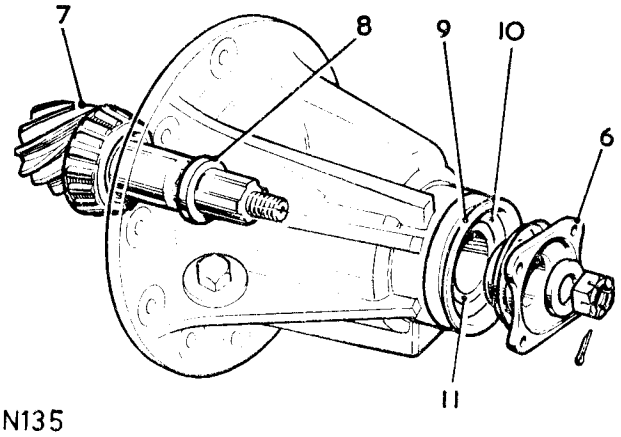
Dismantling

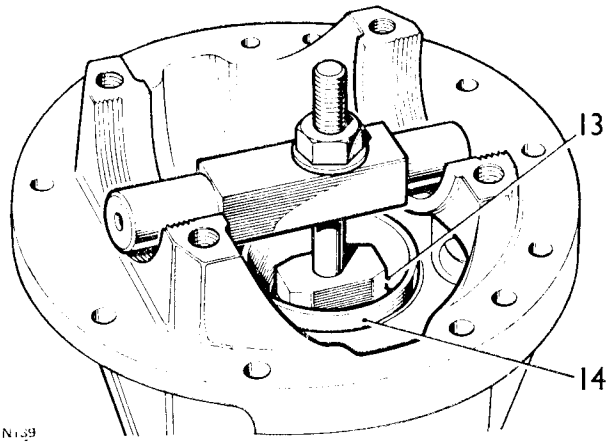
NOTE: During dismantling it is essential that all components are marked in their original position and relative to other components, so that if original components are refitted, their initial setting is maintained.

1. Remove the differential assembly. 11.3.
2. Remove the bearing caps.
3. Remove the serrated nuts.
4. Withdraw the crownwheel and differential assembly.
5. Withdraw the differential bearings outer tracks.
6. Remove the driving flange.
7. Withdraw the pinion.
8. Withdraw the shim washers.
9. Prise out the oil seal.
10. Withdraw the spacer.
11. Withdraw the drive flange roller bearing.
12. Press off the pinion head bearing.
13. Locate the tool 262757 in the pinion housing. Ensure that the projections on the extractor bar fit the cast slots at the rear of the bearing outer race. If necessary, grind the projections until a sliding fit is obtained, otherwise the pinion housing may be damaged.
14. Extract pinion head bearing outer race together with its shim.
15. Press out flange end outer race.

continued







16. For reassembly purposes, add alignment marks to the crownwheel and differential case halves.
17. Remove the crownwheel.
18. Using care not to damage the bearings, lightly compress the differential case in a hand press and remove the screws holding the case halves together.
19. Withdraw the upper half of the casing.
20. Withdraw the upper side gear complete with the side gear ring and clutch plates.

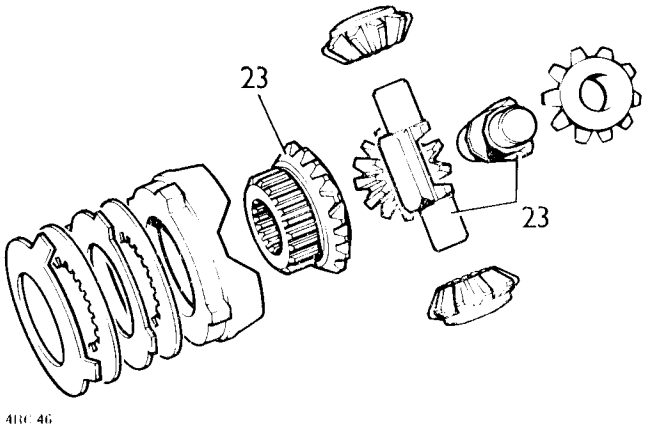
    NOTE: There are alternative arrangements of clutch plates, and the unit being dismantled may differ to that illustrated here. Clutch plate arrangement is dealt with during reassembly.

21. Withdraw the crosspins and pinions.
22. Withdraw the lower side gear complete with the side gear ring and clutch plates.
23. Dismantle the side gear and crosspin sub-assemblies, noting the relative positions of all the components.
24. If required, extract the roller bearings and place them in their relative outer tracks.

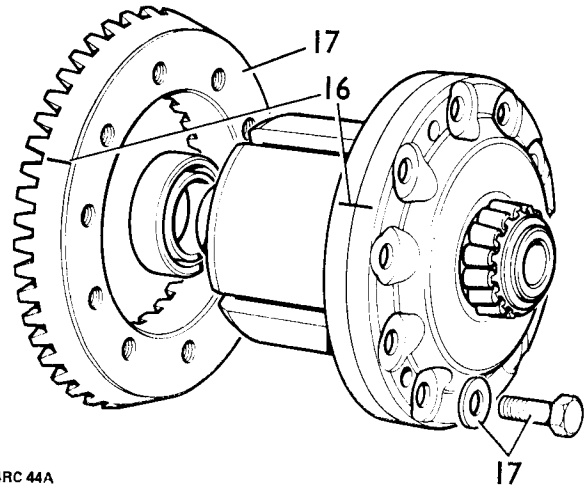
Inspecting

25. Examine all components for obvious wear or damage.
26. All bearings must be a press fit, except the flange end pinion bearing, which must be a slide fit on the shaft.
27. The crownwheel and pinion are only supplied as a matched set and must not be interchanged separately.
28. Bevel pinion housing and bearing caps are matched sets and must not be interchanged separately.
29. The differential case halves are a matched set and must not be interchanged separately.

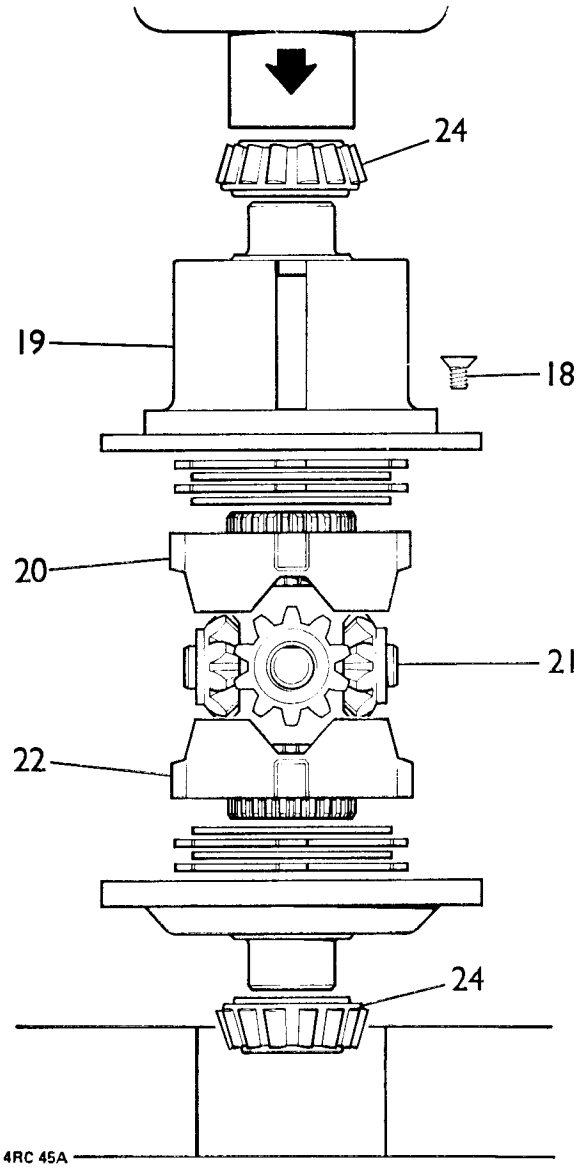
continued



4RC 46



4RC 44A



4RC 45A

Reassembling

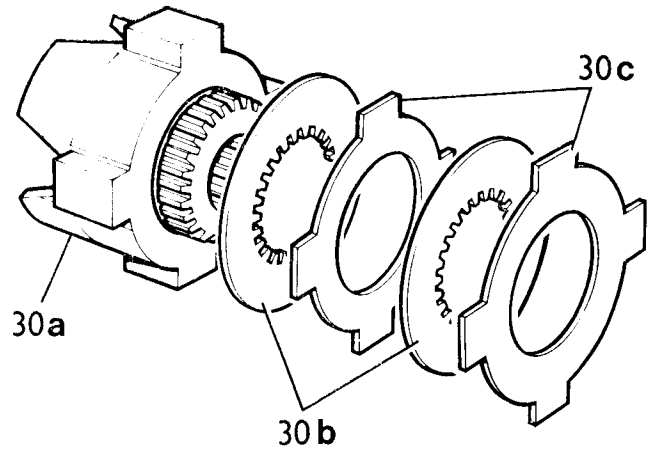
Determining the clutch pack clearance

30. Fit the following components onto each side gear.
    (a) Retaining ring.
    (b) Two clutch discs.
    (c) Two flat clutch plates.

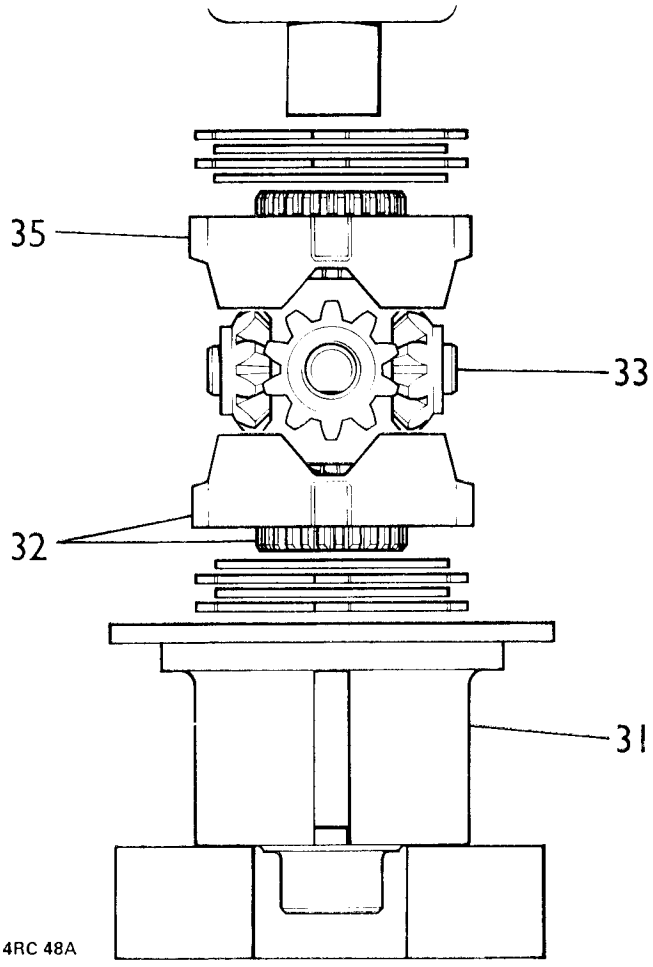
    NOTE: For the purpose of this check, the Belleville (dished) clutch plates must be omitted and be replaced by the flat type.

31. Place the larger case half under a mandrel press, with the flange end uppermost.
32. Fit a side gear and clutch plate assembly, into the larger case half.
33. Assemble the crosspins and pinions.
34. Fit the crosspin assembly on to the side gear already contained in the differential case half, ensuring that the gears locate correctly.
35. Fit the other side gear and clutch plate assembly on to the crosspin, ensuring correct location of the gears.
36. Place a true flat, metal distance piece on to the top clutch plate. The distance piece must be a clearance fit over the side gear splines.
37. Using the mandrel press, apply pressure to the distance piece to compress the clutch pack, to eliminate any clearance between the components.
38. While holding the clutch pack compressed, measure and record the clearance between the case flange and the underside of the distance piece. Make a number of checks around the flange to ensure accuracy, then release the press.
39. Position the smaller case half with the flange end uppermost.
40. Using a depth gauge and a straight edge, measure and record the dimension from the case joint face to the clutch plate seat face in the smaller case half.

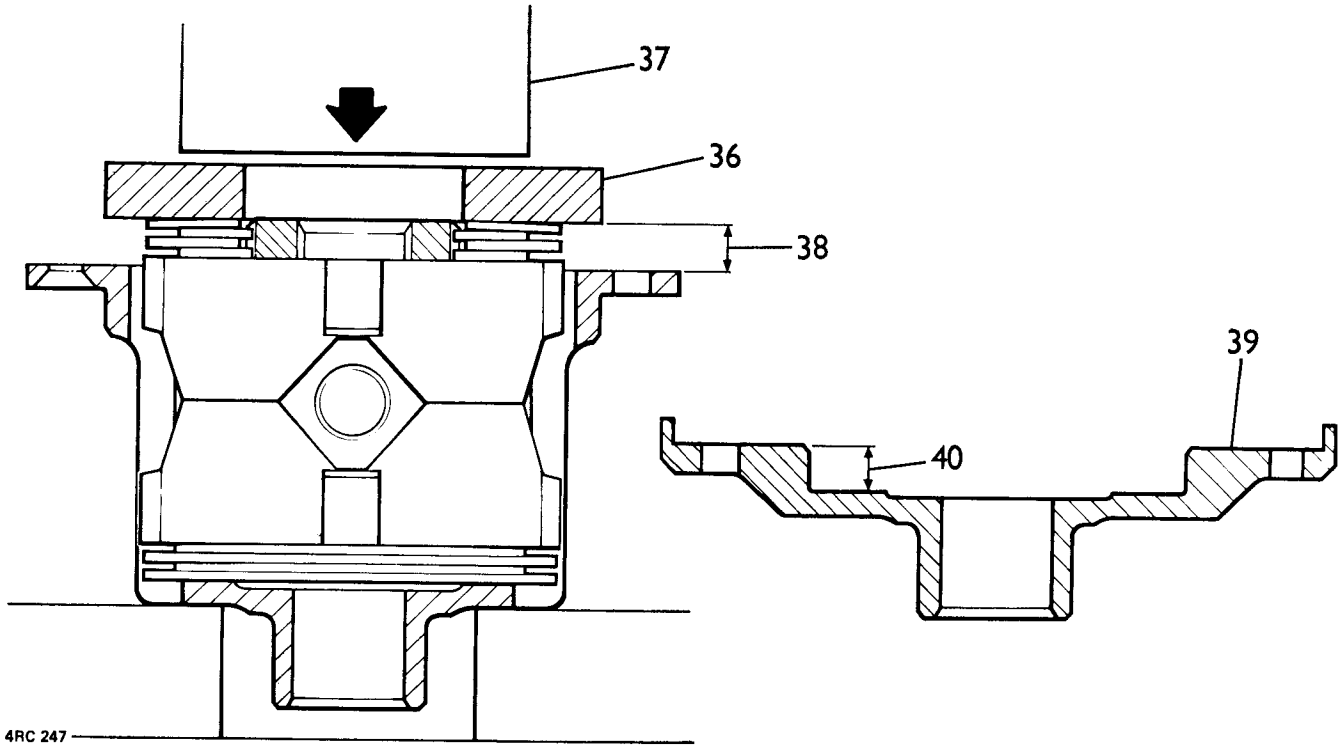
continued



4RC 47A



4RC 48A



41. Using the dimensions obtained in items 38 and 40, subtract the first from the second. The result must be between 0,5 to 1,5 mm (0.020 to 0.060 in) to ensure sufficient clearance for the clutch pack when the case halves are secured together. If the result of the foregoing check is not within the stated limits, there is sufficient manufacturing tolerance on new clutch plates and discs to allow selective assembly, therefore, fit new clutch plates and/or discs as required, and repeat the check until the correct result is obtained.
42. When the correct, clutch pack clearance has been obtained, withdraw the upper side gear complete with the side gear ring and clutch plates.
43. Withdraw the crosspins and pinions.
44. Withdraw the lower side gear complete with the side gear ring and clutch plates.
45. Remove the clutch plates and discs from each side gear assembly and change the temporarily fitted, flat, outer clutch plate for a Belleville (dished) clutch plate, ready for subsequent assembly.

    NOTE: The clutch pack clearance dimension allows for changing the flat clutch plates for Belleville type without further checks.

continued

Powr-Lock assembly

46. Liberally oil the faces between the side gear rings and the clutch plates and discs, using the lubricant recommended for the final drive.
47. Fit the following components on to each side gear.
    (a) Retaining ring.
    (b) Two clutch discs.
    (c) One flat clutch plate.
    (d) One Belleville (dished) clutch plate, fitted at the far end of the pack from the gear and with the concave side towards the gear.

    NOTE: The clutch plates and discs should be refitted in the same order as removed, if in doubt, reassemble as illustrated.
48. Position the larger case half with the flange uppermost.
49. Fit a side gear and clutch plate assembly into the larger case half.
50. Assemble the crosspins and pinions.
51. Fit the crosspin assembly on to the side gear already contained in the differential case half, ensuring that the gears locate correctly.
52. Fit the other side gear and clutch plate assembly on to the crosspin ensuring correct location of the gears.
53. Fit the two case halves together, maintaining the alignment marking and ensuring correct gear mating. Fit the screws and tighten them gradually one at a time in order to maintain squareness of the axis of the two case halves during compression of the clutch pack. When the two case halves are fitted together, the screws should be tightened to a torque of 1,4 to 1,7 kgf.m (10 to 13 lbf.ft).

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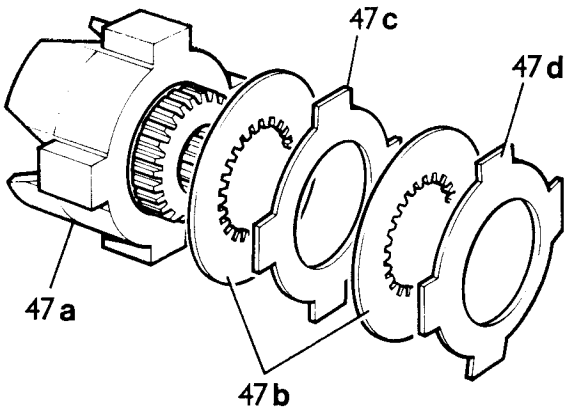

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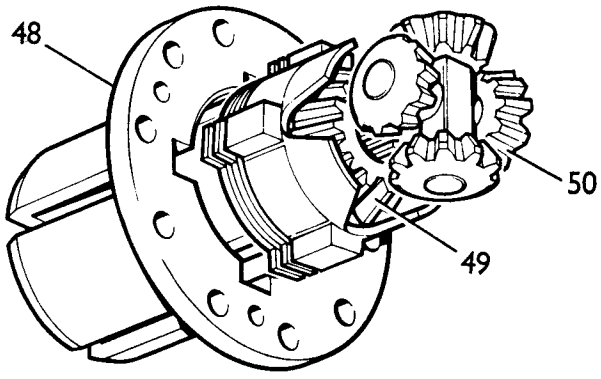

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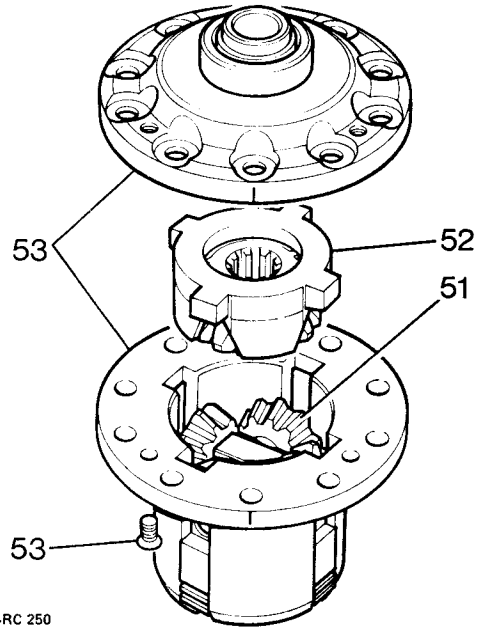


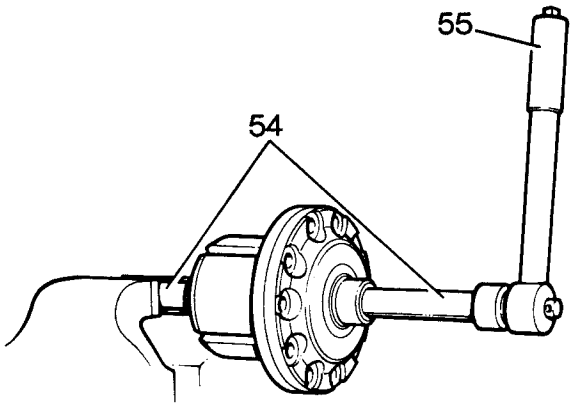
4RC 250

Powr-Lock test

In order to carry out this test, two slave axle shafts are required. The shafts should be shortened and suitably modified so that, when fitted to the differential, one shaft can be held in a vice and the other shaft will accept a torque spanner.

54. Insert the slave axle shafts into the differential unit from each end to engage the side gears.
55. Hold one shaft stationary and measure the torque required to turn the other shaft. The reading must be within one of the following limits, depending on whether the Belleville (dished) clutch plates are new or if the original plates have been refitted.
    Torque with new Belleville clutch plates:
    8,3 to 16,6 kgf.m (60 to 120 lbf.ft).
    Torque with original, refitted Belleville clutch plates:
    4,2 to 8,3 kgf.m (30 to 60 lbf.ft).
56. If the result of the foregoing test is within the specified limits, proceed from item 64.
57. If the result of the foregoing test is NOT within the specified limits, it can be corrected by rearranging the clutch plates and discs to increase or decrease the number of friction faces which will also increase or decrease the torque to turn figure accordingly.
58. Depending on the existing arrangement of the clutch plates and discs, select one of the following rearrangements to increase or decrease the torque to turn figure, as required.

continued



4RC 251

59. Maximum torque to turn is obtained with both sets of clutch plates and discs arranged as illustrated.
60. Reduced torque to turn can be obtained by arranging one set of clutch plates and discs as described in item 59, and rearranging the other set as illustrated.
61. Minimum torque to turn is obtained with both sets of clutch plates arranged as illustrated.
62. An alternative arrangement that gives the same performance as those illustrated in items 60 and 61 may be used.

    CAUTION: A Belleville (dished) clutch plate should always be fitted at each end of the clutch pack. A rotating (splined) clutch disc must NEVER be fitted adjacent to the differential case.

63. When the Powr-Lock test is satisfactory, continue reassembly as follows:

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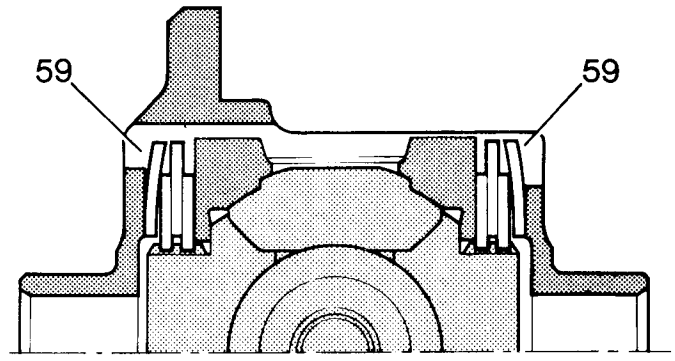
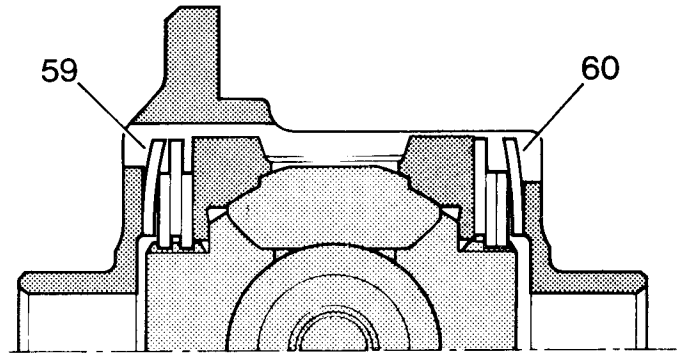
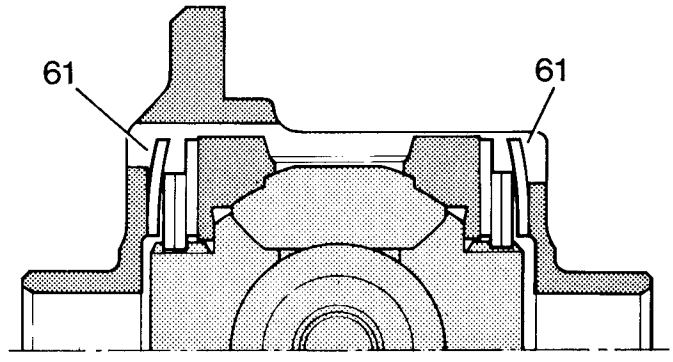
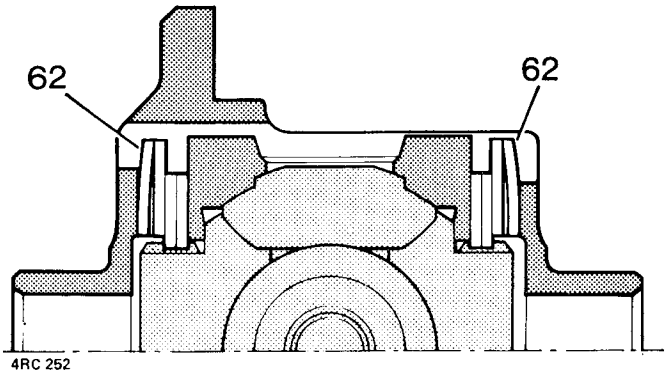


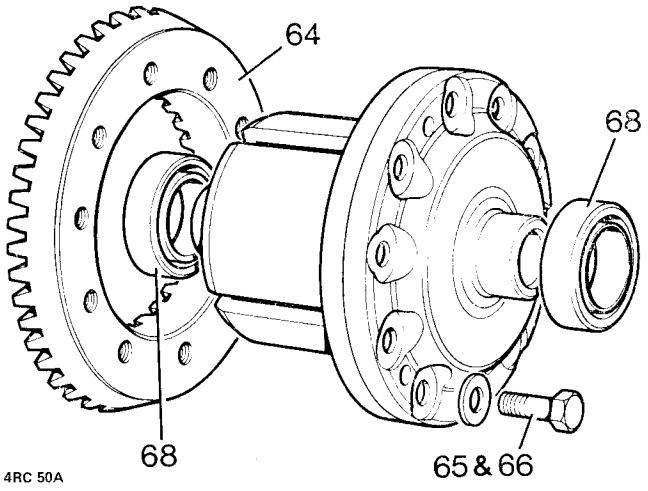






4RC 252

64. Align the crownwheel with the differential case.
65. Coat the threads of the crownwheel securing bolts with 'Loctite Studlock' compound.
66. Fit the crownwheel securing bolts together with plain washers. Torque: 5,5 to 6,2 kgf.m (40 to 45 lbf.ft).
67. After fitting the crownwheel, repeat the Powr-Lock test, items 54 to 55 ensure that the torque to turn figure is still within the permitted limits. If this second test is satisfactory, continue with the re-assembly. But, if the torque to turn figure has moved outside the limits, the clamping affect of the crown-wheel bolts has shown that a defect exists in the assembly, and the unit should be dismantled for examination and rectification, commencing the reassembly from item 30.
68. If removed, press on the differential roller bearings.
69. Place the Powr-Lock unit on one side for subsequent assembly.



continued

Bevel pinion assembly

70. Fit shim of same thickness, removed during dismantling, in pinion head bearing seat.

    NOTE: If original shim has been mislaid, use new shim of at least 1,27 mm (0.050 in) thickness.

71. Press in the pinion head bearing outer race, 262757-1 used with 262757.
72. Press in the flange end bearing outer race.
73. Press the pinion head roller bearing on to the pinion.
74. Locate the pinion shaft into the case together with the bearing pre-load adjustment shim removed during dismantling.

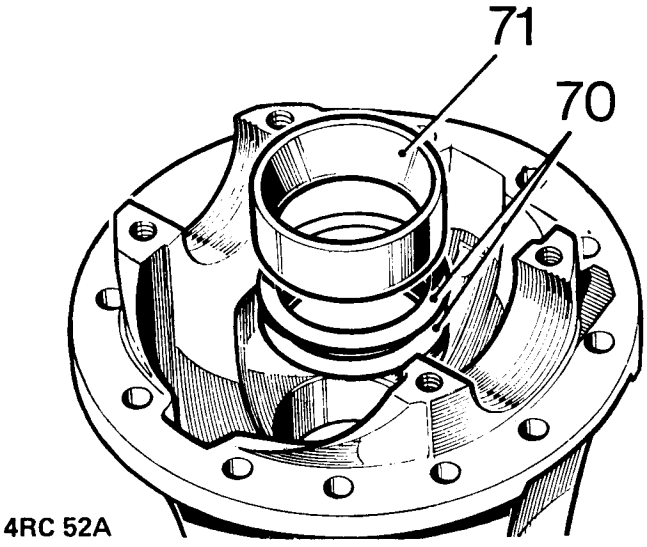
    NOTE: If original shim has been mislaid, use new shim of at least 4,06 mm (0.160 in) thickness.

75. Fit the flange end roller bearing.
76. Fit the distance washer.

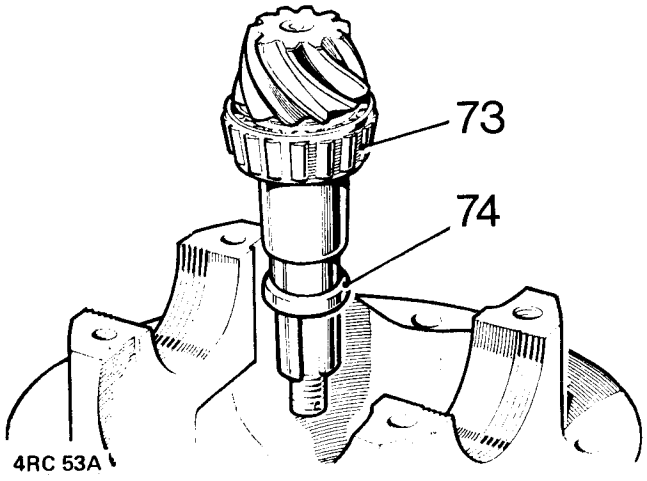
    NOTE: Do not fit the oil seal at this stage.

77. Fit the driving flange.
78. Fit the washer and nut. Torque: 11,7 kgf.m (85 lbf.ft).
79. While tightening the nut, check that the pinion can rotate. If the pinion becomes excessively stiff, use a thicker pre-load adjustment shim.

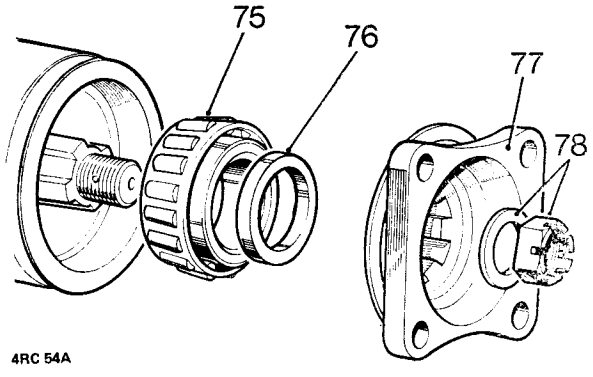
continued



4RC 52A



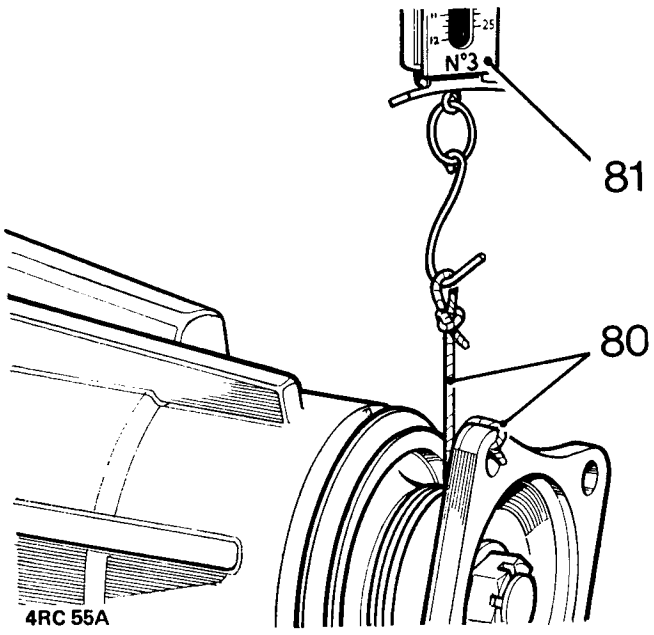
4RC 53A



4RC 54A

Check and adjust pinion bearing pre-load

80. Tie a length of cord to the driving flange, then coil it around the flange hub.
81. Attach a spring balance to the loose end of the cord.
82. Apply a steady pull on the spring balance and note the force required to rotate the pinion shaft, after having overcome inertia.
83. Bearing pre-load is correct when a figure of 3,2 to 4,5 kg (7 to 12 lb) is recorded on the spring balance. Adjustment can be made by changing the shims located on the pinion shaft between the bearings, shims are available in a range of thicknesses. Thicker shimming will reduce bearing pre-load, thinner shimming will increase pre-load.



Check and adjust pinion height setting

84. Locate the pinion height gauge into the pinion housing and secure with the bearing caps.

    NOTE: There are four variations of height gauge in use, and any of these may be used.

85. Place the slip gauge on to the pinion face and hold firmly in place.
86. Using feeler gauges, measure the clearance between the height gauge and the slip gauge. Depending on the height gauge used, the following clearance must be obtained.
    0,07 mm to 0,10 mm (0.003 in to 0.004 in) with height gauges Part Nos. 601998, 262761 and 600299.
    0,28 mm to 0,30 mm (0.011 in to 0.012 in) with height gauge Part No. 605004.

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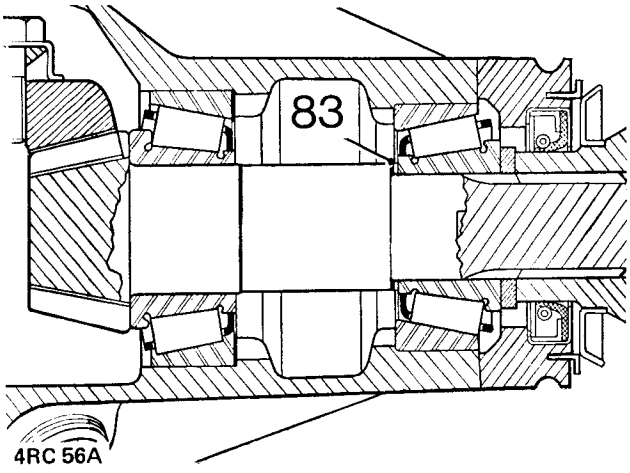
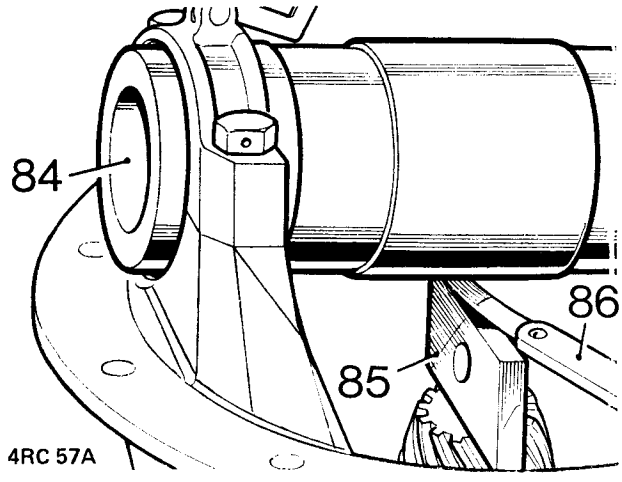
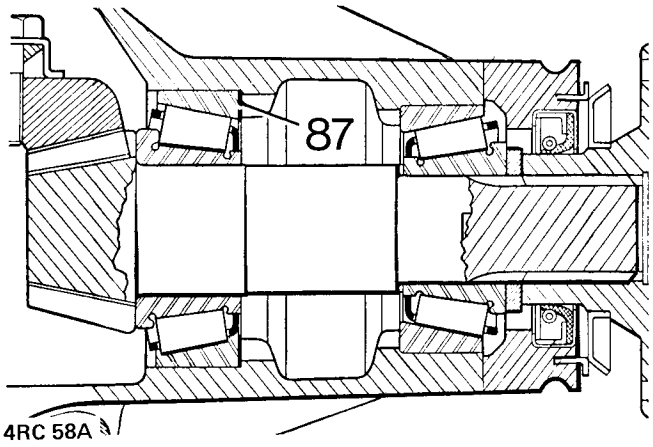




87. If necessary, adjust the thickness of shims between the pinion head bearing outer race and the pinion case to obtain the correct clearance. Use tool 262757 to remove outer race.

    NOTE: Any adjustment of the pinion height will affect the pinion bearing pre-load. When the pinion height is correct, repeat items 80 to 83.

88. When the pinion height and bearing pre-load is correct, remove the height gauge.
89. Remove the pinion driving flange.
90. Smear the outside diameter of the pinion oil seal with jointing compound.
91. Fit the seal, lipped side inward.
92. Fit the driving flange.
93. Fit the flange securing nut and washer. Torque: 11,7 kgf.m (85 lbf.ft).
94. Secure nut with split pin.



Fitting the crownwheel and differential case assembly

95. Fit the bearing outer races to the differential case assembly, and locate the assembly into the bevel pinion housing.

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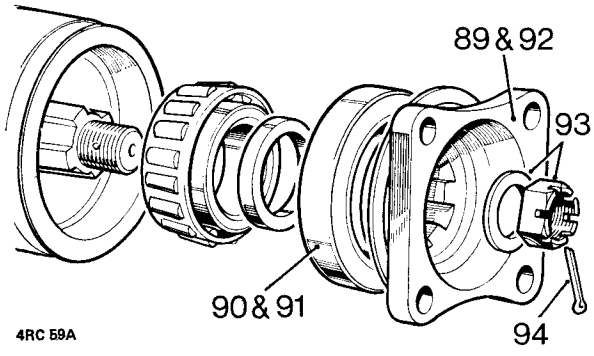
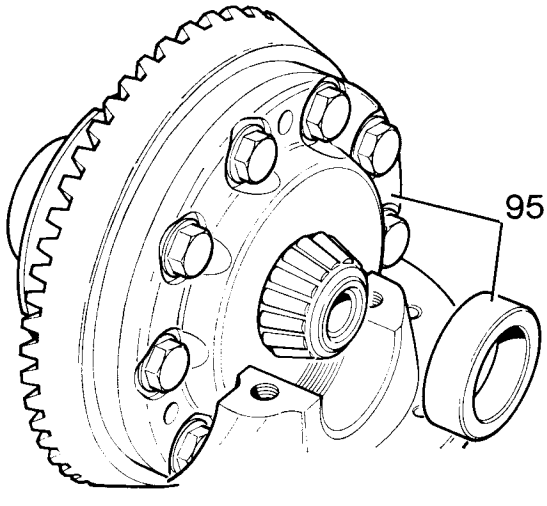
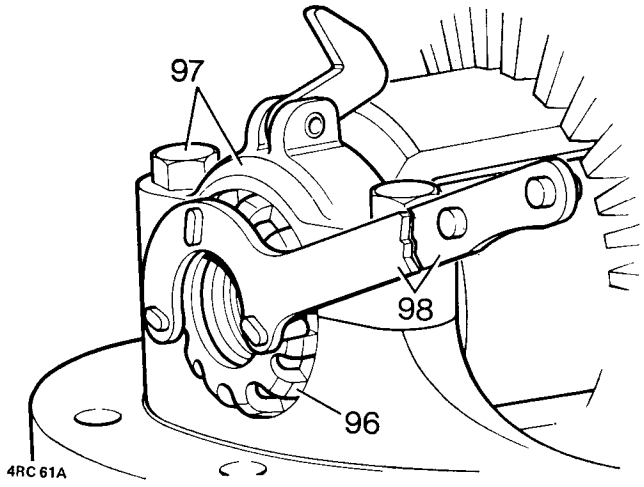


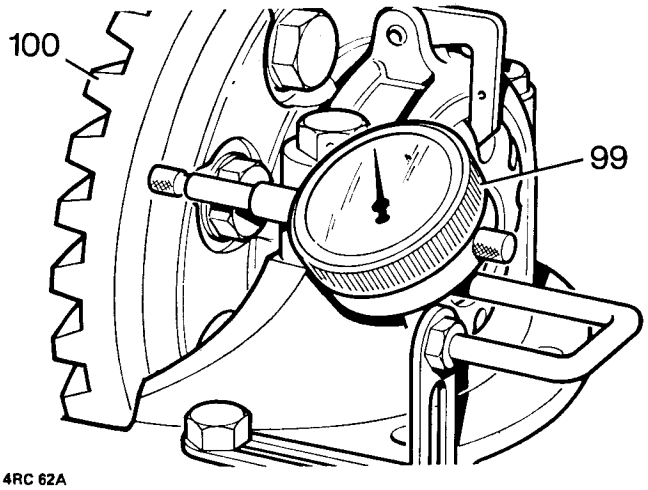


96. Fit the serrated nuts.
97. Fit the bearing caps. Tighten the securing bolts firmly but not fully.
98. Using tool 530105, tighten both serrated nuts to remove all bearing end-float without introducing pre-load.
99. Using a dial test indicator, measure the run-out on the rear face of the crownwheel, this must not exceed 0,10 mm (0.004 in). If excessive run-out is recorded, the crownwheel and differential must be removed from the bevel pinion housing and the crownwheel repositioned on the differential case. Re assemble and recheck. If necessary, this procedure must be repeated until the run-out is correct.
100. Using a dial test indicator, check the crownwheel to bevel pinion backlash. This must be 0,20 mm to 0,25 mm (0.008 in to 0.010 in). Where necessary, adjust the crownwheel backlash by alternately slackening and tightening the serrated nuts until the backlash is correct.
101. Move serrated nuts as indicated to reduce backlash.
102. Move serrated nuts as indicated to increase backlash.

continued



4RC 61A



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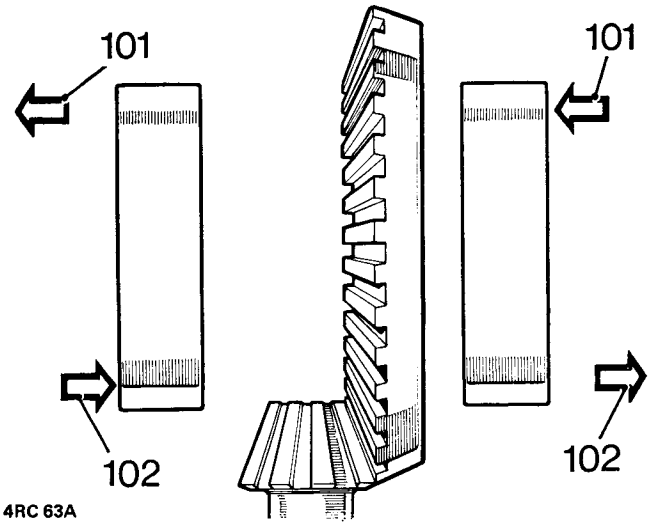
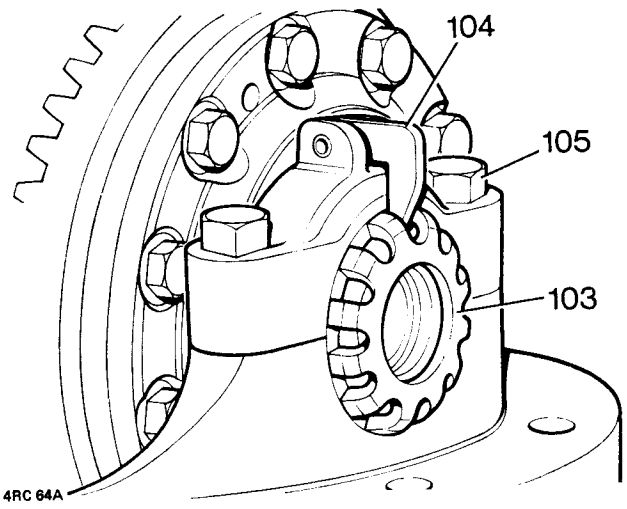


4RC 63A

103. With the backlash correct and no bearing end-float or pre-load, tighten both serrated nuts by half a serration only to pre-load the taper roller bearings.
104. Engage the lockers into the serrated nuts. If either locker is not opposite a serration, bend it to fit.
105. Tighten the bearing cap bolts. Torque: 8,9 kgf.m (65 lbf.ft).
106. Refit the differential assembly. 11.3.



DATA

Pinion bearing pre-load	3,2 to 4,4 kg (7 to 12 lb) torque resistance
Pinion height setting, clearance between height gauge and slip gauge	0,07 to 0,10 mm (0.003 to 0.004 in) using gauges 601998, 262761 or 600299; 0,28 to 0,30 mm (0.011 to 0.012 in) using gauge 605004
Crownwheel run-out	0,10 mm (0.004 in)
Crownwheel to bevel pinion backlash	0,20 to 0,25 mm (0.008 to 0.010 in)
Powr-Lock Assembly:	
Clutch pack clearance	0,5 to 1,5 mm (0.020 to 0.060 in)
Torque to turn test:	
With new Belleville clutch plates	8,3 to 16,6 kgf.m (60 to 120 lbf.ft)
With original, refitted Belleville clutch plates	4,2 to 8,3 kgf.m (30 to 60 lbf.ft)

PINION OIL SEAL

—Remove and refit **11.5**

Removing

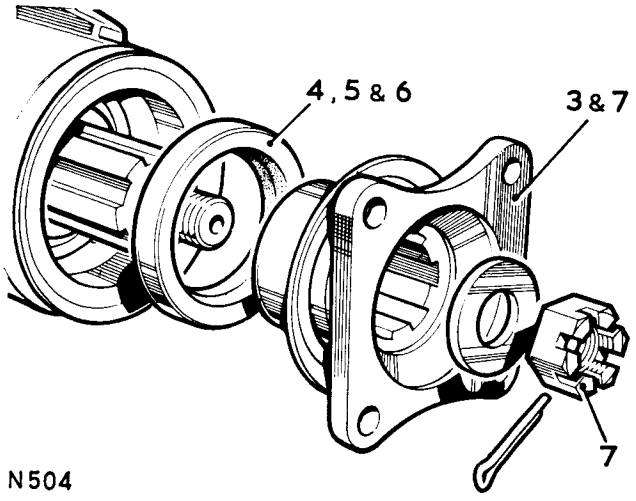
1. Drain the lubricating oil from axle case.
2. Disconnect the propeller shaft at the differential.
3. Remove the pinion driving flange.
4. Prise out the oil seal.

Refitting

5. Smear the outside diameter of the oil seal with jointing compound.
6. Fit the seal, lipped side inward.

   NOTE: Before fitting the driving flange, examine outside diameter for roughness or damage which may have caused failure of original seal, and rectify or replace as necessary.

7. Fit the pinion driving flange. Tighten the securing nut. Torque 11,7 kgf m (85 lbf ft).
8. Fit the propeller shaft.
9. Replenish the differential lubricating oil.
10. Ensure the axle case breather is clear. A blocked breather could cause failure of oil seals fitted in the axle assembly.



N504

REAR AXLE ASSEMBLY

—Remove and refit **11.6**

Removing

1. Slacken the fixings at both rear road wheels.
2. Jack up the rear of the vehicle and support on stands.
3. Remove both rear road wheels.
4. Disconnect the rear propeller shaft and move it clear of the final drive unit.
5. Disconnect the rear brake pipe at the connection with the flexible hose.
6. Withdraw the flexible hose from the chassis bracket.
7. Depress the brake pedal and wedge in that condition to minimise brake fluid loss.
8. Support the axle, using a jack.
9. Disconnect one end of each axle check strap.

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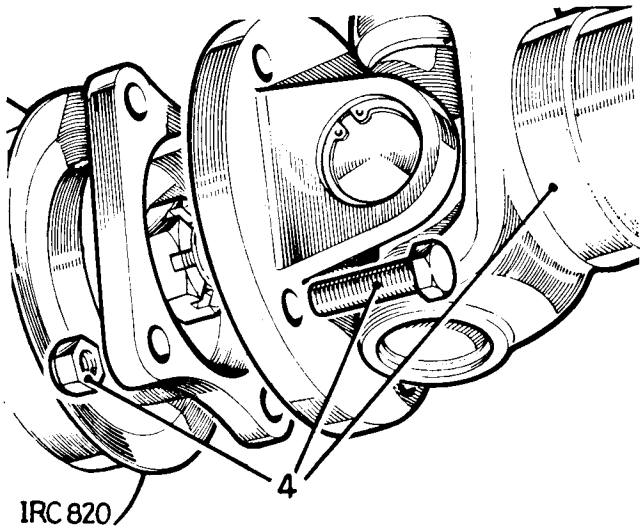
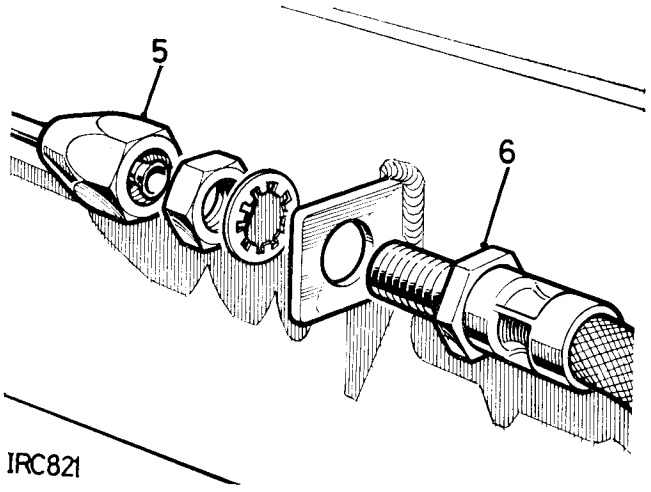
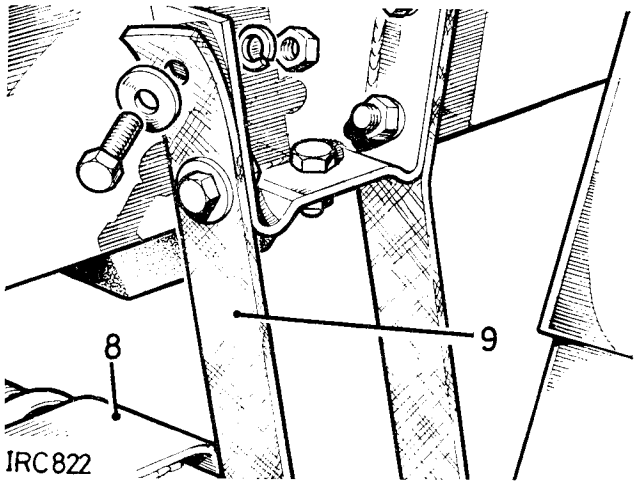


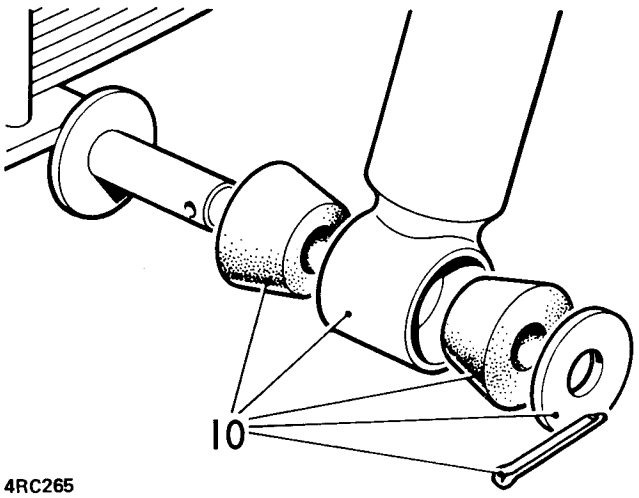




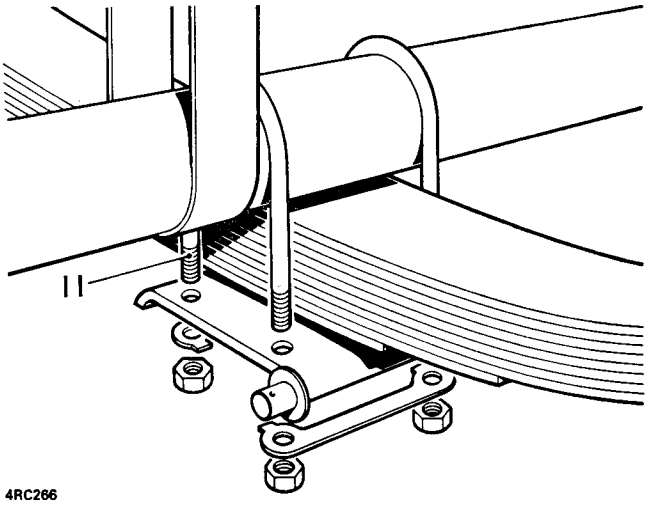
10. Disconnect the lower ends of the shock absorbers from the road spring bottom plates.
11. Remove the four 'U' bolts from the axle.
12. Slacken the six shackle pins at the rear road springs, then remove the two rearmost shackle pins.
13. Lower and withdraw the rear axle.

Refitting

14. Reverse 12 and 13. Do not tighten the shackle pins at this stage.
15. Reverse 1 to 11.
16. Lower the vehicle to the ground and move vehicle bodily backward and forward to settle the springs. Tighten all six shackle pins and locknuts.



4RC265



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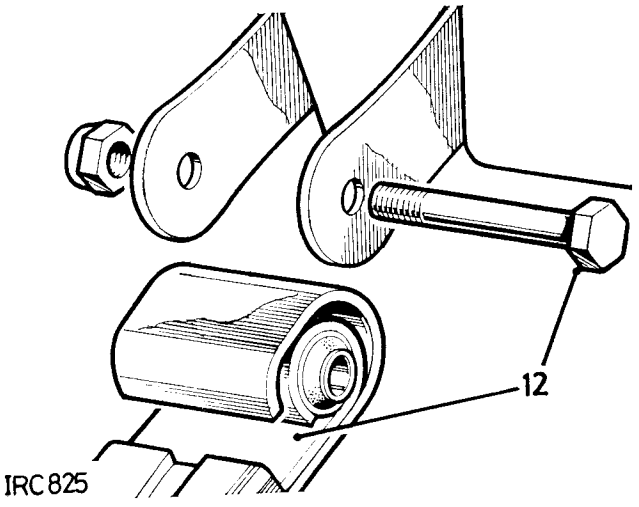


IRC825

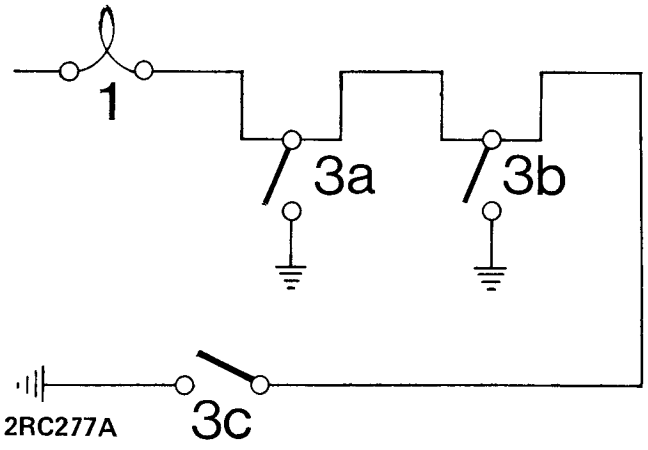
BRAKE OPERATIONS

BRAKE WARNING LIGHT

—General information 12.1

Warning light function

1. A red warning light marked 'BRAKE' is provided on the instrument panel.
2. The following brief description of the warning light function is intended as a guide to aid in brake system fault diagnosis.
3. The warning light is in series circuit with the following warning indicator switches to provide a visual indication of hydraulic fluid leakage or servo vacuum loss.
   a. A servo mounted vacuum switch which indicates lack of vacuum assistance at the brake servo.
   b. A chassis mounted pressure differential switch which indicates fluid leakage in the front or rear brake hydraulic systems.
   c. A dash mounted test switch which is push button operated. Failure of the bulb to illuminate on being tested could indicate a faulty bulb or earth connection.



Fault diagnosis—Brake warning light 'ON'

General

4. The brake warning light circuit is energised with the ignition switched 'ON' only.
5. The warning indicator switches are normally on open circuit and short the circuit to earth, to illuminate the brake warning light, when the switches are closed (refer to the accompanying schematic circuit diagram).

Procedure—Ignition switched 'ON'—test button fully out from dash

6. **Servo vacuum switch.**
   a. Ensure vacuum is available at the switch by checking the hose connections for soundness, then running the engine for a short period during which engine overrun conditions are obtained, that is, throttle opened then allowed to quickly close.
   b. With vacuum available, if the brake warning light remains 'ON', disconnect the electrical leads at the vacuum switch and connect together the leads, using a slave Lucar male connector blade.
   c. If the light is extinguished, the vacuum switch is faulty and must be replaced. If the warning light remains 'ON', leave the leads connected together and proceed to the next switch in the circuit.

7. **Brake pressure differential switch**
   a. Disconnect the switch leads and interconnect them to remake the circuit.
   b. If the warning light remains 'ON', proceed to check the next switch in the circuit; if the light is extinguished, check for hydraulic system leakage which would cause the differential switch plunger to displace to one end.

   NOTE: On dual braking systems, the hydraulic fluid reservoir is divided into two compartments. The front compartment supplies the rear brakes and the rear compartment the front brakes. A difference in fluid levels may indicate which system is leaking.

   c. To centralise the differential switch plunger, bleed a brake line in the pressurised system (front or rear as applicable) using very slow pedal travel and observing the brake warning light. Immediately the warning light is extinguished, keep a light pressure only on the pedal and close off the bleed nipple.

TRANSMISSION BRAKE ASSEMBLY

—Adjust	**36 to 39**	**12.2**
—Remove and refit	**1 to 39**	**12.3**

TRANSMISSION BRAKE SHOES

—Remove and refit	**1 to 7, 32 to 39**	**12.4**

Removing

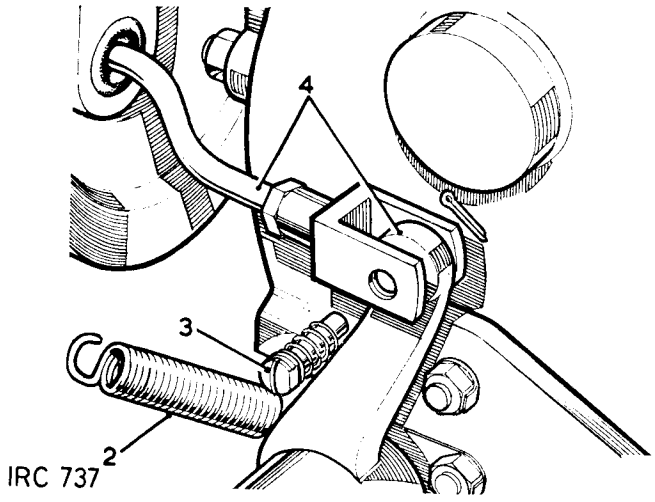
NOTE: It is not essential to remove the transmission brake from the vehicle, the brake shoe components are accessible after removing the brake drum, which can be detached from the gearbox output flange and pushed back over the propeller shaft.

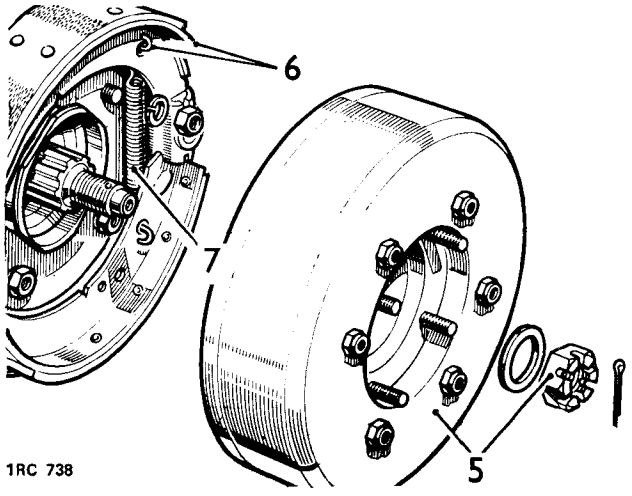
1. Chock the road wheels.
2. Disconnect the brake return spring.
3. Remove the expander rod fork fixings.
4. Disconnect the expander rod from the relay lever.
5. Remove the fixings and withdraw the brake drum.

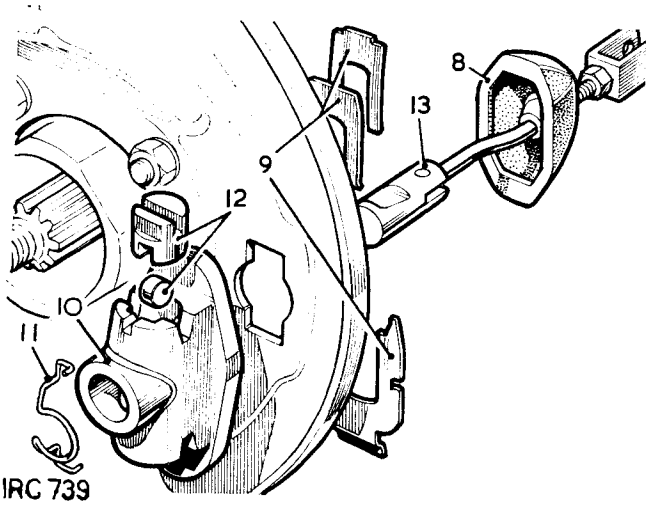
WARNING:
Do not blow out the dust in the brake drum it is dangerous if inhaled.

6. Remove the brake shoes together with the pull-off springs.
7. Separate the shoes by detaching the springs.
8. Withdraw the dust excluder.
9. Remove the expander unit fixing plates.
10. Withdraw the expander unit.
11. Remove the spring clip from the expander unit.
12. Withdraw the plungers and rollers.
13. Withdraw the operating rod.

continued



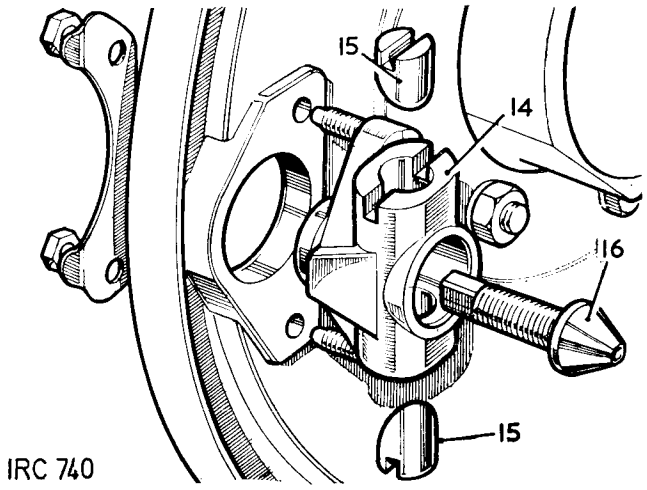




14. Remove the adjuster unit assembly.
15. Pull out the adjuster plungers.
16. Unscrew the adjuster cone.

Inspecting

17. Clean all components in Girling cleaning fluid and allow to dry.
18. Examine all items for obvious wear and replace as necessary.
19. Examine the brake drum for scoring and ovality and skim if required.
    Standard diameter is 228,6 mm (9.0 in); reclamation limit is 0,75 mm (0.030 in) oversize.
20. If the brake linings are oily, check and if necessary replace the output shaft oil seal, Division 7.
21. If required, reline the brake shoes. 12.11.



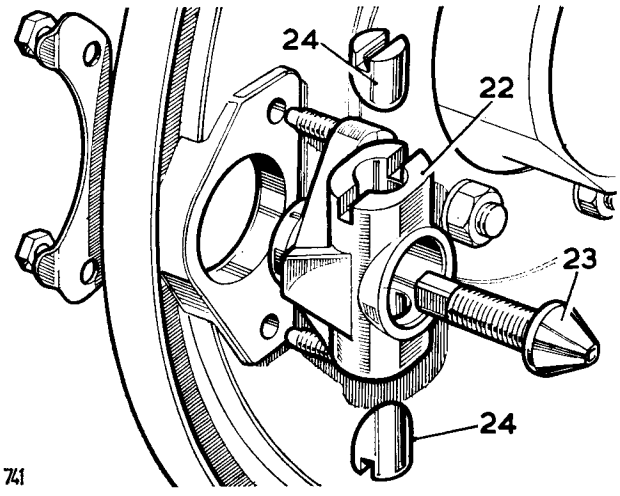
IRC 740

Assembling

22. Fit the adjuster unit housing, do not tighten the fixings at this stage.
23. Screw in the adjuster cone.
24. Grease and refit the adjuster plungers.

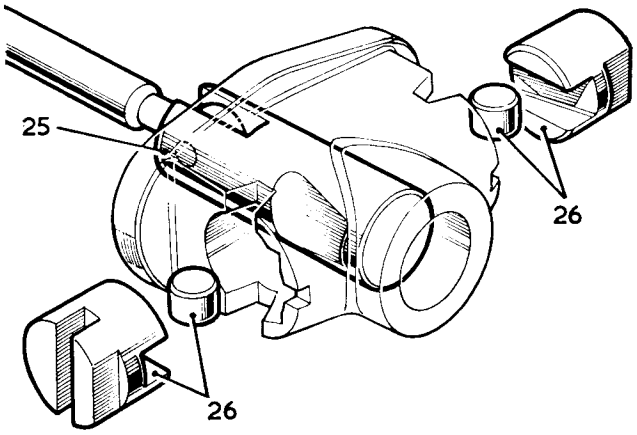
    NOTE: The two plungers are identical and may be fitted to either bore. Align the chamfered ends of the plungers with the cone on the adjuster.

continued

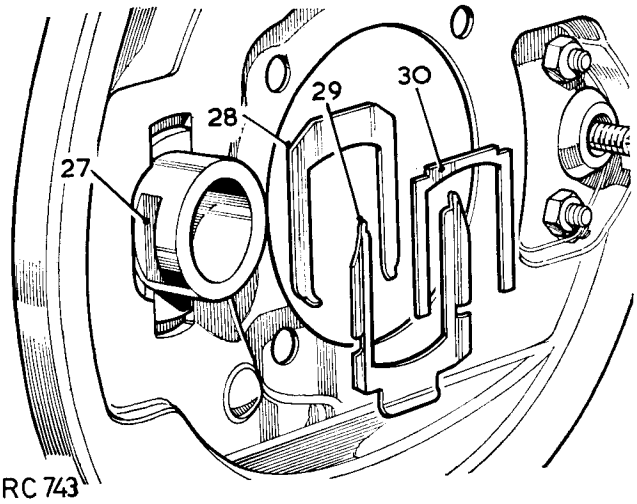


IRC 741

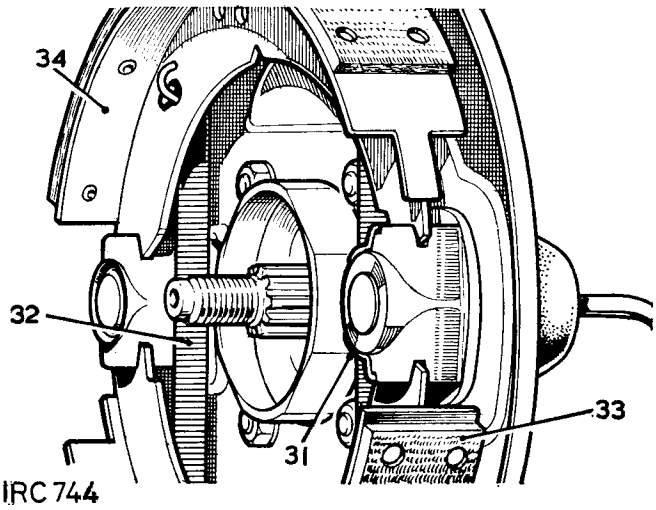
25. Grease and fit the expander rod.
26. Grease and fit the plungers and rollers.
27. Position the adjuster housing on the back plate.
28. Fit the packing piece.
29. Fit the locking plate.
30. Fit the retainer spring.
31. Fit the spring clip to the expander unit.
32. Fit the brake shoes and pull-off springs together.
33. The fully lined end of the lower shoe must be toward the expander housing.
34. The fully lined end of the upper shoe must be toward the adjuster housing.
35. Reverse 2 to 5.
36. Turn the adjuster cone fully in and tighten the fixings.
37. Slacken off the adjuster cone two 'clicks'; give the brake a firm application to ensure that the shoes have centralised at the expander end. The brake drum should now be free to rotate.
38. Set the hand brake linkage at the vertical adjuster rod, so that the hand brake has one or two clicks free movement in the 'off' position.
39. Remove the road wheel chocks.



IRC 742



IRC 743



IRC 744

TRANSMISSION BRAKE, HAND LEVER AND LINKAGE

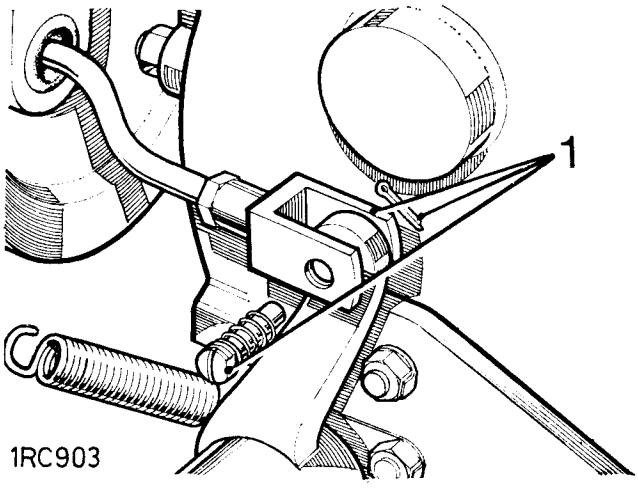
—Remove and refit **12.5**

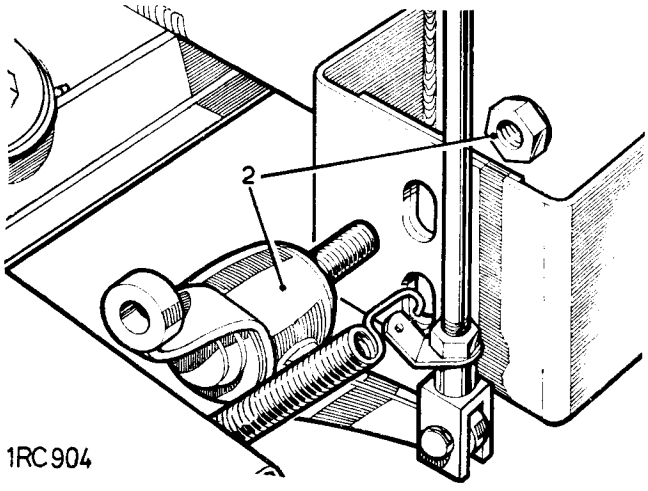
Removing

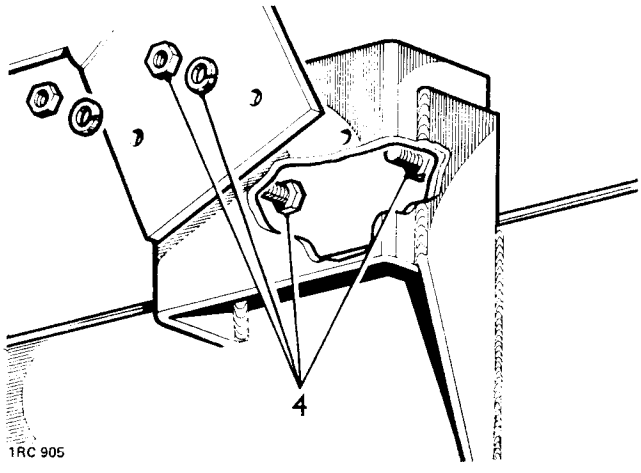
CAUTION: Before commencing work on the hand brake mechanism, chock the road wheels to prevent the vehicle moving.

1. From under the vehicle, disconnect the hand brake expander rod from the relay lever.
2. Remove the relay lever fixings.
3. Remove the fixings between the hand brake cross-shaft and the RH chassis member.
4. Remove the fixings securing the hand brake lever to the chassis.

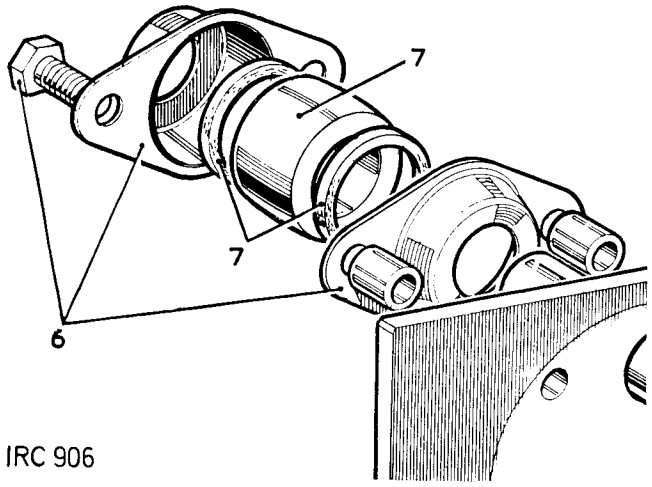
continued







5. Remove the hand brake assembly complete from the vehicle, withdrawing the lever grip carefully through the rubber draught excluder in the front of the seat box.
   To facilitate removal, release the hand brake lever to ratchet fixings and withdraw the cross-shaft and lever separately.
6. If required, remove the split housings from the cross-shaft support brackets.
7. Remove the felt dust seals and self-lubricating bushes supporting the hand brake cross-shaft.
8. Remove the brake catch pin, catch and distance pieces.
9. Unscrew the plunger and withdraw the spring, washer and the plunger rods.
10. If required, remove the relay lever and spindle. If necessary, press the bush from the lever.



IRC 906

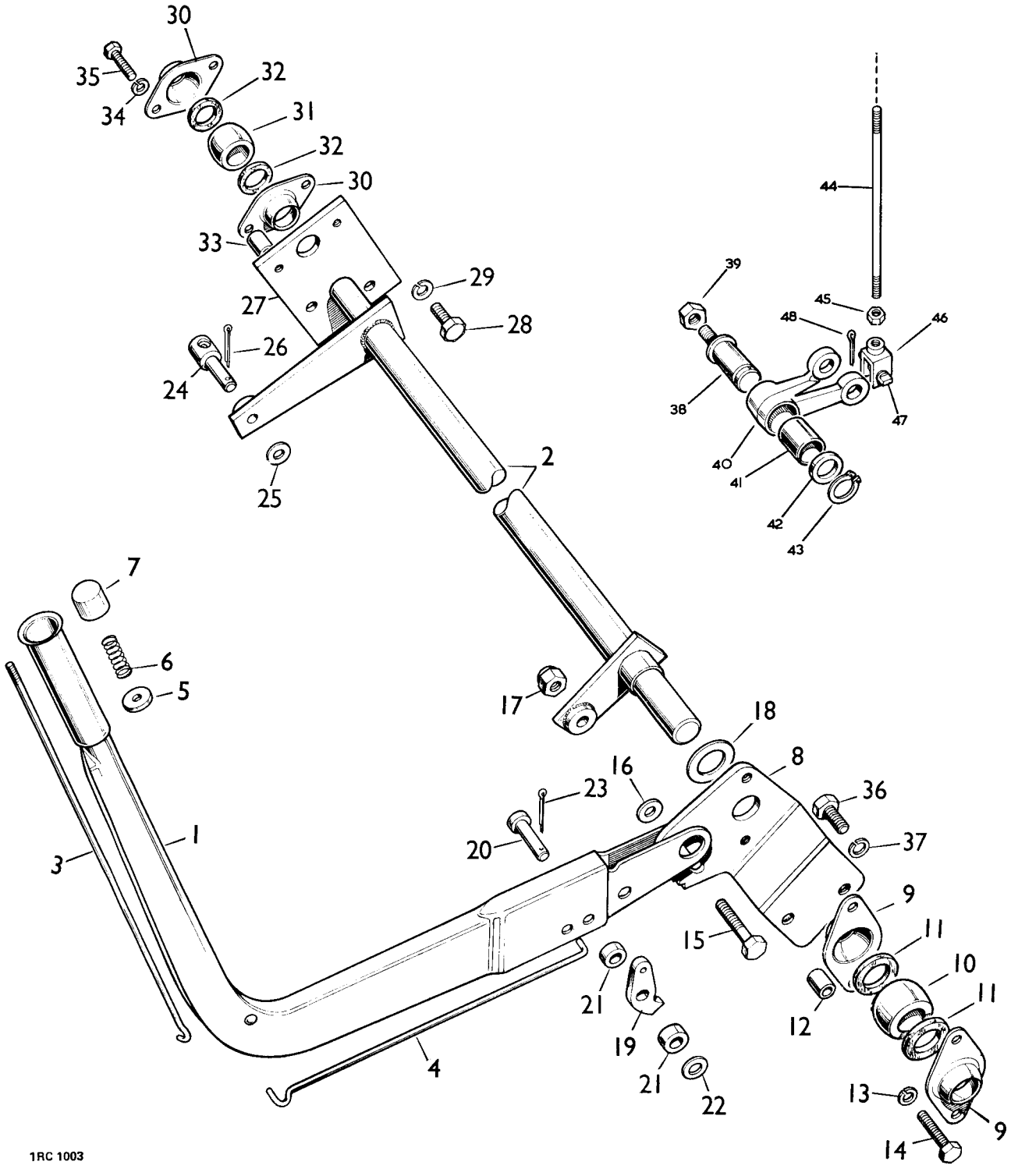
Refitting

11. If removed, fit the bush to the relay lever and fit the relay lever and spindle to the chassis.

    NOTE: The bore size of a new relay lever bush is 19,088 mm —0,0254 mm (0.7515 in —0.001 in).

12. Reverse 1 to 10; lubricate the cross-shaft bearings with general purpose grease.
13. Set the hand brake linkage at the vertical adjuster rod, so that the hand brake has one or two clicks free movement in the 'off' position.

continued



Hand brake lever arrangement

Key to handbrake lever arrangement

1. Hand brake lever
2. Cross-shaft for hand brake
3. Plunger rod, upper
4. Plunger rod, lower
5. Washer for plunger spring
6. Spring for plunger rod
7. Plunger
8. Ratchet for hand brake
9. Housing for cross-shaft bearing
10. Spherical bearing for cross-shaft
11. Felt ring for bearing
12. Distance piece
13. Spring washer
14. Set bolt ($\frac{5}{16}$ in UNF × $1\frac{1}{8}$ in long)

   } Fixing bearing and housing to ratchet

15. Bolt ($\frac{3}{8}$ in UNF × $1\frac{3}{4}$ in long)
16. Plain washer
17. Self-locking nut ($\frac{3}{8}$ in UNF)

   } Fixing lever to ratchet

18. Plain washer between lever and ratchet
19. Brake catch
20. Pin
21. Distance Piece

   } Fixing catch to lever

22. Plain washer
23. Split pin
24. Pin for hand brake adjuster rod
25. Plain washer
26. Split pin

   } Fixing pin to cross-shaft lever

27. Support plate for hand brake bearing housing
28. Bolt ($\frac{3}{8}$ in UNF × $\frac{7}{8}$ in long)
29. Spring washer
    Nut ($\frac{3}{8}$ in UNF)

   } Fixing support plate to chassis frame

30. Housing for cross-shaft bearing
31. Spherical bearing for cross-shaft
32. Felt ring for bearing
33. Distance piece
34. Spring washer
35. Set bolt ($\frac{5}{16}$ in BSF × $\frac{7}{8}$ in long)

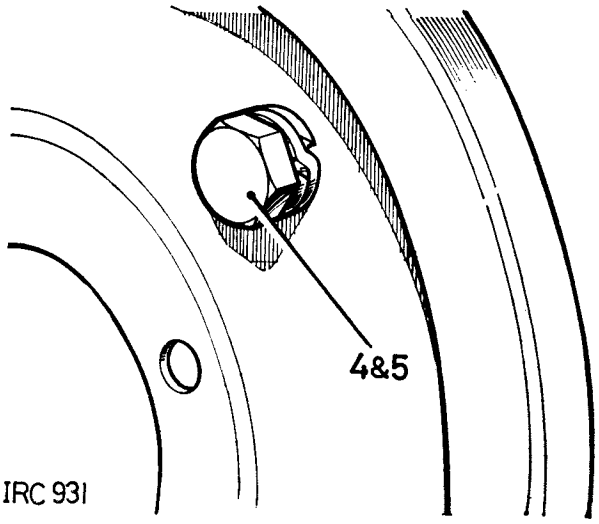
   } Fixing housing and bearing to support plate

36. Bolt ($\frac{3}{8}$ in UNF × $\frac{7}{8}$ in long)
37. Spring washer
    Nut ($\frac{3}{8}$ in UNF)

   } Fixing hand brake lever to chassis frame

WHEEL BRAKES

—Adjust 12.6



Adjusting procedure

1. Apply the transmission brake.
2. Raise the applicable wheel.
3. Ensure that the wheel is free to rotate, back-off the adjuster as necessary.
4. Turn in the adjuster/s until the brake shoe/s contacts the wheel drum.
5. Back-off two serrations on the adjuster.
6. Lower the wheel.

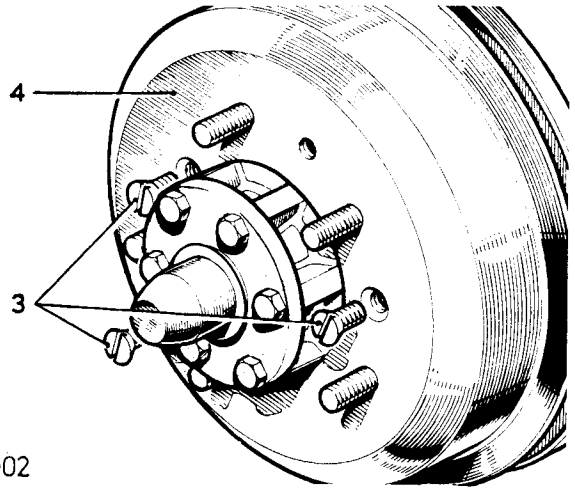
BRAKE DRUMS

—Remove and refit

Front drums	**12.7**
Rear drums	**12.8**

Removing

1. Remove the road wheel.
2. Slacken off the brake adjuster at the brake anchor plate.
3. Remove the brake drum fixings.
4. Withdraw the brake drum.



IRC 902

WARNING:
Do not blow out the dust in a brake drum it is dangerous if inhaled.

Refitting

5. Reverse 1 to 4.

DATA

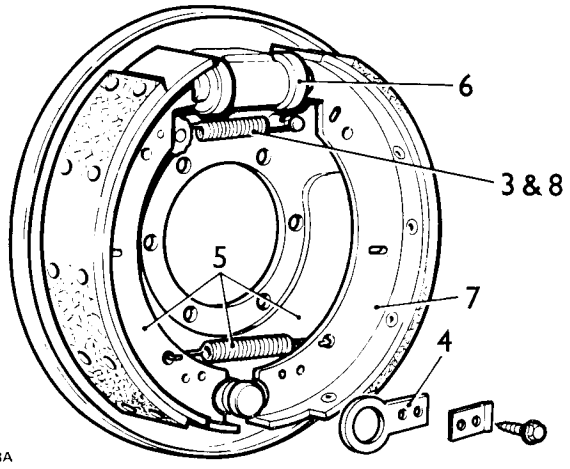
Brake drums

Diameter:	
Front and rear	254mm (10in)
Reclamation limit	0,75 mm (0.030 in) oversize on both models

BRAKE SHOES

—Remove and refit

Front shoes	**12.9**
Rear shoes	**12.10**



3RC 198A

Removing

1. Remove the road wheel.
2. Remove the brake drum. 12.7 or 12.8 as applicable.
3. Remove the leading shoe pull-off spring.
4. Remove the trailing shoe anchor plate.
5. Withdraw the brake shoes together from the pivot end first; part them by disconnecting the return spring.
6. Retain the pistons in the wheel cylinder, using a rubber band.
7. If required, re-line the brakes. 12.11.

Refitting

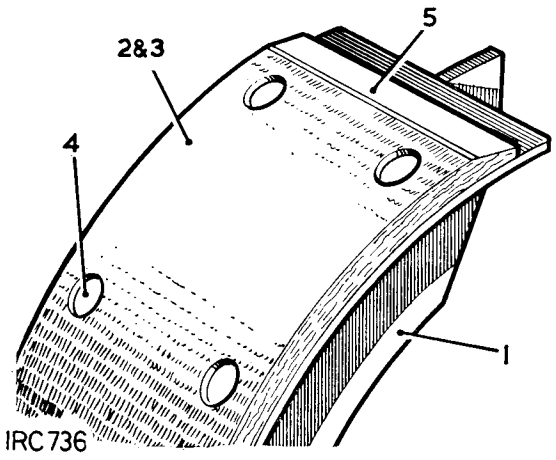
8. Reverse 2 to 6, refitting the leading shoe pull-off spring with its longest extremity hooked over the post on the shoe web.
9. Adjust the brakes fully on, then back off two serrations on the adjuster.
10. Reverse 1.

DATA

Brake shoe width	38 mm (1.5 in)

BRAKE LININGS

—Remove and refit **12.11**



Removing

1. Remove the brake shoes. 12.9 and 12.10
2. Remove the old linings from the shoes by shearing the rivets.

   NOTE: Brake shoes fitted with bonded linings: If the shoes incorporate rivet holes, the bonded linings can be removed and riveted linings can be fitted in their place. If the shoes are not pre-drilled, replacement shoe and lining assemblies must be fitted.

Refitting

3. Attach the new linings to the shoes, commencing at the centre and working outwards, but only peen the rivets sufficient to locate the linings.
4. Then with all the rivets loosely fitted, fully secure, commencing from the centre again.
5. Chamfer both ends of each lining.
6. Reverse 1.

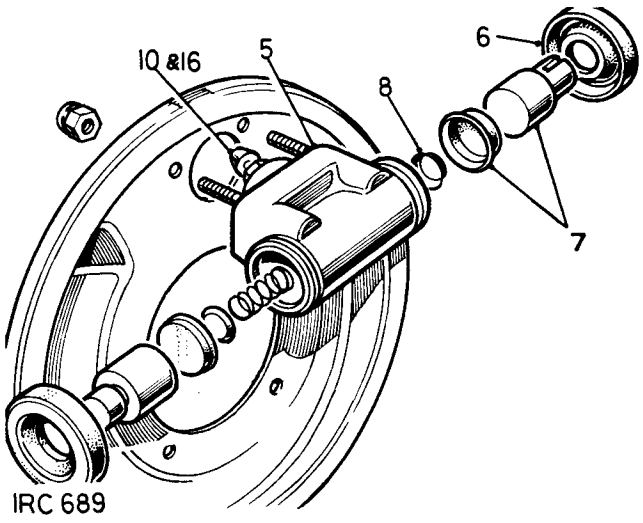
WHEEL CYLINDER

Front wheel cylinder

—Remove and refit	**1 to 5 and 14 to 18**	**12.12**
—Overhaul	**6 to 13**	**12.13**

Rear wheel cylinder

—Remove and refit	**1 to 5 and 14 to 18**	**12.14**
—Overhaul	**6 to 13**	**12.15**

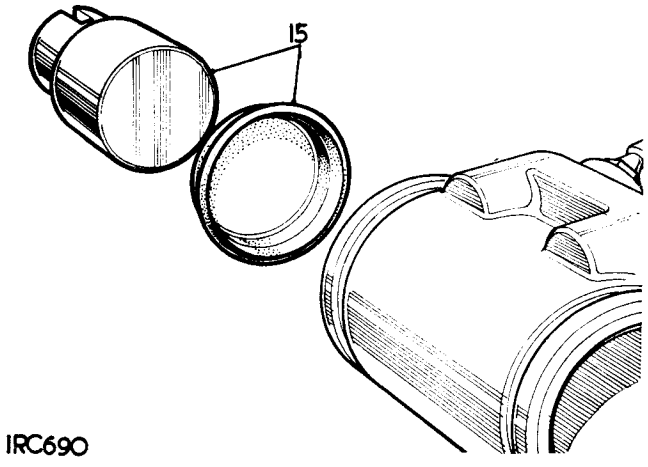


Removing

1. Remove the road wheel.
2. Remove the brake drum. 12.7 or 12.8.
3. Remove the brake shoes 12.9 or 12.10.
4. Disconnect and seal the brake fluid pipe.
5. Remove the wheel cylinder.

Dismantling

6. Withdraw the dust covers.
7. Withdraw the pistons and seals.
8. Withdraw the seal supports.
9. Withdraw the spring.
10. Remove the bleed screw.



Inspecting

11. Clean all components, using Girling cleaning fluid, and allow to dry.
12. Inspect the cylinder bore and pistons for corrosion, scores and wear. If any component is not satisfactory, replace the complete wheel cylinder assembly.
13. Provide new seals and dust covers from the wheel cylinder overhaul kit.

Assembly

14. Lubricate the components, using the recommended Girling brake fluid.
15. Reverse 6 to 9. Fit the piston seal with the flat face toward the piston.
16. Fit the bleed screw, do not overtighten. Torque 0,5 to 0,8 kgf m (4 to 6 lbf ft).

Refitting

17. Reverse 1 to 5.
18. Bleed the brakes. 12.34

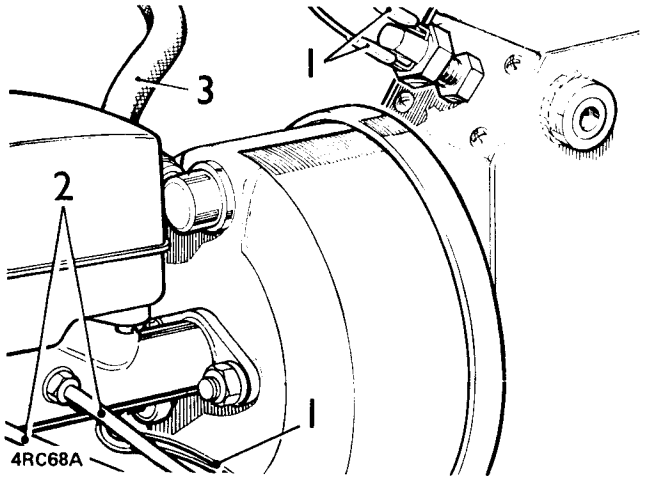
BRAKE PEDAL, Servo Systems

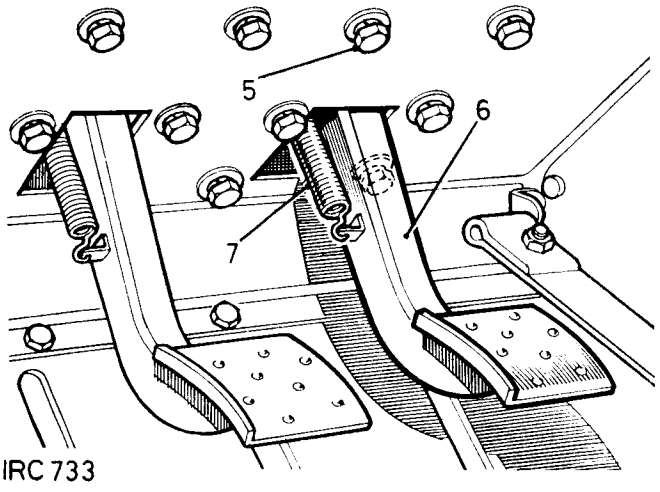
—Remove and refit **12.16**

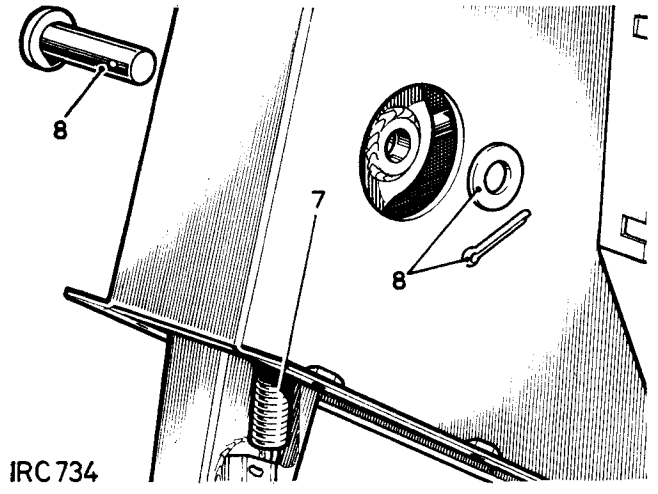
Removing

1. Disconnect the electrical lead from the stop light switch. Also, disconnect the lead from the vacuum loss warning switch.
2. Disconnect the outlet pipe/s from the master cylinder. Fit a blanking plug to the outlet aperture/s or drain the fluid reservoir, to prevent fluid spillage.
3. Disconnect the vacuum pipe from the servo unit.
4. Remove the toe-board finisher panel.
5. Remove the fixings securing the brake pedal bracket to the toe box.
6. Withdraw the brake pedal and bracket assembly from the engine compartment, manoeuvring the pedal through the aperture in the toe box.
7. Disconnect the brake pedal return spring.
8. Remove the split pin and pivot pin from the brake pedal to servo coupling.

continued







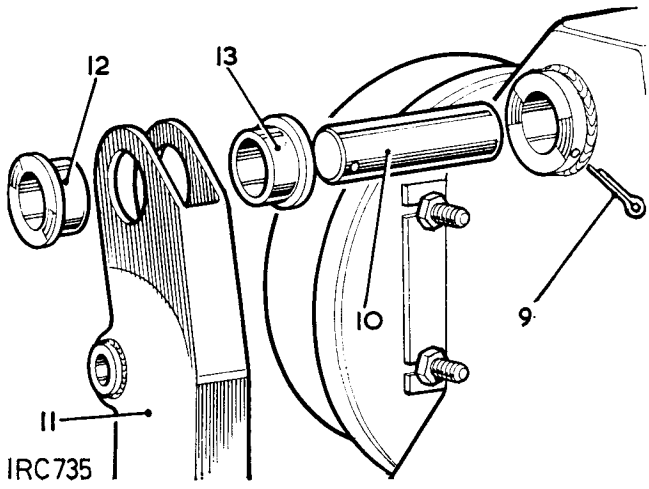
9. Using a suitable punch, drift out pin from the pedal shaft.
10. Remove the pedal shaft.

(Servo Systems)

11. Withdraw the brake pedal complete with bushes.
12. If required, remove the bushes from the pedal.

Refitting

13. If removed, fit the bushes to the brake pedal. New bushes must be reamered to 15,875 mm + 0,025 mm (0.750 in + 0.001 in).
14. Reverse 7 to 10, using general purpose grease to lubricate moving parts.
15. Apply a waterproof sealant between the joint flanges of the pedal bracket and the tow box.
16. Reverse 1 to 6.
17. Check, and if necessary, adjust the brake pedal switch located on the pedal box top cover to operate at 19 mm to 25 mm (0.750 in to 1 in) of pedal movement.
18. Bleed the complete braking system. 12.34.



BRAKE HOSES AND PIPES

HOSES

—Remove and refit

Front left hand	**12.17**
Front right hand	**12.18**
Intermediate	**12.19**

PIPES

—Remove and refit

Feed to front left hand hose connector	**12.20**
Feed to front right hand hose connector	**12.21**
Feed to front left hand cylinder	**12.22**
Feed to front right hand cylinder	**12.23**
Feed to rear left hand cylinder	**12.24**
Feed to rear right hand cylinder	**12.25**
Feed to intermediate hose	**12.26**
Feed to brake failure switch, front system	**12.27**
Feed to brake failure switch, rear system	**12.28**

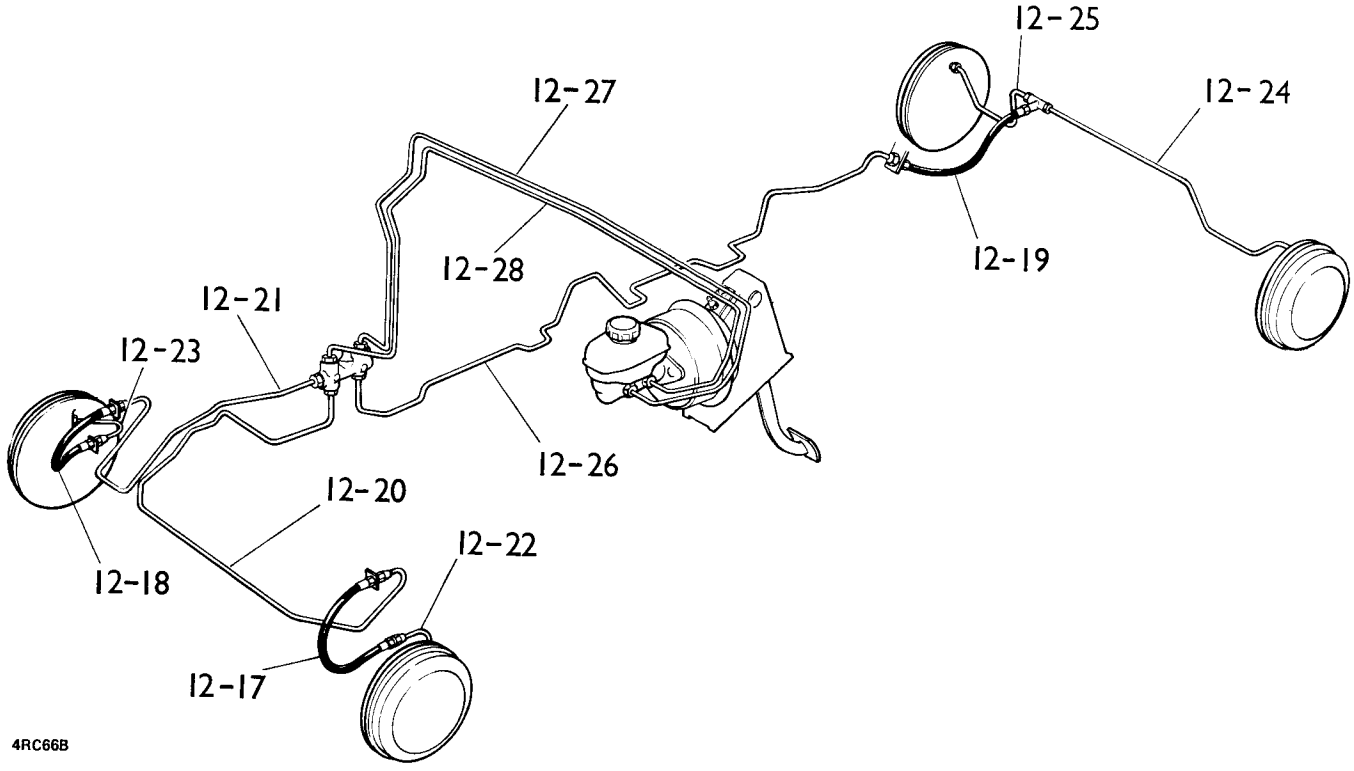
NOTE: The operation numbers are included on the brake system illustration to facilitate identification of the individual pipes.

Removing

1. Disconnect the hose or pipe at both connections.
2. Release the clipping.
3. Withdraw the hose or pipe.

Refitting

4. Reverse 1 to 3.
5. Bleed the brakes. 12.34.



BRAKE FAILURE SWITCH

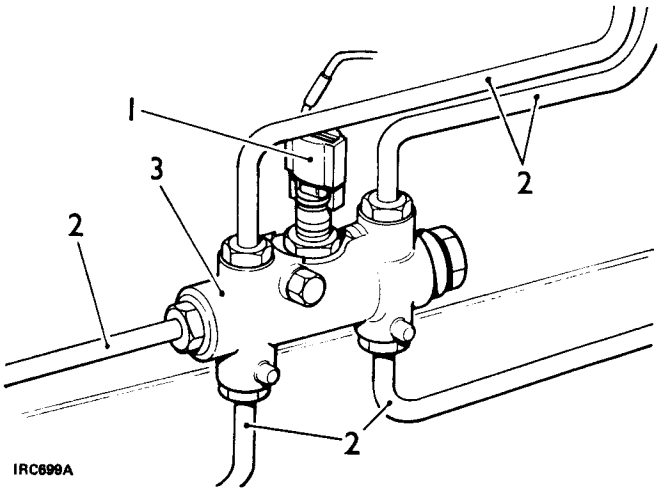
—Remove and refit **12.29**

Removing

1. Disconnect the electrical leads from the brake failure switch, located in the engine compartment at the chassis RH side member.
2. Disconnect and blank off the five fluid pipes.
3. Remove the brake failure switch.

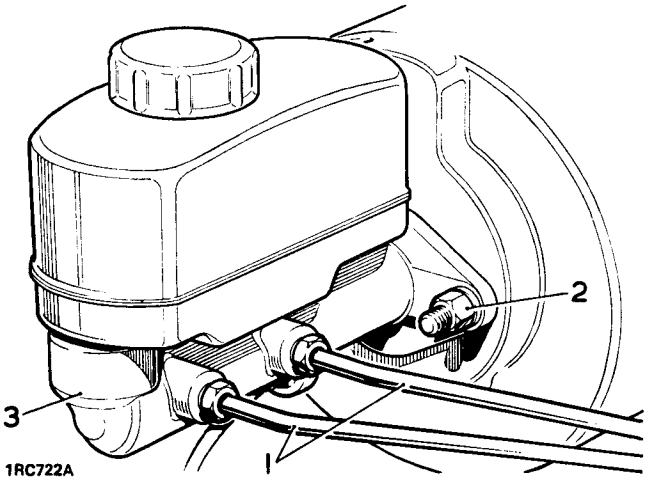
Refitting

4. Secure the brake failure switch in position, with the electrical leads socket uppermost.
5. Reverse 1 and 2.
6. Bleed the brakes. 12.34.



MASTER CYLINDER

—Remove and refit **12.30**



Removing

1. Disconnect the brake pipes.
2. Remove the fixings at the flange.
3. Withdraw the master cylinder and fluid reservoir complete.

Refitting

4. Reverse 2 and 3. Torque loading 2,2 to 2,6 kgf m. (16 to 19 lbf ft).
5. Reverse 1.
6. Bleed the brakes. 12.34.

MASTER CYLINDER

—Overhaul **12.31**

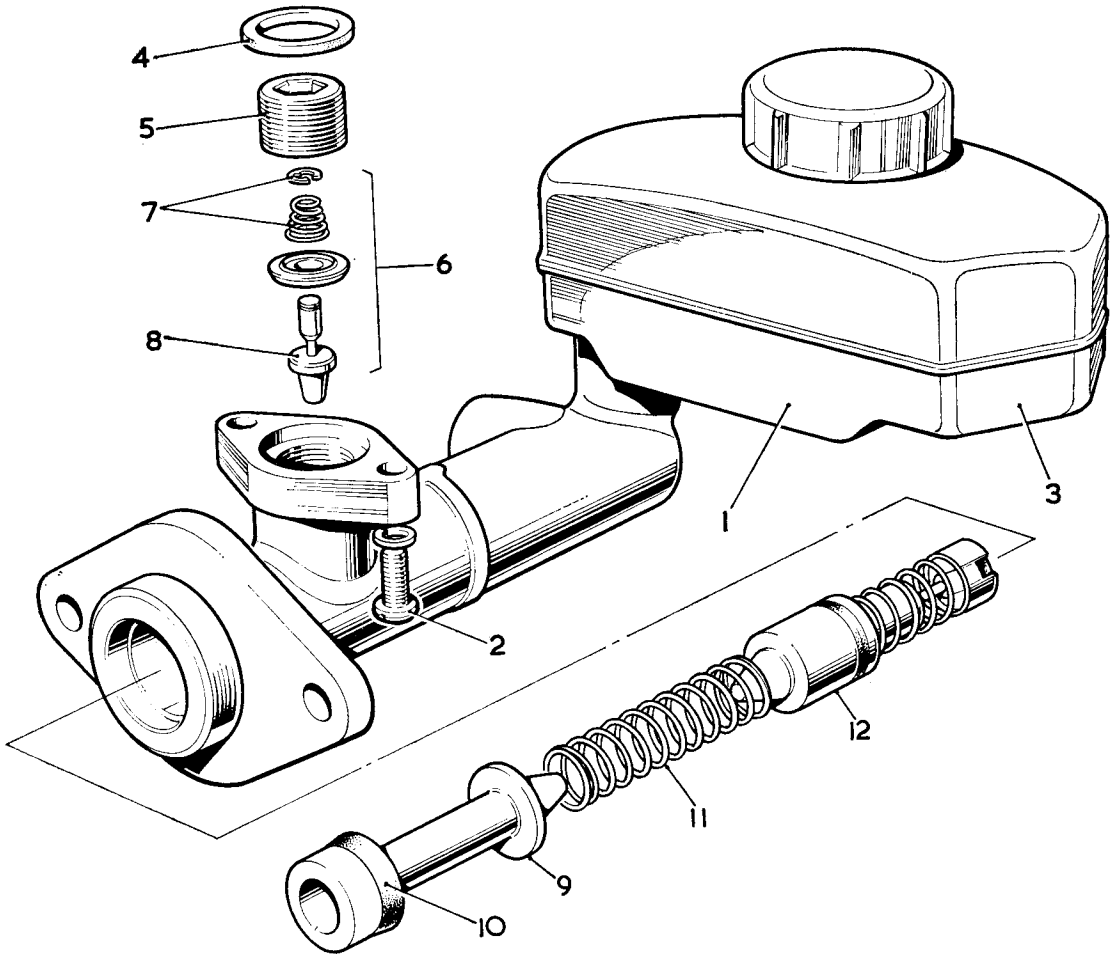
Dismantling

1. Remove the master cylinder and fluid reservoir complete. 12.30.
2. Remove the reservoir fixing screws.
3. Pivot the reservoir front end aside to expose the master cylinder front inlet bore.

   NOTE: Do not attempt to remove completely the reservoir which is retained by an internal fixing at the rear inlet bore.

4. Withdraw the oil seal ring.
5. Unscrew the tipping valve assembly retainer.
6. Lift out the tipping valve assembly.
7. Remove the retaining circlip and withdraw the spring.
8. Withdraw the tipping valve from the seal plate.
9. Withdraw the outer piston.
10. Remove and discard the oil seal.
11. Withdraw the piston spring.
12. Withdraw the inner piston and valve assembly.

continued



IRC 723

13. Prise the spring retainer locking prong clear of the piston shoulder and withdraw the piston and spring.
14. Remove and discard the oil seal.
15. Position the valve stem to align with the larger hole in the valve retainer. Withdraw the retainer.
16. Slide the valve spacer over the valve stem. Remove the wave washer and valve seal from the stem.

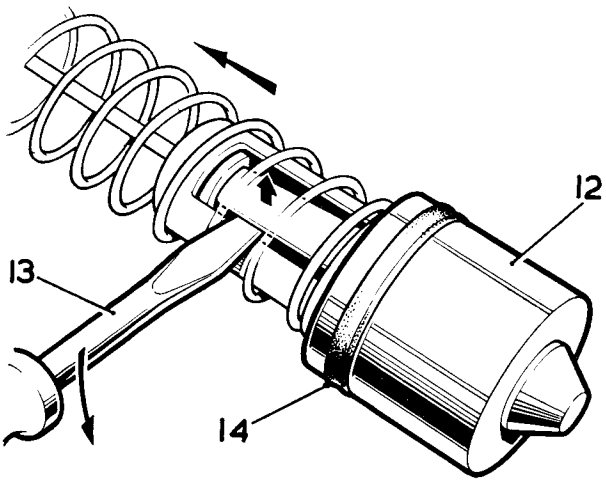
Inspecting

17. Clean all components in Girling cleaning fluid and allow to dry.
18. Examine the cylinder bore and pistons, ensure that they are smooth to the touch with no corrosion, score marks or ridges. If there is any doubt, fit new replacements.
19. The seals should be replaced. These items are included in the master cylinder overhaul kit.

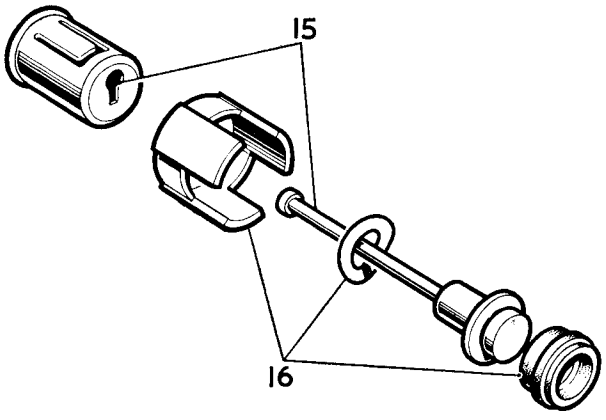
Assembling

20. During assembly, smear the seals with Castrol Girling rubber grease and the remaining internal items with Castrol Girling Brake and Clutch Fluid.
21. Fit the valve seal, flat side first, to the end of the valve stem.
22. Fit the wave washer, domed side toward the valve head.
23. Fit the valve spacer, legs first.
24. Fit the valve retainer.

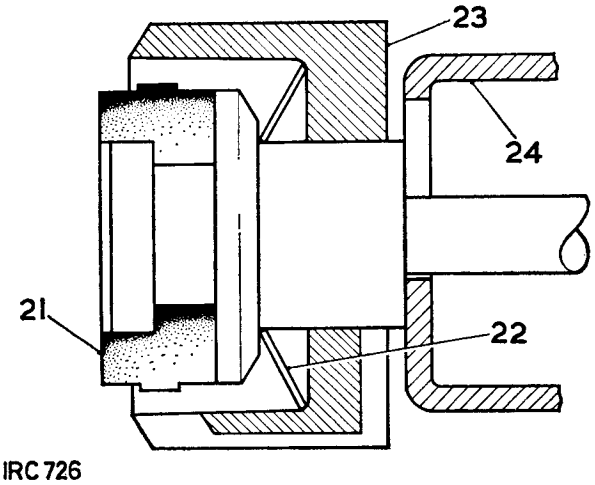
continued



IRC 724

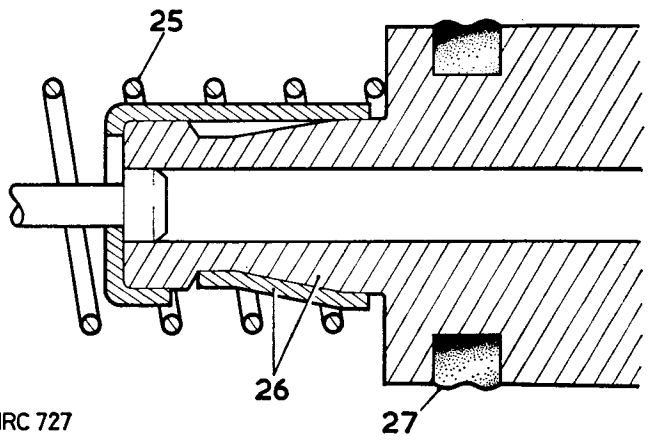


IRC 725



IRC 726

25. Locate the spring over the retainer and squarely seat on the valve spacer.
26. Insert the inner piston into the spring and compress until the locking prong on the valve retainer engages in the groove in the piston. If necessary, depress the locking prong to ensure that the free end is fully engaged with the groove shoulder.
27. Fit the piston seal.
28. Insert the inner piston and valve assembly, valve end first, into the cylinder.
29. Reverse 5 to 9. Torque loading for tipping valve retainer is 4,9 to 6,2 kgf m (35 to 45 lbf ft).
30. Reverse 2 to 4. Do not overtighten the reservoir fixings. Torque load 0,3 to 0,4 kgf m (2 to 3 lbf ft).
31. Refit the master cylinder. 12.30.



IRC 727

DATA

Master cylinder bore size	22,2 mm (0.875 in) diameter

SERVO ASSEMBLY

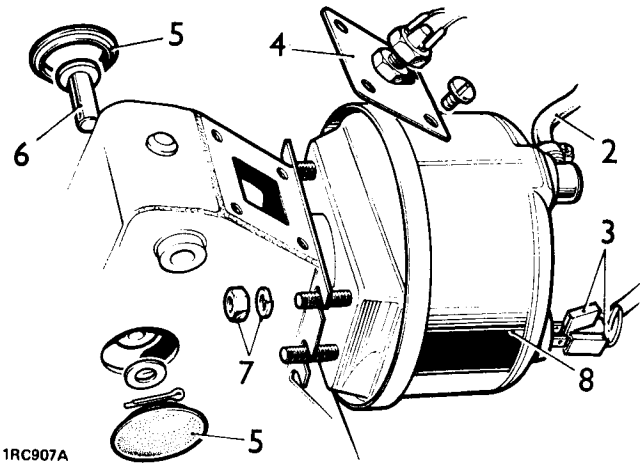
—Remove and refit **12.32**

Removing

1. Remove the brake master cylinder. 12.30.
2. Disconnect the vacuum hose from the servo assembly.
3. Disconnect the leads from the vacuum loss indicator switch.
4. Remove the switch plate.
5. Remove the rubber plugs from the pedal box.
6. Remove the split pin and withdraw the clevis pin securing the servo rod to the pedal.
7. Remove the fixings.
8. Withdraw the servo assembly.

Refitting

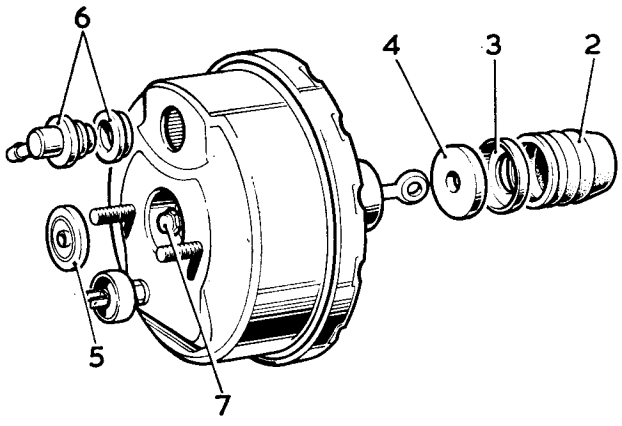
9. Reverse 1 to 8. Torque load for servo fixings is 1,2 kgf m (9 lbf ft).



SERVO ASSEMBLY

—Overhaul **12.33**

NOTE: The Supervac servo unit can be serviced, with a kit that is available, without completely dismantling the servo. In the event of the servo developing a major fault, the unit must be renewed.



1RC908A

Dismantling

1. Remove the servo. 12.32.
2. Pull back the dust cover.
3. Remove the end cap.
4. Withdraw the filter.
5. Remove the seal and plate assembly from the front shell recess.
6. Remove the non-return valve and grommet.
7. **CAUTION:** Do not attempt to remove or adjust the operating rod which is pre-set and locked at the manufacturers.

Reassembling (using the service kit)

8. Lubricate the non-return valve grommet with Girling Grease (64949009), and fit to the front shell.
9. Fit the new non-return valve into the grommet.
10. Smear the new seal and plate assembly with Girling Grease (64949008), and press into the front shell, ensuring the plate faces inwards.
11. Fit the new filter into the neck of the diaphragm plate.
12. Fit the new end cap.
13. Locate the new dust cover over the lugs of the rear shell.
14. Fit the servo. 12.32.

BRAKES

—Bleed **12.34**

General

1. **Observe strict cleanliness precautions to prevent foreign matter from entering the hydraulic system.**
2. Use only new supplies of the recommended brake hydraulic fluid.
3. Keep the fluid reservoir 'topped up' during bleeding.
4. Where the complete hydraulic system is to be refilled, it is advantageous to first charge the system, to each bleed point in turn, before attempting to expel all air from the system.

Isolating local air pockets

5. Use of Girling Brake Service Hose Clamp considerably facilitates the location of air in the system, therefore saving time by locating the hydraulic fault, and saving fluid when servicing the wheel cylinders.

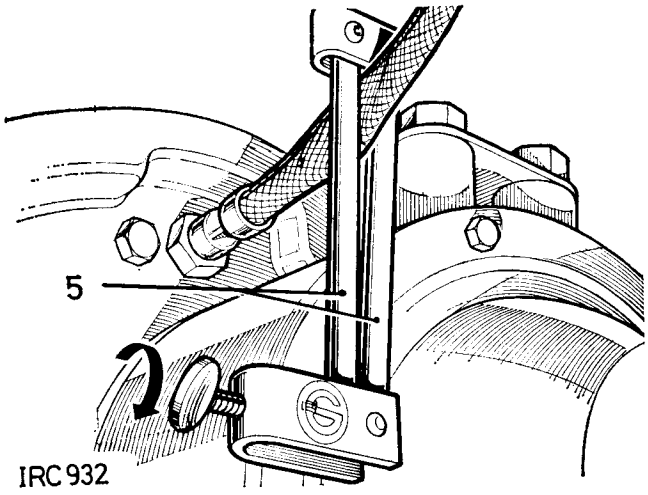
Providing the brake hose is in reasonable condition, damage cannot be caused using the hose clamp, but the use of other tools to clamp the hoses is not recommended as damage may be caused internally to the hose without it being noticed externally.

6. With clamps fitted on the two front and one rear hose the pedal action should be perfect with no indication of 'spongyness'. If under these circumstances a spongy pedal is apparent, a new or overhauled master cylinder assembly must be fitted and bled and the test repeated.
7. If perfect pedal action is obtained with the three hose clamps in position, remove the rear clamp and if the pedal is spongy, the air must be in the rear cylinders. However, if the pedal action is good, remove first one then the other of the two front clamps, repeating the test until the air is located.

Wheel cylinder—servicing

8. For wheel cylinder servicing only the appropriate hose need be clamped. This keeps the loss of fluid to a minimum and after the service is satisfactorily completed, only the affected parts require bleeding.

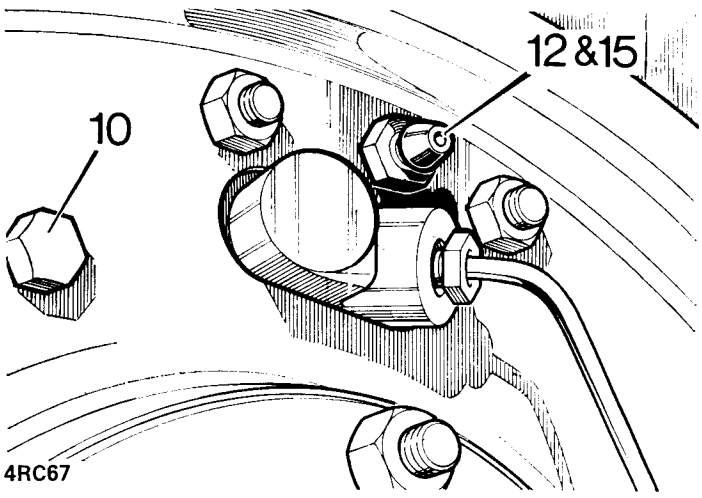
continued



Brake bleeding procedure

9. Keep both sections of the fluid reservoir 'topped up' during bleeding.
10. Slacken off the brake shoe adjuster on each wheel to minimise wheel cylinder volume.
    NOTE: Because the dual brake system is divided into front and rear sections, it should only be necessary to bleed the section affected, but note that the brake pedal movement will be restricted by the remaining section.
11. Attach a bleed tube to the bleed nipple farthest from the master cylinder. Submerge the tube free end in brake fluid in a transparent container.
12. Slacken the bleed nipple a half turn.
13. Operate the brake pedal firmly through its full travel, allowing it to return freely.
14. Allow at least five seconds to elapse with the foot right off the pedal, then repeat item 13 until fluid clear of bubbles is seen to emerge from the bleed tube. Hold the pedal down and tighten the brake bleed nipple.
15. Repeat the foregoing procedure on the remaining brakes, commencing and continuing at the next wheel farthest from the master cylinder.

    NOTE: The condition of the braking system may affect the ease with which the bleeding operation may be carried out. In cases of difficulty, where repeated pumping does not clear the fluid, allow a much longer interval between strokes of the pedal. This will enable the master cylinder to recuperate fully and ensure a complete charge of fluid on each stroke. If difficulty persists, it will be necessary to bleed the brakes in pairs, that is, the front and rear on the driver's side, then the front and rear, passenger's side.
16. Remove the bleed tube and container. Refit the nipple dust covers.
17. Adjust the brakes. 12.6.
18. Apply normal working load to the brake pedal for three minutes and inspect the system for fluid leaks.
19. Finally, check the fluid level in the reservoir.



WHEELS AND TYRES OPERATIONS

WHEELS AND TYRES

—General information 13.1

1. Removing and refitting procedures follow normal practices. Note that when refitting tyres, the two black spots on the inner tube should coincide with the two white spots on the cover adjacent to the beading.
2. Where 'V' tread tyres are fitted, the point of the 'V' must point forward when the tyre is viewed from the top.

TYRES

Type/Size

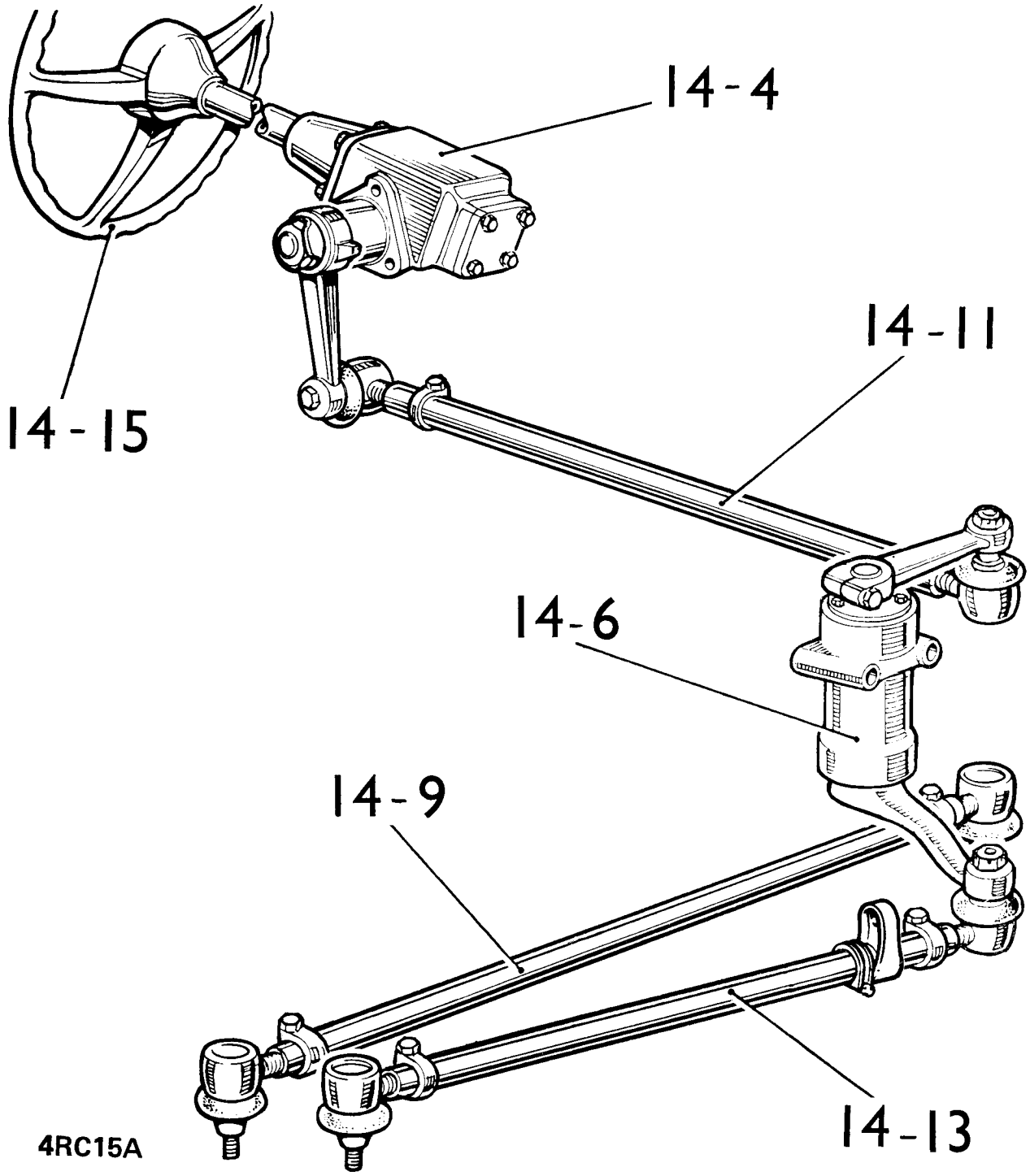
Standard — Cross Ply 6.00—16

Optional — Cross Ply 6.50—16
Cross Ply 7.00—16
Cross Ply 7.50—16 with 5.50F x 16 wheel

Tyre pressures

		Normal				Emergency soft			
		Load under 250 kg (550 lb)		Load over 250 kg (550 lb)		Load under 250 kg (550 lb)		Load over 250 kg (550 lb)	
		Front	Rear	Front	Rear	Front	Rear	Front	Rear
6.00, 6.50 and 7.00—16	kg/cm²	1,8	1,8	1,8	2,1	1,1	1,1	1,1	1,4
	lb/in²	25	25	25	30	15	15	15	20
	bars	1.72	1.72	1.72	2.07	1.03	1.03	1.03	1.38
7.50—16	kg/cm²	1,8	1,8	1,8	2,1	0,8	0,8	0,8	1,4
	lb/in²	25	25	25	30	12	12	12	20
	bars	1.72	1.72	1.72	2.07	0.83	0.83	0.83	1.38

STEERING OPERATIONS

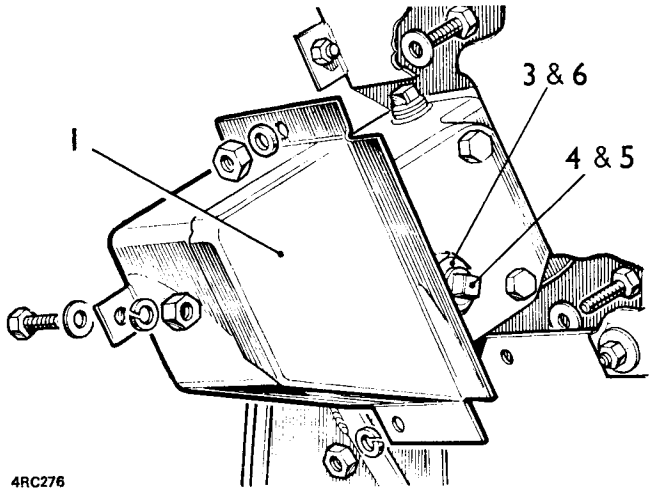

14-4
14-11
14-15
14-6
14-9
14-13
4RC15A

STEERING BOX

—Adjust **14.1**

Procedure

1. Remove the steering unit cover box from the wheel arch.
2. Set the steering in the straight ahead position.
3. Slacken the locknut and adjuster.
4. Screw in the adjuster until steering wheel backlash is taken up.
5. Screw in a further one-half flat maximum to allow for locknut tightening.
6. Tighten the locknut without disturbing the adjuster.
7. Refit the steering unit cover box.



STEERING COLUMN TOP BEARING

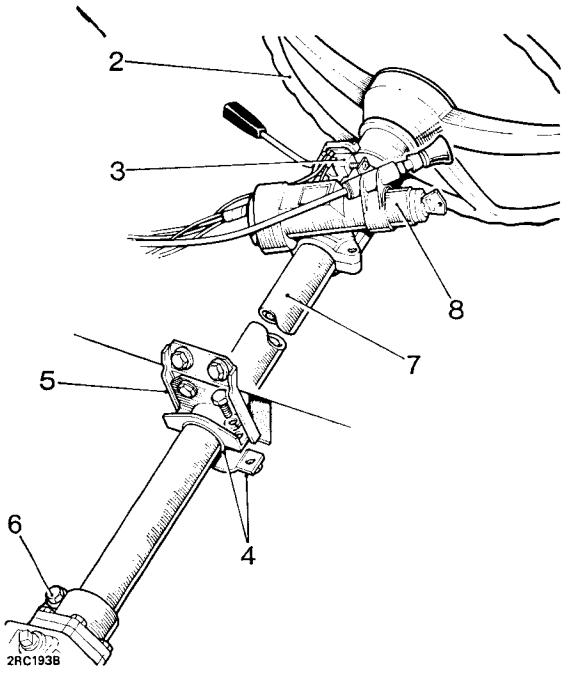
—Remove and refit **14.2**

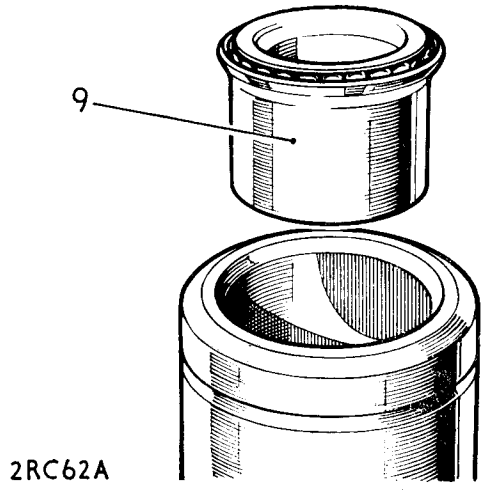
Removing

1. Disconnect the battery earth lead.
2. Remove the steering wheel. 14.15.
3. Release the combined switch from the steering column. 6.33.
4. Remove the column clamp bracket and seal.
5. Remove the column support bracket.
6. Slacken the pinch bolt, outer column to steering box.
7. Withdraw the outer column from the inner column and steering box.
8. Disconnect the cold start control in the engine compartment and disconnect the leads from the ignition/starter switch (14.3 refers); turn the ignition/starter key to unlock the steering.
9. Remove the column top bearing.

Refitting

10. Reverse 1 to 9.



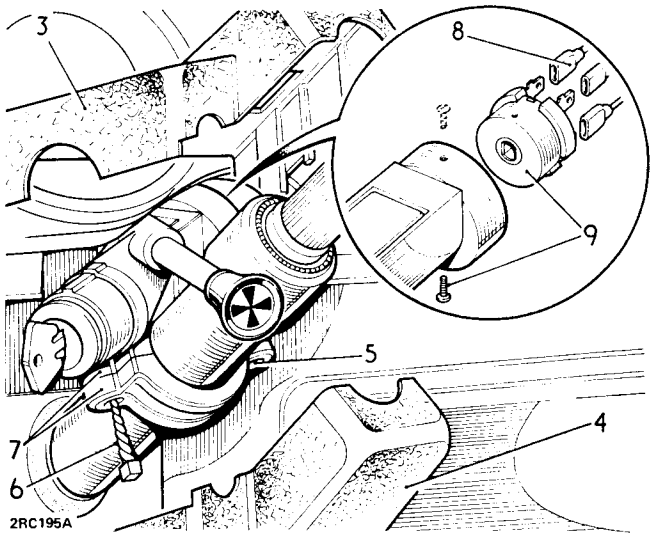


STEERING COLUMN LOCK AND IGNITION/ STARTER SWITCH

—Remove and refit **14.3**

Removing

1. Disconnect the battery earth lead.
2. Disconnect the cold start control in the engine compartment. 3.9 refers.
3. Remove the fixings and withdraw the steering column upper shroud.
4. Remove the fixings and move aside the lower shroud.
5. Centre punch and drill a hole in each sheared bolt to accept an extractor.
6. Remove the sheared bolts, using a suitable 'Easy-out' extractor.
7. Withdraw the steering column lock and retainer saddle.
8. Disconnect the electrical leads at the ignition/starter switch.
9. If required, remove the fixing screws and withdraw the switch and the cold start control.



Refitting

10. Reverse 9 as required.
11. Reconnect the electrical leads at the ignition/starter switch as illustrated in the circuit diagram.
12. Reverse 1 to 7.
13. Check the steering lock operation—the steering column should be unlocked when the ignition/ starter key is at the 'Services' position, and locked when the key is withdrawn.

STEERING COLUMN AND BOX ASSEMBLY

—Remove and refit **14.4**

Service tool 600000 Drop arm remover
601763 Ball joint extractor

Removing

1. Fully open or remove the bonnet panel.
2. Disconnect the battery earth lead.
3. Remove the steering wheel. 14.15.
4. Remove the combined switch from the steering column. 6.33.
5. Remove the steering column lock. 14.3.
6. Remove the lower clamp bracket and rubber sleeve from the outer column.
7. Remove the upper clamp bracket and support bracket from the bulkhead.
8. Remove the fixings from the ball joint connecting the longitudinal arm to the steering box drop arm.
9. Using service tool 601763, extract the ball joint from the drop arm.

   NOTE: It may be necessary to remove the exhaust manifold to provide access for the extractor.
10. Disconnect the throttle linkage at the bracket attached to the steering box support bracket.
11. Remove the fixings, steering box stiffener bracket to toe box.
12. Raise the front of the vehicle and support on stands.
13. Remove the driver's side front road wheel.

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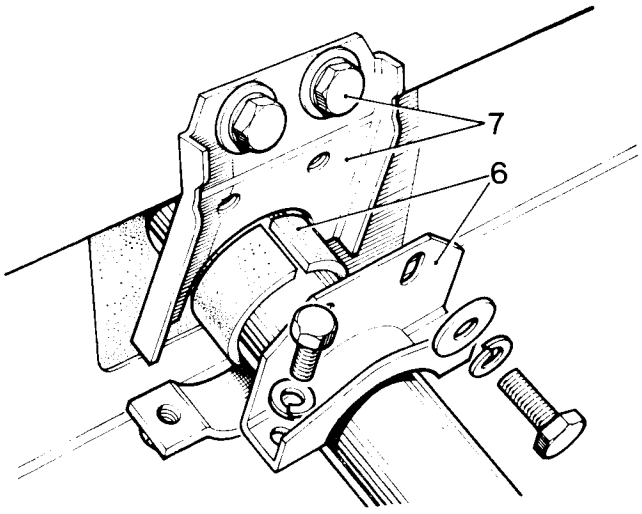

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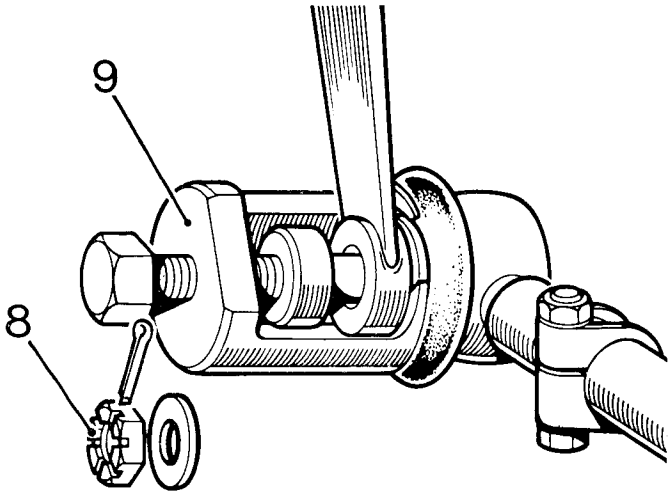

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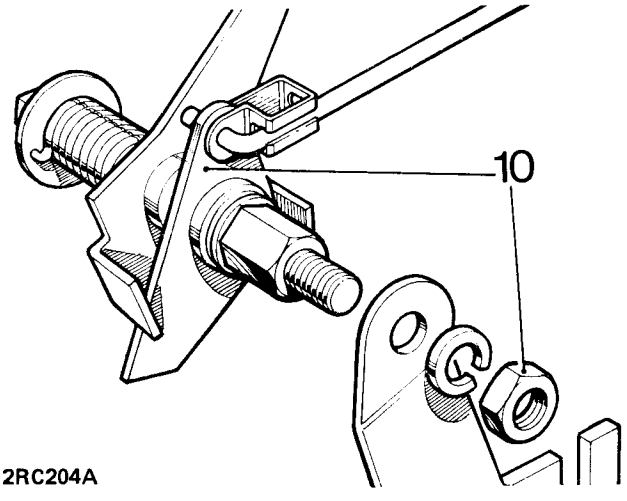
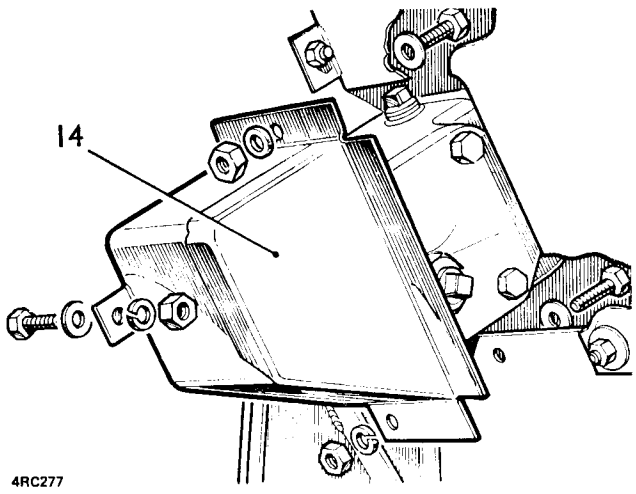


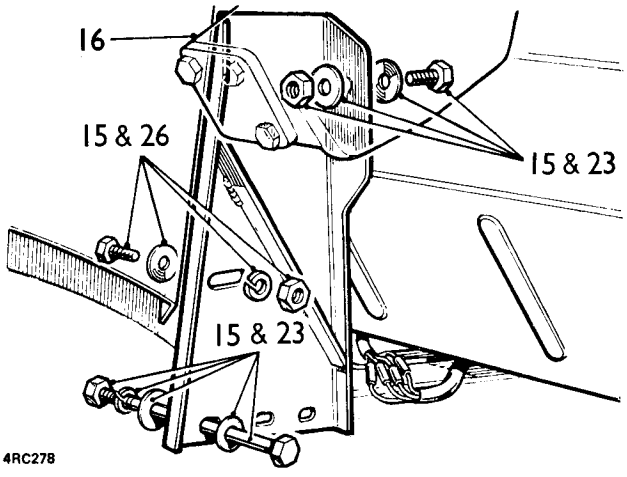
2RC204A

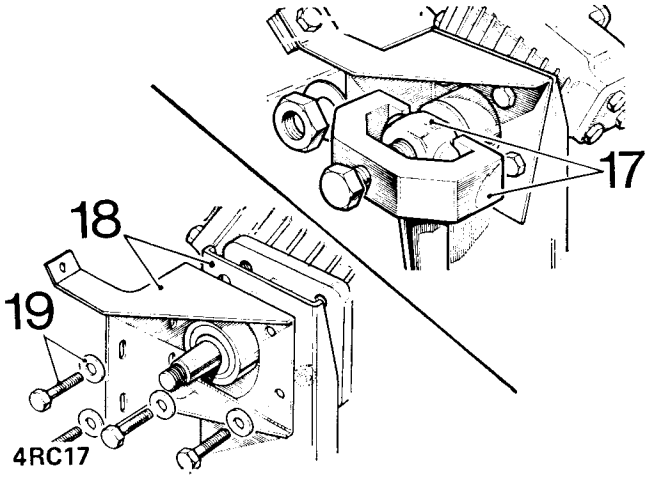
14. Remove the steering unit cover box from the wheel arch.
15. Remove the fixings, steering box support bracket to toe box, wing valance and chassis.
16. Withdraw the steering column and box assembly complete with attached brackets from beneath the front wing.
17. If required, remove the steering box drop arm, using service tool 600000.
18. If required, remove the stiffener bracket and support bracket from the steering box.

NOTE: The steering box can be overhauled without removing the brackets.

continued





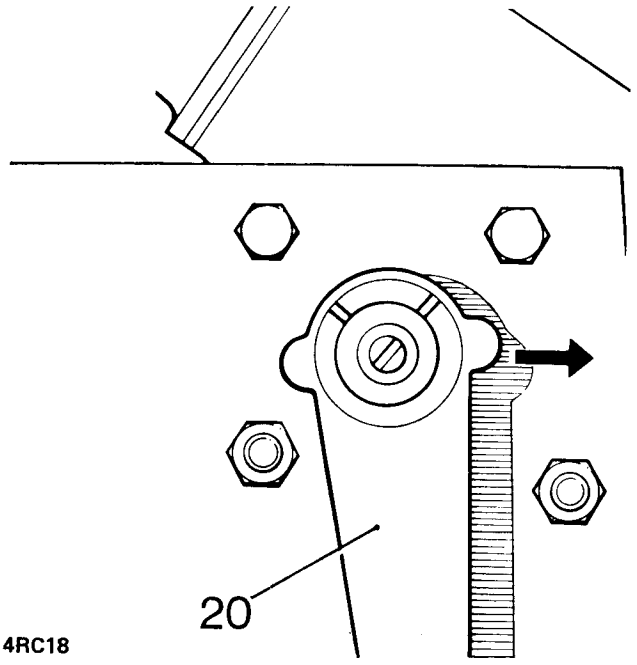


Refitting

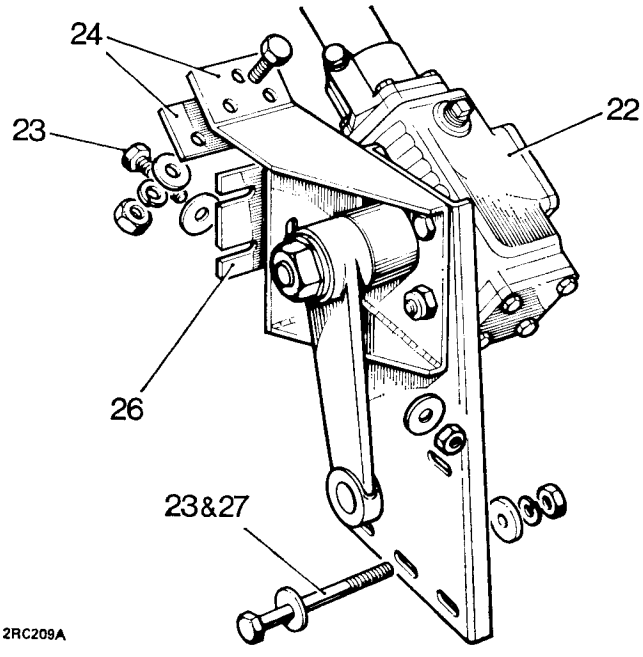
19. If removed, fit the support bracket and stiffener brackets to the steering box. Torque: 7,0 to 8,5 kgf.m (50 to 60 lbf.ft).
20. If removed, fit the drop arm to the steering box, aligning the mark on the steering rocker shaft with the forward mark of the two on the drop arm. The arrow in the illustration points towards the front of the vehicle.
21. Tighten the drop arm fixings to 8,5 to 11,0 kgf.m (60 to 80 lbf.ft).
22. Locate the steering box and bracket assembly in position on the vehicle.
23. Retain the support bracket to the chassis, wing valance and toe box, but do not fully tighten the fixings at this stage.
24. Retain the steering box stiffener bracket to the toe box, but do not fully tighten the fixings at this stage. If necessary, fit shim washers between the stiffener bracket and the toe box to prevent distorting the toe box or bracket.

    CAUTION: During the next item, DO NOT strain the steering column. If necessary, adjust the steering box position, using the slotted fixing holes in the support and stiffener brackets, to obtain a snug fit between the clamp upper half and the steering column, before securing the clamp halves.

25. Reverse 6 and 7.
26. Insert slotted packing pieces, as required, to take up clearance between the support bracket and the toe box.
27. Secure the support bracket and stiffener bracket fixings. Torque load for support bracket to chassis fixings is 2,0 kgf.m (15 lbf.ft).
28. Reverse 12 to 14.
29. Reverse 8 to 10. Torque for ball joint fixings 4,0 kgf.m (30 lbf.ft).
30. Reverse 1 to 5.



4RC18



2RC209A

STEERING COLUMN AND BOX ASSEMBLY

—Overhaul **14.5**

Dismantling

1. Remove the steering column and box assembly. 14.4.
2. Remove the side cover and drain the oil from the steering box.
3. Lift out the roller for the main nut, and withdraw the rocker shaft.
4. Hold the outer column in a vice and remove the fixings securing the steering box.
5. Using a mallet, tap the inner column at the steering wheel end to partially remove the box.
6. Withdraw the box and inner column complete. Take care not to loose any of the steel balls from the steering box bearings.
7. Rotate the inner column to locate the main nut in the mid-way position on the worm shaft.
8. Using a mallet, gently tap the box away from the inner column sufficient to remove the upper ball race. Take care not to loose the steel balls which will be released from the bearings.
9. Wind the worm shaft through the main nut and remove the shaft, main nut and any loose steel balls.
10. Remove the end cover, shims and lower ball race.
11. Dislodge and remove the twelve 9,52 mm (0.375 in) diameter ball bearings from the main nut and recirculating tube.

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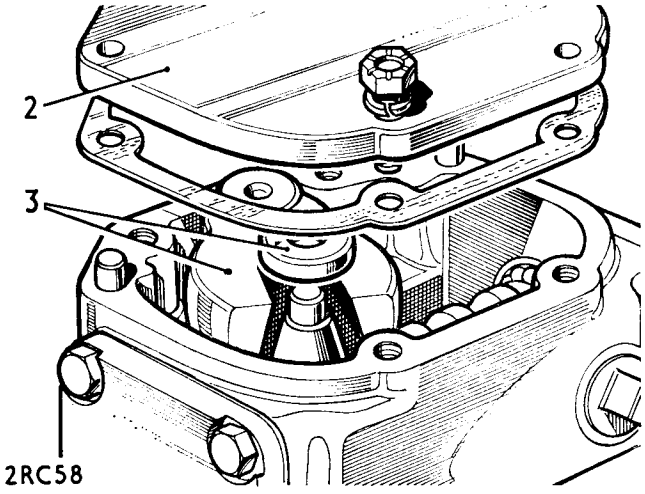
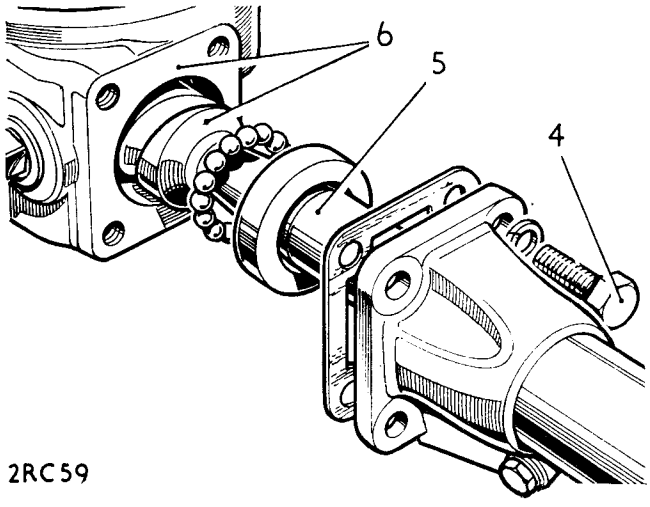
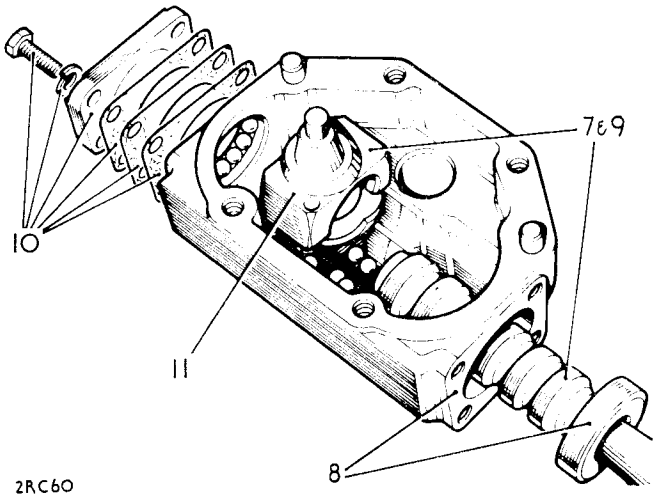






12. Remove the retaining washer and oil seal.
13. If required, press out the rocker shaft bush.
14. If required, remove the outer column top bearing.

Inspecting

15. Examine all components for obvious signs of wear or damage.

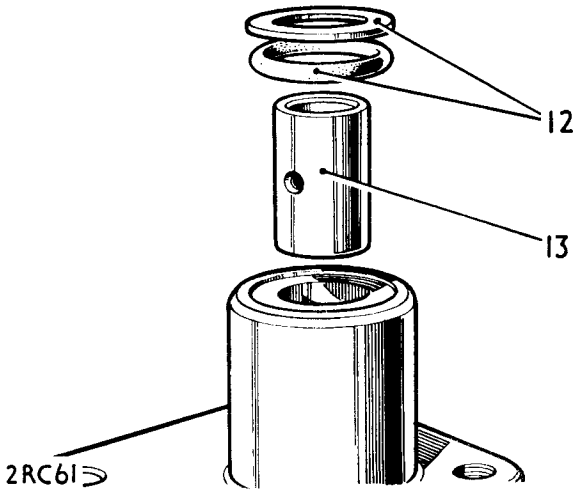
    NOTE: Some early models are fitted with a short outer column identified with a spot of yellow paint on the column upper end and used in conjunction with a 2,8 mm (0.155 in) thick spacer fitted between the column lower end and the steering box face.
    Later columns are 2,8 mm (0.155 in) longer and measure 587,73 ± 0,38 mm (23.139 ± 0.015 in) from the column lower end face to the top face of the sleeve attached to the column.
    The early column and spacer may be replaced with the later column, if required, and the spacer discarded.

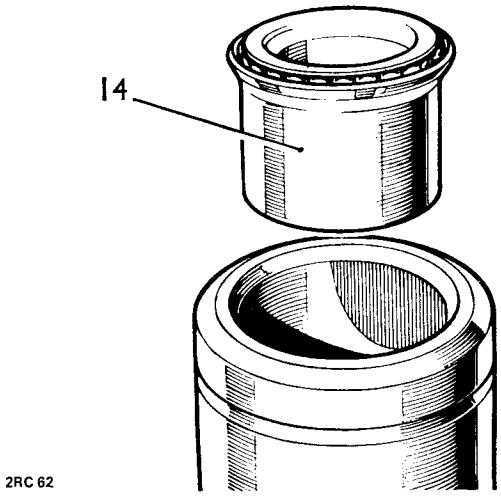
16. Examine the main nut ball bearing track for evidence of indentations or scaling.
17. Examine the worm shaft for similar markings. Slight indentations at the extreme end of the shaft can be disregarded as this is a normal wear condition, but if indentations have spread to the middle of the shaft, a replacement must be fitted.

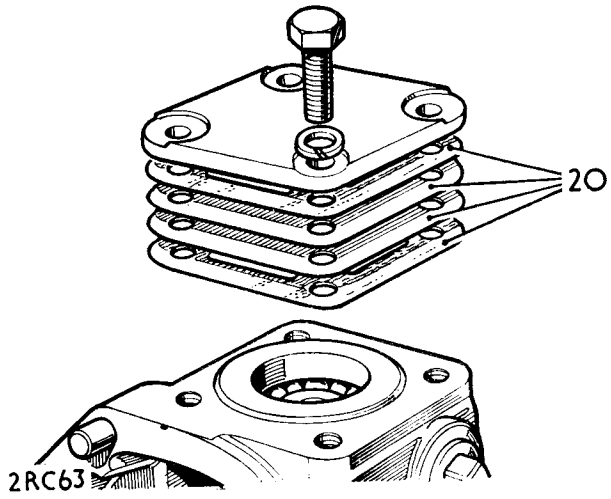
Reassembling (refer also to 'NOTE', item 15)

18. Reverse 12 to 14, using a press as required.
19. Reverse 2 to 11, using general purpose grease to retain the ball bearings and to coat the joint washers. Coat all cover plate fixing bolt threads with 'Well-seal' or a suitable equivalent sealing compound and tighten to 2,3 to 2,8 kgf m (17 to 20 lbf ft).
20. Check for end-float on the inner steering column. Adjust the shim washer thickness between the end cover and the steering box to obtain a 'free-to-rotate-but-no-end-float' condition on the inner column.

continued







21. Set the steering in the straight ahead position (mid-way lock-to-lock).
22. Screw the steering box adjuster by hand until there is just no end-float between the adjuster and the rocker shaft.
23. Tighten the adjuster locknut ensuring that the adjuster does not move.
24. Fill the steering box with the correct grade of lubricating oil.
25. Reverse 1.

DATA

Inner column end-float	Column to be free to rotate with no end-float
Outer column overall dimension	Early, shorter column measuring 584,9 mm ± 0,38 mm (22.99 in ± 0.015 in) used with 2,8 mm (0.155 in) thick spacer. Later, longer column measuring 587,73 mm ± 0,38 mm (23.139 ± 0.015 in) no spacer required.

STEERING RELAY

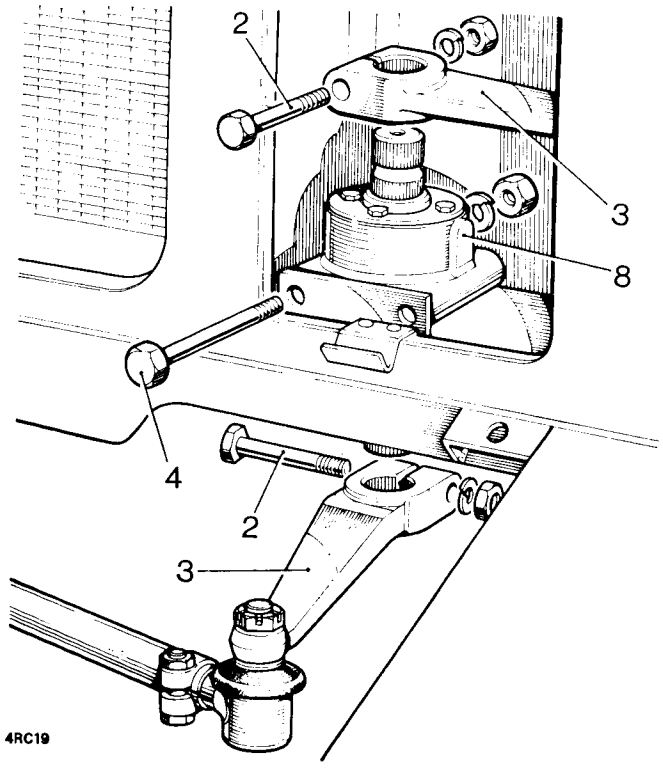
—Remove and refit **14.6**

Removing

1. Remove the name plate and withdraw the radiator grille.
2. Remove the fixings securing the upper and lower relay levers to the relay unit.
3. Prise the levers clear, avoiding damage to the oil seals.
4. Remove the fixings between the relay housing and the chassis top face.
5. Remove the relay mounting flange plate from the underside of the chassis.

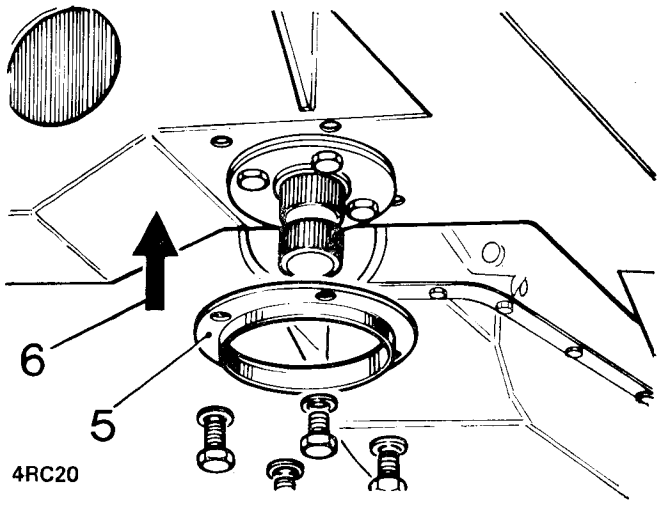
   NOTE: Before attempting to remove the relay unit, remove any equipment that is mounted directly above and would obstruct relay unit removal.

6. Using a brass drift and mallet, drive the relay unit upward to free it from the chassis. If necessary, use penetrating oil between the unit and the chassis.



Refitting

7. Before fitting the relay unit, ensure that it is filled with oil.
8. Reverse 4 to 6, fitting the relay unit to the chassis with the filler plug boss towards the driver's side of the vehicle. The relay unit must be a drive fit in the chassis.
9. Reverse 2 and 3, tighten the relay levers pinch bolts to 7,6 kgf m (55 lbf ft). The angular relationship between the upper and lower relay levers must be within 81° to 90° when fitted.
10. Reverse 1.



DATA

Angular relationship between relay levers	81° to 90° when fitted

STEERING RELAY

—Overhaul **14.7**

Service tool: 600536, spring compressor

Dismantling

1. Remove the steering relay. 14.6.
2. Remove two of the fixing bolts from the relay top cover, invert the relay and allow the oil to drain.
3. Remove the bottom oil seal retainer complete with seal and joint washer.

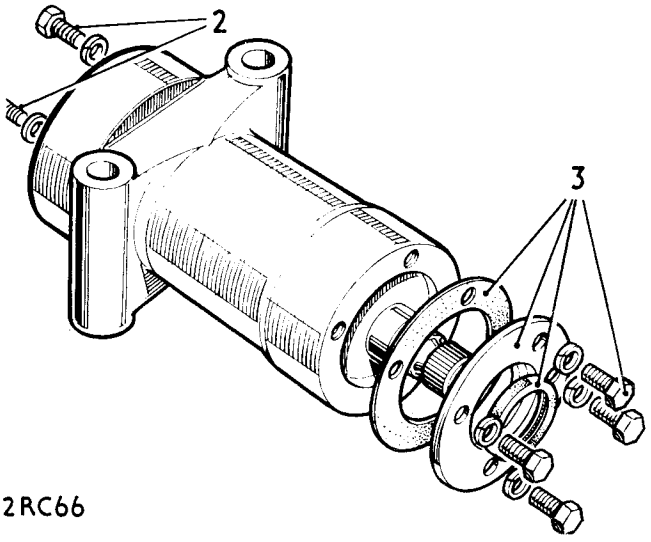
   WARNING: During the following procedure use extreme care, the relay housing contains a large compressed spring which is automatically released during dismantling.

4. Cover the bottom end of the shaft, using a suitable cover, secured as illustrated.
5. Using a mallet, tap out the shaft, thrust washer, spring, fibre bush and plain washer into the cover.
6. Remove the cover and lift out the relay shaft and fittings.
7. Remove the top oil seal retainer complete with seal and joint washer.

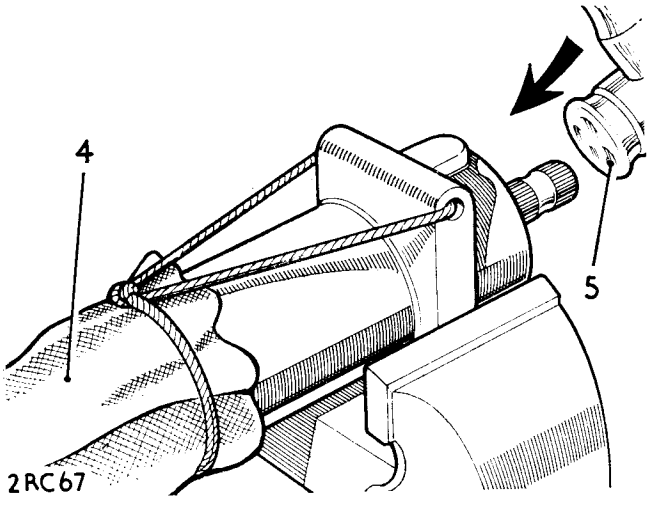
Inspecting

8. Examine all components for obvious signs of wear or damage and fit replacements as required.
9. Check the relay shaft at the diameters which form the tracks for the oil seals. Any damage or score marks would cause failure of the oil seals, and a replacement shaft must be fitted.
10. The free length of the spring should be 184 mm (7.250 in).

continued



2RC66

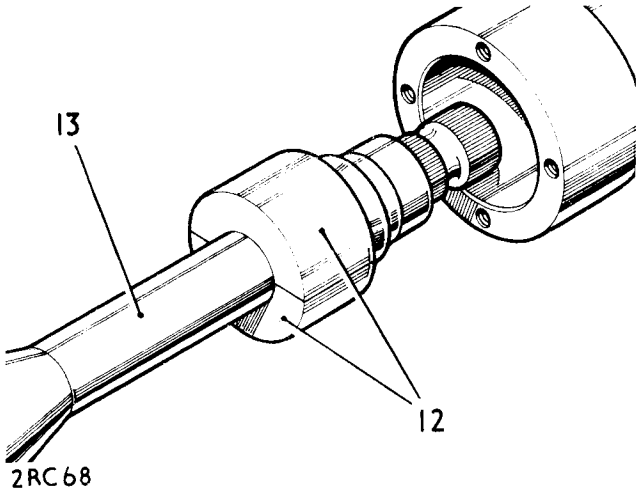


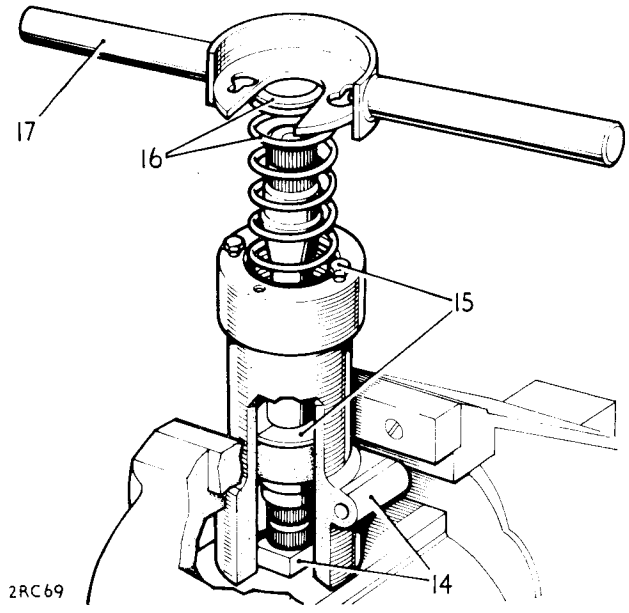
2RC67

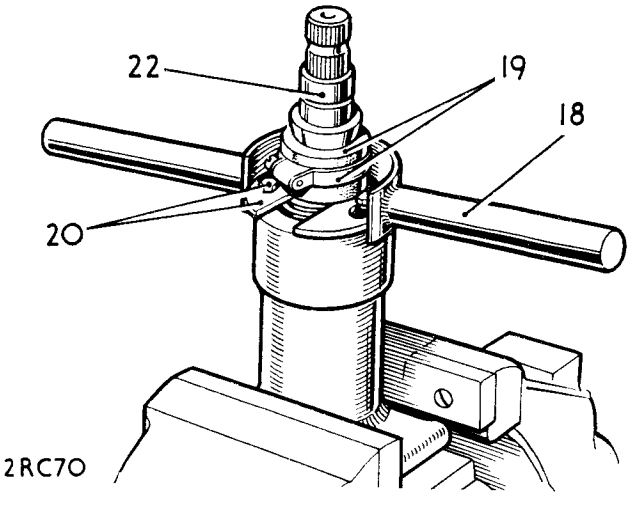
Reassembling

11. If removed, fit the oil seals, lipped side inward, to their retainers, using jointing compound on the outside diameter of the seals.
12. Locate two halves of the split bush on the top cone of the shaft.
13. Insert the assembly of shaft and bush into the housing from the bottom.
14. Secure the housing and shaft assembly, bottom end uppermost, in a vice with a 19 mm (0.750 in) support block under the bottom end of the shaft.
15. Insert washer for spring into housing and fit two of the oil seal retainer fixing bolts into the housing diametrically opposite each other.
16. Fit the spring and washer.
17. Using service tool 600536, carefully compress the spring.
18. Turn the tool to lock in position with the keyhole slots under the heads of the bolts.
19. Locate the other split bush in position on the bottom cone of the shaft and secure with a 50 mm (2 in) hose clip.
20. Remove the service tool and the seal retainer fixing bolts.
21. Remove the assembly from the vice, gently tap shaft into position until the split bush has entered the housing for at least half its length.

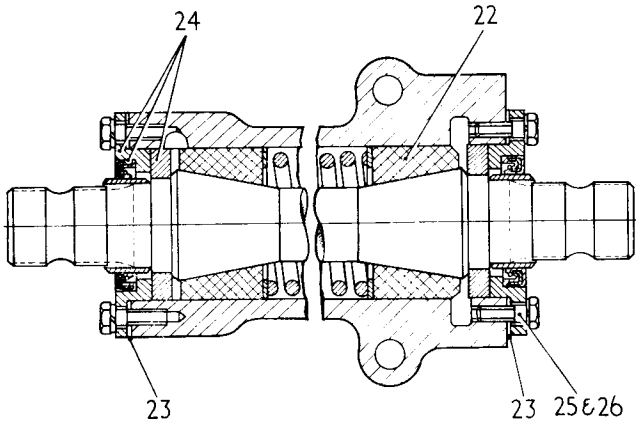
continued



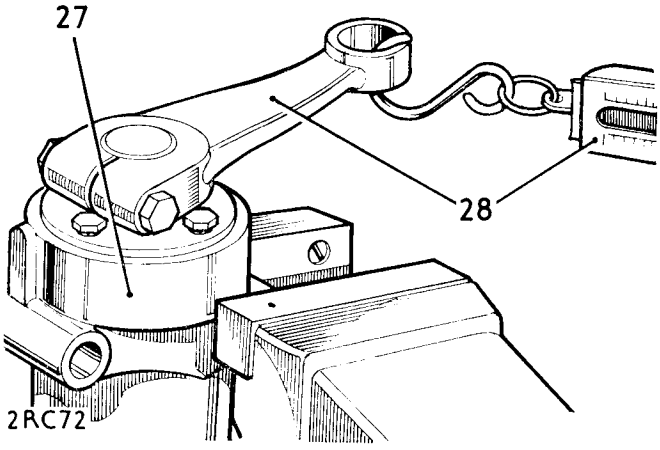




22. Remove the hose clip and continue to tap the shaft into the housing until the bushes are correctly located in the housing.
23. Smear general purpose grease on both sides of the joint washers and fit one to each end of the housing.
24. Fit the thrust washer and oil seal retainer, complete with seal, to bottom end of the housing only. Use 'Wellseal' or suitable equivalent sealing compound on the threads of the bolt fitted to the breather hole.
25. Fill the housing with the correct grade oil, see Division 10 for the correct procedure.
26. Fit the thrust washer and oil seal retainer, complete with seal to the top of the housing, using sealing compound on the threads of the four securing bolts.
27. Hold the relay unit in a vice.
28. Temporarily attach the **upper** relay lever and use a suitable spring balance to check resistance to rotation of the relay shaft. The resistance, measured on the spring balance, must not be less than 5,4 kg (12 lb) and should not exceed 7,3 kg (16 lb).
    If the resistance is less than 5,4 kg (12 lb), fit a new replacement spring.
    If the resistance is excessive, remove the oil seal retainers and thrust washers, then use a suitable piece of tube to push each split bush in turn, clear of its cone and inject lubricating oil. Reassemble and recheck.
29. Reverse 1.



2RC71



2RC72

DATA

Relay spring free length	184 mm (7.250 in)
Resistance to rotation, relay shaft	5,4 kg to 7,3 kg (12 lb to 16 lb) measured using a spring balance

TRACK ROD BALL JOINTS

—Remove and refit, items 6 to 9 **14.8**

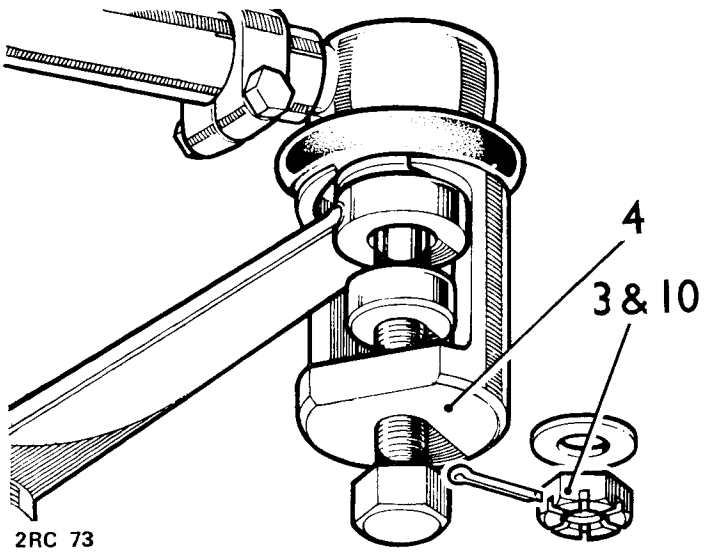
TRACK ROD

—Remove and refit, items 1 to 5 and 10 to 14 **14.9**

Service tool: 601763, Ball joint extractor

Removing, track rod

1. Jack up the vehicle front end and support on stands.
2. Remove the front road wheels.
3. Remove the fixings from both ball joints.
4. Extract the ball joints, using 601763.
5. Withdraw the track rod and ball joints.

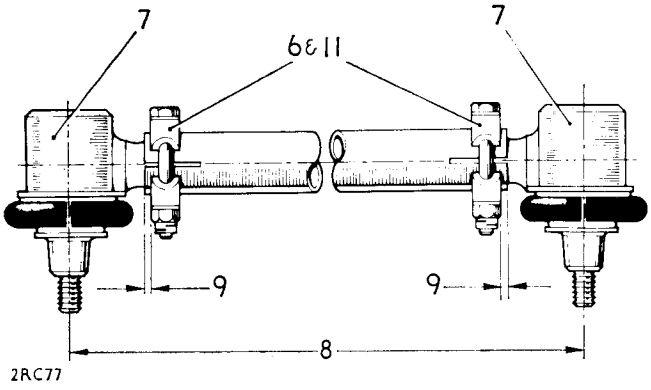


Removing, ball joints

6. Slacken the ball joints clamp fixings.
7. Unscrew the ball joints, LH and RH thread.

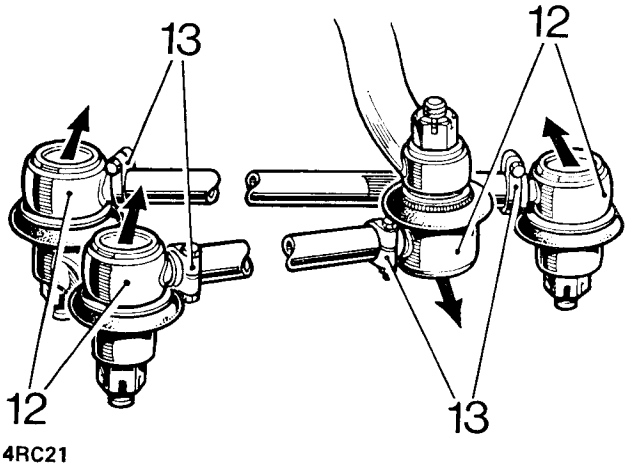
Refitting, ball joints

8. Screw in the ball joints equally until the overall dimension between the ball joint centres is 1030,3 to 1033,4 mm (45.56 to 45.68 in).
9. Position the ball joint clamps 1,58 to 3,17 mm (0.062 to 0.125 in) from the track rod ends with the clamp jaws situated over the slot in the tube; do not tighten the fixings at this stage.



Refitting, track rod

10. Reverse 3 to 5. Torque for ball joint fixings 4,0 kgf m (30 lbf ft).
11. Check and if necessary adjust the wheel alignment, 57.65.01, leaving the clamp fixings slackened.
12. Lightly tap the ball joint cups in the directions illustrated to the maximum of their travel to ensure full, unrestricted movement of the track rod.
13. Tighten the ball joint clamps. Torque load 1,1 to 1,5 kgf m (8.5 to 10.5 lbf ft).
14. Reverse 1 and 2.



DATA

Initial setting dimension for track rod and ball joints	1030,3 mm to 1033,4 mm (45.56 in to 45.68 in) measured between ball joint centres
Position of ball joint clamps	1,58 mm to 3,17 mm (0.062 in to 0.125 in) from track rod ends

LONGITUDINAL STEERING TUBE BALL JOINTS

—Remove and refit, items 9 to 12 **14.10**

LONGITUDINAL STEERING TUBE

—Remove and refit, items 1 to 8 and 13 to 19 **14.11**

Service tool: 601763, Ball joint extractor

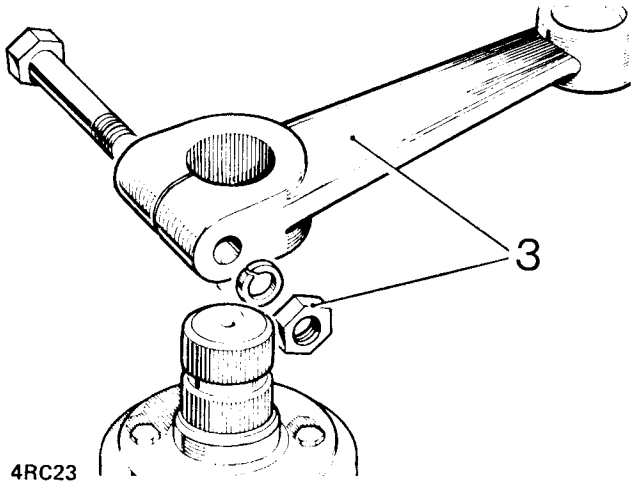
Removing

1. Remove the bonnet panel.
2. Remove the name plate and withdraw the radiator grille.
3. Remove the fixings securing the upper relay lever to the relay unit and prise the lever clear.
4. Remove the fixings from the ball joint connecting the longitudinal arm to the steering box drop arm.
5. Using service tool 601763 extract the ball joint from the steering box drop arm.

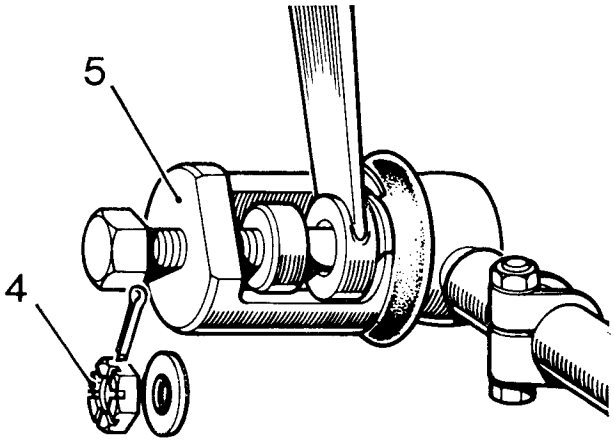
   NOTE: It may be necessary to remove the exhaust manifold to provide access for the ball joint extractor.

6. Manoeuvre the end of the upper relay lever through the aperture in the grille panel, then moving the steering box drop arm fully forward, carefully withdraw the upper relay lever and longitudinal arm assembly.
7. Remove the fixings and extract the ball joint from the upper relay lever, using 601763.

continued



4RC23



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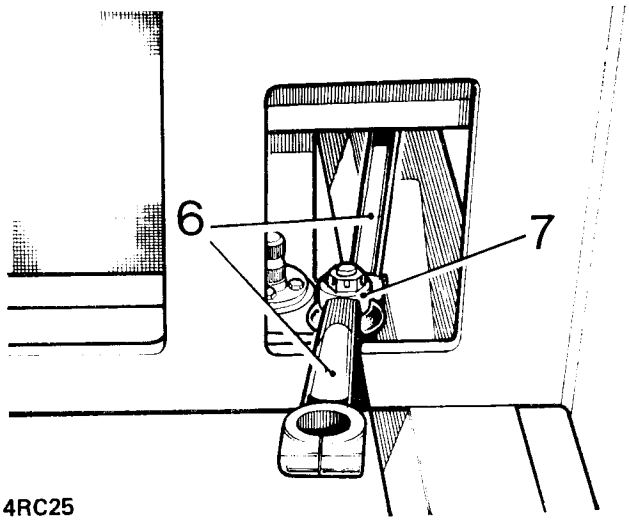


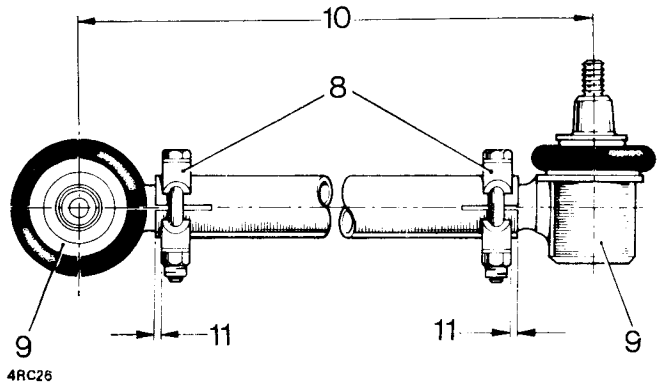
4RC25

Removing ball joints

8. Slacken the ball joint clamp fixings.
9. Unscrew the ball joints, LH and RH thread.

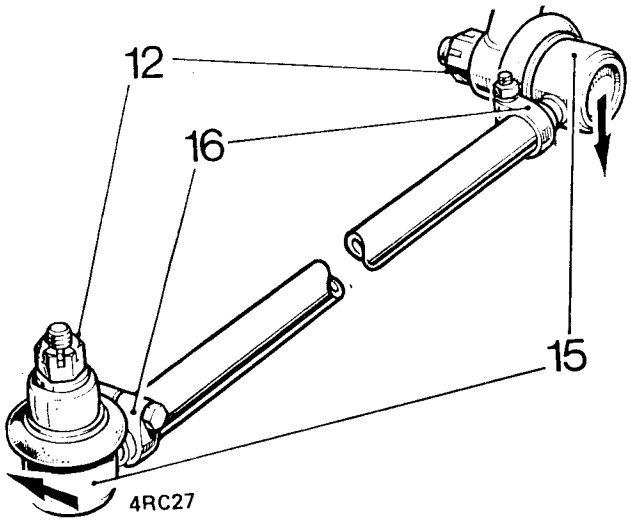
Refitting ball joints

10. Screw in the ball joints equally until the overall dimension between ball joint centres is 621,4 to 624,6 mm (24.46 to 24.59 in).
11. Position the clamps 1,58 to 3,17 mm (0.062 to 0.125 in) from the longitudinal tube ends with the clamp jaws situated over the slot in the tube; do not tighten the clamp fixings at this stage.



Refitting the longitudinal tube

12. Reverse 4 to 7. Torque load for ball joint fixings is 4,0 kgf m (30 lbf ft).
13. Place the front wheels in the straight ahead position and the steering wheel in the intermediate position, then connect the upper relay lever to the relay unit, the longitudinal arm may require adjusting slightly to align the splines of the relay lever and unit.
14. Tighten the lever pinch bolt. Torque 7,6 kgf m (55 lbf ft).
15. Using a mallet, lightly tap the ball joint cups in the direction indicated to the maximum of their travel, to ensure full unrestricted movement of the longitudinal arm.
16. Secure both ball joint clamps. Torque load 1,1 to 1,5 kgf m (8.5 to 10.5 lbf ft).
17. Check the steering lock stops setting. 14.18.
18. Check the steering, lock-to-lock, for correct functioning. If necessary, adjust the overall length of the longitudinal arm by slackening the ball joint clamps and screwing the arm in or out, as required, then resecure the clamps.
19. Reverse 1 and 2.



DATA

Initial setting dimension for longitudinal tube and ball joints	621,4 mm to 624,6 mm (24.46 in to 24.59 in) measured between ball joint centres
Position of ball joint clamps	1,58 mm to 3,17 mm (0.062 in to 0.125 in) from tube ends

DRAG LINK BALL JOINTS

—Remove and refit, items 6 to 9 **14.12**

DRAG LINK

—Remove and refit, items 1 to 5 and 10 to 13 **14.13**

Service tool: 601763, Ball joint extractor

Removing, drag link

1. Jack up the vehicle front end.
2. Remove the front road wheel from the side where the drag link is connected to the swivel pin steering lever.
3. Remove both of the ball joints fixings.
4. Extract the ball joints, using 601763.
5. Withdraw the drag link and ball joints.

Ball joints, removing

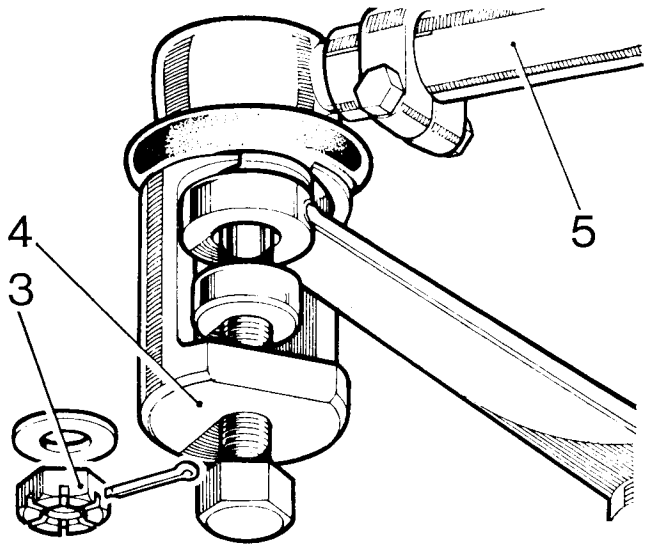
6. Slacken the clamp fixings.
7. Unscrew the ball joints, LH and RH thread.

Ball joints, refitting

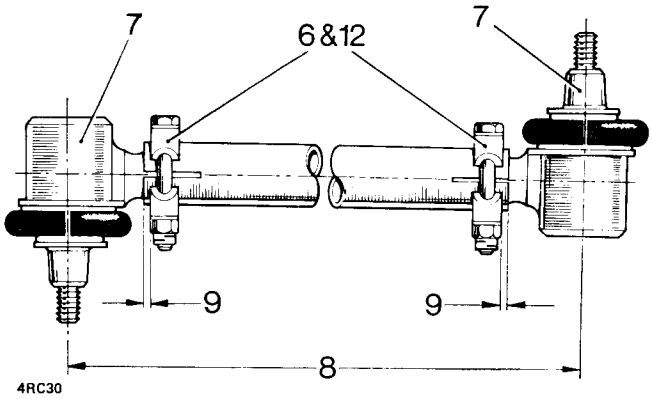
8. Screw in the ball joints equally until the overall dimension between ball joint centres is 782,62 to 785,79 mm (30.812 to 30.937 in).
9. Position the clamps 1,58 to 3,17 mm (0.062 to 0.125 in) from the drag link ends with the clamp jaws situated over the slot in the tube; the relay lever ball joint is in the pendant position when fitted. Do not tighten the clamp fixings at this stage.

Refitting, drag link

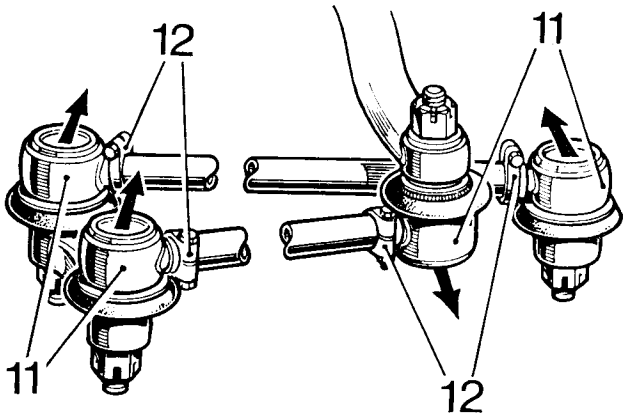
10. Reverse 3 to 5. Torque for ball joint fixings 4,0 kgf m (30 lbf ft).
11. If the clamps were previously slackened, lightly tap the ball joint cups in the direction indicated to the maximum of their travel, to ensure full unrestricted movement of the drag link using a mallet.
12. Tighten the ball joint clamps. Torque load 1,1 to 1,5 kgf m (8.5 to 10.5 lbf ft).
13. Reverse 1 and 2.



4RC29



4RC30



4RC31

DATA

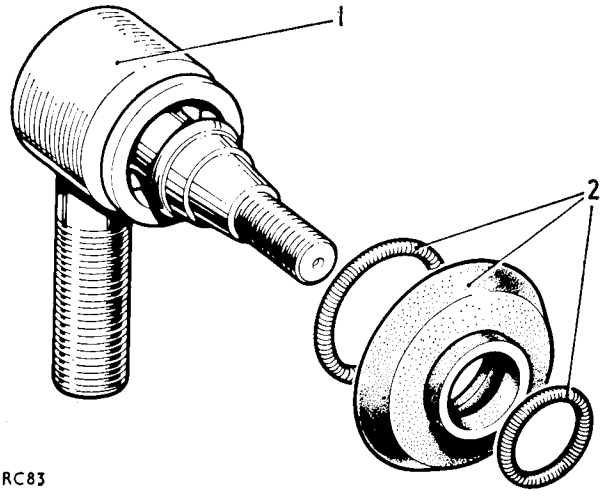
Initial setting dimension for drag link and ball joints	782,62 mm to 785,79 mm (30.812 in to 30.937 in) measured between ball joint centres
Position of ball joint clamps	1,58 mm to 3,17 mm (0.062 in to 0.125 in) from draglinks ends

STEERING BALL JOINTS

—Clean, inspect and regrease **14.14**

General

The steering ball joints have been designed in such a way as to retain the initial filling of grease for the normal life of the ball joint; however, this applies only if the rubber boot remains in position on the joint. The rubber boots should be checked at the maintenance intervals to ensure that they have not become dislodged or the joint damaged. Should any of the rubber boots be dislodged, proceed as follows:



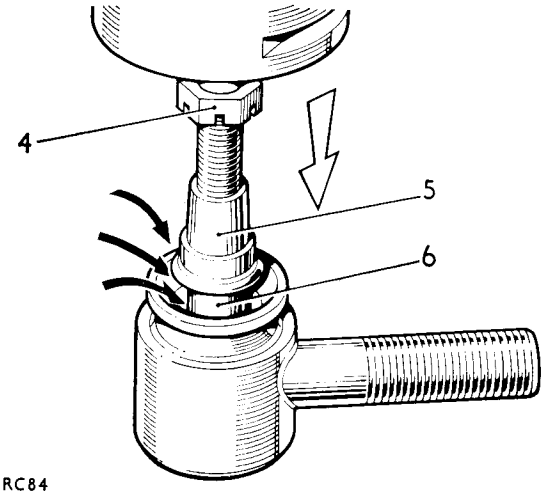
2RC83

Procedure

1. Remove the ball joints from the longitudinal arm, track rod and drag link, as required. 14.10, 14.8, 14.12.

   NOTE: If only one ball joint requires attention, it is only necessary to disconnect the applicable end of the steering arm.

2. Remove the rubber cover and spring rings.
3. Thoroughly clean all parts.
4. Place the castle nut upside down on the pin and screw on a few threads.
5. Place the ball joint under a press or between the jaws of a vice and carefully force the pin and ball down against the spring. In this position the interior of the ball joint can be cleaned and lubricated.
6. Apply grease around the taper, and fill the replacement rubber boot.
7. Reassemble, using replacement spring rings.
8. Reverse 1.
9. If necessary, check and adjust the wheel alignment. 14.16.



2RC84

STEERING WHEEL

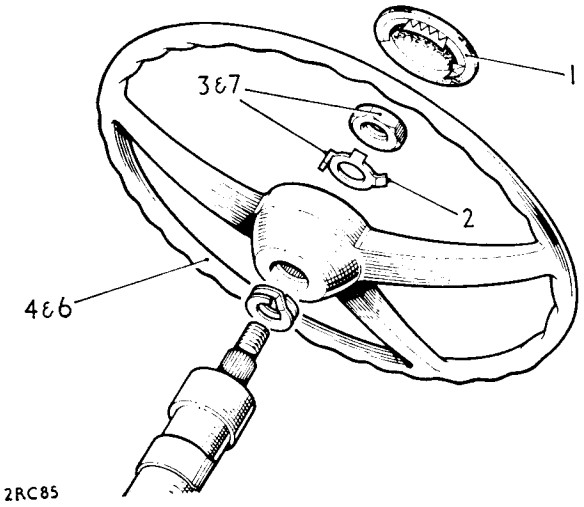
—Remove and refit **14.15**

Removing

1. Prise off the wheel centre cover.
2. Release the locking tab.
3. Remove the tab washer and fixing nut
4. Withdraw the steering wheel.

Refitting

5. Position the road wheels in the straight ahead position.
6. Fit the steering wheel with the centre spoke pointing downwards.
7. Reverse 1 to 3. Torque load for steering wheel securing nut is 5,4 kgf m (40 lbf ft).



FRONT WHEEL ALIGNMENT

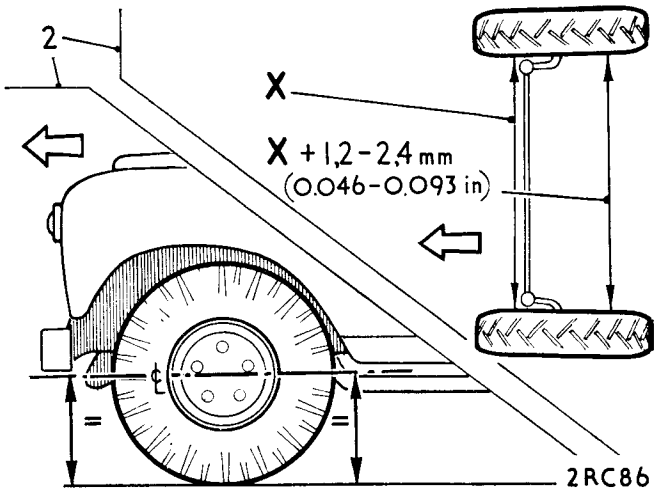
—Check and adjust **14.16**

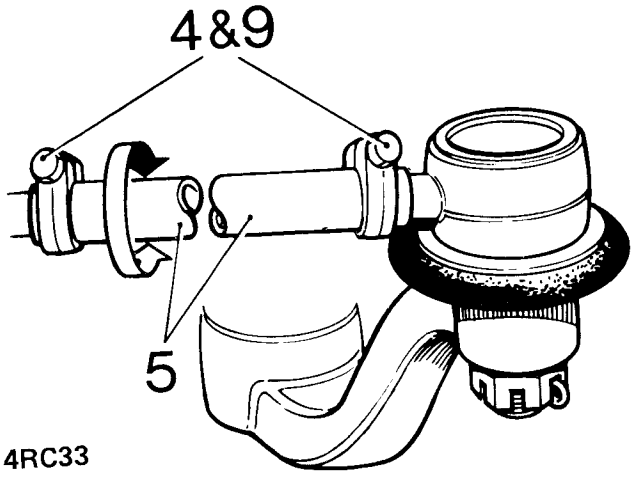
Checking

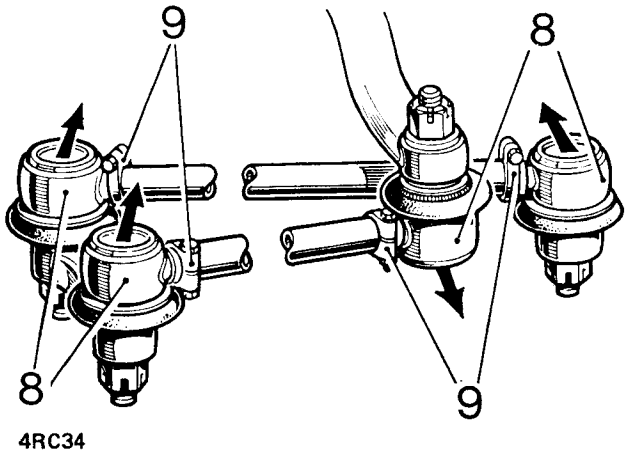
1. Set the vehicle on level ground with the road wheels in the straight ahead position, and push it forward a short distance.
2. Measure the toe-in with the aid of a tracking stick or suitable proprietary equipment; it should be 1,2 mm to 2,4 mm (0.046 to 0.093 in) measured at the horizontal centre-line of the road wheels.
3. If necessary, adjust the toe-in as follows:

Adjusting

4. Slacken the clamps securing the ball joints at each end of the track rod.
5. Turn the track rod to decrease or increase its effective length as necessary, until the toe-in is correct.
6. Push the vehicle rearwards turning the steering wheel from side to side to settle the ball joints. Then, with the road wheels in the straight ahead position, push the vehicle forward a short distance.
7. Recheck the toe-in. If necessary carry out further adjustment.
8. When the toe-in is correct, lightly tap the track rod ball joints in the direction indicated to the maximum of their travel, to ensure full unrestricted movement of the track rod.
9. Secure the ball joint clamps. Torque load 1,1 to 1,5 kgf m (8.5 to 10.5 lbf ft).







DATA

Front wheel toe-in	1,2 to 2,4 mm (0.046 to 0.093 in) measured at the horizontal centre line of the road wheels.

STEERING GEOMETRY

—Check 14.17

General

No adjustment is provided for castor, camber or swivel pin inclination; 14.16 refers for wheel alignment setting.

DATA—vehicle in static unladen condition with coolant, oils and 22,7 litres (5 gallons UK) of fuel; tyres at recommended pressures.

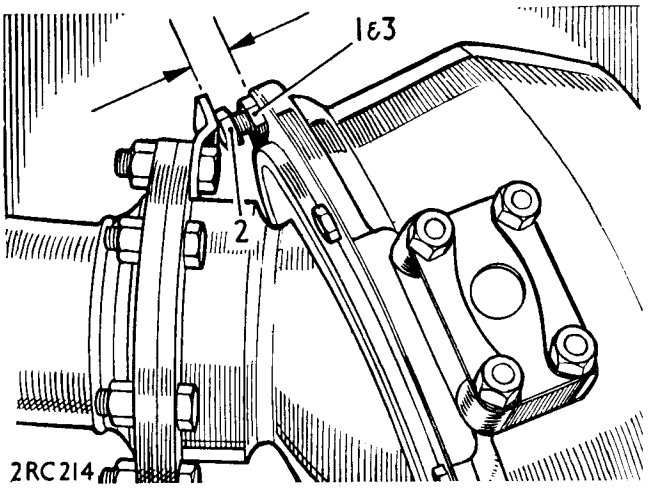
Wheel castor angle	3°
Wheel camber angle	1° 30′
Swivel pin inclination	7°
Front wheel toe-in	1,2 mm to 2,4 mm (0.046 in to 0.093 in)

LOCK STOPS

—Check and adjust 14.18

Procedure

1. Slacken the locknuts.
2. Adjust the stop bolts to obtain 12,5 mm (0.500 in) between the bolt head top face and the oil seal retainer face.
3. Tighten the locknuts.
4. Check the steering at full lock and ensure clearance between the tyres and chassis components.



DATA

Lock stop setting	12,5 mm (0.500 in) from bolt top face to oil seal retainer

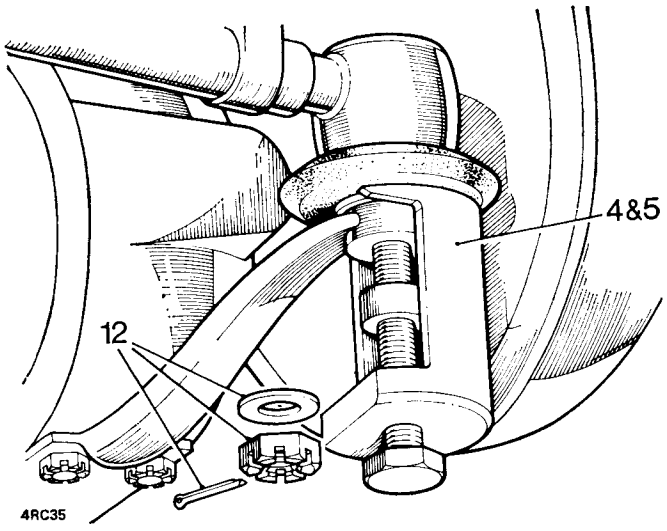
SWIVEL PIN HOUSING ASSEMBLY

—Remove and refit **14.19**

Service tool: 601763 Ball joint extractor

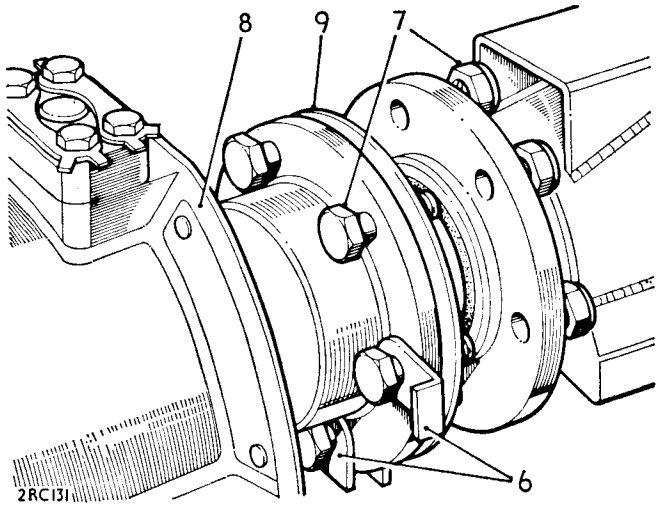
Removing

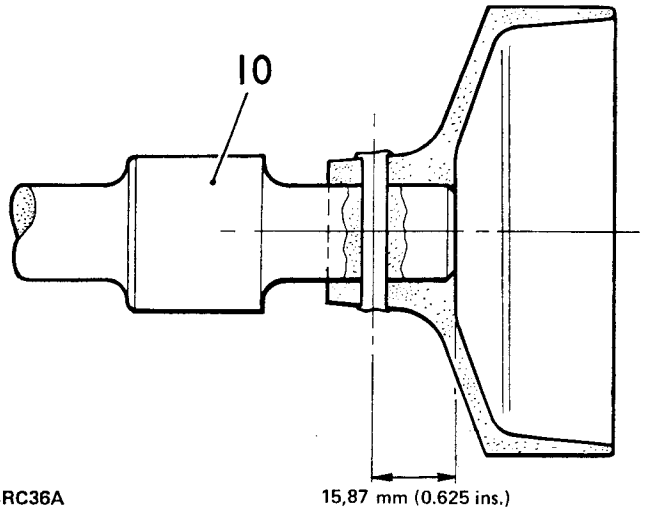
1. Remove the front hub assembly. 10.2.
2. Remove the hub stub axle. 10.5.
3. Withdraw the driven shaft and oil distributor assembly.
4. Disconnect the track rod at the ball joint, using 601763.
5. If required, disconnect the drag link at the ball joint, using 601763.
6. Note the fitted position of the steering lock stop plate and, on the RH side only, the jack location stop plate.
7. Remove the fixings, swivel pin housing to axle case.
8. Withdraw the swivel pin housing.
9. Withdraw the joint washer.



Refitting

10. If a new driven shaft is being fitted, assemble the oil distributor to the shaft then drill and fit a $\frac{3}{16}$ inch diameter mills pin to the dimension illustrated. Peen over both ends of the mills pin after fitting.
11. Reverse 6 and 7.
12. Reverse 4 and 5. Torque load 4,0 kgf.m (30 lbf.ft).
13. Reverse 1 to 3.





SWIVEL PIN HOUSING ASSEMBLY

—Overhaul **14.20**

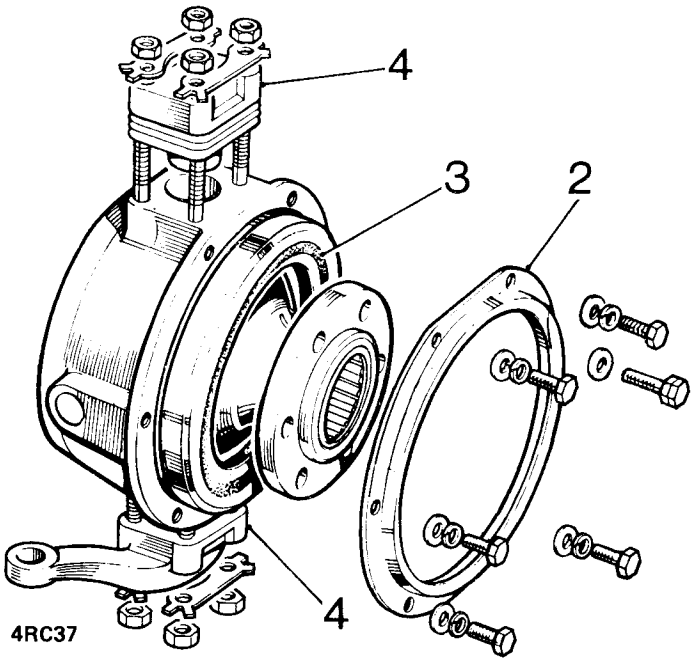
Dismantling

1. Remove the swivel pin housing assembly. 14.19.
2. Remove the oil seal retainer.
3. Prise out the bearing housing oil seal.
4. Remove the upper and lower swivels.
5. Withdraw the bearing housing and bearings.
6. Press the bush and bearings from the swivel pin bearing housing, as required.

Inspecting

7. Examine all components for obvious wear or damage.
8. The taper roller bearing must be a light push fit on the bottom swivel pin, if a new bearing is a loose fit, the swivel pin assembly must be renewed.
9. The Railko bush must be a light push fit on the top swivel pin, if a new bush is a loose fit, the swivel pin assembly must be renewed. It is important to note that these bushes and thrust washers should not be washed in any type of cleaning fluid, otherwise there is a danger that the damping characteristics of the material will be adversely affected.
10. Examine the surface of the swivel pin bearing housing for signs of corrosion or damage; replace the housing if necessary.

continued



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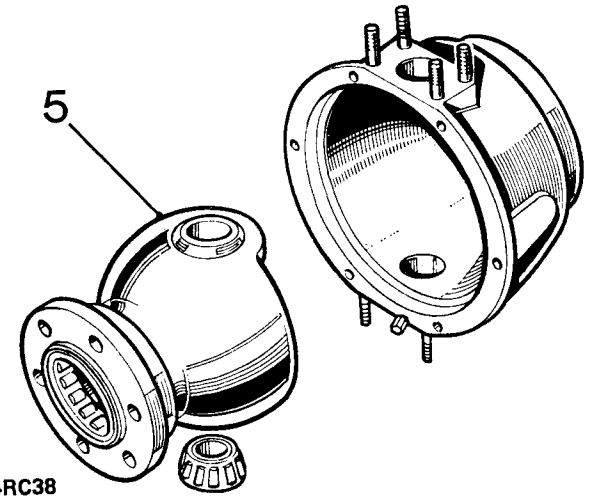

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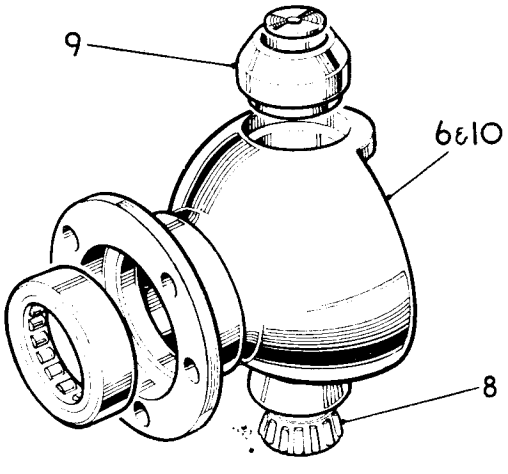

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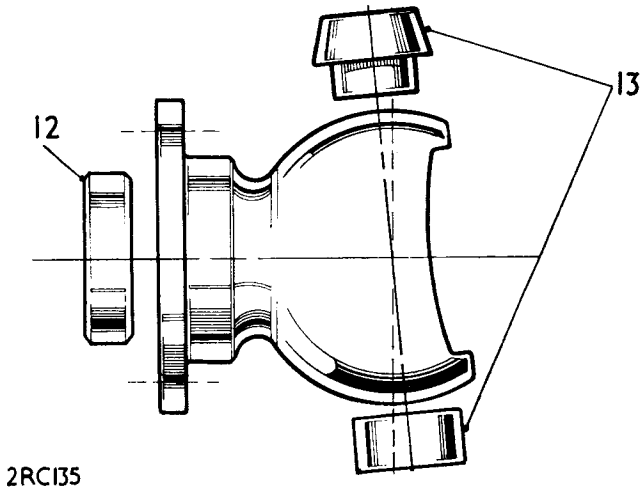
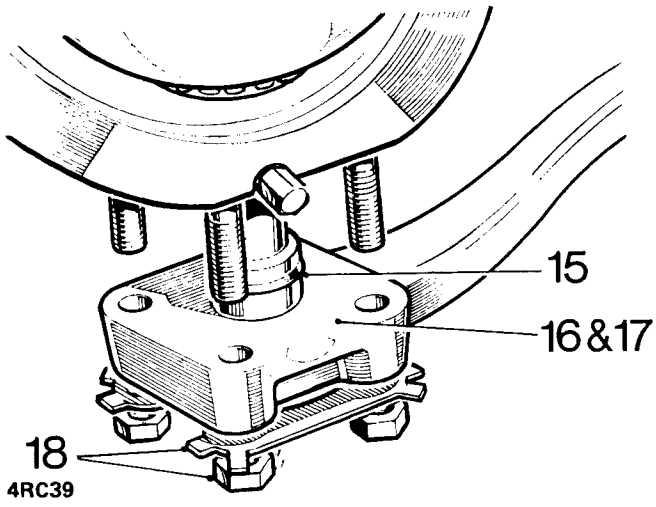
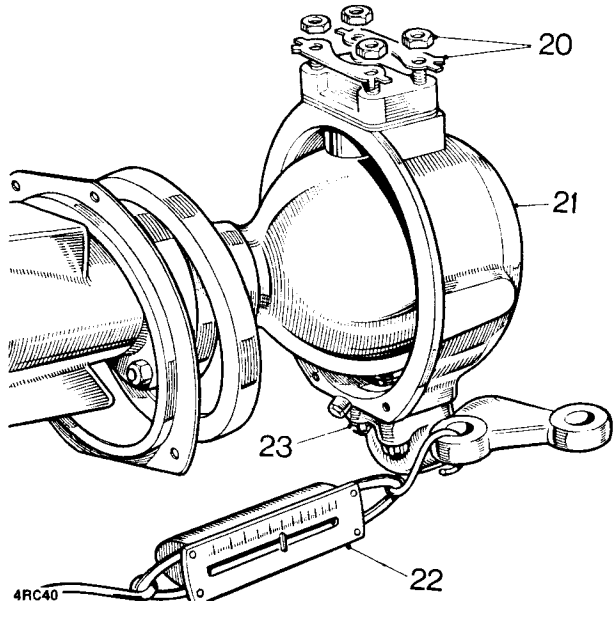
Reassembling

11. Using the same oil as recommended for the swivel pin housing, thoroughly lubricate the internal diameter of the Railko bush.
12. Press the roller bearing for the axle half shaft into the swivel pin bearing housing.
13. Press the Railko bush into the top of the bearing housing, and the taper bearing outer race, wide edge first, into the bottom of the housing. Take care to correctly identify the bush and bearing locations, noting that the top of the housing is narrower, as illustrated.
14. Place the taper roller bearing in position in the bottom of the swivel pin bearing housing, and locate the bearing housing into the swivel pin housing.
15. Fit a rubber 'O' ring to the steering lever and swivel pin assembly.
16. Smear the mating surfaces of the swivel pin and housing with jointing compound. Smear the steering lever mounting studsw ith 'Loctite Stud-Lock' compound.
17. Fit the steering lever (using new replacement nuts) ensuring that it faces forward (away from the oil filler/level plug).
18. Secure the fixings, torque load 7,0 kg fm (50 lbf ft) and engage the lock plates.
19. Fit the swivel pin and bracket assembly to the top of the swivel pin housing, fitting the shims removed during dismantling to the value of 1,0 mm (0.040 in).
20. Tighten the fixings bolts 7,0 kgf m (50 lbf ft) but do not engage the lock plates at this stage.
21. Hold the swivel pin bearing housing by clamping the flange in a vice fitted with soft jaws, or temporarily fit the swivel pin housing to the axle case.
22. Using a spring balance attached to the steering lever at the track rod connecting eye, measure the resistance to rotation of the swivel pin housing, which must be 3,6 to 4,5 kg (8 to 10 lb) after having overcome inertia. Adjust as necessary by adding or subtracting shims under the swivel pin bracket until the correct resistance figure is obtained.
23. Engage the lockplates at the swivel pin fixing nuts.

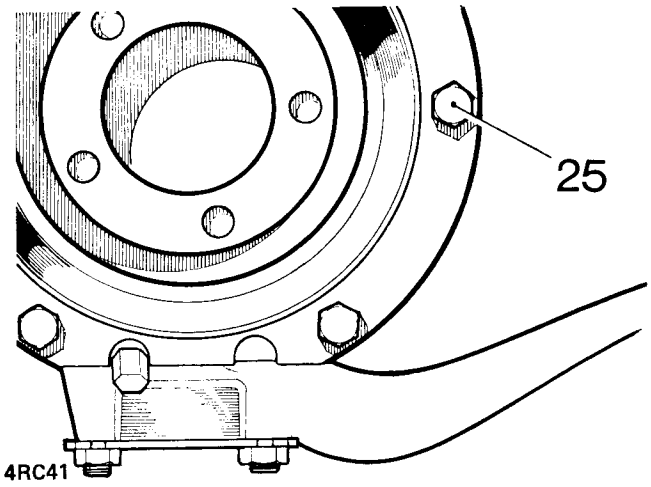
continued







24. Pack the swivel pin housing oil seal with heavy grease.
25. Fit the seal and its retainer to the swivel pin housing, locating the steering stop adjustment bolt in the forwardmost hole.
26. Check that the oil seal wipes the full surface of the bearing housing and adjust the position, if necessary, by slackening off the retainer bolts and resetting the seal.
27. Reverse 1.



DATA

Swivel pin housing resistance to rotation	3,6 to 4,5 kg (8 to 10 lb)

CHASSIS OPERATIONS

CHASSIS FRAME

—Alignment check 15.1

Procedure

With the vehicle assembled, a check for chassis 'squareness' can be made as follows, 1 to 7:

1. Place the vehicle on a level floor.
2. Hold a plumb line against one of the measuring points as illustrated. (The measuring points are the **fixed** spring shackle locations).
3. Mark the floor directly beneath the plumb-bob.
4. Repeat items 2 and 3 at the remaining measuring points.

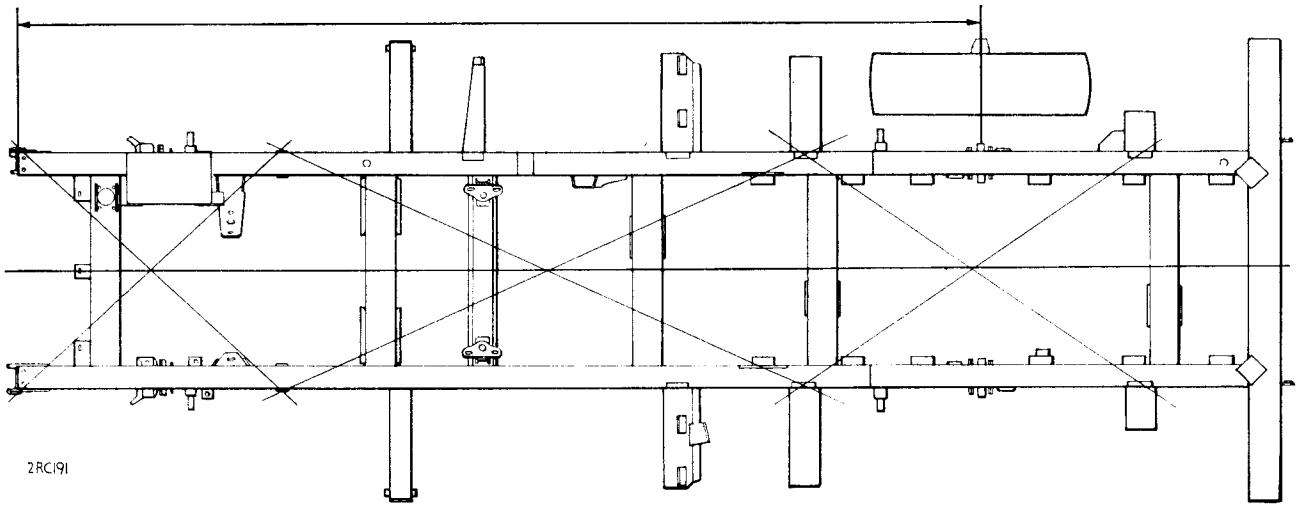
   NOTE: When measuring diagonals, ensure that exactly corresponding points are used on each side of the chassis frame.

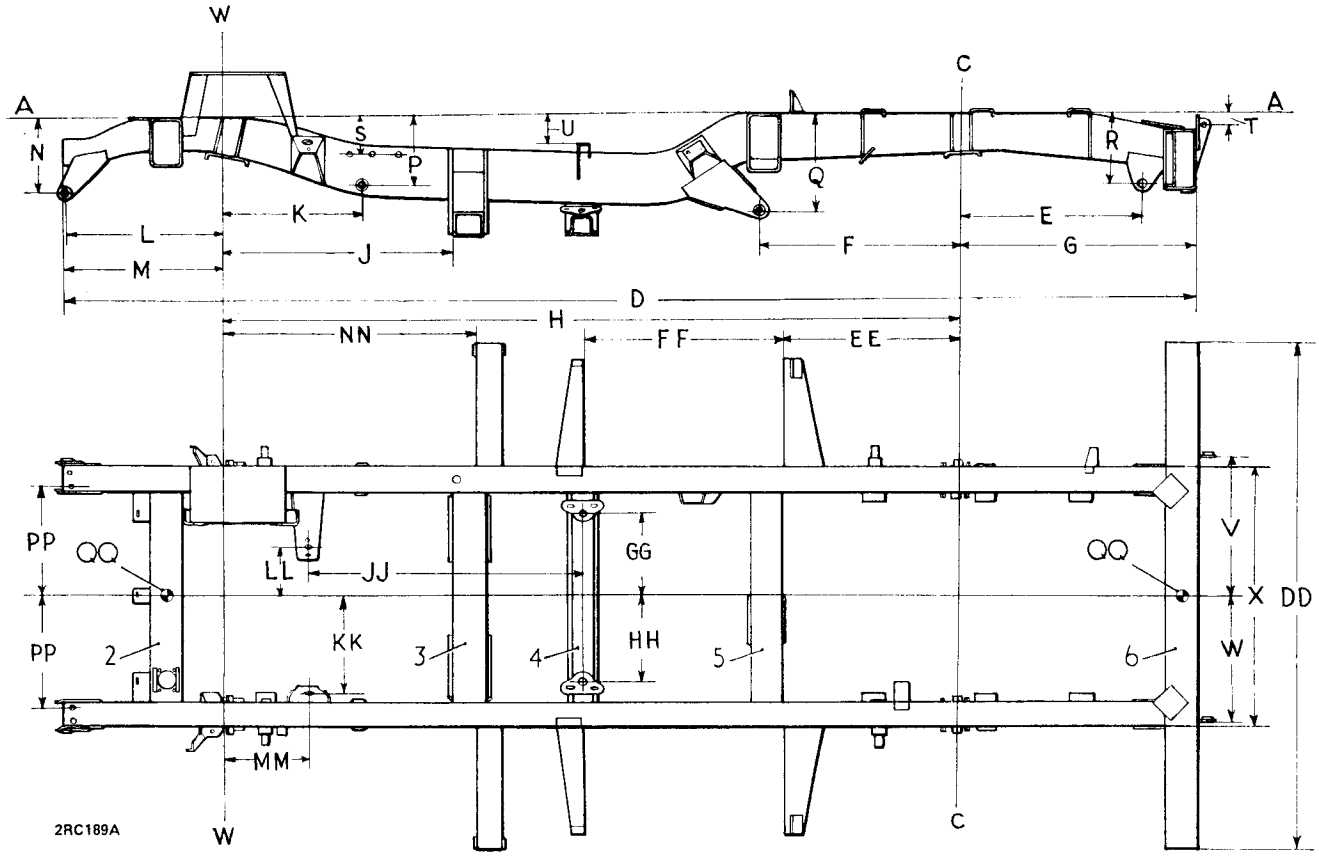
5. Move the vehicle and measure between the chalk marks.
6. The diagonals between the related measuring points should agree within 9,5 mm (0.375 in).
7. Using a suitable trammel, make comparative side-to-side checks between the front suspension front shackle pin and the rear wheel hub centre.
8. With the vehicle upper structure removed, comparative side-to-side checks for chassis frame malalignment can be made, using as datums the 9,5 mm (0.375 in) diameter holes provided in the No. 2 and also in the rearmost cross-member.

   NOTE: The vehicle front bumper is regarded as the No. 1 cross-member.

9. Chassis frame dimensional checks can be made referring to the applicable illustration and key on the following page.

continued





Chassis frame dimensions, 88 models

AA —Datum line
WW—Centre line of front axle
CC —Centre line of rear axle
D —3420 mm (134.6 in)
E —539,7 mm (21.25 in)
F —610 mm (24.0 in)
G —713,2 mm (28.08 in)
H —2235 mm (88.0 in)
J —692,1 mm (27.250 in)
K —422,3 mm (16.625 in)
L —457 mm (18.0 in)
M —472,2 mm (18.58 in)
N —229 mm (9.0 in)
P —212,7 mm (8.37 in)
Q —290,5 mm (11.44 in)
R —198,4 mm (7.81 in)
S —120,6 mm (4.75 in)
T —29,3 mm (1.15 in)
U —82,5 mm (3.25 in)
V —432 mm (17.0 in)
W —387,3 mm (15.25 in)
X —787 mm (31.0 in)
DD —1536 mm (60.5 in)
EE —536,5 mm (21.125 in)
FF —610 mm (24.0 in)
GG —257 ±0,8 mm (10.12 ±0.030 in)
HH —257,1 mm (10.125 in)
JJ —835 ±0,8 mm (32.87 ±0.030 in)
KK —289,7 mm (11.40 in)
LL —166,7 mm (6.56 in)
MM—250,8 ±1,5 mm (9.875 ±0.060 in)
NN —771,5 mm (30.375 in)
PP —331,78 ±0,5 mm (13.062 ±0.020 in)
QQ —9,52 mm (0.375 in) diameter holes

SPRING AND SHOCK ABSORBER OPERATIONS

DATA

SUSPENSION	
Type	Rigid axles, semi-elliptic springs
Springs	
Front (Driver)	
Length	920,7 mm (36.25 in)
Width	63,5 mm (2.5 in)
No. of leaves	9
Thickness	
1 at	5,15 mm (0.203 in)
8 at	4,19 mm (0.165 in)
Rate	233 kg cm (203 lb in)
Free camber	154,4 mm (6,080 in)
Front (Passenger)	
Length	920,7 mm (36.25 in)
Width	63,5 mm (2.5 in)
No. of leaves	9
Thickness	
1 at	5,15 mm (0.203 in)
8 at	4,19 mm (0.165 in)
Rate	233 kg cm (203 lb in)
Free camber	135,3 mm (5.330 in)
Rear (Driver)	
Length	1219 mm (48 in)
Width	63,5 mm (2.5 in)
No. of leaves	11
Thickness	
1 at	6,3 mm (0.250 in)
10 at	4,7 mm (0.187 in)
Rate	191 kg cm (166 lb in)
Free camber	188,4 mm (7.420 in)
Rear (Passenger)	
Length	1219 mm (48 in)
Width	63,5 mm (2.5 in)
No. of leaves	11
Thickness	
1 at	6,3 mm (0.250 in)
10 at	4,7 mm (0.187 in)
Rate	191 kg cm (166 lb in)
Free camber	171,4 mm (6.750 in)

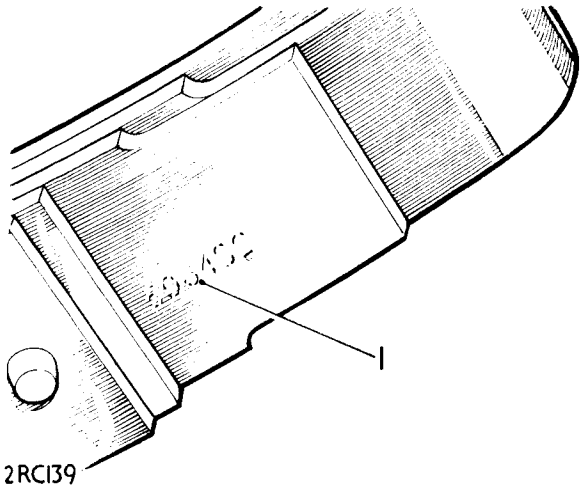
ROAD SPRING

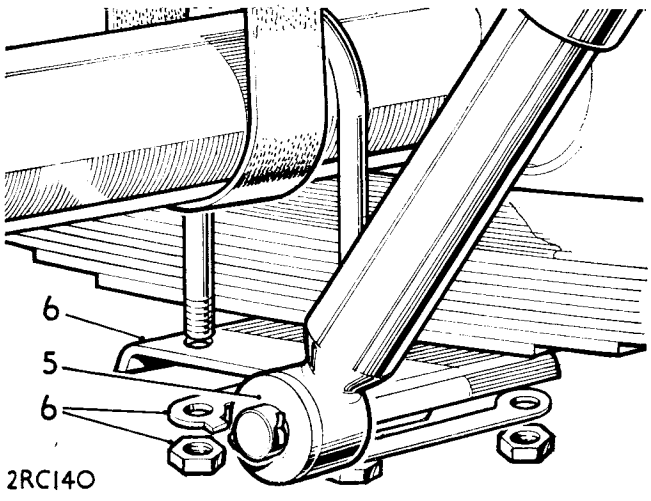
—Remove and refit **16.1**

Removing

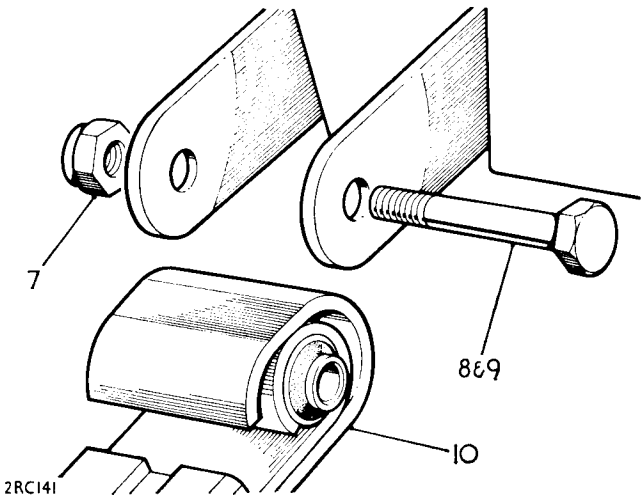
1. The driver side and passenger side road springs are not interchangeable, the free camber of the driver's side spring being greater to compensate for the extra weight (driver, etc.) carried on that side of the vehicle. Springs are identified with the part number which is marked on the top face and on the under face of one of the leaves.
2. Jack up the vehicle and support on stands.
3. Remove the road wheel.
4. Support the axle with a jack.
5. Disconnect the shock absorber at the lower fixings.
6. Remove the fixings and withdraw the spring support plate.

continued





7. Remove the self-locking nut from the shackle pin in each spring eye.
8. Remove the shackle pin from the rear end of the spring, the pin is threaded into the inner shackle plate.
9. Remove the shackle pin from the front end of the spring.
10. Remove the road spring complete.

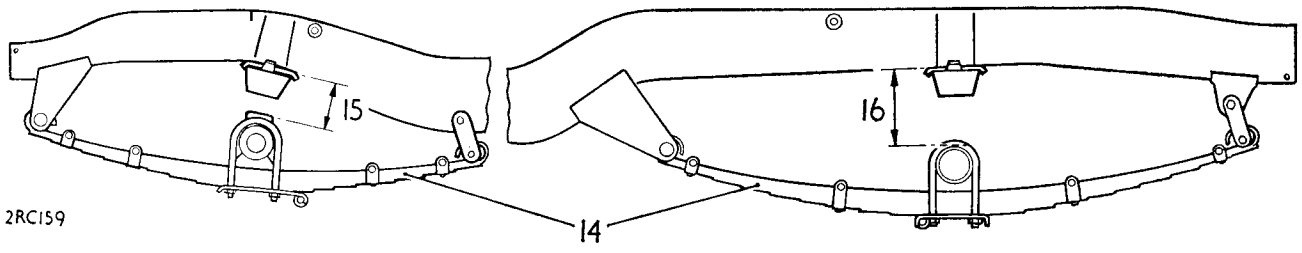


Refitting

11. Slacken the shackle pin securing the shackle plates to the chassis.
12. Reverse 6 to 10; do not tighten the shackle pins and locking nuts at this stage.

Spring setting procedure

13. In the following procedure, the spring shackles are tightened onto the shackle bushes whilst in their approximate working positions, thus minimising the torque load on the shackle bush rubbers when the vehicle weight is taken on the springs and so prolonging the bush working life.
14. Deflect the spring toward the chassis, using a suitable chain and lever, until the following dimensions (measured as illustrated) are obtained; items 15 and 16.
15. Front springs:
    89 mm (3.50 in).
16. Rear springs:
    127 mm (5.00 in).
17. With the springs held in position, tighten first the shackle pin then the locknut. Torque 9,6 kgf m (70 lbf ft).
18. Reverse 2 to 5.
19. Check the vehicle trim height. 16.4.

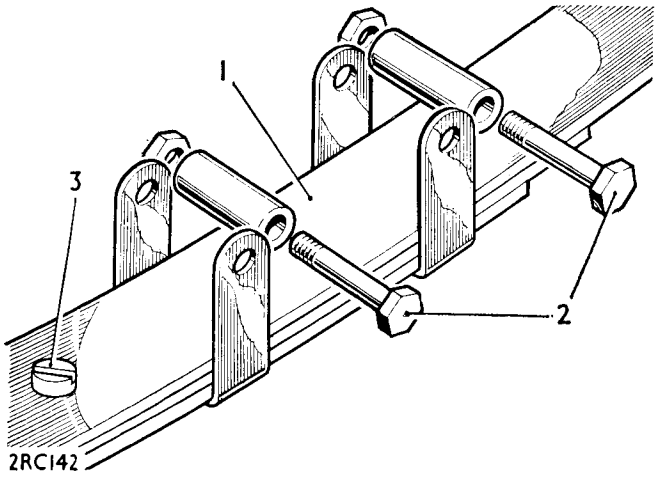


ROAD SPRING

—Overhaul **16.2**

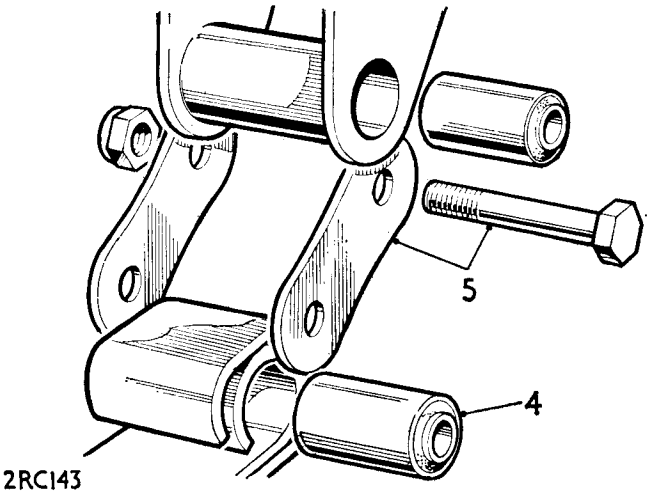
Dismantling

1. Remove the road spring. 16.1.
2. Remove the fixings from the leaf clips, which may be bolts and nuts, and/or long screws threaded into the leaf clips.
3. Remove the centre bolt and nut to release the spring leaves.
4. Press out the bushes from each end of the spring.
5. Remove the fixings and withdraw the shackle plates from the chassis frame.
6. If necessary, remove the shackle bush from the chassis frame bracket with the aid of a tubular drift or suitable extractor; if the bush disintegrates, leaving the outer casing in the chassis frame bracket, it should be carefully sawn through with a hack-saw to facilitate removal. DO NOT saw the chassis bracket.



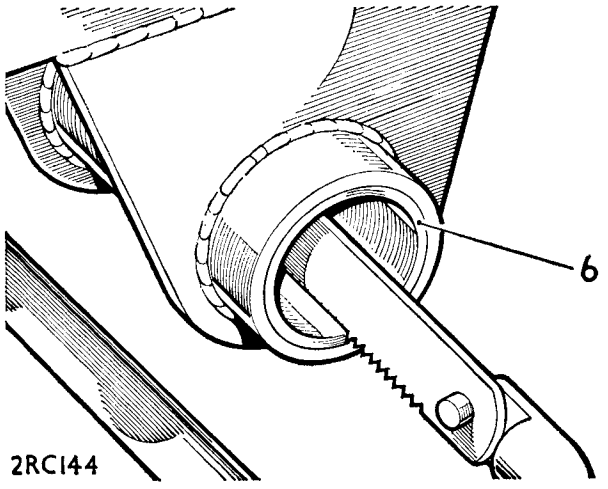
Inspecting

7. Clean the leaves and examine for cracks. Only the main and second leaves and the spring assembly complete are supplied as replacement.
8. The recambering of road springs is not advised, but if no alternative is possible, the spring should be reset, if necessary, either to a new spring or to the dimensions included in Data at the beginning of this Division.



Reassembling

9. If removed, fit the shackle bush to the chassis frame bracket. The bush must be a drive fit.
10. Grease each leaf with graphite grease and reassemble the spring by fitting the centre bolt and leaf clips; fit the spring bushes, which must be a press fit.
11. Fit the shackle plates to the chassis frame, but do not fully tighten the fixings until the spring is refitted to the vehicle.
12. Reverse 1.



SHOCK ABSORBER

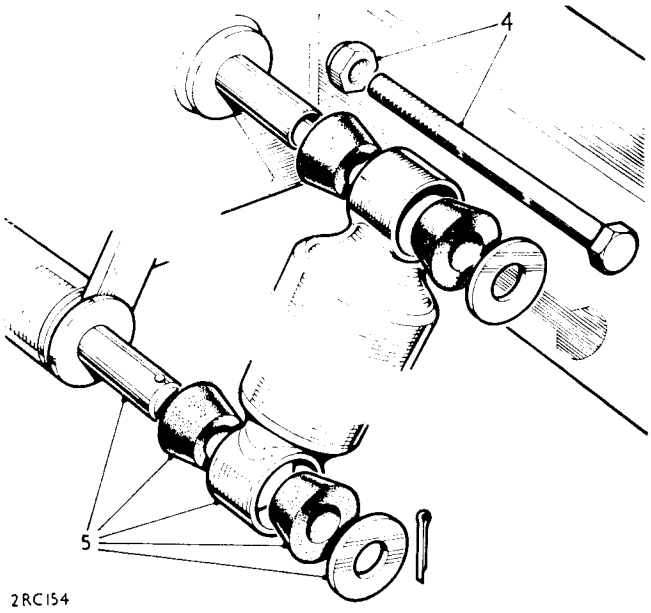
—Remove and refit **16.3**

Removing

1. Slacken the fixings at the road wheel.
2. Jack up the vehicle and support on stands.
3. Remove the road wheel.
4. Remove the shock absorber top fixings.
5. Remove the lower fixings.

Checking the shock absorber operation

6. Secure the shock absorber vertically in a vice by holding the bottom fixing between the jaws.
7. The shock absorber incorporates differential damping, having greater resistance on the extension stroke. Check the operation by extending and compressing the shock absorber, there must be a uniform resistance throughout the length of the stroke. If the resistance is erratic or weak, fit a new shock absorber.



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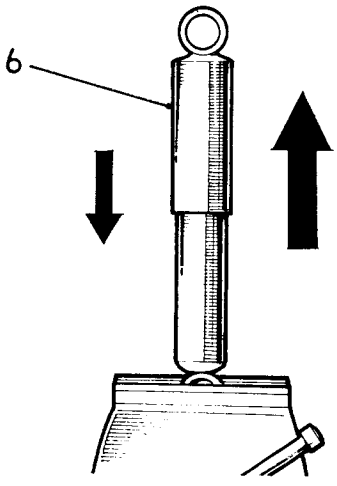
Refitting

8. Reverse 1 to 5.



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TRIM HEIGHT

—Check and adjust **16.4**

General

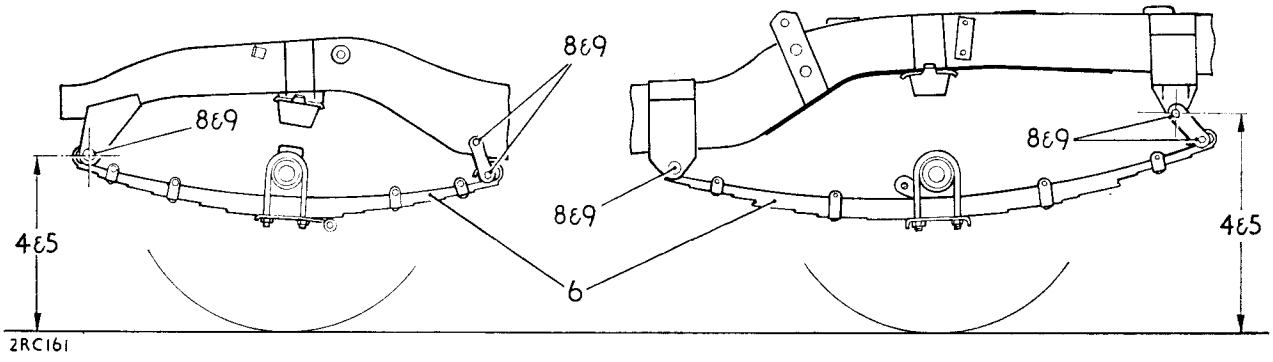
The road springs differ in spring rating according to their fitting position (see Data at the beginning of this Division) and no adjustment is provided. An incorrect replacement spring or incorrect fitting procedure can adversely affect the vehicle trim; check before replacing parts.

Checking procedure

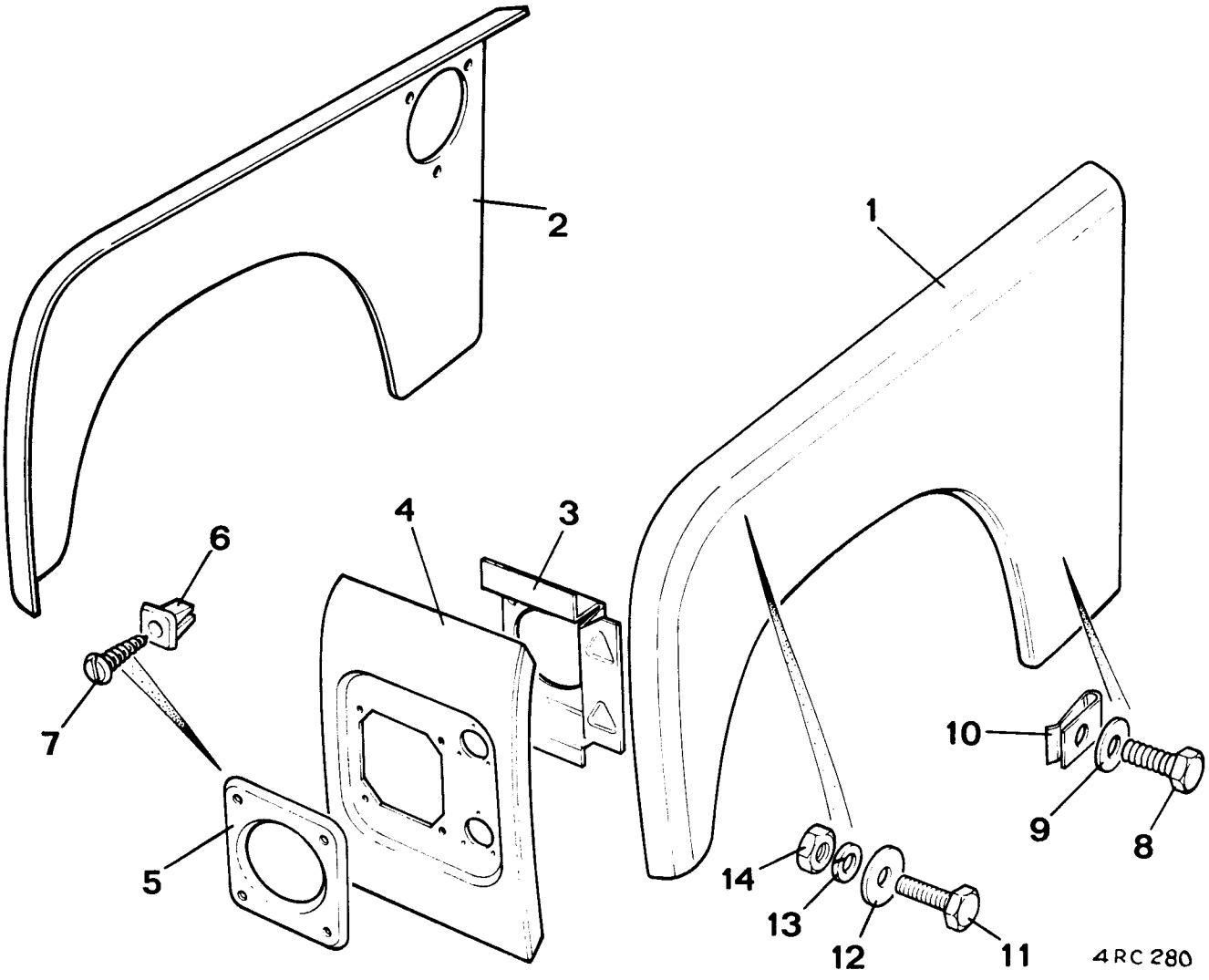
1. Position the vehicle on firm level ground.
2. Ensure that the vehicle is in the static unladen weight condition, that is with a full coolant and lubrication system and 22,5 litres (5 UK gallons) of fuel.

continued

3. Check and if necessary adjust tyres to recommended pressures.
4. Measure the distance from the ground to the shackle pin centres as illustrated on both sides of the vehicle.
5. The measurements at the front should agree within 25 mm (1.0 in), as should those at the rear.
6. Where measurements are not within limits, first check that the correct springs are fitted. The spring part number is marked on the spring top face and also on the underside of one of the leaves.
7. If the springs are correct, jack up the vehicle and take the weight off the road springs.
8. Remove the shackle pins and ensure that they are a free fit in the shackle plate threads and not binding in the shackle pin bushes. Lubricate or polish to achieve this condition.
9. Deflect the springs and torque load the pins as detailed in operation 16.1.
10. Lower the vehicle and recheck the trim height.



BODY OPERATIONS

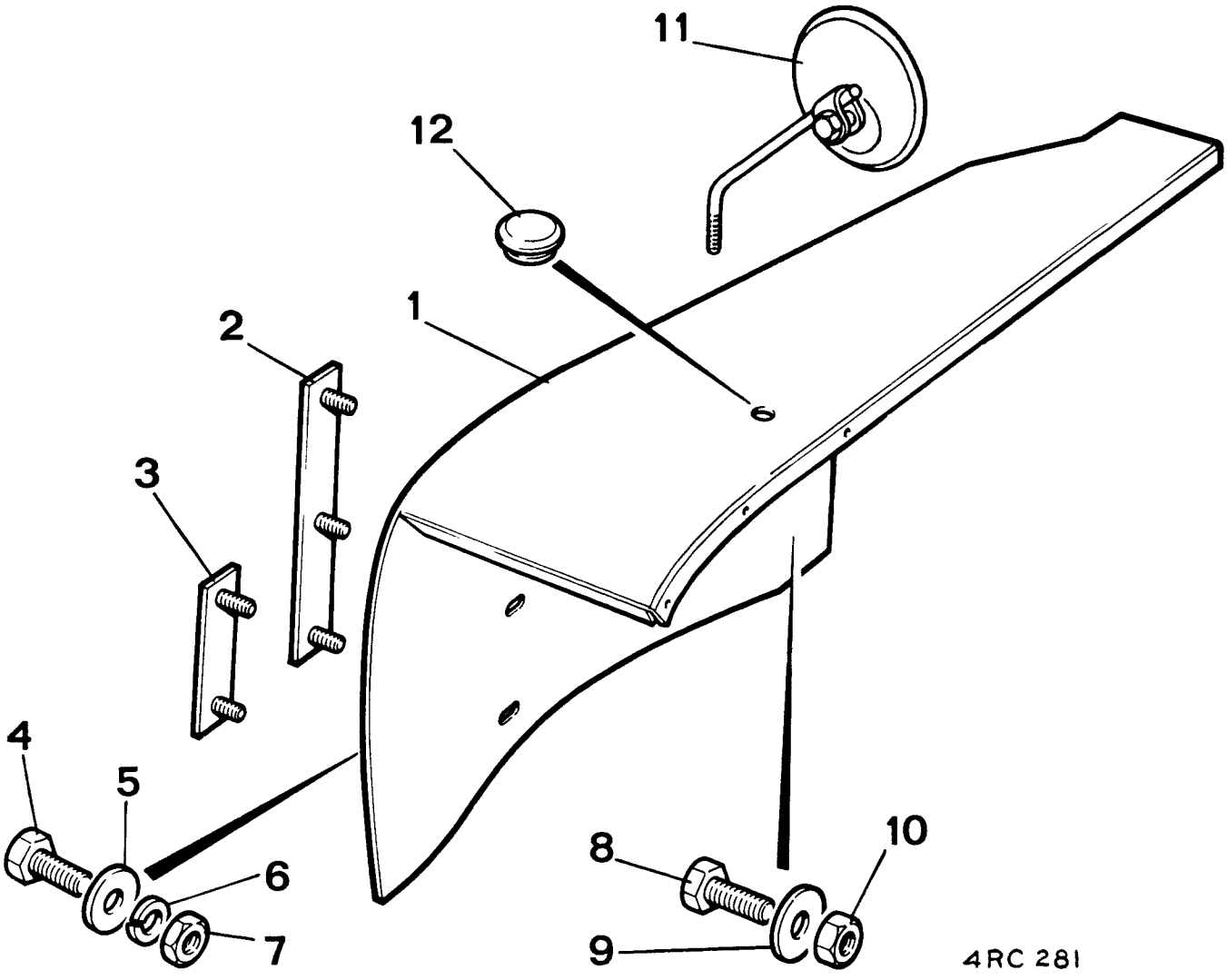


Front wings

1 Front wing outer panel, L.H.
2 Front wing outer panel, R.H.
3 Headlamp mounting panel R.H.
4 Nose panel R.H.
5 Headlamp bezel
6 Expansion nut
7 Drive screw
} Fixing bezel to nose panel

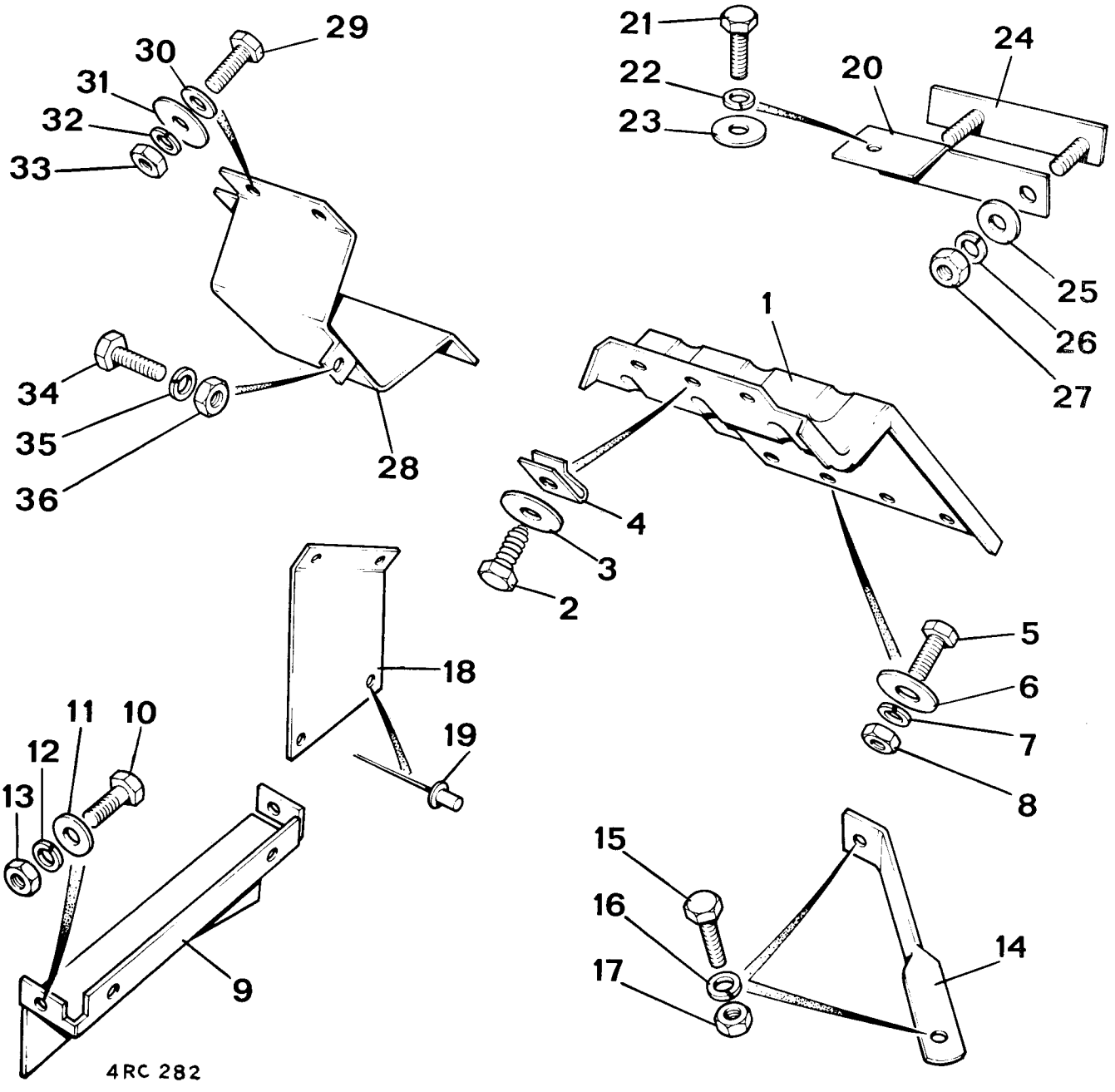
8 Bolt
9 Plain washer
10 Spire nut
} Fixing front wing to dash side pillar

11 Bolt, $\frac{1}{4}$" UNF × $\frac{5}{8}$" long
12 Plain washer
13 Spring washer
14 Nut, $\frac{1}{4}$" UNF
} Fixing wing valance



Front wing top and valance

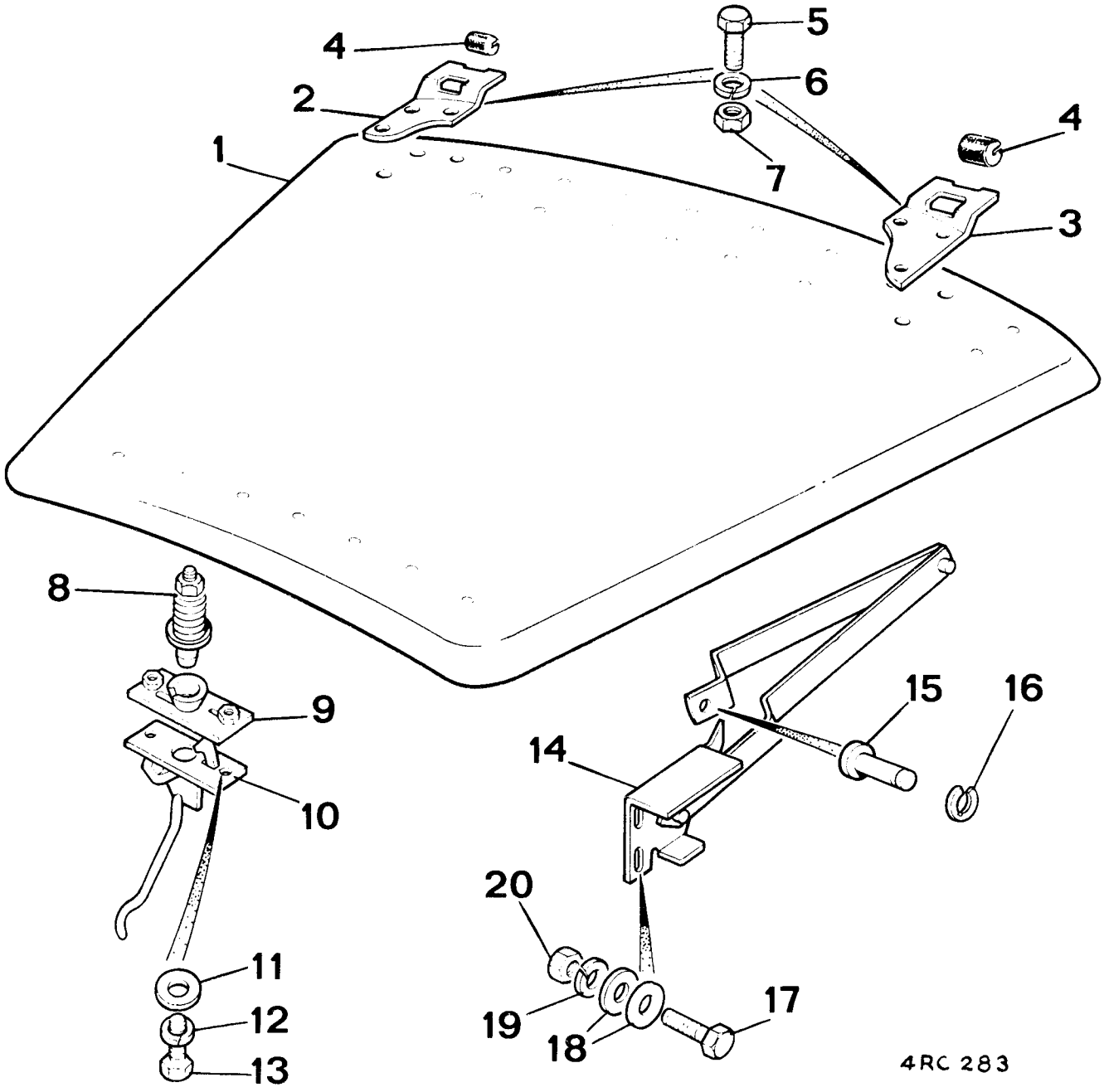
1 Front wing top and valance, R.H.
2 Fixing plate, front wing, L.H. side to grille panel
3 Fixing plate, front wing, L.H. side
4 Bolt, $\frac{1}{4}$″ UNF × $\frac{3}{4}$″ long
5 Plain washer
6 Spring washer
7 Nut, $\frac{1}{4}$″ UNF
(4–7: Fixing wings to grille panel)
8 Bolt, $\frac{1}{4}$″ UNF × $\frac{5}{8}$″ long
9 Plain washer
10 Nut $\frac{1}{4}$″ UNF
(8–10: Fixing wing top and valance to outer panel)
11 Wing mirror, complete with fixings
12 Plug, for redundant mirror holes in wings



Cover panels — Front wings

Key to illustration of cover panels

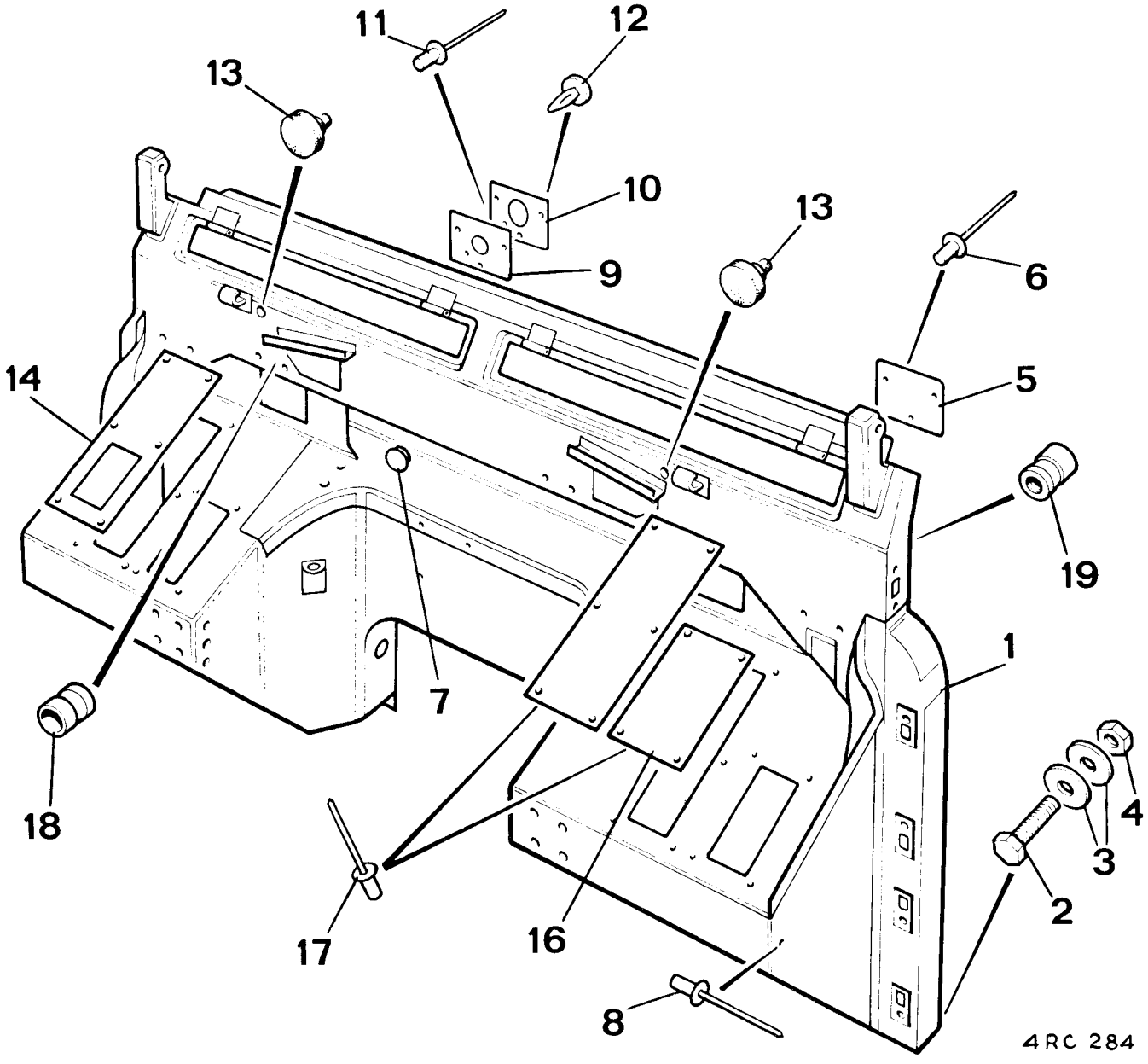
1 Mud shield, for front wing R.H.
2 Acme bolt
3 Plain washer
4 Spire nut
Fixing mud shields to angle on wings
5 Bolt, $\frac{1}{4}$" UNF×$\frac{1}{2}$" long
6 Plain washer
7 Spring washer
8 Nut, $\frac{1}{4}$" UNF
Fixing wing mud shield to toe box
9 Bottom panel, for L.H. side wing valance
10 Bolt, 2 BA×$\frac{1}{2}$" long
11 Plain washer
12 Spring washer
13 Nut, 2 BA
Fixing bottom panel to L.H. wing valance
14 Front wing stay
15 Bolt, $\frac{1}{4}$" UNF×$\frac{5}{8}$" long
16 Spring washer
17 Nut, $\frac{1}{4}$" UNF
Fixing stay to front wing and dash
18 Cover plate, for redundant exhaust hole
19 Pop rivet, for fixing cover plate
20 Fixing bracket, for R.H. wing
21 Bolt, $\frac{1}{4}$" UNF×$\frac{5}{8}$" long
22 Spring washer
23 Plain washer
Fixing wing to bracket at dash
24 Fixing plate, for dash to wing fixing
25 Plain washer
26 Spring washer
27 Nut, $\frac{1}{4}$" UNF
Fixing bracket to dash
28 Cover box, for steering unit
29 Bolt, $\frac{1}{4}$" UNF×$\frac{1}{2}$" long
30 Plain washer
31 Plain washer
32 Spring washer
33 Nut, $\frac{1}{4}$" UNF
Cover box to mud shield
34 Bolt, $\frac{1}{4}$" UNF×$\frac{1}{2}$" long
35 Spring washer
36 Nut, $\frac{1}{4}$" UNF
Cover box to wing valance



Bonnet

Key to illustration of bonnet

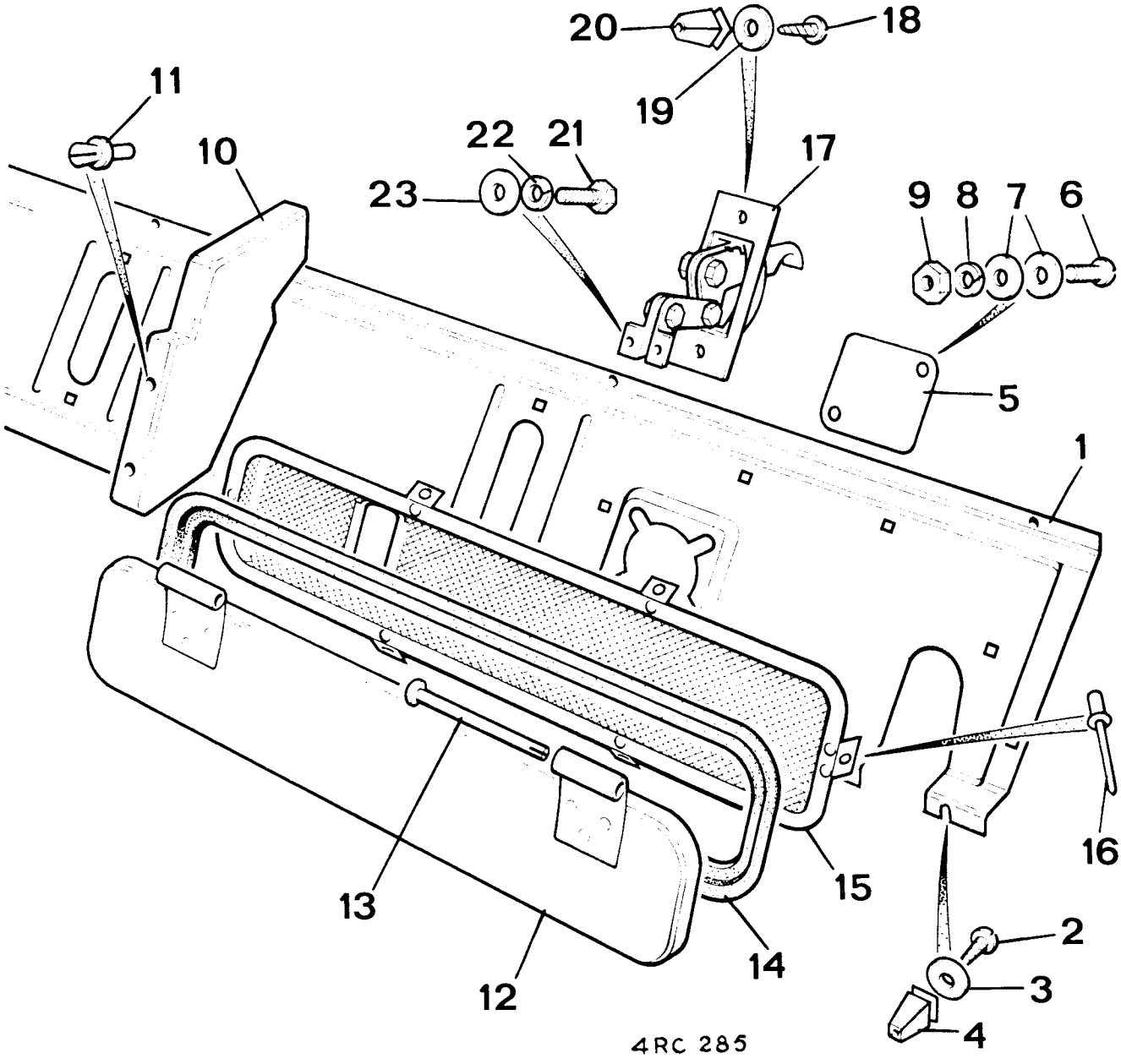
1 Bonnet
2 Hinge, R.H.
3 Hinge, L.H.
4 Bush, for hinge
5 Bolt, $\frac{1}{4}$" UNF×$\frac{5}{8}$" long
6 Spring washer
7 Nut, $\frac{1}{4}$" UNF
(5, 6, 7) Fixing hinge to bonnet
8 Striker pin
9 Washer plate, for catch
10 Bonnet catch
11 Plain washer
12 Spring washer
13 Set bolt, $\frac{1}{4}$" UNF×$\frac{5}{8}$" long
14 Bonnet prop
15 Pivot pin
16 Retainer clip
(15, 16) Fixing prop to bonnet bracket
17 Bolt, $\frac{1}{4}$" UNF×$\frac{3}{4}$" long
18 Plain washer
19 Spring washer
20 Nut, $\frac{1}{4}$" UNF
(17, 18, 19, 20) Fixing prop to wing valance and grille panel



Dash

Key to illustration of dash

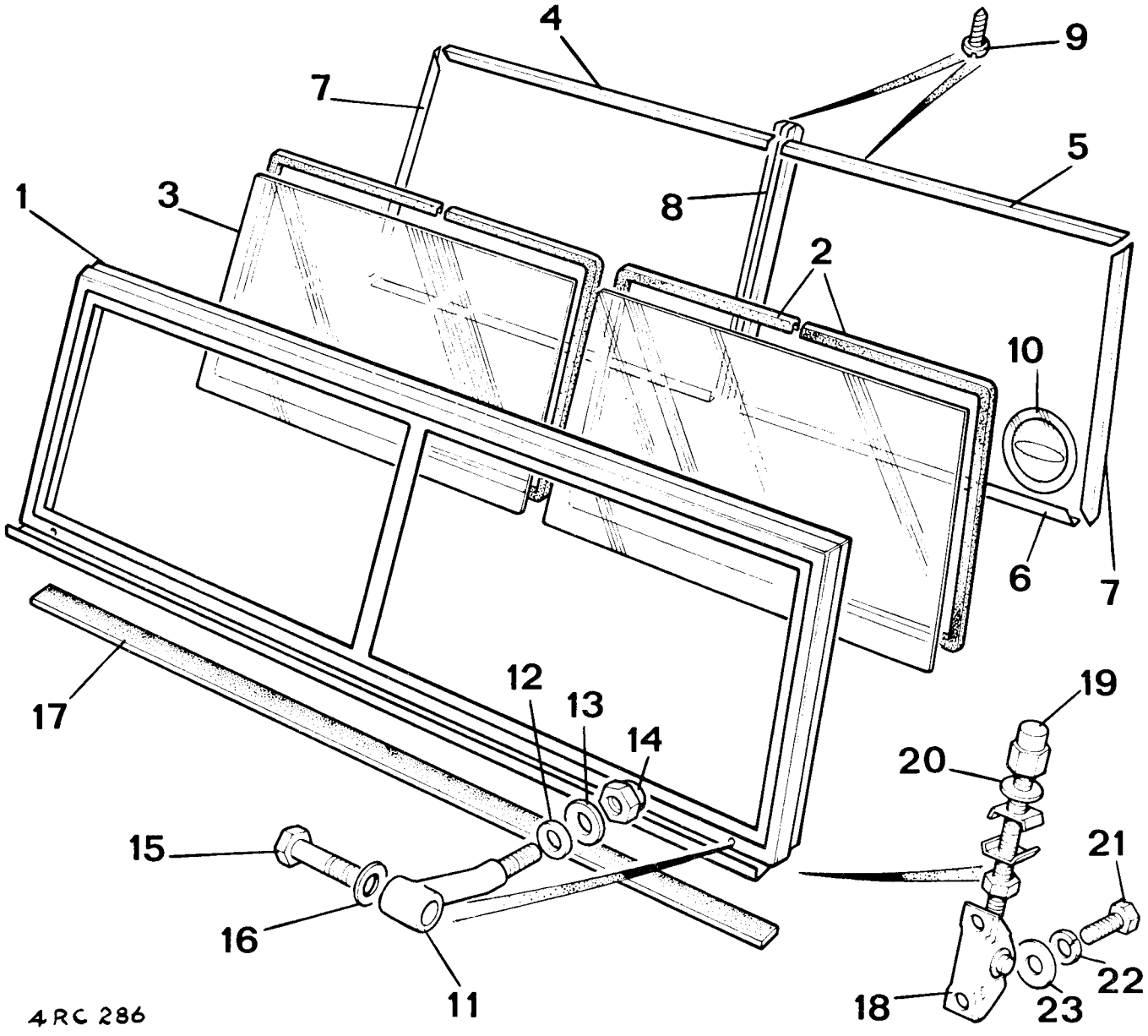
1 Dash Assembly
2 Tie bolt, ½″ UNF
3 Plain washer
4 Nut, ½″ UNF
(2, 3, 4: Fixing dash to chassis brackets)
5 Blanking plate, for redundant heater hole
6 Pop rivet, for fixing blanking plate
7 Plug, for inner panel toe-box
8 Pop rivet, for paint drain hole
9 Seal, steering column to dash
10 Backing plate, for seal
11 Pop rivet, for fixing seal to dash
12 Plug, for heater cable hole in seal
13 Buffer, in dash for bonnet
14 Cover plate, for pedal hole driver side
15 Cover plate, for pedal hole passenger side
16 Cover plate, for pedal hole passenger side
17 Rivet, for fixing cover plates to dash toe panel
18 Nutsert, for steering column support bracket
19 Nutsert, for windscreen clamp



Ventilators and flyscreen

Key to ventilators and flyscreen

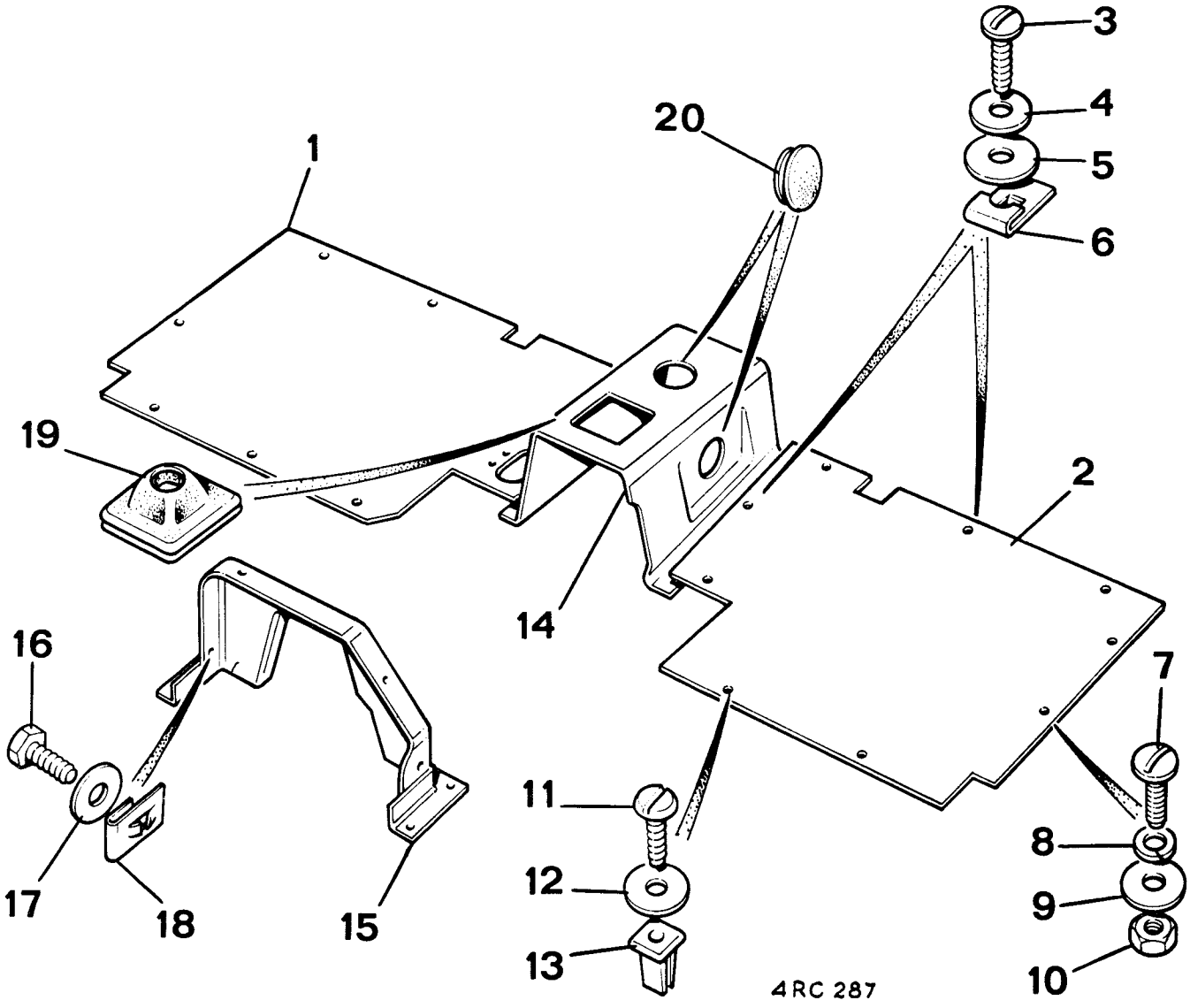
1 Front plate, to upper crash padding
2 Drive screw
3 Plain washer
4 Special nut
(2, 3, 4: Fixing front plate to dash)
5 Blanking plate
6 Screw, 10 UNF×½″ long
7 Plain washer
8 Spring washer
9 Nut, 10 UNF
(6, 7, 8, 9: Fixing blanking plate to front plate)
10 Air flow divider panel
11 Rivet, fixing air flow divider panel
12 Ventilator lid, R.H.
13 Hinge pin, for ventilator lid
14 Scaling rubber, for ventilator lid
15 Flyscreen, R.H.
16 Pop-rivet, fixing flyscreen to dash
17 Ventilator control
18 Drive screw
19 Plain washer
20 Special nut
(18, 19, 20: Fixing ventilator control to front panel upper crash rail)
21 Set bolt, 2BA×½″ long
22 Spring washer
23 Plain washer
(21, 22, 23: Fixing pivot bracket to ventilator lid)



Windscreen

Key to illustration of windscreen

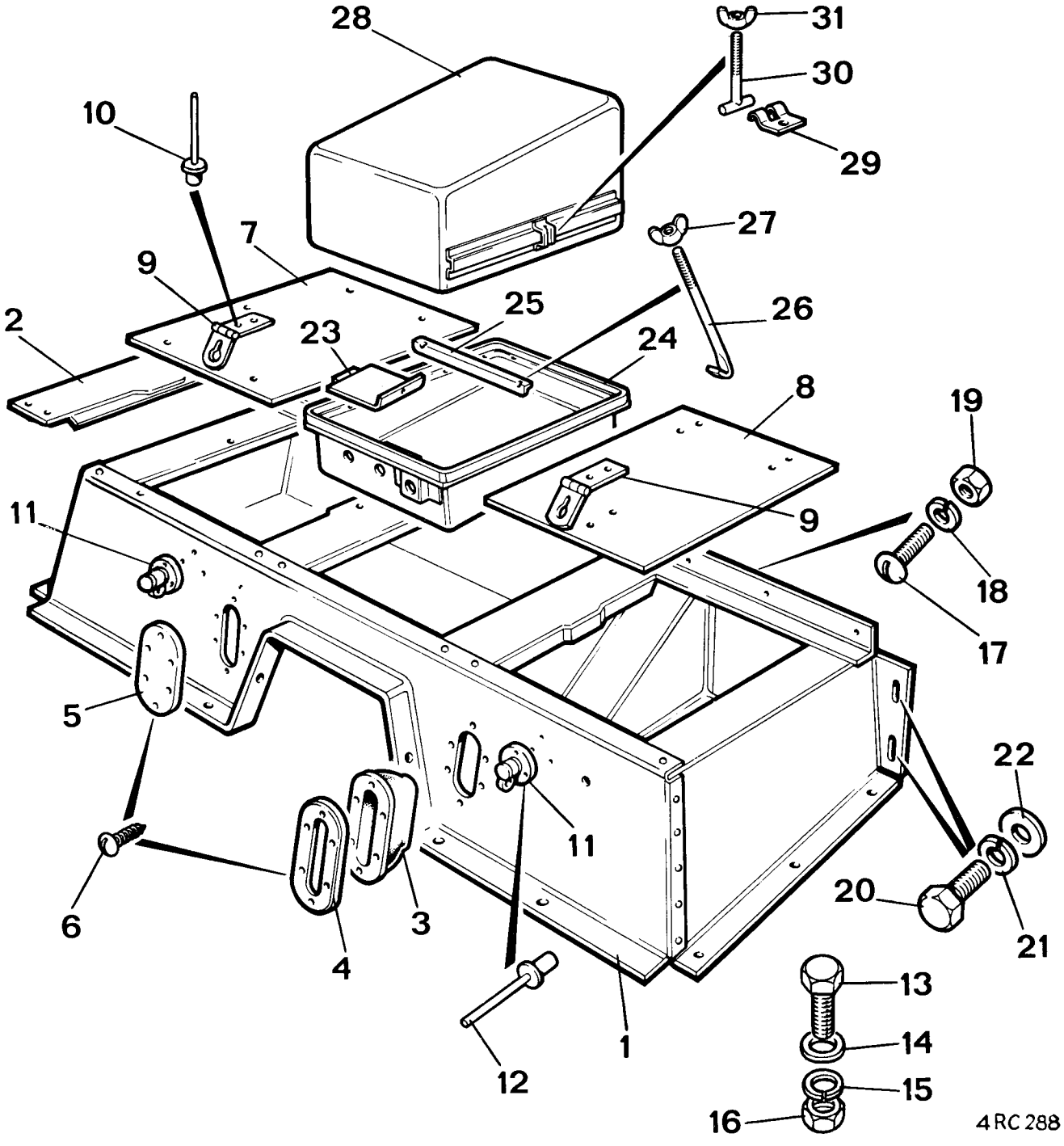
1 Windscreen, complete assembly
2 Glazing strip
3 Glass, for windscreen
4 Retainer, R.H. top, for windscreen glass
5 Retainer, L.H. top, for windscreen glass
6 Retainer, R.H. bottom, for windscreen glass
7 Retainer, sides, for windscreen glass
8 Cover, for windscreen centre rail
9 Drive screw, fixing retainers and cover to frame
10 Licence holder
11 Hinge arm
12 Copper washer
13 Plain washer
14 Nyloc nut, $\frac{5}{16}$" UNF
} Fixing hinge arm to windscreen
15 Hinge bolt, $\frac{5}{16}$" UNF × $1\frac{1}{2}$" long
16 Plain washer
} Windscreen to dash (pivot pt.)
17 Seal, dash to windscreen
18 Windscreen clamp assembly
19 Turret nut, $\frac{5}{16}$" UNF
20 Plain washer
21 Screw, $\frac{1}{4}$" UNF × $\frac{5}{8}$" long
22 Spring washer
23 Plain washer
} Fixing windscreen clamp to dash



Front floor

Key to illustration of front floor

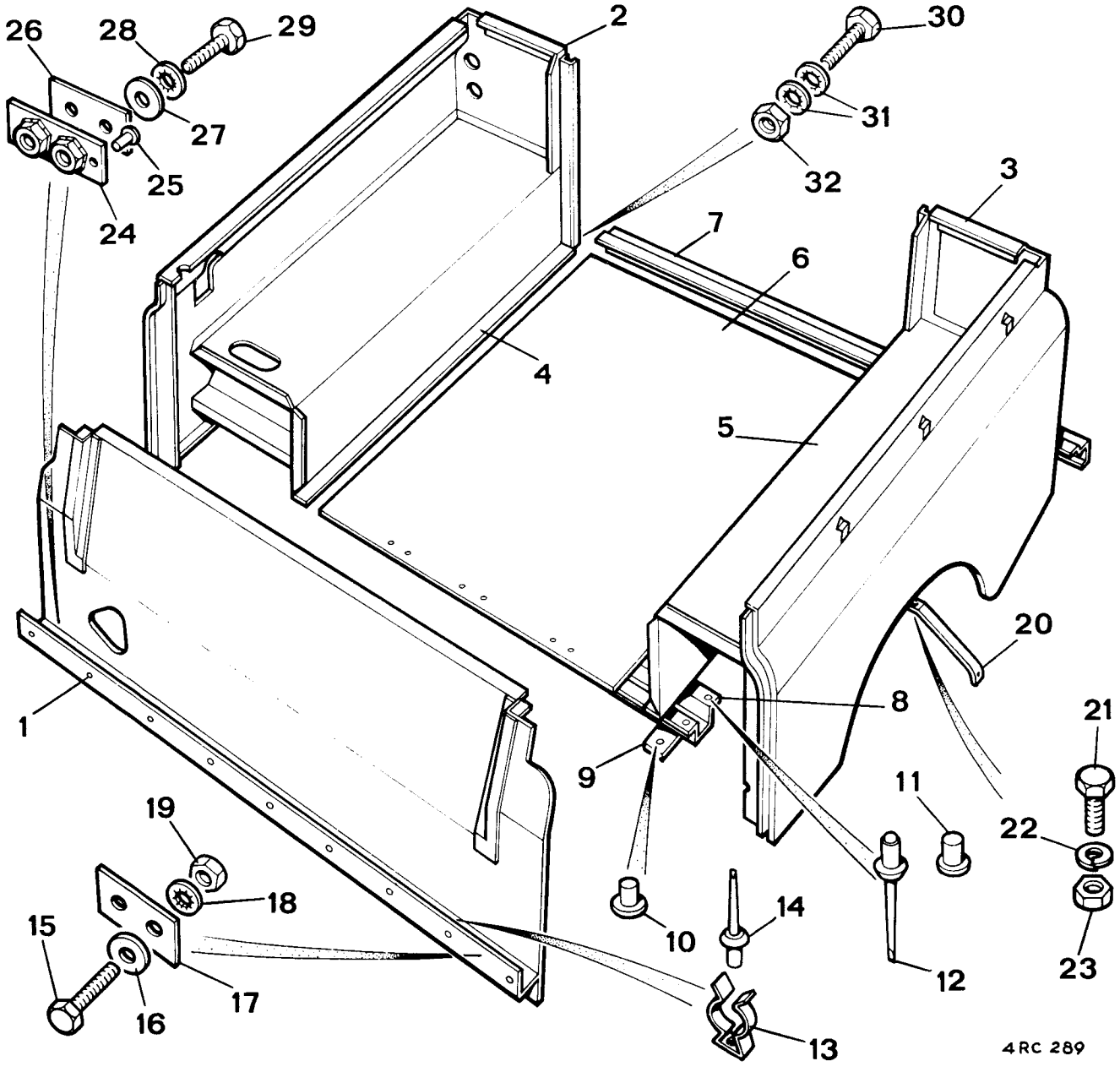
1 Front floor plate, R.H.
2 Front floor plate, L.H.
3 Acme bolt
4 Plain washer
5 Plain washer
6 Spire nut
— Fixing floor plates to gearbox cover, to diaphragm (dash), and to heelboard
7 Bolt, $\frac{1}{4}$″ UNF × $\frac{3}{4}$″ long
8 Spring washer
9 Plain washer
10 Nut, $\frac{1}{4}$″ UNF
— Fixing front floor to sill channel
11 Drive screw
12 Plain washer
13 Lokut nut
— Fixing front floor to dash toe boxes
14 Gearbox cover
15 Gearbox diaphragm
16 Acme bolt
17 Plain washer
18 Spire nut
— Fixing diaphragm to dash
19 Seal, for main gear change lever
20 Grommet, for gearbox cover



Seat base and battery storage

Key to illustration of seat base and battery storage

1 Seat base assembly
2 Extension panel, for seat base end
3 Seal, for handbrake lever
4 Retainer, for handbrake seal
5 Cover plate, for redundant handbrake lever hole
6 Drive screw, for fixing retainer and cover plate
7 Side locker lid, R.H.
8 Side locker lid, L.H.
9 Hasp, for locker lid
10 Pop rivet, for fixing hasp to locker lid
11 Turnbuckle, for retaining locker lid
12 Pop rivet, for fixing turnbuckle
13 Bolt, $\frac{1}{4}$" UNF×$\frac{3}{4}$" long
14 Plain washer
15 Spring washer
16 Nut, $\frac{1}{4}$" UNF
17 Screw, $\frac{1}{4}$" UNF×$\frac{3}{8}$" long
18 Spring washer
19 Nut, $\frac{1}{4}$" UNF
20 Bolt, $\frac{1}{4}$" UNF×$\frac{5}{8}$" long
21 Spring washer
22 Plain washer
23 Cover plate, for transfer box access
24 Battery box
25 Clamp
26 'J' bolt, $\frac{1}{4}$" UNF
27 Wing nut, $\frac{1}{4}$" UNF
} Retaining vehicle batteries into battery box
28 Battery cover
29 Bracket, for clamping bolt
30 Clamping bolt, for battery cover
31 Wing nut, $\frac{1}{4}$" UNF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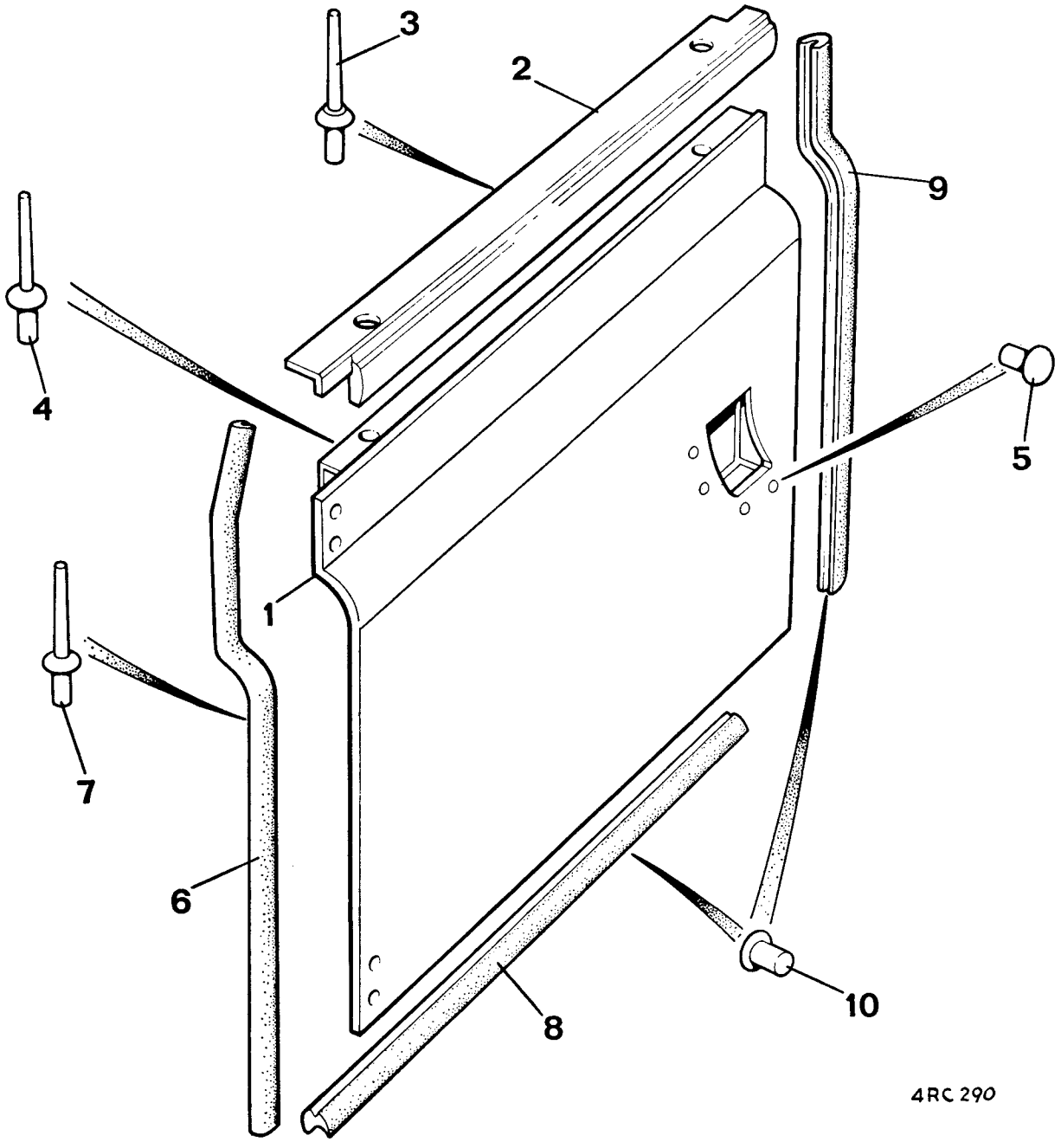
Rear body

Key to illustration of rear body

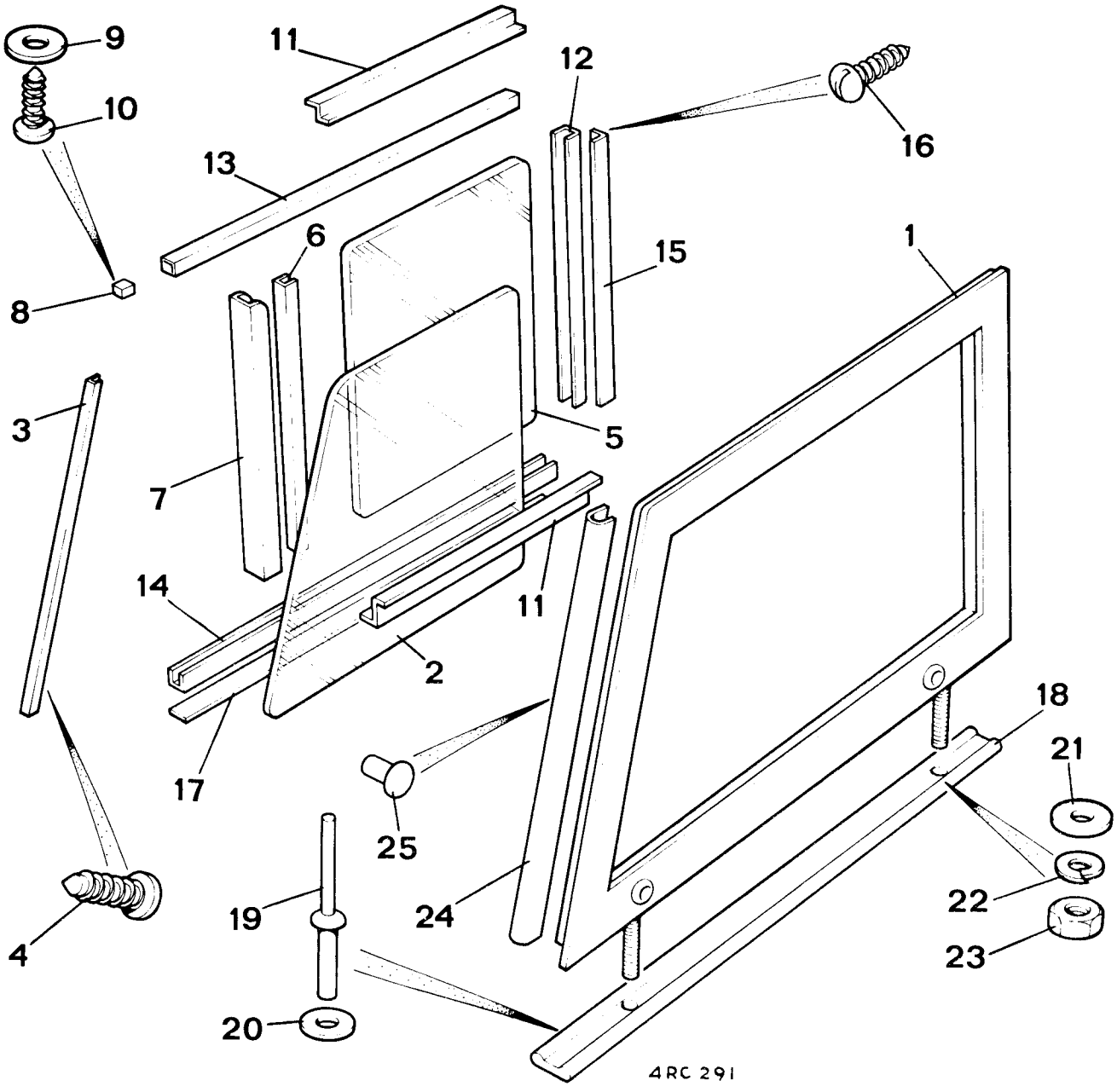
1 Front end panel
2 Rear end panel, R.H.
3 Rear end panel, L.H.
4 Bodyside assembly, R.H.
5 Bodyside assembly, L.H.
6 Rear floor plate
7 Rear mounting angle
8 Crossmember with pads
9 Mounting pad, for crossmember
10 Rivet, for fixing pads to crossmember
11 Rivet
12 Pop rivet
} Fixing crossmember to rear floor plate
13 Spring clip, for jack handle, starting handle and roof stays
14 Pop rivet, for fixing spring clips
15 Bolt, $\frac{1}{4}$" UNF × $\frac{3}{4}$" long
16 Plain washer
17 Shim
18 Fan disc washer
19 Nut, $\frac{1}{4}$" UNF
} Fixing heelboard to chassis frame bracket
20 Tie bar
21 Bolt, $\frac{1}{4}$" UNF × $\frac{5}{8}$" long
22 Spring washer
23 Nut, $\frac{1}{4}$" UNF
} Fixing tie bar to wing and chassis
24 Nut plate
25 Rivet, fixing nut plate
26 Shim
27 Plain washer
28 Fan disc washer
29 Set screw, $\frac{5}{16}$" UNF × $1\frac{1}{8}$" long
30 Bolt, $\frac{5}{16}$" UNF × $\frac{7}{8}$" long
31 Fan disc washer
32 Nut, $\frac{5}{16}$" UNF
} Fixing rear body to chassis



Front doors

Key to illustration of front doors

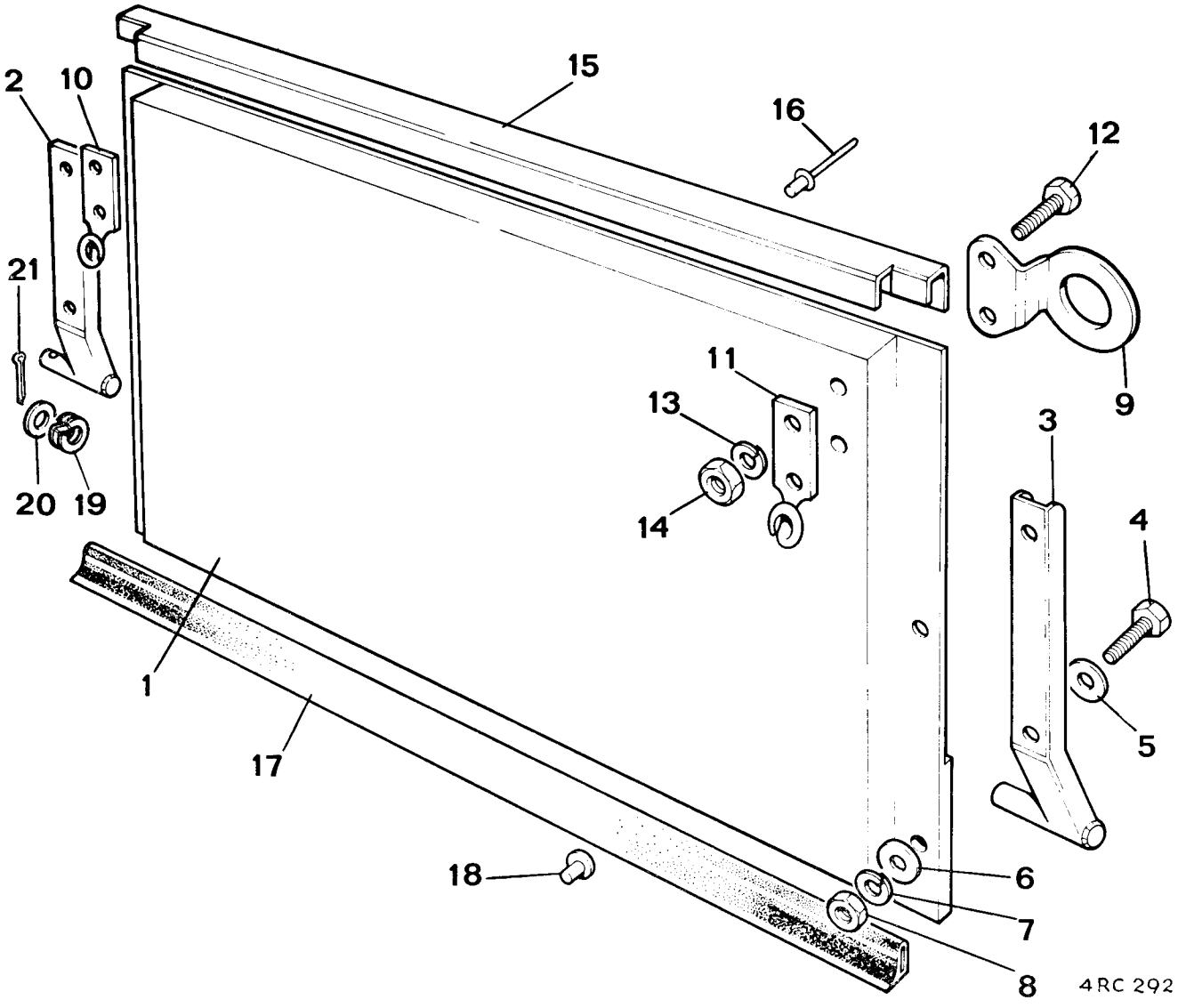
1 Front door, L.H.
2 Top capping, for front door, L.H.
3 Pop-rivet, top cappings to door
4 Pop-rivet, fixing door outer panel at top
5 Rivet, fixing door lock cover to outer panel
6 Door sealing rubber, for dash pillar, L.H.
7 Rivet, for fixing sealing rubber
8 Door sealing rubber, at sills
9 Door sealing rubber, at rear body lower, L.H.
10 Rivet, fixing sealing rubbers



Windows, channels and side screens

Key to illustration of windows, channels and side screens

1 Front door side screen assembly R.H. with plug
2 Fixed window, front
3 Retainer, for window
4 Drive screw, fixing retainer
5 Sliding window, rear
6 Sealing rubber, for front edge of sliding window
7 Channel, for sealing rubber
8 Buffer, for sliding window at top
9 Plain washer } Fixing buffers and channels
10 Drive screw } to frame
11 Filler, top and bottom } For windows
12 Filler, rear } For windows
13 Channel, top
14 Channel, bottom
15 Channel, rear
16 Drive screw, fixing channel
17 Packing strip, bottom
18 Sealing strip for sidescreen
19 Pop rivet } Fixing sealing strip
20 Plain washer } Fixing sealing strip
21 Plain washer } Fixing side screen to door
22 Spring washer } Fixing side screen to door
23 Nut, $\frac{7}{16}$" UNF } Fixing side screen to door
24 Door sealing rubber, at windscreen side
25 Rivet, fixing rubber to windscreen



Tailboard assembly

Key to illustration of tailboard assembly

1 Tailboard, complete assembly
2 Hinge, R.H.
3 Hinge, L.H.
4 Bolt, ¼″ UNF×2⅛″ long
5 Plain washer
6 Plain washer
7 Spring washer
8 Nut, ¼″ UNF
(4 to 8: Fixing hinge to tailboard)
9 Locking plate
10 Hook, R.H. for tailboard chain
11 Hook, L.H. for tailboard chain
12 Bolt, ¼″ UNF×2¼″ long
13 Spring washer
14 Nut, ¼″ UNF
(12 to 14: Fixing locking plates and hooks to tailboard)
15 Reinforcing panel
16 Pop rivet, fixing reinforcing panel to tailboard
17 Sealing rubber, for tailboard bottom
18 Rivet, fixing sealing rubber to tailboard
19 Spring washer
20 Plain washer
21 Split pin
(19 to 21: Retaining tailboard hinge to chassis)

BODY REPAIRS

—General information 17.1

Body panels

1. Land-Rover body panels are manufactured from a special aluminium-alloy known as 'Birmabright'.
2. 'Birmabright' melts at a slightly lower temperature than pure aluminium and will not rust nor corrode under normal circumstances. It is work-hardening, but is easily annealed. Exposed to the atmosphere, a hard oxide skin forms on the surface.

Panel beating 'Birmabright'

3. 'Birmabright' panels and wings can be beaten out after accidental damage then must be annealed, by the application of heat, followed by slow air-cooling; as the melting point is low, heat must be applied slowly and carefully. A practical temperature control is to apply oil to the cleaned surface to be annealed. Play the welding torch on the underside of the cleaned surface and watch for the oil to clear, leaving the surface clean and unmarked; then allow to cool naturally in the air, when the area so treated will again be soft and workable. Do not quench with oil or water. Another method is to clean the surface to be annealed and then rub it with a piece of soap. Apply heat beneath the area, as described above, and watch for the soap stain to clear. Then allow to cool, as for the oil method. When applying the heat for annealing, always hold the torch some little distance from the metal, and move it about, so as to avoid any risk of melting it locally.

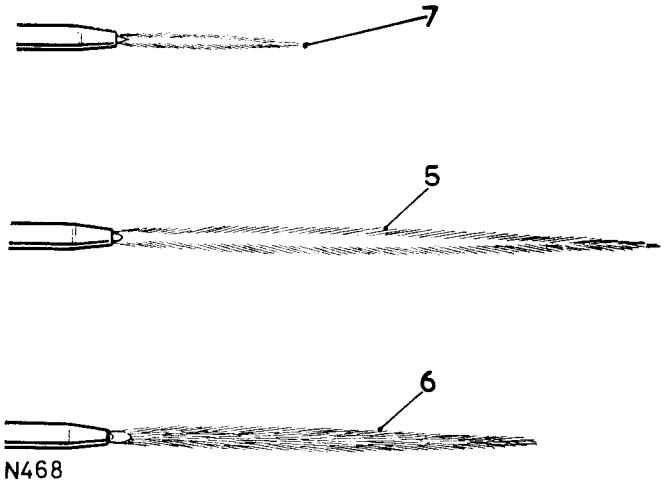
4. **Gas welding 'Birmabright'**

   A small jet must be used, one or two sizes smaller than would be used for welding sheet steel of comparable thickness. For instance, use a No. 2 nozzle for welding 18 swg (0.048 in) sheet, and a No. 3 for 16 swg (0.064 in) sheet.
5. The flame should be smooth, quiet and neutral and have a brilliant inner core with a well defined, rounded end. The hottest point of the flame is close to the jet, and the flame should have a blue to orange envelope becoming nearly colourless at the end.
6. A slightly reducing flame may also be used, that is, there may be a slight excess of acetylene. Such a flame will have a brilliant inner core with a feathery white flame and a blue to orange envelope.
7. Do not use an oxydising flame, which has a short pointed inner core bluish white with a bluish envelope.
8. Use only 5 per cent magnesium/aluminium welding rod (5 Mg/A). Sifalumin No. 27 (MG.5 Alloy) (Use Sifbronze Special flux with this rod) or a 'Birmabright' offcut sheet. Do not use too wide or thick an offcut or trouble may be experienced in making it melt before the material which is being welded.
9. Clean off all grease and paint, dry thoroughly then clean the edges to be welded, and an area at least half an inch on either side of the weld, with a stiff wire scratch-brush or wire wool. Cleanliness is essential. Also clean the welding rod or strip with wire wool.
10. A special acid flux must be used, and we recommend 'Hari-Kari' which is obtainable from:
    The Midland Welding Supply Co. Ltd.,
    105 Lakey Lane,
    Birmingham 28, England.

    or
    Sifbronze Special Flux, which is obtainable from:

    Suffolk Iron Foundry (1920) Ltd.,
    Sifbronze Works,
    Stowmarket, England.

11. A small quantity of 'Hari-Kari' may be made into a paste with water, following the directions on the tin, and the paste must be applied to both surfaces to be welded and also to the rod. In the case of Sifbronze Special Flux, use in powder form as directed. Remember that aluminium and its alloys do not show 'red-hot' before melting, and so there is nothing about the appearance of the metal to indicate that it has reached welding temperature. A little experience will enable the operator to gauge this point, but a useful guide is to sprinkle a little sawdust over the work; this will sparkle and char when the right temperature is approached; a piece of dry wood rubbed over the hot metal will sparkle at the point of contact.
12. As the flux used is highly acid, it is essential to wash it off thoroughly immediately after a weld is completed. The hottest possible water should be used, with wire wool or a scratch-brush. Very hot soapy water is good, because of the alkaline nature of the soap, which will tend to 'kill' the acid.



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13. It is strongly recommended that a few welds are made on scrap metal before the actual repair is undertaken if the operator is not already experienced in welding aluminium and its alloys.
14. The heat of welding will have softened the metal in the area of the repair, and it may be hardened again by peening with a light hammer. Many light blows are preferable to fewer heavy ones. Use a 'dolly' or anvil behind the work to avoid denting and deformation, and to make the hammering more effective. Filing of surplus metal from the weld will also help to harden the work again.

Welding tears and patching

15. If a tear extends to the edge of a panel, start the weld from the end away from the edge and also at this point drill a small hole to prevent the crack spreading, then work towards the edge.
16. When welding a long tear, or making a long welded joint, tack the edges to be welded at intervals of from 50 to 100 mm (2 in to 4 in) with spots. This is done by melting the metal at the starting end and fusing into it a small amount of the filler rod, repeating the process at the suggested intervals. After this, weld continuously along the joint from right to left, increasing the speed of the weld as the material heats up.
17. After the work has cooled, wash off all traces of flux as described previously, and file off any excess of build-up metal.
18. When patching, cut the patch to the correct shape for the hole to be filled, but of such size as to leave a gap of 0,8 mm (0.030 in) between it and the panel, and then weld as described above. Never apply an 'overlay' patch.

Electric welding

19. **CAUTION:** The battery earth lead must be disconnected before commencing electric welding, otherwise the alternator will be damaged.
20. At the Rover Factory the 'Argon-Arc' process is used, all atmospheric oxygen being excluded from the weld by the Argon gas shield. For all body repair work normally undertaken by a Distributor's or Dealer's service department, the gas welding method is sufficient and quite satisfactory.

Spot-welding

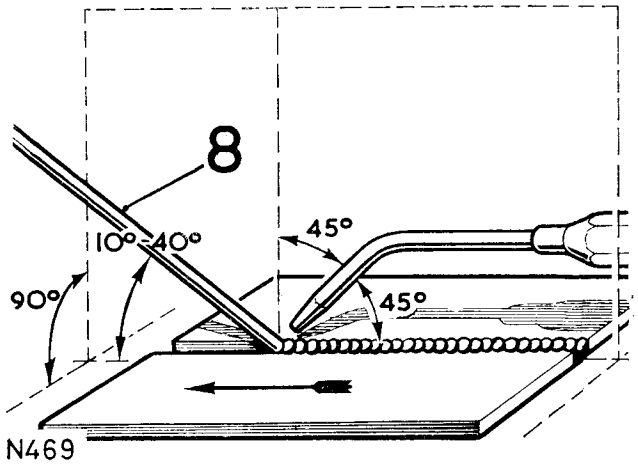
21. Spot-welding is largely used in the manufacture of Land-Rover bodies, but this is a process which can only be carried out satisfactorily by the use of the proper apparatus. Aluminium and its alloys are very good conductors of heat and electricity, and thus it is most important to maintain the right conditions for successful spot-welding. The correct current density must be maintained, and so must the 'dwell' of the electrodes. Special spot-welding machines have been developed, but they are expensive, and though the actual work can be carried out by comparatively unskilled labour, supervision and machine maintenance must be in the hands of properly qualified persons.

Riveting

22. Where both sides of the metal are accessible and it is possible to use an anvil or 'dolly', solid aluminium rivets may be used, with a suitable punch or 'pop' to ensure clean, rounded heads on the work. For riveting blind holes, 'pop-rivets' must be used. These are inserted and closed by special 'Lazy-Tong' 'pop-rivet' pliers.

Painting 'Birmabright'

23. Refer to the procedure detailed in the following Operation, 17.2.



PAINTWORK

—General information **17.2**

Body panels

1. Land-Rover body panels are manufactured from a special aluminium-alloy known as 'Birmabright' and the following paintwork procedure should be followed on these panels.

Painting 'Birmabright'

2. The area to be painted must be flatted to remove the hard oxide skin which forms on the surface of the alloy when exposed to the atmosphere. Degrease and dry the area, then apply a suitable etch-primer. Unless an etch-primer is used, paint is liable to come away as it cannot 'Key' into the hard oxide of an untreated alloy surface and the use of I.C.I. Etching Primer P565-5002 is recommended. It is quick and easy to apply, and it prolongs the life of the paint film by ensuring excellent adhesion.

Application

3. The activated Etching Primer has a limited pot-life of about 8 hours at normal temperatures and should not be used after this time, as it may have inferior adhesion and corrosion resistance. Any Etching Primer which has been mixed for more than 8 hours must be thrown away, and not returned to the can.
4. Apply Etching Primer as soon as possible after cleaning, and paint as soon as the pre-treatment is completed. Undue delay may cause the surface to be contaminated again and thus nullify the treatment. Do not leave pretreated work overnight before it is painted.
5. Etching Primer, when followed by a suitable paint system, gives a film which is very resistant to moisture, but the Etching Primer itself is water sensitive. It should therefore be coated with paint as soon as possible when it is dry.
6. Activate the Etching Primer by mixing it with an equal volume of Activator P273-5021 and allow to stand for 10 minutes.
7. Adjust the spraying viscosity of the mixture if necessary to 22-25 sec. BSB4 Cup by adding small quantities of Thinner 851-565; never add more Activator.
8. Apply by spray to a clean, dry surface in a thin uniform coat, rather than a thick heavy one which may impair adhesion.
9. Air dry for at least 15 minutes before applying undercoat by spray or for 2 hours before brush application. If required, these times can be shortened by force drying, this also gives increased hardness to the film.
10. Subsequent painting follows normal paintshop practice.
11. When wet flatting the subsequent paint layers take care not to rub through to the Etching Primer. If this does occur allow to dry out thoroughly, dry flat the area and spot in with Etching Primer.

REAR BODY

—Remove and refit **17.3**

Removing

1. Disconnect the battery earth lead.
2. Remove the hood and hood frame.
3. Remove the seat cushions.
4. Disconnect or remove all electrical equipment fitted in the rear body, including rear lamps.
5. Disconnect the fuel filler and breather hoses.
6. Remove the bolts, washers and nuts securing the rear body to the seat base.
7. Remove the bolts securing the sill channel mounting bracket to the seat base and rear body.
8. Detach the nuts and bolts securing the rear sill panel to the body.
9. Detach the wing stays from the chassis members.
10. Remove the nuts and bolts securing the body to the rear cross-member mounting brackets.
11. Remove the rear body complete.
12. If necessary, remove all serviceable parts for fitment to new body.

Refitting

13. Reverse 1 to 12.

FRONT FLOOR

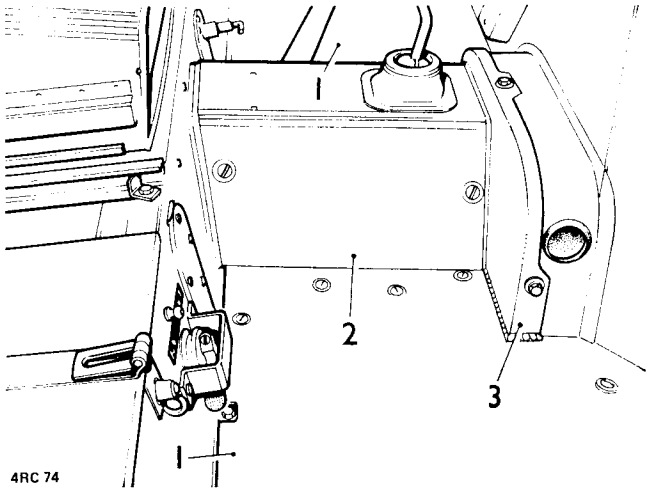
—Remove and refit **17.4**

Removing

1. Remove both halves of the front floor.
2. Remove the gearbox tunnel cover.
3. Remove the gearbox tunnel front panel.

Refitting, both models

4. Reverse 1 to 3.
   Use waterproof sealant between the joint flanges. A suitable sealant is 'Sealastrip', manufactured by Expandite Ltd., Chase Road, London NW10, England.



FRONT WING

—Remove and refit 17.5

Removing

1. Remove the bonnet panel. 17.7.
2. Disconnect the side lamp leads at the snap connectors adjacent to the radiator.
3. Remove the radiator grille.
4. Disconnect the headlamp leads at the snap connectors and earth terminal beneath the bonnet catch platform and withdraw the leads from the grille panel.
5. Drivers side: Remove the steering box mudshield.
6. Remove the securing bolts and lift the mudshield out from under the wing.
7. Remove the bolts securing the wing to the scuttle pillar.
8. Remove the bolts securing the wing stay and the wing to the sill panel.
9. Remove the bolts securing the wing to the rear wing upper mounting bracket.
10. Remove the bolt securing the wing to the steering column support plate.
11. Remove the bolts securing the wing to the grille panel (on RH wings, this action also releases the bonnet prop bracket) and withdraw the wing.
12. If required, remove the head, side and flasher lamps and wing mirrors.

Refitting

13. Reverse 1 to 12.

DASH PANEL ASSEMBLY

—Remove and refit **17.6**

Service tool 601763, Ball joint extractor

General

The following instructions are generally applicable to all models, but individual models may vary slightly, particularly with regard to equipment attached to the dash panel.

Removing

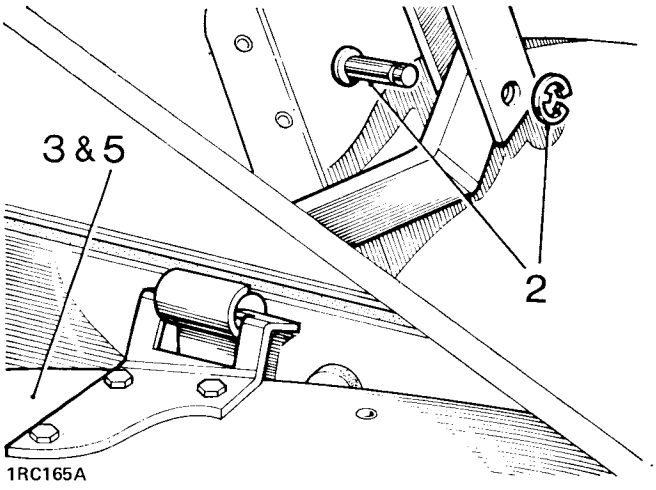
1. Disconnect the battery earth lead.
2. Remove the bonnet. 17.7.
3. Remove the front wings. 17.5.
4. Remove the windscreen. 17.17.
5. Remove the front doors. 17.8.
6. Remove the front floor. 17.4.
7. Remove the facia top rail. 17.13.
8. Remove the facia support panel. 17.15.
9. Disconnect the longitudinal steering arm at the steering box drop arm, using ball joint extractor 601763.
10. Remove or release, as applicable, all components fitted or attached to the dash panel assembly.
11. Remove the fixings, steering box support bracket to chassis.
12. Remove the tie bolts and fixings, dash assembly to chassis.
13. Remove the fixings, sill panel extremities to dash.
14. Withdraw the dash panel complete.

Refitting

15. Reverse 12 to 14, using a waterproof sealant between the joint faces.
16. Reverse 11, torque loading 2,0 kgf m (15 lbf ft).
17. Reverse 10, referring to the appropriate Divisions of the Manual for linkage and control settings and wiring connections.
18. Reverse 9, torque loading 4,0 kgf m (30 lbf ft).
19. Reverse 1 to 8.

BONNET

—Remove and refit **17.7**



1RC165A

Removing

1. Remove the spare wheel, if fitted on the bonnet.
2. Disconnect the prop rod.
3. Raise the bonnet to the vertical position.
4. Disconnect the bonnet earth straps.
5. Lift the bonnet clear from the hinges.

Refitting

6. Reverse 1 to 5.

DOORS

—Remove and refit **17.8**

Removing

1. Disconnect the door check strap.
2. Remove the fixings securing the hinges to the door.
3. Withdraw the door.

Refitting

4. Reverse 1 to 3, replacing weather seals as necessary.

TAILGATE, LOWER

—Remove and refit **17.9**

Removing

1. Withdraw the tailgate retaining keys.
2. Lower the tailgate.
3. Unhook the chains.
4. Remove the retaining fixings at the RH hinge pin.
5. Slide out the tailgate.
6. If required, remove the hinges and chain hooks.

Refitting

7. Reverse 1 to 6.

DOOR HINGE

—Remove and refit **17.10**

Removing

1. Remove the door. 17.8.
2. Remove the hinge from the body.

Refitting

3. Reverse 1 and 2.

SIDE DOOR GLASS

—Remove and refit **17.11**

Removing

Sliding glass

1. Move the sliding window to allow access to the screws securing glass run channel—top and bottom —then remove the screws from inside the channel.
2. Withdraw the top run channel and sliding window.
3. Renew the bottom run channel if necessary.

Fixed glass

4. Remove the sliding window.
5. Remove the screws securing front retainer and ease the fixed glass clear of frame.

Refitting, both glasses

6. Apply new Prestik sealing strip to window frame.
7. Reverse 1 to 3 or 4 and 5 as applicable.

DOOR LOCKS

—Remove and refit **17.12**

Removing

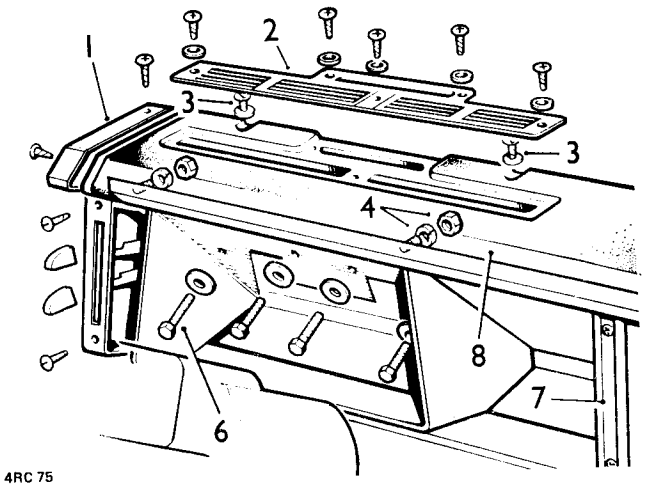
1. Remove the door trim, where fitted.
2. Remove the fixings and withdraw the door lock.
3. If required, remove the striker plate from its support bracket.

Refitting

4. Reverse 1 and 2.
5. Adjust the striker plate position as necessary such that the door draught excluders are slightly compressed with the door closed.

FACIA TOP RAIL

—Remove and refit **17.13**



4RC 75

Removing

1. Remove the cover from each end of the top rail.
2. Remove the fresh air grilles.
3. Remove the fixings from the front edge of the top rail.
4. Remove the fixings securing the top rail to the facia support panel.
5. Withdraw the instrument panel clear of the dash. 6.14 (items 1 to 5).
6. Slacken the four bolts securing the instrument housing to the facia support panel.
7. Remove the fixings from the auxiliary switch panel in the centre of the dash.
8. Withdraw the facia top rail.

Refitting

9. Reverse 1 to 8.

LOWER FACIA

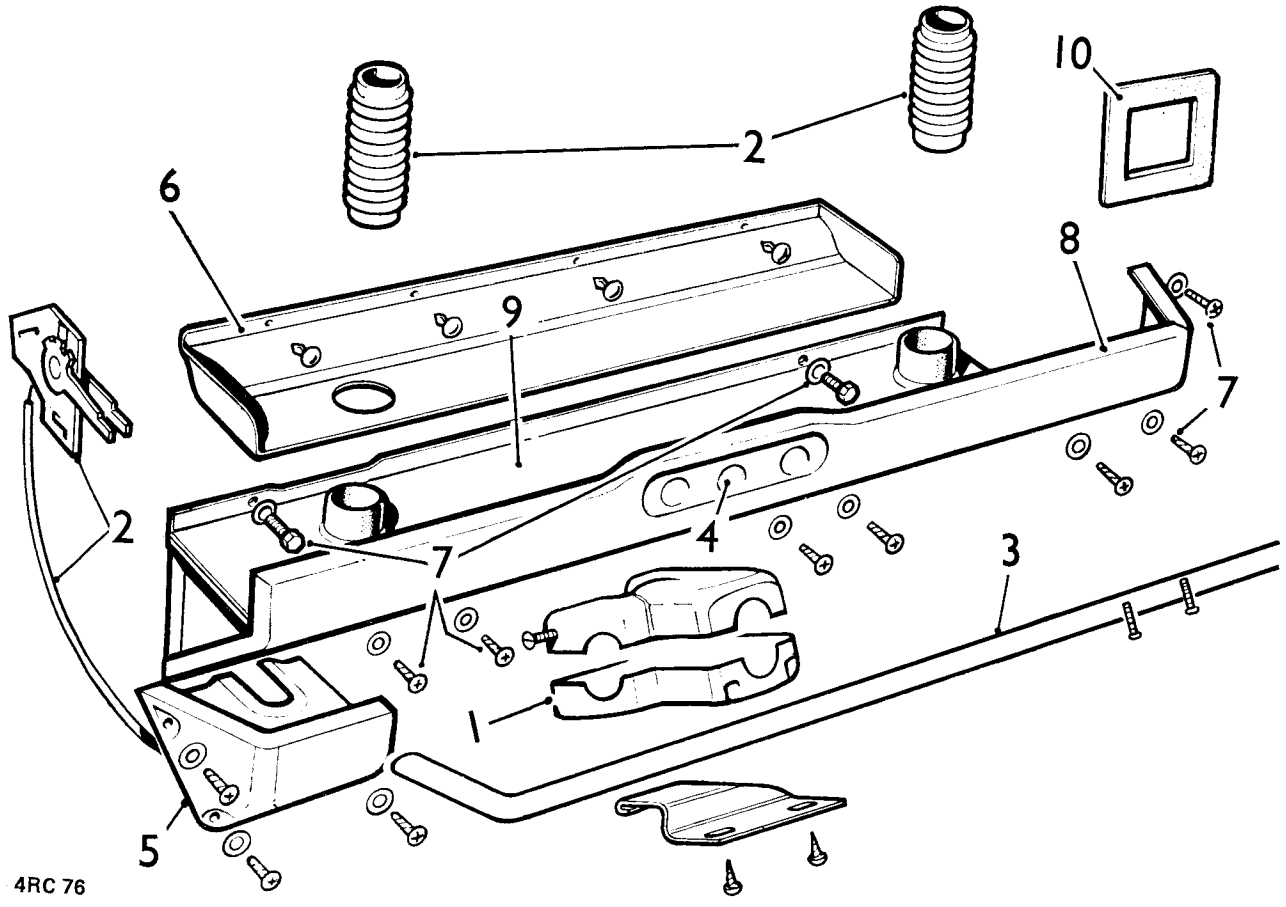
—Remove and refit 17.14

Removing

1. Release the switch shroud from the steering column and the lower facia.
2. If the vehicle is fitted with a heater, proceed as follows:
   a. Remove the heater control panel from the drivers end of the facia and disconnect the distribution control cable.
   b. Withdraw the instrument panel clear of the dash. 6.14 (items 1 to 5).
   c. Withdraw the demister hoses.
3. Withdraw the finisher strip from the top edge of the lower facia.
4. If the vehicle is fitted with auxiliary instruments at the centre of the lower facia, remove as applicable.
5. Remove the end cover from the lower facia.
6. Remove the parcel tray.
7. Remove the fixings securing the lower facia to the dash.
8. Withdraw the lower facia.
9. If required, remove the heater duct cover and the distribution flap valves, as applicable.

Refitting

10. Reverse 1 to 9. Where applicable, ensure that the gasket is fitted between the heater duct and the dash.



FACIA SUPPORT PANEL

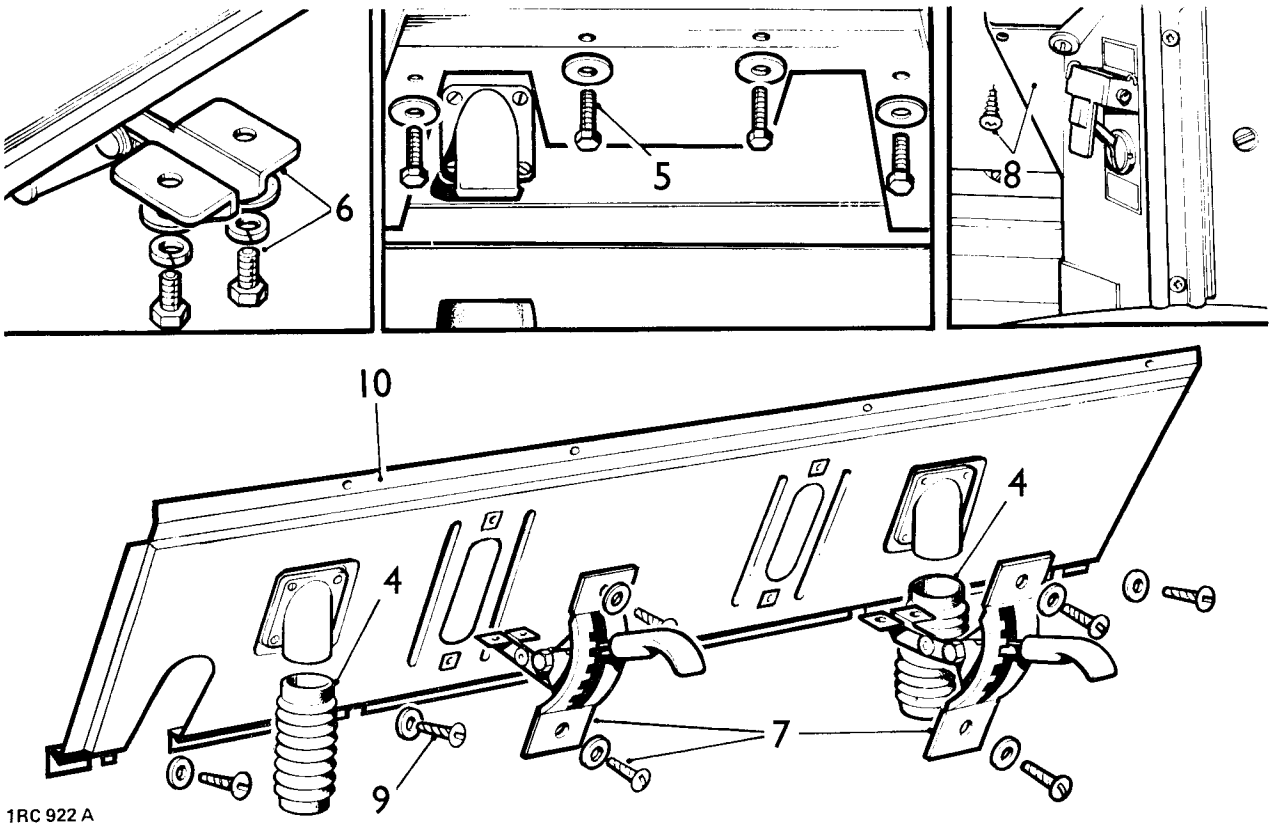
—Remove and refit **17.15**

Removing

1. Disconnect the battery earth lead.
2. Remove the facia top rail. 17.13.
3. Remove the instrument panel. 6.14.
4. If the vehicle is fitted with a heater, disconnect the hoses from the demister nozzles.
5. Remove the instrument housing.
6. Remove the fixings securing the ventilator control levers to the lids.
7. Remove the ventilator controls complete.
8. If the vehicle is fitted with an auxiliary instrument panel, remove the fixings securing it to the facia support panel.
9. Remove the fixings securing the facia support panel to the dash.
10. Withdraw the facia support panel.
11. If applicable, remove the heater demister nozzles as required.

Refitting

12. Reverse 1 to 11.



RADIATOR GRILLE PANEL

—Remove and refit **17.16**

Removing

1. Remove the bonnet. 17.7.
2. Disconnect the battery earth lead.
3. Remove the air cleaner. 3.5.
4. Remove the front apron panel.
5. Remove the radiator grille.
6. Disconnect the leads from the alternator control box.
7. Remove the alternator control box.
8. Disconnect the leads from the split charge diode.
9. Remove the radiator cap.
10. Remove the radiator drain plug.
11. Open the drain tap at the cylinder block, LH side.
12. Allow all coolant to drain, then reverse 10 and 11.
13. Disconnect the top hose from the radiator.
14. Disconnect the bottom hose from the radiator.

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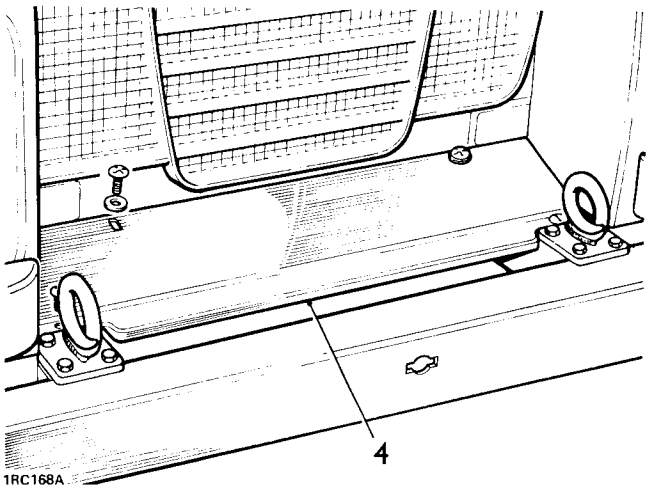
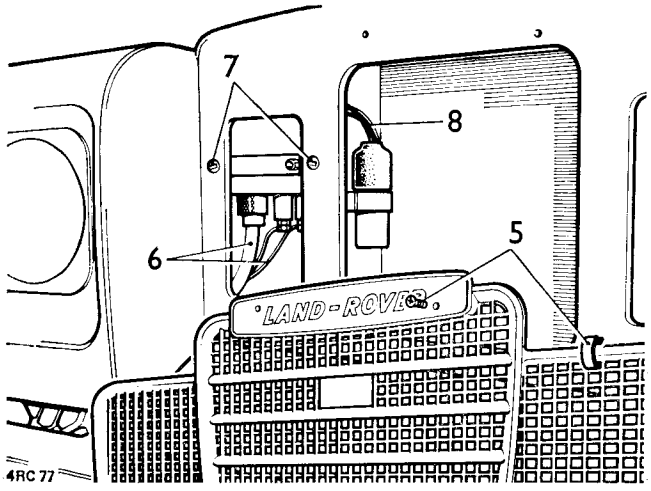
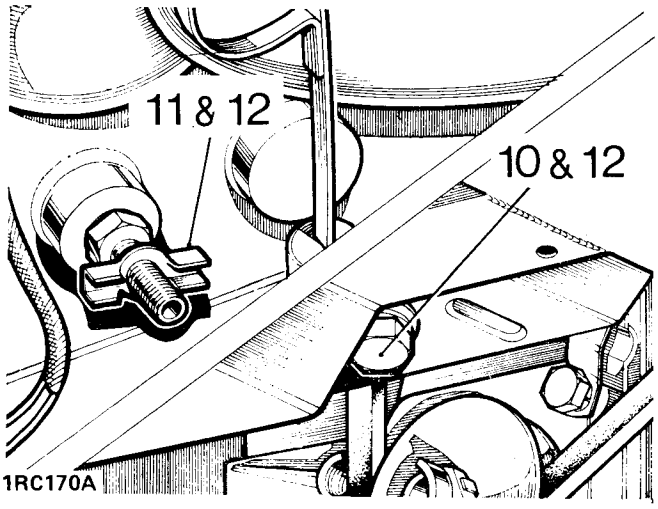
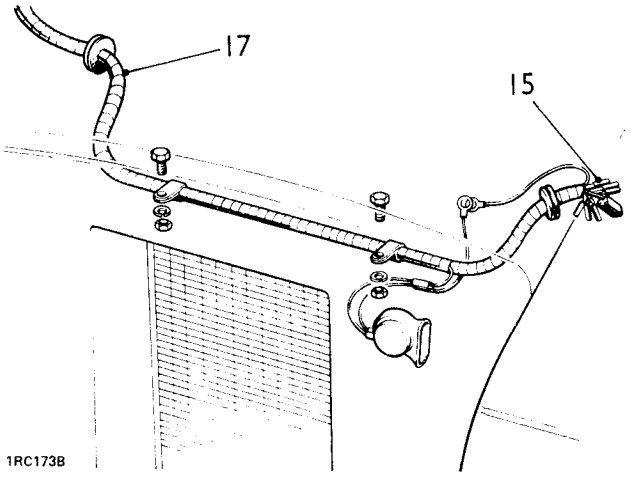




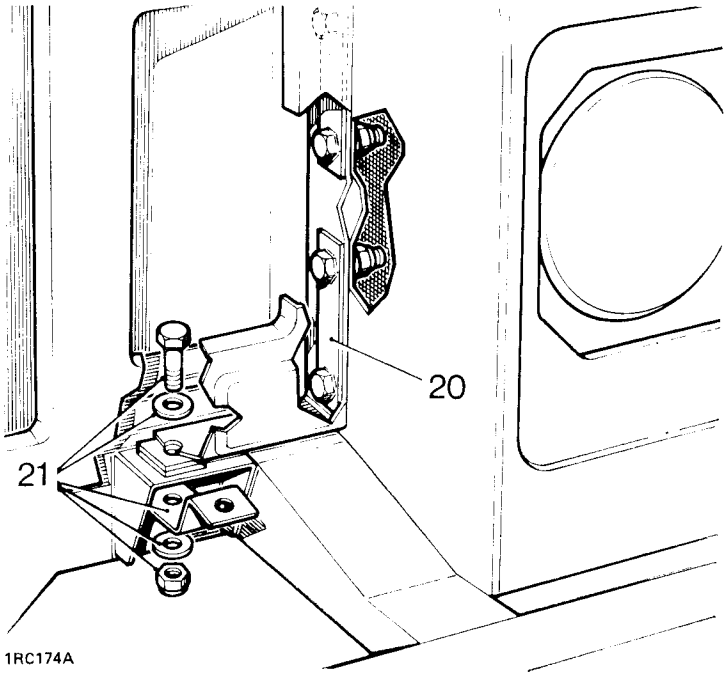


15. Disconnect the front lamps electrical leads at the snap connectors, LH side.
16. Disconnect the harness earth leads at the LH side.
17. Withdraw the headlamp harness from the grille panel.
18. Disconnect the leads from the horn.
19. Remove the fan blades fixings and rest the blades on the lower part of the fan cowl.
20. Remove the grille panel to front wing fixings.
21. Remove the grille panel fixings at the chassis and withdraw the assembly complete.
22. Remove the radiator from the grille panel.
23. If required, remove the split charge diode and the horn.



Refitting

24. Reverse 22 and 23.
25. Locate the radiator and grille panel assembly in position. Fit the fan blades before engaging the grille panel fixings.
26. Reverse 1 to 20.



WINDSCREEN AND FRAME

—Remove and refit **17.17**

Removing

1. If a soft hood is fitted, release the front straps from the support stays at the top of the windscreen and disconnect the top drain channels from the windscreen.
2. Slacken the nuts at the bottom corners of the windscreen.
3. Remove the windscreen pivot bolts and remove the windscreen complete.

Refitting

4. Reverse the removal procedure, renewing the windscreen sealing strip as necessary.

WINDSCREEN GLASS

—Remove and refit **17.18**

Removing

1. Remove the windscreen wiper blade.
2. Remove the retainers drive screws.
3. Prise away the retainers.
4. Withdraw the windscreen glass.

Refitting

5. Apply sealing strip 12 mm (0.500 in) wide around the outsides on both faces of the replacement glass.
6. Reverse 1 to 4.

SEAT OPERATIONS

FRONT SEAT BASE

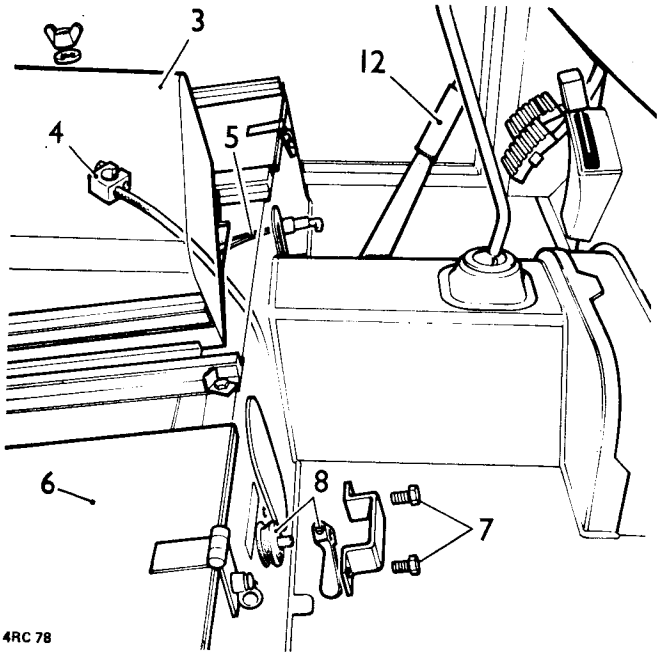
—Remove and refit **18.1**

Removing

1. Remove the front floor. 17.4.
2. Lift out the seat cushions.
3. Disconnect and remove the batteries.
4. Pass the battery leads through the grommets in the seat base.
5. Disconnect the leads from the battery master switch.
6. Remove the cover plate from the passenger's side of the seat base.
7. Remove the two bolts and nuts securing the two-way fuel cock.
8. Remove the lever from the fuel cock and pass the cock inside the seat base.
9. Release the seat squab retaining straps from the support rail.
10. From under the vehicle, remove the handbrake mounting bracket to chassis fixings.
11. Remove the seat base fixings.
12. Lift out the seat base complete, manoeuvring the handbrake lever through the aperture in the seat base front.

Refitting

13. Reverse 1 to 12, using a suitable waterproof sealant between the seat base and body joint flanges.



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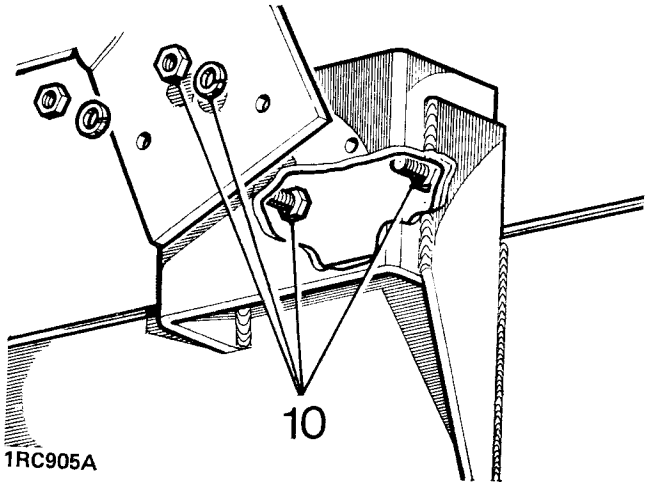

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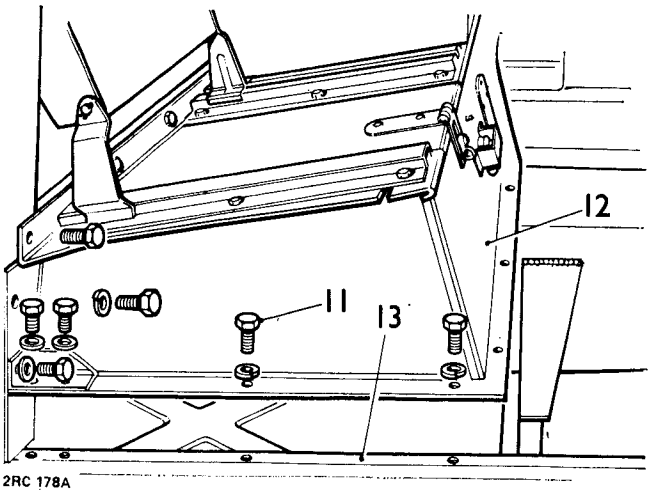


2RC 178A

ACCESSORY OPERATIONS

WASHER RESERVOIR

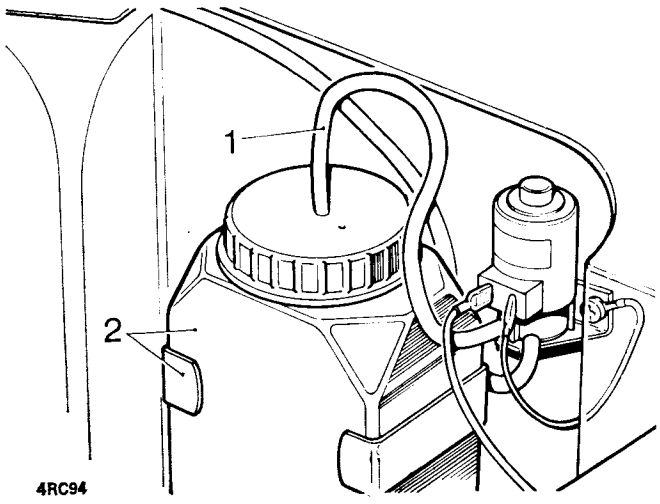
—Remove and refit **22.1**

Removing

1. Disconnect the tubing from the reservoir.
2. Slide the reservoir upwards out of its retaining bracket.

Refitting

3. Reverse 1 and 2.



WASHER JETS

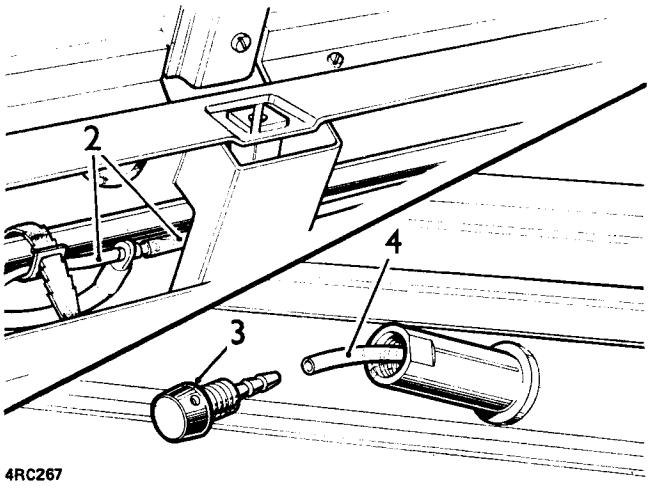
—Remove and refit **22.2**

Removing

1. Remove the facia top rail. 17.13.
2. Disconnect the jet feed tubes from the 'T'-piece.
3. Unscrew the washer jets.
4. Disconnect the feed tubes from the jets.

Refitting

5. Reverse 1 to 4.



WASHER TUBES

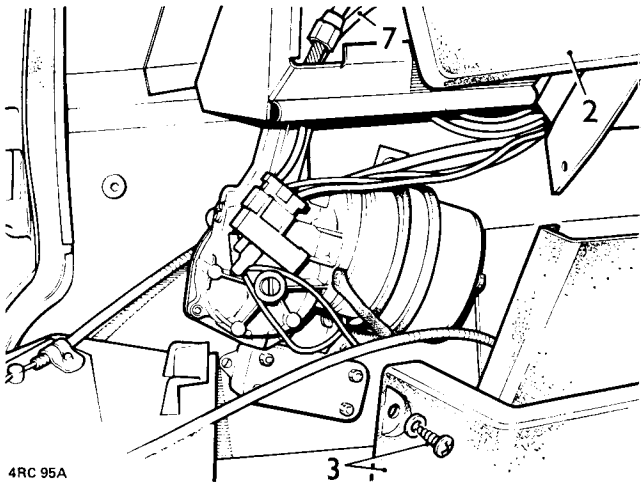
—Remove and refit **22.3**

Removing

1. Remove the facia top rail. 17.13.
2. Withdraw the instrument panel clear of the dash. 6.14 (items 1 to 5).
3. Remove the end cover from the lower facia.
4. Remove the washer jets. 22.2.
5. Disconnect the washer tube from the reservoir.
6. Release the washer tube from the retaining clips.
7. Withdraw the washer tubes.

Refitting

8. Reverse 1 to 7.



WASHER PUMP

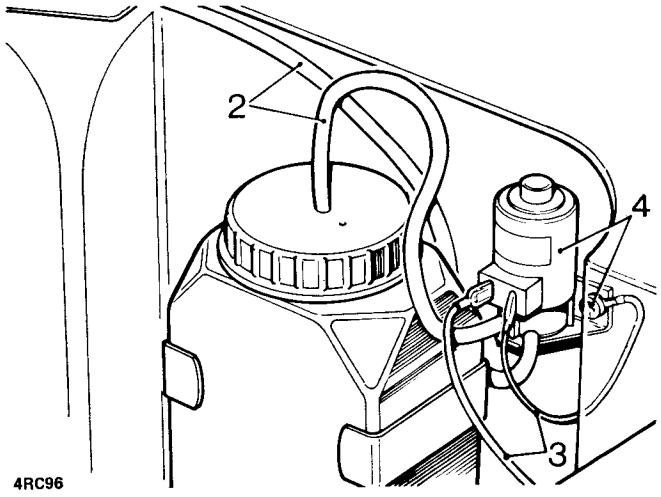
—Remove and refit **22.4**

Removing

1. Disconnect the battery earth lead.
2. Disconnect the tubing from the washer pump.
3. Disconnect the electrical leads from the washer pump.
4. Remove the pump unit.

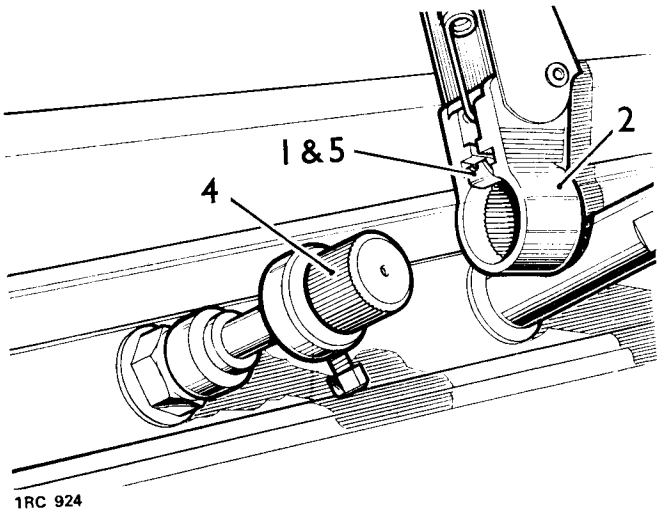
Refitting

5. Reverse 1 to 4.



WIPER ARMS

—Remove and refit **22.5**



1RC 924

Removing

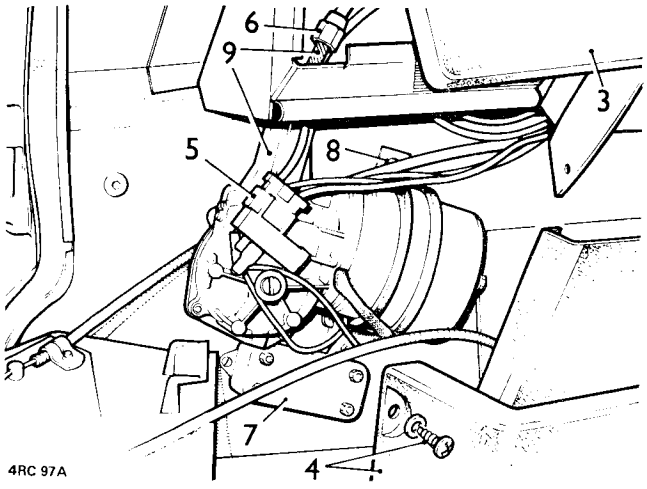
1. Using a small screwdriver, hold back the spring clip which retains the wiper arm on the spindle.
2. Withdraw the wiper arm from the spindle boss.

Refitting

3. Allow the motor to move to the 'park' position.
4. Push the arm onto the boss, locating it on the splines so that the wiper blade is just clear of the screen rail.
5. Ensure that the spring retaining clip is located in the retaining groove on the boss.

WIPER MOTOR AND DRIVE

—Remove and refit **22.6**



4RC 97A

Removing

1. Disconnect the battery earth lead.
2. Remove the wiper arms. 22.5.
3. Withdraw the instrument panel clear of the dash. 6.14 (items 1 to 5).
4. Remove the end cover from the lower facia.
5. Disconnect the electrical leads from the wiper motor.
6. Disconnect the drive cover tube from the wiper motor.
7. Remove the two screws securing the suppressor unit.
8. Slacken the clamp securing the wiper motor.
9. Remove the wiper motor together with the suppressor unit, withdrawing the drive from the cover tube.

Refitting

10. Reverse 1 to 9. Rotate the wheel box spindle to assist feeding the drive through the cover tube.
11. Connect the leads between the wiper motor and the limit switch in accordance with the circuit diagram. Division 6.

WIPER MOTOR, DRIVE AND WHEEL BOXES

—Remove and refit **22.7**

Removing

1. Disconnect the battery earth lead.
2. Remove the wiper arms. 22.5.
3. Remove the drive adaptor from the wheel box spindles.
4. Withdraw the grommet from the wheel box spindles.
5. Remove the locknuts from the wheel boxes.
6. Remove the facia top rail. 17.13.
7. Remove the facia support panel. 17.15.
8. Remove the end cover from the lower facia.
9. Remove the backplate from the RH wheel box.
10. Withdraw the RH wheel box.

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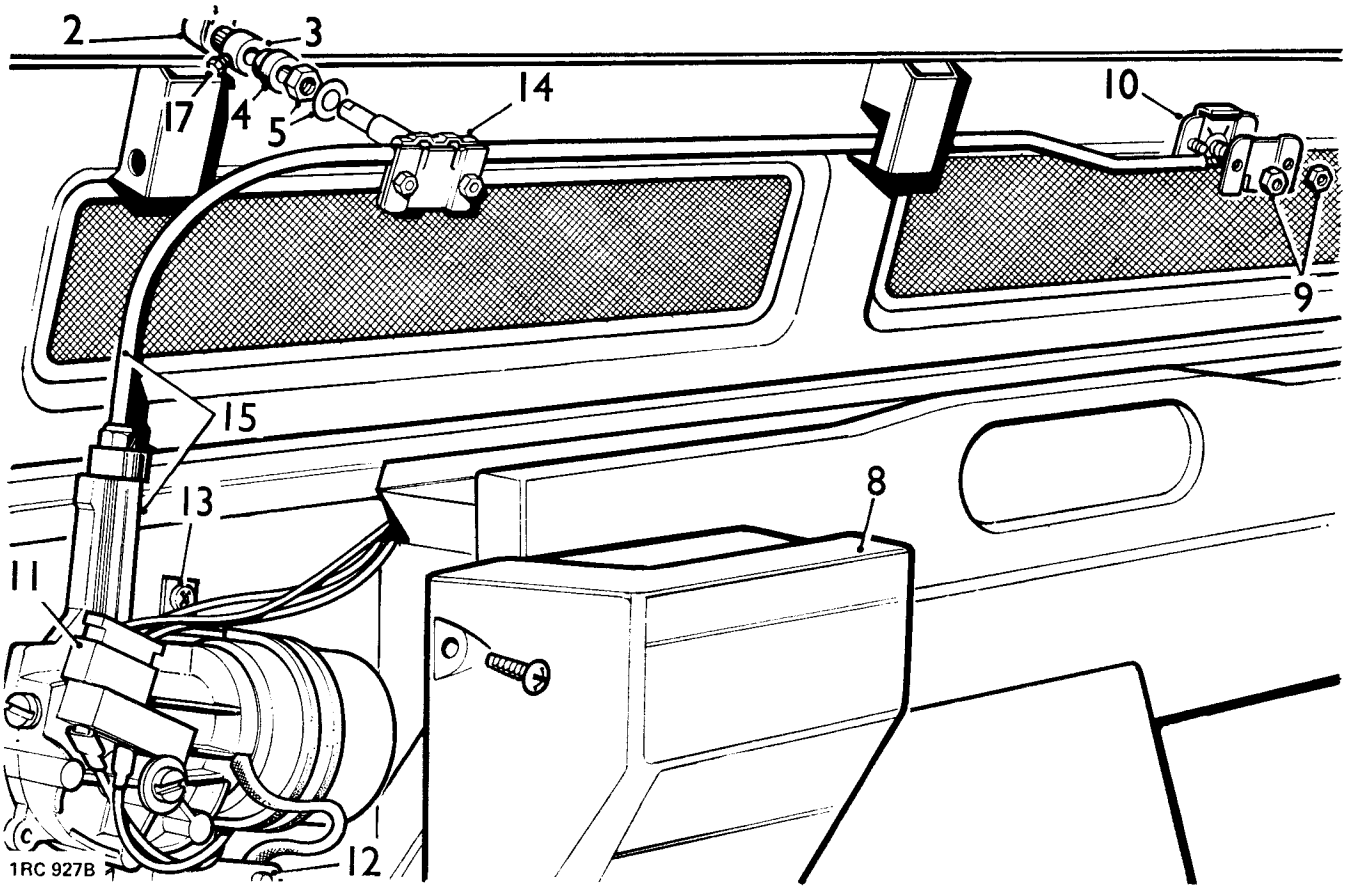

11. Disconnect the electrical leads from the wiper motor.
12. Remove the two screws securing the suppressor unit.
13. Slacken the clamp securing the wiper motor.
14. Withdraw the LH wheel box clear of the dash.
15. Withdraw the wiper motor complete with the suppressor unit, drive cable and LH wheel box.

Refitting

16. Reverse 1 to 15. Connect the leads between the wiper motor and the limit switch in accordance with the circuit diagram. Division 6.
17. Tighten the screws securing the drive adaptors to the wheel box spindles. Torque 34,5 kgf cm (03 lbf in).

WIPER MOTOR

—Overhaul **22.8**

Dismantling

1. Remove the wiper motor and drive. 22.6.
2. Remove the gearbox cover.
3. Remove the circlip and plain washer securing the connecting rod.
4. Withdraw the connecting rod.
5. Withdraw the flat washer.
6. Remove the circlip and washer securing the shaft and gear.
7. Clean any burrs from the gear shaft and withdraw the gear.
8. Withdraw the dished washer.
9. Add alignment marks to the yoke and gearbox for re-assembly.
10. Remove the yoke securing bolts.
11. Withdraw the yoke and armature.
12. Remove the brush gear assembly.
13. Remove the limit switch.

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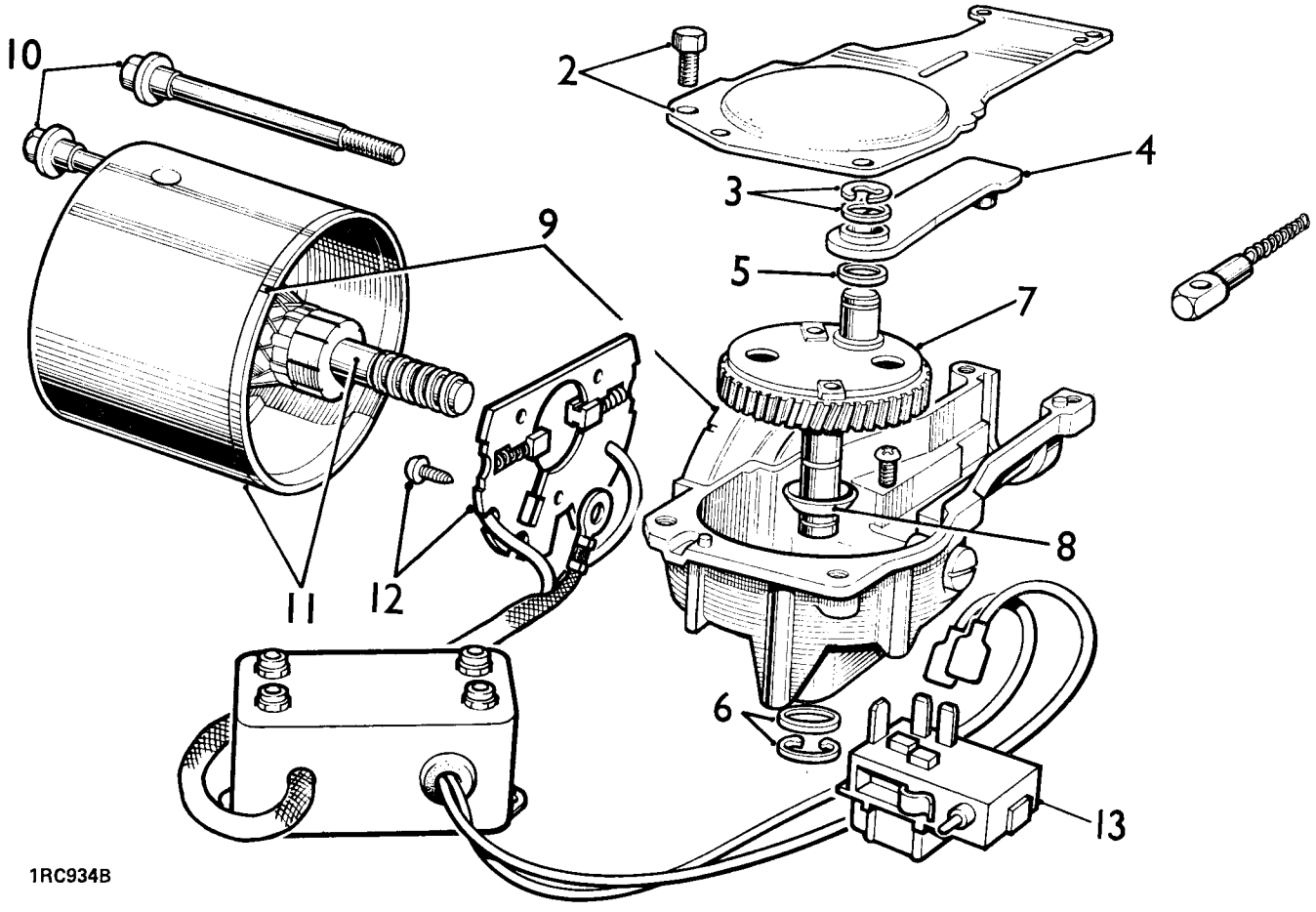

Inspecting

14. Check the brushes for excessive wear, if they are worn to 4,8 mm (0.190 in) in length, fit a new brush gear assembly.
15. Using a push type gauge, check that the brush spring pressure is 140 to 200 g (5 to 7 oz) when the bottom of the brush is level with the bottom of the slot in the brush box. Fit a new brush gear assembly if the springs are not satisfactory.
16. Test the armature for insulation and open-or short-circuits. Use a test lamp (110V, 15W). Fit a new armature if faulty.
17. Examine the gear wheel for damage or excessive wear.

Assembling

18. Reverse 1 to 13, noting 19 to 26.
19. Use Ragosine Listate Grease to lubricate the gear wheel teeth, armature shaft worm gear, connecting rod and pin, cable rack and wheel box gear wheels.
20. Use Shell Turbo 41 oil sparingly to lubricate the bearing bushes, armature shaft bearing journals, gear wheel shaft and wheel box spindles. Thoroughly soak the felt washer in the yoke bearing with oil.
21. Tighten the yoke fixing bolts. Torque 14 to 18 kgf cm (12 to 16 lbf in).
22. If a replacement armature is being fitted, slacken the thrust screw to provide end-float for fitting the yoke.
23. Fit the dished washer beneath the gear wheel with its concave side towards the gear wheel.
24. Ensure that the larger of the two washers is fitted to the crankpin beneath the connecting rod.
25. Armature end-float. Hold the yoke vertical with the adjuster screw uppermost. Carefully screw in the adjuster until resistance is felt then, screw back a quarter turn. This will give the required end float.
26. Connect the leads between the suppressor unit and the wiper motor limit switch as follows.
    Blue lead to No. 1 terminal.
    Red lead to No. 5 terminal.

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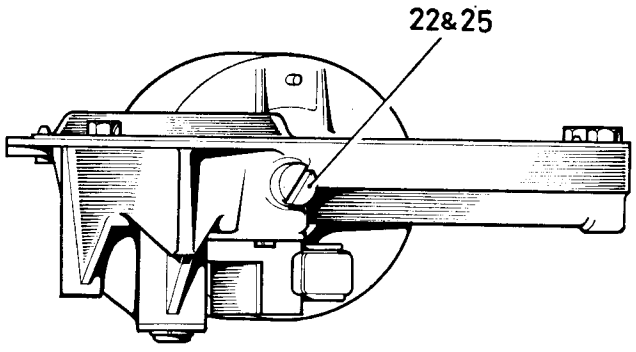


IRC 935

DATA

Windscreen wiper motor

Armature end float	0,1 mm to 0,2 mm (0.004 in to 0.008 in)
Brush length, minimum	4,8 mm (0.190 in)
Brush spring tension	140 g to 200 g (5 oz to 7 oz)

Light running, rack disconnected:

60 seconds from cold:

Current	0,8 amps (approximate)
Speed	46 to 52 rev/min

HEATER CONTROLS

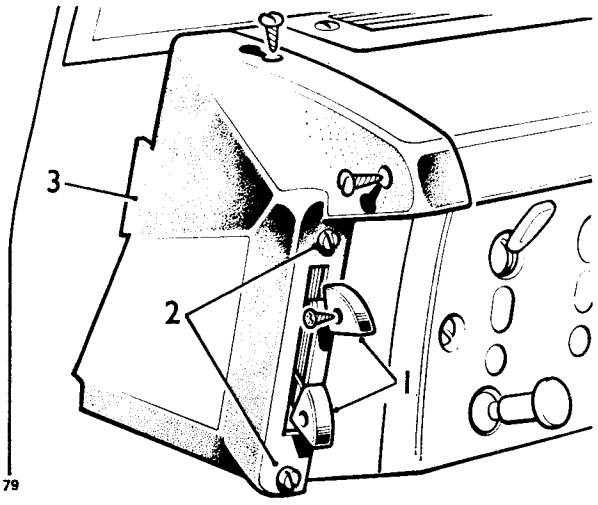
—Remove and refit **22.9**

Removing

1. Remove the fixings and withdraw the finger grips.
2. Remove the fixings, control lever assembly to end panel.
3. Remove the end panel.
4. Slacken the inner cables grub screws.
5. Slacken the outer cables clamp screws.
6. Withdraw the heater control lever assembly.

Refitting

7. Reverse 1 to 6; adjust the cables to operate the water valve and air distribution flaps before fitting the control levers and end panel assembly to the dash.



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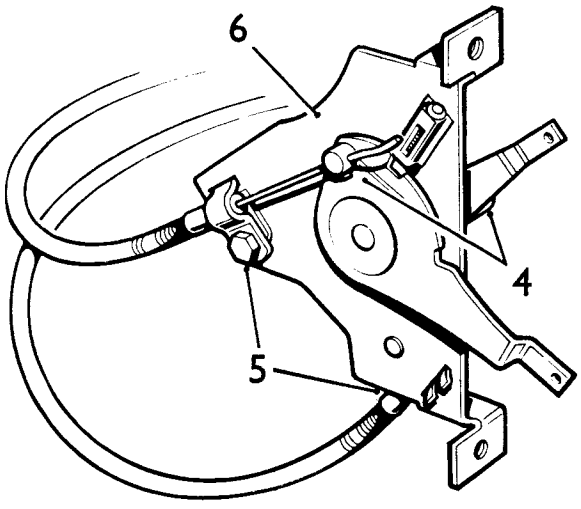


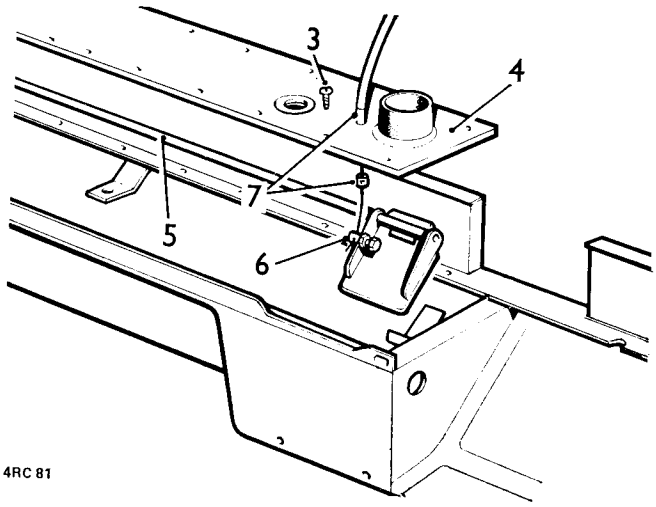
4RC80A

HEATER/VENTILATOR AIR FLOW CONTROL CABLE

—Remove and refit **22.10**

Removing

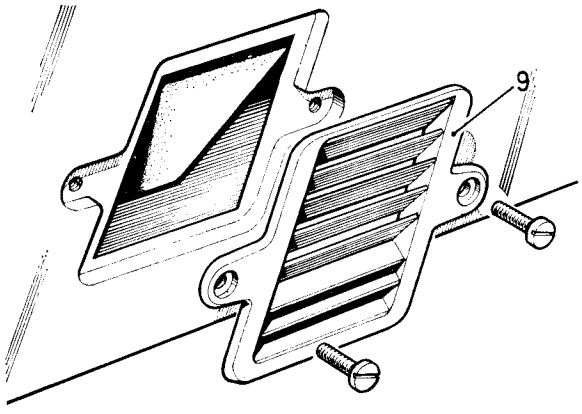
1. Remove the heater controls 22.9 items 1 to 3 and disconnect the air flow control cable.
2. Remove the lower facia. 17.14.
3. Remove the heater ducting cover fixings.
4. Withdraw the ducting cover to gain access to the air distribution flaps.
5. Withdraw the distribution flaps from the facia.
6. Disconnect the inner cable at the flaps.
7. Withdraw the outer cable, retained at the ducting cover by a tubular clip.



4RC 81

Refitting

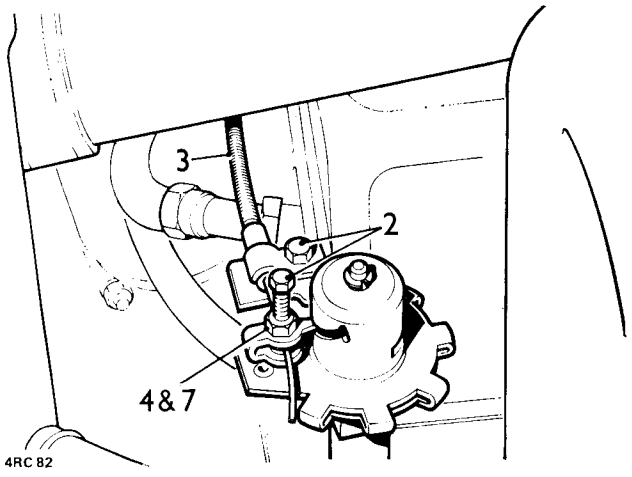
8. Reverse 2 to 7.
9. Refit the heater controls and air flow control cable ensuring full air distributor flap operation. The flaps are easily checked after removing the air outlet grilles in the lower facia.



IRC 1000

HEATER WATER VALVE CONTROL CABLE

—Remove and refit **22.11**

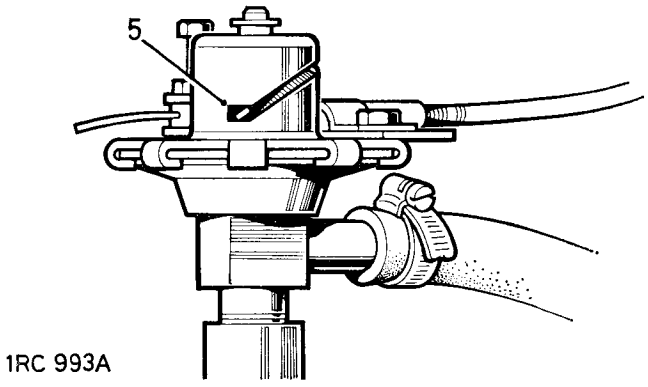


Removing

1. Remove the heater controls assembly. 22.9.
2. Disconnect the inner and outer cables at the water valve.
3. Withdraw the cable through the dash grommet.

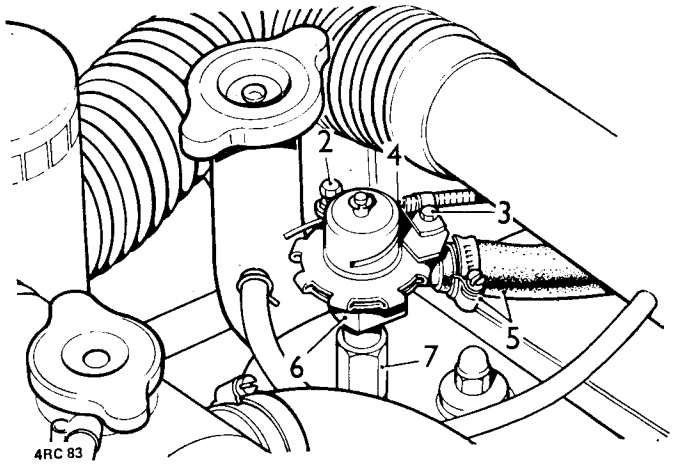
Refitting

4. Reverse 1 to 3; do not tighten the cable fixings at the water valve at this stage.
5. Set the water valve in the closed position.
6. Set the cable control lever in the fully up 'cold' position.
7. Take up all slack in the inner cable then tighten the inner cable fixing.



HEATER WATER VALVE

—Remove and refit **22.12**

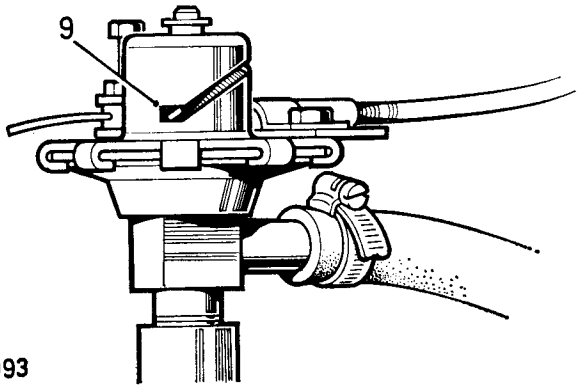


Removing

1. Partially drain the coolant from the radiator.
2. Slacken the inner cable fixing.
3. Slacken the outer cable clamp fixing.
4. Free the inner cable and withdraw from the valve.
5. Release the heater hose clips and slide the hose away from the water valve.
6. Unscrew and withdraw the heater water valve complete with adaptor.
7. Withdraw the adaptor sealing washer.

Refitting

8. Reverse 3 to 7; do not tighten the inner cable fixing at this stage.
9. Set the water valve in the closed position.
10. Set the cable control lever in the fully up 'cold' position.
11. Take up all slack in the inner cable then secure the cable to the water valve.
12. Reverse 1.



HEATER FAN SWITCH

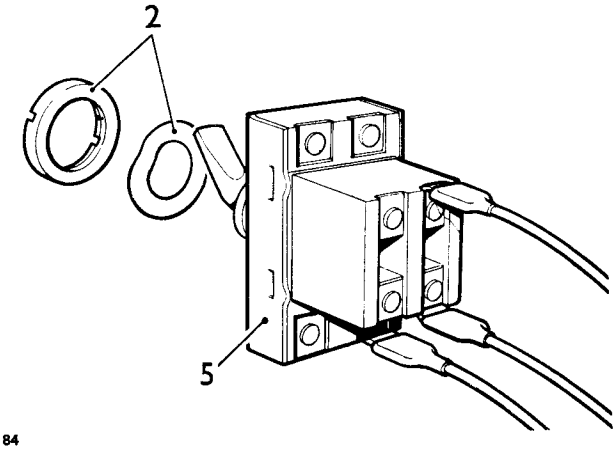
—Remove and refit **22.13**

Removing

1. Disconnect the battery earth lead.
2. Unscrew the lockring and withdraw the wave washer from the switch knob.
3. Withdraw the instrument panel clear of the dash. 6.14, items 1 to 5.
4. Disconnect the leads from the switch.
5. Withdraw the switch.

Refitting

6. Reverse 4 and 5; connect the leads in accordance with the circuit diagram. Division 86.
7. Reverse 1 to 3.



DE-MISTER HOSES

—Remove and refit **22.14**

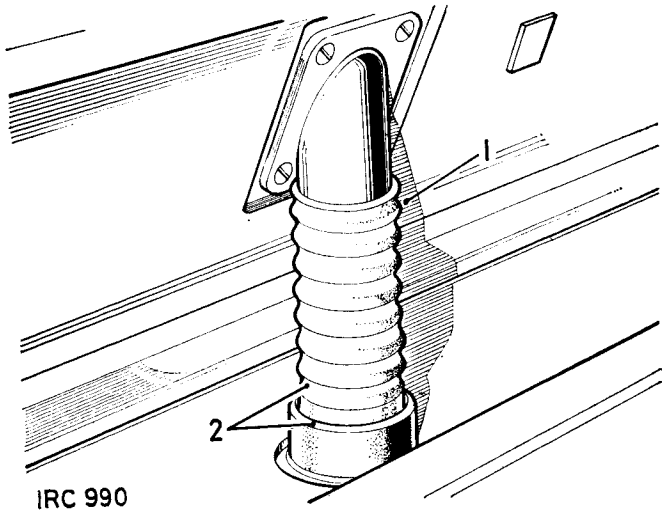
Passenger's side hose, items 1 to 3
Driver's side hose, items 4 to 7

Removing, passenger's side hose

1. Disengage the hose upper end from the nozzle adaptor.
2. Withdraw the hose from the rubber connector.

Refitting

3. Reverse 1 and 2.

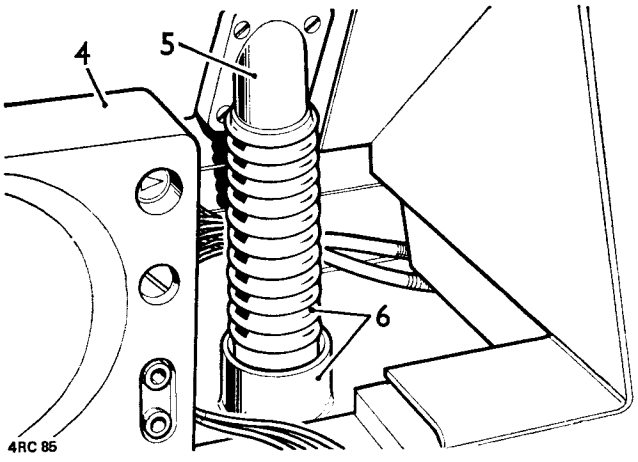


Removing, driver's side hose

4. Withdraw the instrument panel sufficient to gain access to the hose 6.14, items 1 to 5.
5. Disengage the hose upper end from the nozzle adaptor.
6. Withdraw the hose from the rubber connector.

Refitting

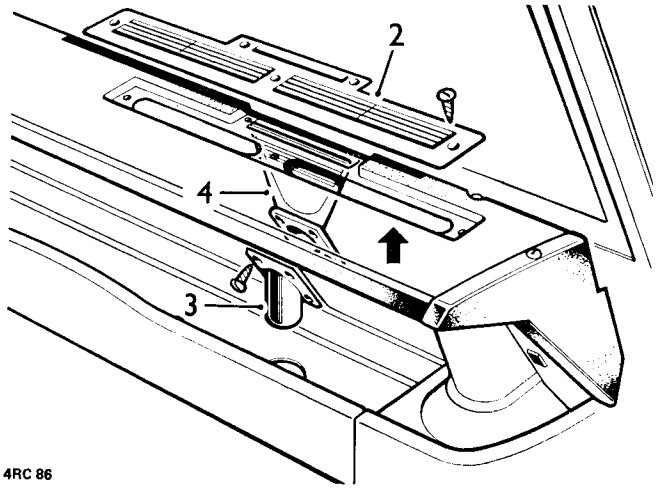
7. Reverse 4 to 6.



DEMISTER NOZZLES

—Remove and refit **22.15**

Passenger's side, items 1 to 4
Driver's side, items 6 to 13



Removing, passenger's side nozzle

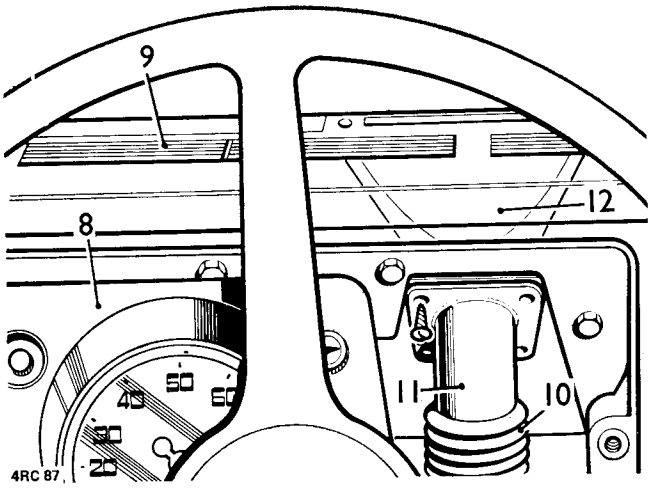
1. Remove the demister hose. 22.15.
2. Remove the fresh air grille.
3. Remove the nozzle adaptor.
4. Manoeuvre the nozzle out through the fresh air grille aperture.

Refitting

5. Reverse 1 to 4.

Removing, driver's side nozzle

6. Disconnect the battery earth lead.
7. Remove the switch shrouds from the steering column.
8. Withdraw the instrument panel clear of the dash, 6.14 items 1 to 5.
9. Remove the fresh air grille.
10. Withdraw the demister hose.
11. Remove the nozzle adaptor.
12. Manoeuvre the nozzle out through the fresh air grille aperture.



Refitting

13. Reverse 6 to 12.

AIR DISTRIBUTION FLAPS

—Remove and refit **22.16**

This operation is described in 22.10.

VENTILATOR GRILLE PANEL

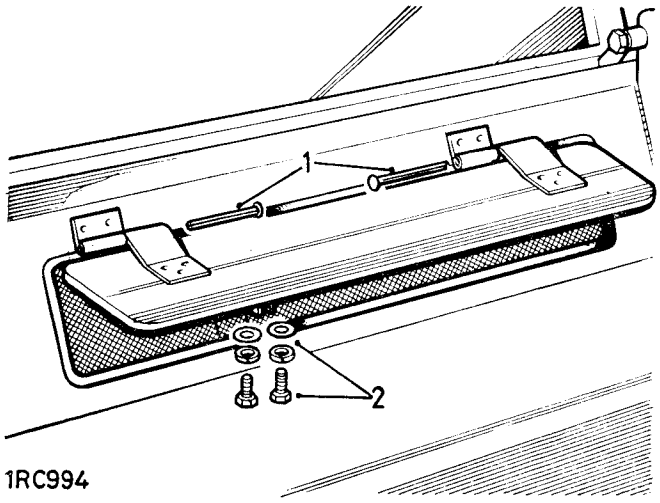
—Remove and refit **22.17**

Removing

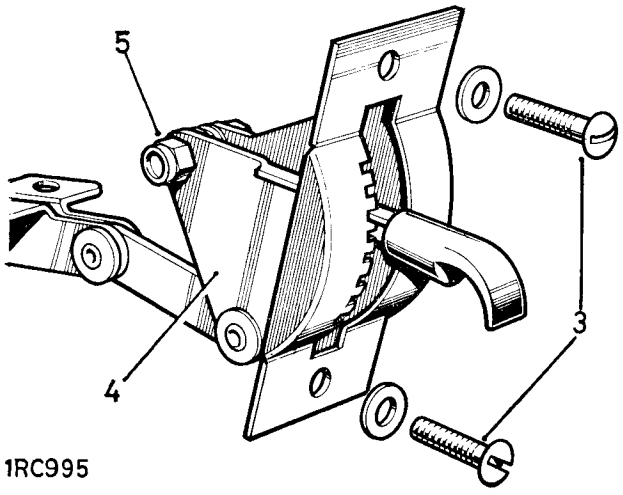
1. Remove the hinge pins.
2. Remove the control lever fixings.
3. Remove the ventilator control to dash fixings.
4. Withdraw the ventilator control and quadrant assembly.

Refitting

5. Check the lever operation in the quadrant. If required, adjust the special locknut to alter the spring loading on the lever.
6. Reverse 1 to 4.



1RC994



1RC995

FRESH AIR INTAKE

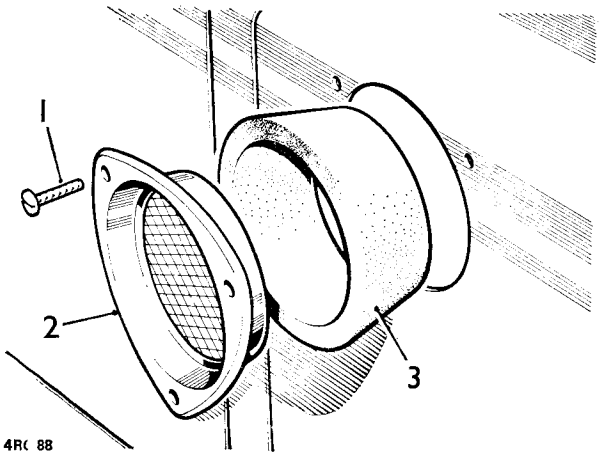
—Remove and refit **22.18**

Removing

1. Remove the fixings.
2. Withdraw the intake grille assembly.
3. If required, withdraw the air inlet seal.

Refitting

4. Reverse 1 to 3.



4RC 88

HEATER BOX COMPLETE

—Remove and refit 1 to 6 and 13 **22.19**

HEATER RADIATOR

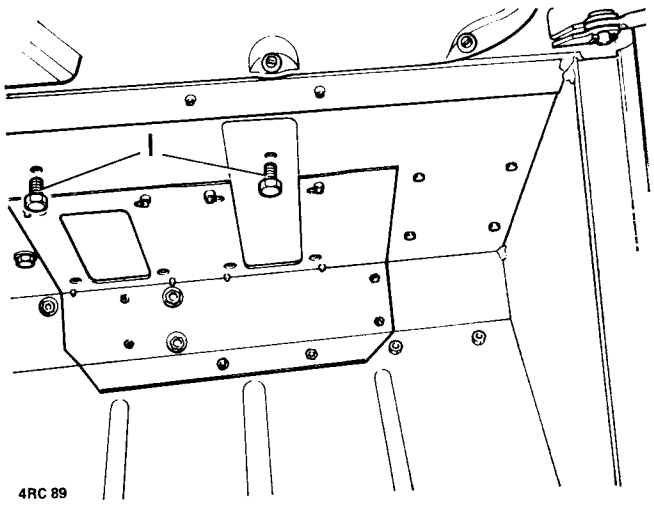
—Remove and refit 1 to 12 **22.20**

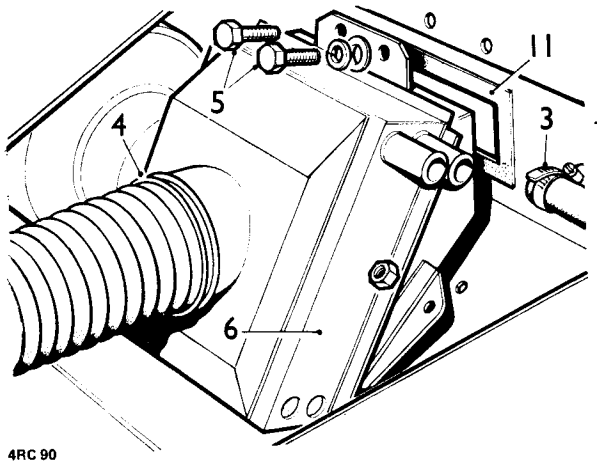
Removing

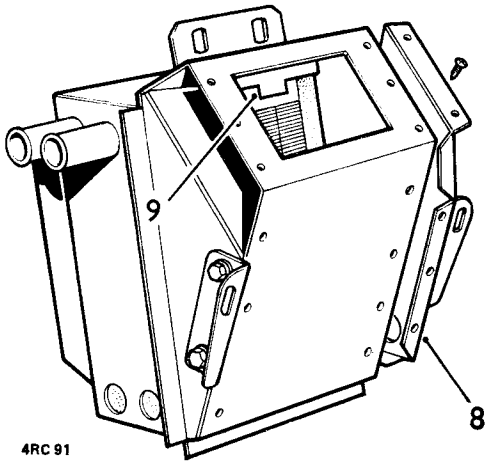
1. From inside the cab remove the heater box lower fixings.
2. Prop open the bonnet.
3. Disconnect the heater water hoses.
4. Disconnect the air inlet hose.
5. Remove the heater box upper fixings.
6. Withdraw the heater box.
7. If radiator removal is required, for inspection purposes, proceed as follows, items 8 to 10.
8. Remove the fixings and withdraw the detachable side panel.
9. Withdraw the radiator and pipes assembly.

Refitting

10. If removed, reverse 8 and 9.
11. Ensure that the joint seal is present and sound.
12. Reverse 1 to 6.

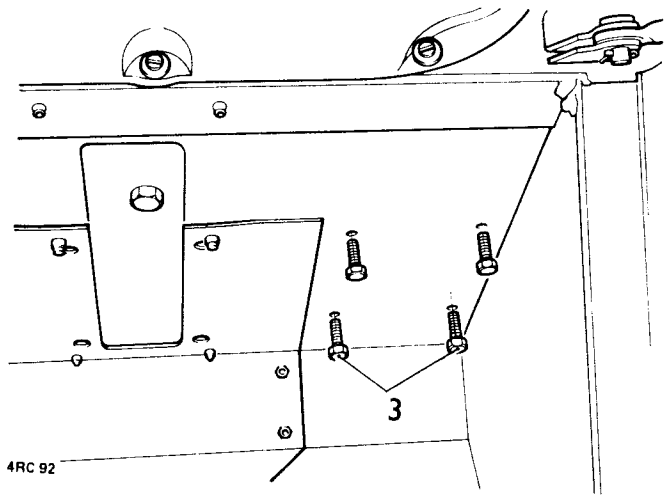






HEATER/BLOWER FAN MOTOR

—Remove and refit **22.21**



Removing

1. Disconnect the battery earth lead.
2. Disconnect the blower motor leads.
3. From inside the cab remove the blower motor fixings.
4. Disconnect the air hose at the matrix inlet.
5. Remove the wing panel rear top fixing bolt.
6. Manoeuvre the blower motor assembly clear, lifting the wing panel sufficient to allow passage.
7. Withdraw the air inlet seal.

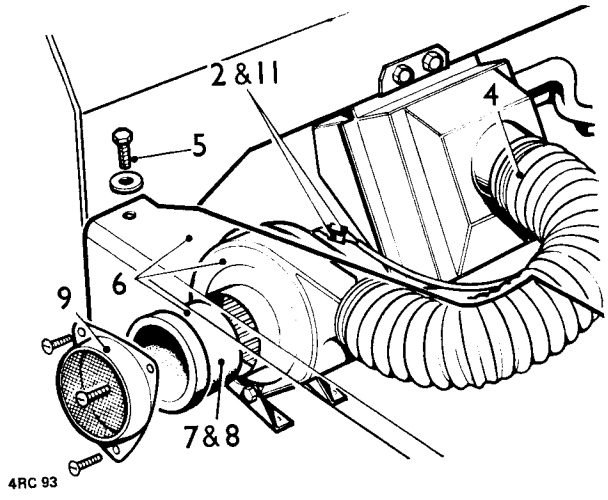
Refitting

8. Fit the blower motor but omit the air inlet seal at this stage.
9. Remove the air intake grille.
10. Fit the air inlet seal and replace the intake grille.
11. Reverse 1 to 6. Connect the electrical leads from the blower motor at the snap connectors in accordance with the circuit diagram. Division 6.

HEATER PIPES

—Remove and refit

Feed to heater	**22.22**
Return from heater	**22.23**



Removing

1. Partly drain the coolant.
2. Disconnect the hoses.
3. Remove the fixings and withdraw the pipe.

Refitting

4. Reverse 1 to 3.

All Service Tools mentioned in this Manual must be obtained direct from the tool manufacturers:

Messrs. V. L. Churchill & Co. Ltd.
P.O. Box No. 3
London Road,
Daventry,
Northants,
England.

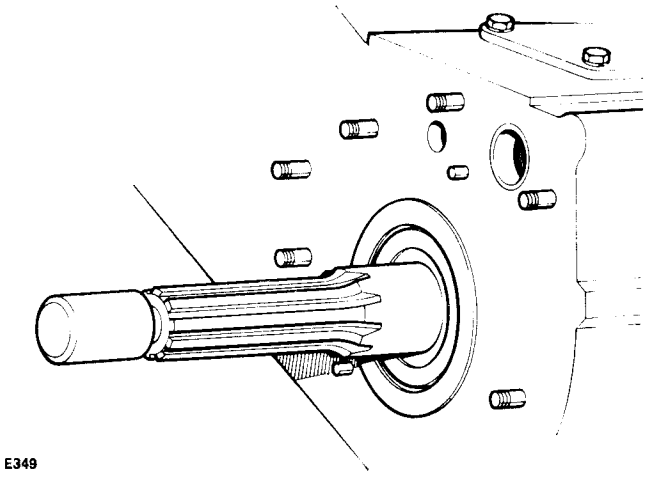
Telephone: 03-272 4461
Telex: 31326
Telegrams: Garaquip Daventry Northants Telex

NOTE: An exception to the above statement are the tools required for overhauling the alternator, refer to Operation 6.2 for details.

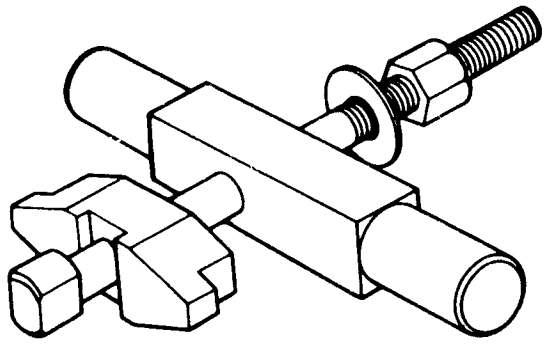
SERVICE TOOLS LIST

Tool Number	Description
243241	Protection cap for output shaft thread.
262757	Extractor for differential pinion rear bearing.
262757-1	Replacer for differential pinion rear bearing.
270304	Guides for rear main bearing cap seals.
274400	Drift for inlet valve guide removal.
274401*	Drift for exhaust valve guide removal.
276102*	Valve spring compressor.
507231	Extractor for chain wheel.
530101*	Extractor for camshaft, gudgeon pin and tappet guide; puller for connecting rod bolts.
530102	Spanner for starter dog.
530105	Spanner for crownwheel locking nuts and differential pinion driving flange.
530106*	Multi-purpose bracket for dial gauge.
530625	Fitting tool for exhaust valve seat.
600000	Extractor for drop arm.
600300	Spanner for gearbox mainshaft nut.
600536*	Compressing tool, relay spring.
600959*	Fitting tool, exhaust valve guides.
600963*	Engine lifting sling.
601508*	Fitting tool, inlet valve guide.
601763*	Extractor for ball joints.
605004*	Gauge for differential pinion setting.
605022	Clutch plate alignment tool.
605052	Remover for engine plug, used when fitting an immersion heater.
605862*	Extractor for intermediate shaft.
605975	Tool for camshaft bearing remove/refit.
606435	Spanner for hub bearing nuts.
RO1013	Adaptor for torque wrench (use with 600300).

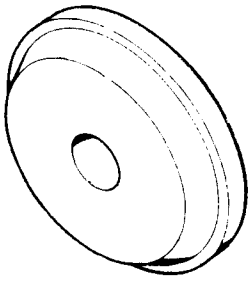
NOTE: Tool Part Numbers marked with an asterisk (*) are included for information. The supply of these particular tools will depend on their availability.



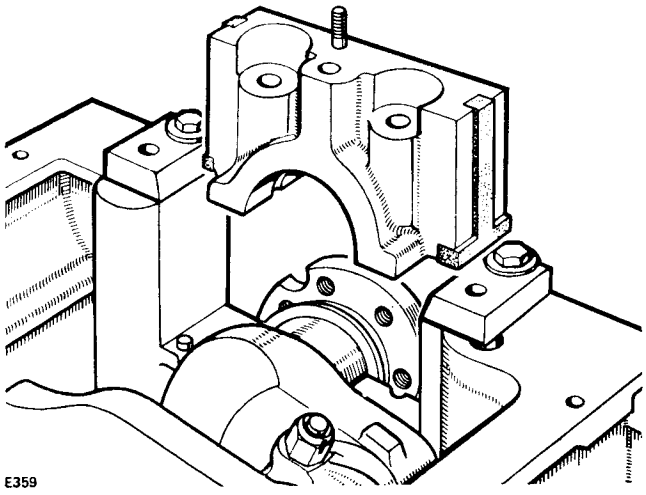
243241 Protection cap, for gearbox output shaft



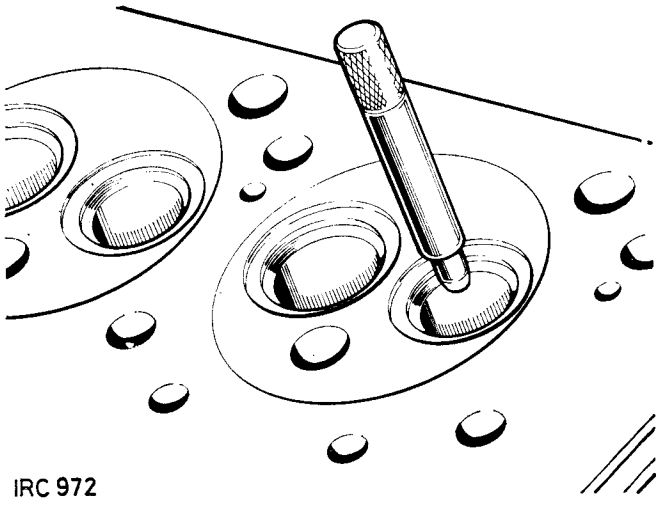
262757 Pinion bearing extractor



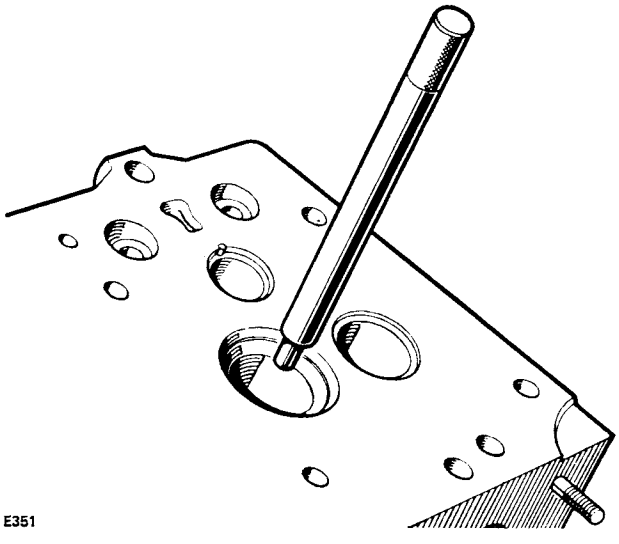
262757-1 Replacer pinion bearing



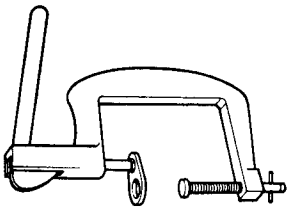
270304 Guides for rear main bearing cap seals



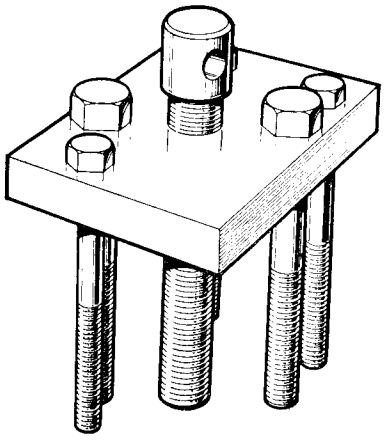
274400 Valve guide removal drift, inlet



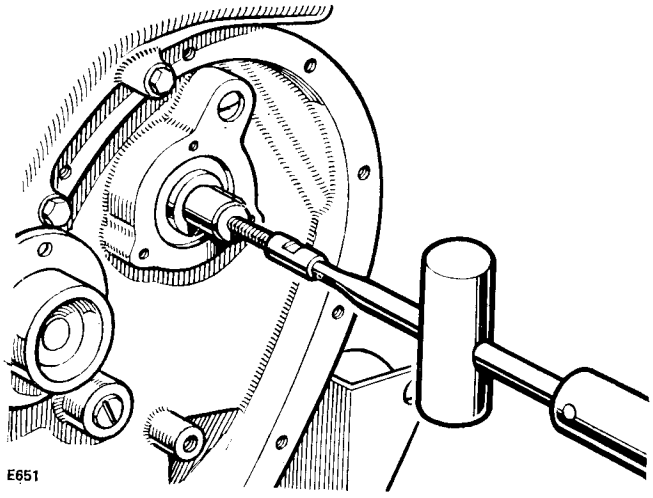
274401 Valve guide removal drift, exhaust



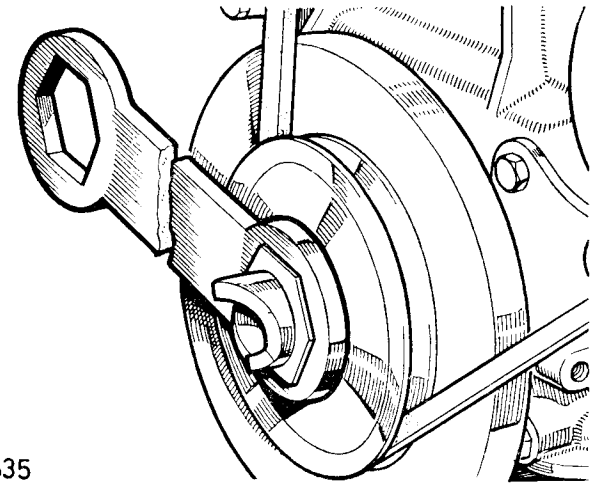
276102 Valve spring compressor



507231 Extractor, chain wheel

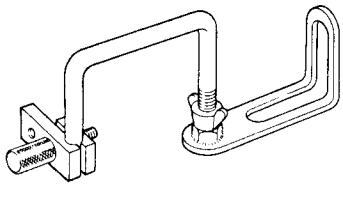


530101 Extractor and puller

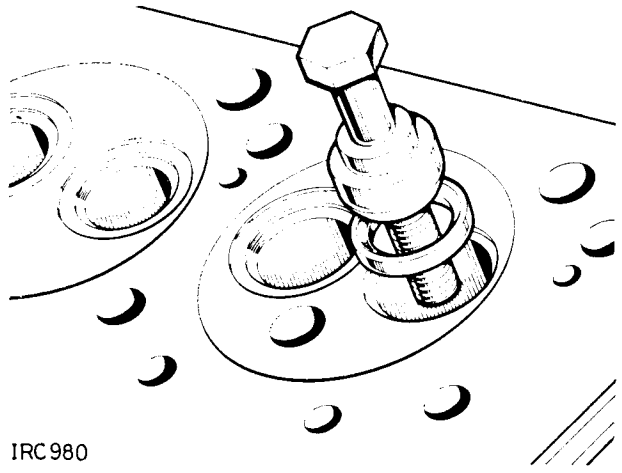


530102 Starter dog spanner

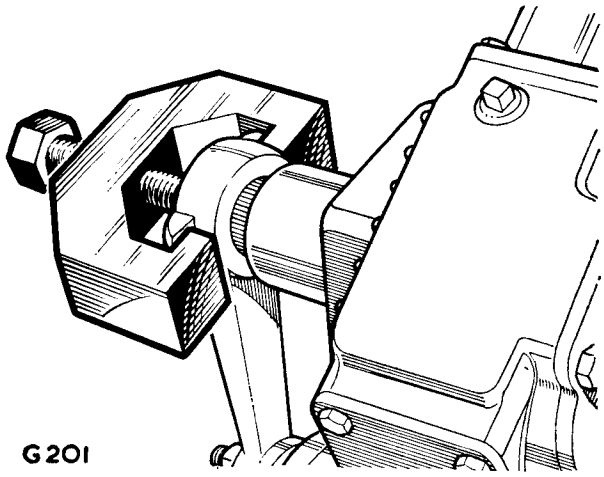
530105 Spanner, crownwheel locking nuts



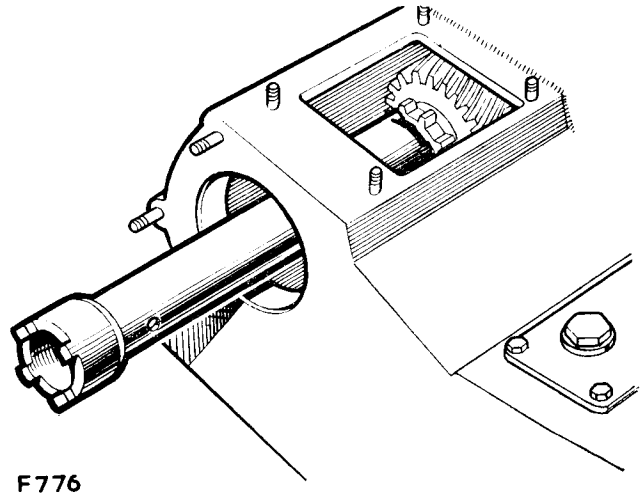
530106 Multi-purpose bracket for dial gauge



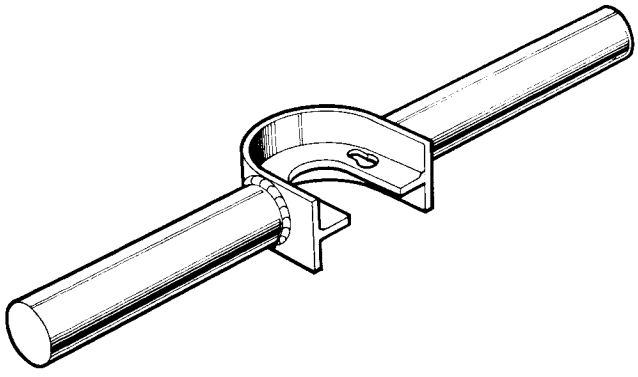
530625 Fitting tool, exhaust valve seat (special use)



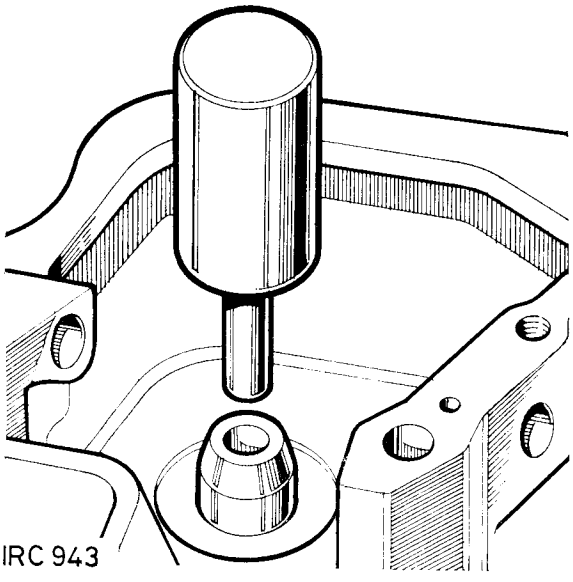
600000 Extractor for steering drop arm



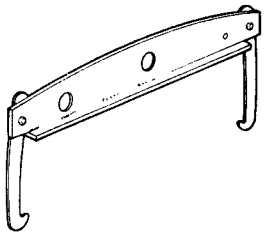
600300 Spanner for gearbox mainshaft nut
(use with adaptor RO 1013, see page 26–7)



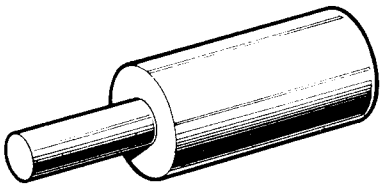
600536 Tool for compressing steering relay spring



600959 Fitting tool for exhaust valve guide

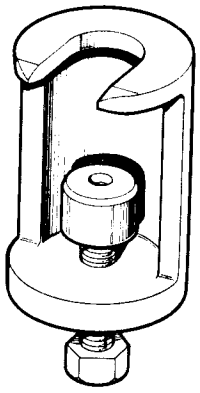


600963 Engine lifting sling



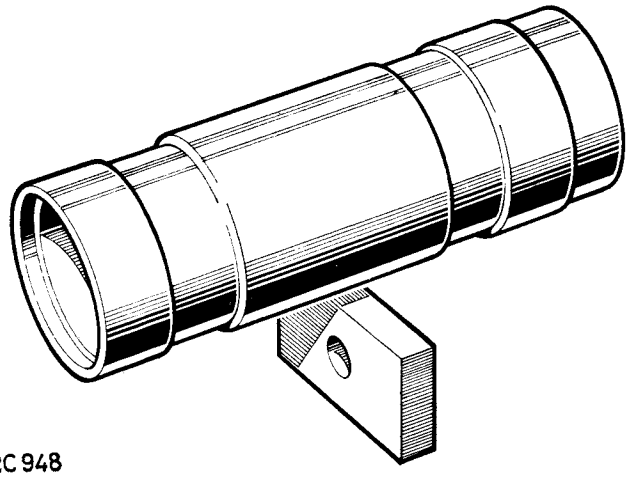
IRC 945

601508 Fitting tool for inlet valve guides



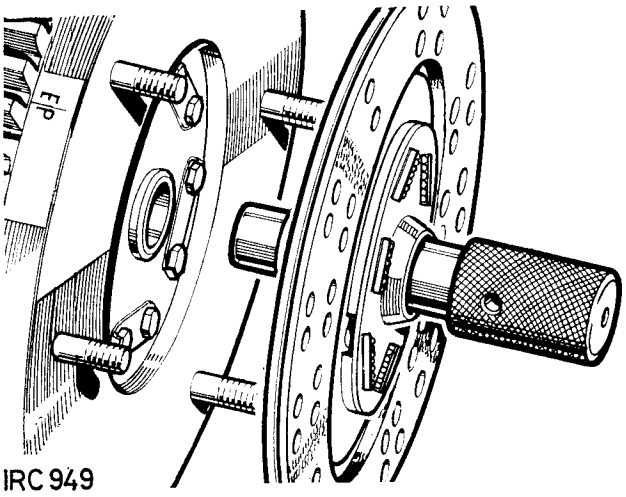
IRC 946

601763 Extractor, steering ball joints



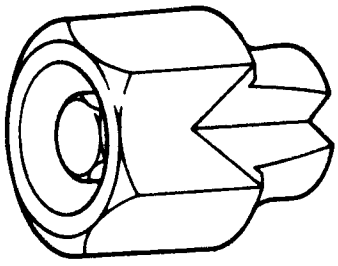
IRC 948

605004 Gauge, differential pinion setting

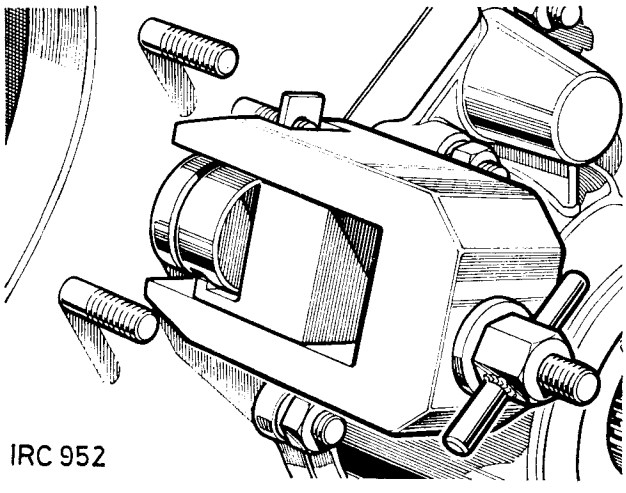


IRC 949

605022 Clutch plate alignment tool

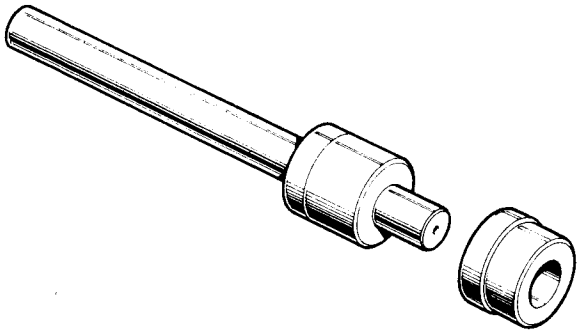


605052 Removal tool for immersion heater plug



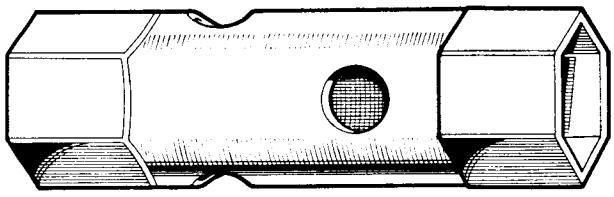
IRC 952

605862 Extractor for transfer box intermediate shaft



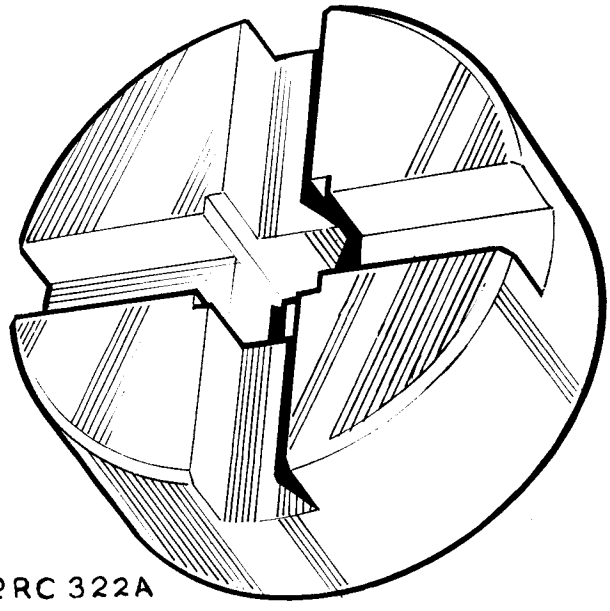
IRC 954

605975 Tool for camshaft bearing remove/refit



IRC 956

606435 Hub nut spanner



2RC 322A

RO1013 Adaptor for torque wrench (use with 600300)

CONTENTS

INTRODUCTION

Times

All operation times are given in decimal hours.

General notes

The times listed in this publication are the results of a careful study of each of the operations concerned. They do not reflect reduced times based on special familiarity, but do assume that the operations are carried out by an operative of average ability who has completed the operation on at least one previous occasion. In establishing the times, a vehicle in good condition has been used.

Allowance has been made for moving and setting up the vehicle, obtaining the appropriate service tools and replacement parts where applicable and the necessary cleaning. No allowance has been included for inaccessibility through damage, removing extras or special fitments, freeing seized parts, removing rusted or broken studs or bolts, or subsequent repairs after test.
Each operation is complete in itself unless otherwise stated. The time shown is achieved by strict adherence to the instructions given in the Repair Operation Manual.

Definitions

The operation 'Remove and Refit' refers to the removing and refitting of an existing component or part, removing an existing part and fitting a new or replacement part, or removing a component prior to overhaul and refitting it after overhaul.

Times given for 'Overhaul' operations include removing the component from its installed position and its subsequent refitting, except where otherwise stated in the Operation concerned.
The term 'Unit' refers to an assembly in the state in which it can most efficiently be removed from the vehicle.
A 'Combined Operation' is one directly related to an operation which can be performed with the vehicle or major system in different stages of assembly; it appears immediately following, and inset to, the operation to which it is related.

The following have been excluded from the times concerned:

(a) Road test, where applicable, and duplication of any repair operations which may follow the road test.

The following have been included in the times concerned:

(a) Time taken in putting the vehicle into position for the repair.
(b) Any jacking up of the vehicle or putting on to a lift.
(c) All intermediate operations, such as raising the bonnet at the beginning of the repair and closing it at the end.
(d) Time taken in obtaining any special tools where applicable and returning same to stores after use.
(e) Time taken in getting appropriate spare parts from the stores.
(f) Any draining and refilling of the radiator, sump, gearbox, axles or final drive unit.
(g) All testing that can be carried out while the vehicle is still in the repair bay.

Numbering

The Operation numbers specified on the following pages, cross-refer to corresponding Operations in the Repair Operation Manual. Un-numbered Operations on the following pages are included in this Division only and provide additional Repair times for information.

Operation Number	Description	Times allowed Hours $2\frac{1}{4}$ Petrol	
	CAMSHAFT		
1–14	Camshaft—remove and refit	14.7	
1–15	Camshaft bearings—remove and refit	36.5	
	CONNECTING RODS AND PISTONS		
1–5	Connecting rods and pistons—remove and refit	6.1	
1–6	Connecting rods and pistons—overhaul	10.9	
	Connecting rod bearings—set—remove and refit	8.1	
	CRANKSHAFT		
1–7	Crankshaft rear oil seal—remove and refit	16.9	
1–8	Crankshaft—remove and refit	19.4	
1–9	Crankshaft—overhaul	21.1	
	CYLINDER BLOCK		
1–2	Cylinder pressures—check	0.6	
1–3	Front side cover—remove and refit	0.6	
1–4	Rear side cover—remove and refit	1.1	
	CYLINDER HEAD		
1–16	Cylinder head—remove and refit	4.0	
1–17	Cylinder head—overhaul	6.9	
	Decarbonise, reface all valves and seats, grind in valves, tune engine	10.1	
1–19	Valve gear—remove and refit	1.6	
	Rocker cover—cylinder head—remove and refit	0.4	
	Valve clearances—check and adjust	0.6	
1–18	Rocker shaft assembly—overhaul	2.5	
1–20	Tappets—remove and refit	6.0	
	Valve guide—inlet—extra each—remove and refit	0.2	
	Valve guide—exhaust—extra each—remove and refit	0.2	
	Exhaust valve seat—extra each—remove and refit	0.4	
	ENGINE ASSEMBLY		
1–1	Engine assembly—remove and refit	11.9	
	Engine assembly—remove—change over ancillary equipment and refit	15.3	
	Engine assembly—strip and rebuild	36.5	
	TUNE ENGINE		
	Tune engine	3.1	
	FLYWHEEL		
2–1	Flywheel—remove and refit	12.4	
2–3	Starter ring gear—remove and refit	12.8	
2–4	Spigot bearing—remove and refit	12.7	
	LUBRICATION SYSTEM		
1–13	Oil filter assembly, external—remove and refit	0.7	
	Oil filter element—remove and refit	0.6	

Operation Number	Description	Times allowed Hours $2\frac{1}{4}$ Petrol	
1–11	Oil pump—remove and refit	2.2	
1–12	Oil pump—overhaul	2.9	
1–10	Oil sump—remove and refit	1.2	
	TIMING GEARS—CHAINS, TENSIONERS AND GUIDES		
1–23	Timing gear cover—remove and refit	4.6	
1–24	Timing gear cover and oil seal—remove and refit	4.7	
1–22	Timing gears—remove and refit	6.0	
1–21	Timing chain tensioner—remove and refit	5.5	

Operation Number	Description	Time allowed Hours
	AIR CLEANERS AND HOSES	
3–5	Air cleaner—remove and refit	0.2
3–6	Air cleaner—clean and re-oil	0.3
	CARBURETTERS	
	Carburetter—tune and adjust	0.6
3–1	Carburetter—remove and refit	0.8
3–2	Carburetter—overhaul	1.7
	Thermostat switch—remove and refit	0.4
	CONTROLS	
	Throttle Pedal—remove and refit	0.8
3–8	Throttle linkage—remove and refit	0.7
3–9	Cold start control cable—remove and refit	0.7
	PIPES AND HOSES	
	Petrol pipe main line, tank end section—remove and refit	0.5
	Petrol pipe main line, engine end section—remove and refit	0.3
	Hose—filler to tank—remove and refit	0.6
	FUEL PUMP	
3–3	Fuel lift pump—remove and refit	1.0
3–4	Fuel lift pump—overhaul	1.9
	FUEL TANK	
3–7	Fuel tank—remove and refit	2.2
	COOLANT AND SYSTEM	
5–1	Coolant—drain and refill	0.3
	EXPANSION HEADER TANK	
5–2	Expansion tank—remove and refit	0.4
	FAN BELTS	
	Fan belt tension—check and adjust	0.2
	Fan belt—remove and refit	0.3
	FAN BLADES AND PULLEYS	
5–4	Fan blades and pulley—remove and refit	1.1
	RADIATOR HOSES	
	Radiator top hose—remove and refit	0.4
	Radiator bottom hose—remove and refit	0.8
	RADIATOR	
5–3	Radiator block—remove and refit	2.6
	THERMOSTAT	
5–9	Thermostat—remove and refit	1.0
5–10	Thermostat—test	1.2

Operation Number	Description	Time allowed Hours
	WATER PUMP	
5–7	Water pump—remove and refit	2.8
5–8	Water pump—overhaul	3.4
	EXHAUST SYSTEM	
4–1	Front pipe—remove and refit	1.0
4–2	Intermediate pipe—remove and refit	1.0
4–3	Tail pipe and silencer—remove and refit	0.8
	MANIFOLDS	
1–25	Induction and exhaust manifold assembly—remove and refit	2.2
	MOUNTINGS	
	Mounting—flexible—each—remove and refit	0.4
	CLUTCH ASSEMBLY	
2–5	Clutch assembly—remove and refit	11.8
	HYDRAULIC SYSTEM	
2–7	Hydraulic system—bleed	0.5
	MASTER CYLINDER	
2–8	Master cylinder—remove and refit	2.1
2–9	Master cylinder—overhaul	2.7
	MECHANICAL LINKAGE AND RELEASE	
2–12	Clutch release assembly—remove and refit	11.0
	PEDAL ASSEMBLIES	
2–13	Clutch pedal—remove and refit	2.4
	SLAVE CYLINDER	
2–10	Slave cylinder—remove and refit	0.9
2–11	Slave cylinder—overhaul	1.1
	COVERS, CASE AND EXTENSIONS	
7–1	Bell housing—remove and refit	11.7
7–2	Bell housing—overhaul	12.2
7–3	Gearbox main casing—remove and refit	13.2
7–4	Gearbox maincase—overhaul	13.6
	GEARCHANGE CONTROLS AND SELECTORS	
7–5	Main gearchange lever—remove and refit	2.2
7–6	Main gearchange lever—overhaul	2.7
7–7	Reverse stop for main gearchange lever—remove, refit and adjust	1.7
7–8	Main gearchange selectors—remove and refit	5.8
7–9	Main gearchange selectors—overhaul	6.5

Operation Number	Description	Time allowed Hours
	GEARBOX ASSEMBLY	
7–10	Gearbox complete assembly—remove and refit	10.8
	Gearbox assembly—overhaul	16.8
7–11	Reverse idler gear and shaft—remove and refit	13.4
7–12	Reverse idler gear and shaft—overhaul	13.8
7–13	Layshaft—remove and refit	11.8
7–14	Mainshaft assembly—remove and refit	12.9
7–15	Gearbox mainshaft—overhaul	13.9
	OIL SEALS	
	Rear output shaft oil seal—remove and refit	3.0
	SPEEDOMETER DRIVE	
	Speedometer drive gear pinion—remove and refit	0.9
8–1	Speedometer drive housing—remove and refit	2.9
8–2	Speedometer drive housing—overhaul	3.2
	TRANSFER GEARBOX	
8–3	Transfer gearbox—remove and refit	10.0
8–4	Transfer box—overhaul	16.0
	PROPELLER SHAFTS	
9–1	Propeller shaft—rear—remove and refit	1.1
9–2	Propeller shaft—rear—overhaul	2.5
	AXLE SHAFTS	
11–2	Axle shaft—remove and refit—one side	0.5
	Axle shafts—both sides—remove and refit	0.7
	Axle shaft oil seal—remove and refit	0.7
	Axle shaft oil seals—both sides—remove and refit	1.0
	DIFFERENTIAL ASSEMBLY	
11–3	Differential—remove and refit	2.1
11–4	Differential—overhaul	6.4
	OIL SEALS	
11–5	Pinion oil seal—remove and refit	1.2
	REAR AXLE	
11–6	Rear axle assembly—remove and refit	4.5
	Rear axle assembly—overhaul	13.7
	FRONT AXLE ASSEMBLY	
10–1	Front axle assembly—remove and refit	4.5
	STEERING BOX ADJUSTMENT	
14–1	Steering box—adjust	0.6
	STEERING COLUMN	
14–2	Steering column—top bearing—remove and refit	2.0
14–3	Steering column lock and ignition/starter switch—remove and refit	1.1

Operation Number	Description	Time allowed Hours
	STEERING COLUMN AND BOX ASSEMBLY	
14–4	Steering column and box assembly—remove and refit	5.8
14–5	Steering column and box assembly—overhaul	7.9
	STEERING RELAY UNIT	
14–6	Steering relay—remove and refit	2.8
14–7	Steering relay—overhaul	3.5
	STEERING RODS	
14–8	Track rod ball joints—remove and refit	1.3
14–9	Track rod—remove and refit	1.1
14–10	Longitudinal steering tube ball joints—remove and refit	1.7
14–11	Longitudinal steering tube—remove and refit	1.5
14–12	Drag link ball joints—remove and refit	1.1
14–13	Drag link—remove and refit	0.9
14.4	Steering ball joints—set—remove—clean—regrease and refit	3.7
	STEERING WHEEL	
14–15	Steering wheel—remove and refit	0.3
	WHEEL ALIGNMENT	
14–16	Front wheel alignment—check and adjust	0.6
14–17	Steering geometry—check	0.8
14–18	Steering lock stops—check and adjust	0.2
	BALL JOINTS/SWIVELS	
	Swivel pin housing assembly—left-hand—remove and refit	3.6
	Swivel pin housing assembly—right-hand—remove and refit	3.5
14–19	Swivel pin housing assemblies—both sides—remove and refit	6.0
	Swivel pin housing assembly—left-hand—overhaul	4.5
	Swivel pin housing assembly—right-hand—overhaul	4.4
14–20	Swivel pin housing assemblies—both sides—overhaul	7.4
	FRONT ROAD SPRINGS	
	Front road spring—remove and refit	1.8
	Front road springs—both sides—remove and refit	3.5
	Front road spring—overhaul	3.1
	HUB ASSEMBLIES	
10–2	Front hub assembly—remove and refit	1.3
	Front hub assemblies—both sides—remove and refit	2.3
10–3	Front hub assembly—overhaul	1.9
	Front hub assemblies—both sides—overhaul	3.5
	Front hub bearing end-float—both sides—check and adjust	1.8
10–4	Front hub bearing end-float—check and adjust	1.0
	Front hub oil seal—remove and refit	1.4
	Front hub oil seals—both sides—remove and refit	2.4
	Front hub stub axles—both sides—remove and refit	5.2
10–5	Front hub stub axle—remove and refit	2.7
10–3	Front hub stub axle—overhaul	3.1

Operation Number	Description	Time allowed Hours
	SHOCK ABSORBERS AND STOP RUBBERS	
16–3	Front shock absorbers—set—remove and refit	1.3
	Front shock absorber—each—remove and refit	0.8
	Bump stop—one side—remove and refit	0.5
	HUB ASSEMBLIES	
	Rear hub assembly—remove and refit	1.3
	Rear hub assemblies—both sides—remove and refit	2.3
	Rear hub assembly—overhaul	1.9
	Rear hub assemblies—both sides—overhaul	3.5
	Rear hub bearing end-float—both sides—check and adjust	1.8
	Rear hub bearing end-float—check and adjust	1.0
	Rear hub oil seal—remove and refit	1.4
	Rear hub oil seals—both sides—remove and refit	2.4
	Rear hub stub axles—both sides—remove and refit	5.2
	Rear hub stub axle—remove and refit	3.0
	Rear hub stub axle—overhaul	3.3
	REAR ROAD SPRINGS	
16–1	Rear road spring—remove and refit	1.8
	Rear road springs—both sides—remove and refit	3.5
16–2	Rear road spring—overhaul	3.1
	REAR SUSPENSION	
16.4	Rear suspension height—check	0.3
	SHOCK ABSORBERS AND STOP RUBBERS	
16–3	Rear shock absorbers—set—remove and refit	1.3
	Rear shock absorber—each—remove and refit	0.8
	Bump stop—remove and refit	0.5
	Check strap—remove and refit	0.9
	Check straps—both sides—remove and refit	1.7
	DRUMS	
	Brake drums—set—remove and refit	1.2
12–7	Front brake drums—each—remove and refit	0.4
12–8	Rear brake drums—each—remove and refit	0.4
	HOSES AND CONNECTIONS	
	Hoses—complete set—remove and refit	1.2
12–17	Front hose—left-hand—remove and refit	0.9
12–18	Front hose—right-hand—remove and refit	0.9
12–19	Intermediate hose—remove and refit	0.8
	Four way connector—remove and refit	0.9
12–29	Brake failure switch—remove and refit	—
	Brake failure switch—overhaul	—
	HYDRAULIC PIPES	
	Feed to front multiway connector—remove and refit	0.9
12–20	Feed to front left-hand hose connector—remove and refit	1.0
12–21	Feed to front right-hand hose connector—remove and refit	0.8

Operation Number	Description	Time allowed Hours
12–22	Feed to front left-hand cylinder—remove and refit	0.8
12–23	Feed to front right-hand cylinder—remove and refit	0.8
	Feed to master cylinder—remove and refit	0.7
12–24	Feed to rear left-hand cylinder—remove and refit	0.9
12–25	Feed to rear right-hand cylinder—remove and refit	0.9
12–26	Feed to intermediate hose—remove and refit	1.4
12–27	Feed to brake failure switch—front brakes—remove and refit	—
12–28	Feed to brake failure switch—rear brakes—remove and refit	—
	HYDRAULIC SYSTEM	
	Brakes—bleed and adjust	1.2
12–34	Brakes—bleed	0.7
12–6	Brakes—adjust	0.5
	Brake system—flush, refill and bleed	1.0
	MASTER CYLINDER	
12–30	Master cylinder—dual systems—remove and refit	—
12–31	Master cylinder—dual systems—overhaul	—
	MECHANICAL LINKAGE	
12–16	Brake pedal—remove and refit	1.5
	SHOES	
	Brake shoes—set—remove and refit	3.3
12–9	Front brake shoes—remove and refit	1.9
12–10	Rear brake shoes—remove and refit	1.9
12–11	Brake linings—set—remove and refit	4.6
	Front brake linings—remove and refit	2.6
	Rear brake linings—remove and refit	2.6
	TRANSMISSION BRAKE	
12–5	Transmission brake—hand lever and linkage—remove and refit	0.7
	Transmission brake—hand lever and linkage—overhaul	1.2
12–2	Transmission brake—adjust	0.3
12–3	Transmission brake assembly—remove and refit	2.2
	Transmission brake drum—remove and refit	1.2
12–4	Transmission brake shoes—remove and refit	1.5
	Transmission brake expander—remove and refit	1.8
	VACUUM SYSTEM	
12–32	Servo assembly—remove and refit	1.3
	WHEEL CYLINDERS	
	Front wheel cylinders—both sides—remove and refit	3.1
12–12	Front wheel cylinder—one—remove and refit	2.3
	Front wheel cylinders—both sides—overhaul	3.6
12–13	Front wheel cylinder—one—overhaul	2.6
	Rear wheel cylinders—both sides—remove and refit	3.1
12–14	Rear wheel cylinder—one side—remove and refit	2.3
	Rear wheel cylinders—both sides—overhaul	3.6
12–15	Rear wheel cylinders—one side—overhaul	2.6

Operation Number	Description	Time allowed Hours
	TYRES	
	Tyre—one—remove and refit	0.6
	Tyres—pair—remove and refit	1.1
	Tyres—set—remove and refit	2.1
	WHEELS	
	Wheels—set—remove and refit	0.7
	BODY—GENERAL	
15–1	Chassis frame—alignment check	1.6
17–3	Body—remove and refit	10.0
17–4	Front floor—remove and refit	1.4
	Chassis frame—remove and refit	80.0
17–5	Front wing—remove and refit	4.0
	Including, remove and refit lamps	5.3
	BONNET AND LOCK	
17–7	Bonnet—remove and refit	0.2
	With spare wheel fitted	0.3
	Bonnet lock—remove and refit	0.5
	Bonnet safety catch—remove and refit	0.3
	BUMPERS	
	Front bumper—remove and refit	0.7
	DOORS	
17–8	Side door—front—remove and refit	0.5
17–10	Side door hinges—front—remove and refit	0.8
	DOOR GLASSES AND FRAMES	
	Door glass—side—front—remove and refit:	
17–11	Fixed window	1.2
17–11	Sliding window	0.6
	DOOR LOCKS	
17–12	Door lock—side front—remove and refit	0.4
	Trimmed door	0.6
	DOOR SEALS	
	Door seal—side front—each—remove and refit	0.5
	FACIA	
17–13	Facia top rail—remove and refit	1.5
17–14	Facia lower rail—remove and refit:	
	With heater	1.6
	Without heater	1.3
17–15	Facia support panel—remove and refit	3.0
	GRILLES	
17–16	Radiator front—grille panel assembly—remove and refit	3.4
	Air vent grille—remove and refit	0.5

Operation Number	Description	Time allowed Hours
	SOFT TOPS	
	Hood—remove and refit:	
	Three-quarter or full length	1.0
	Hood and frame—remove and refit:	
	Three-quarter or full length	1.5
	Full length—including—remove and refit side and top drain channels for doors	2.4
	SEATS	
18–1	Front seat base—remove and refit	4.0
	Front seat runners—remove and refit	1.0
	SEAT BELTS	
	Front seat belts—remove and refit	1.0
	WINDSCREEN AND BODY GLASSES	
17–17	Windscreen and frame assembly—remove and refit	1.6
17–18	Windscreen glass—one side—remove and refit	1.2
	Quarter light—fixed—remove and refit	1.0
	CONTROLS	
22–9	Heater controls—remove and refit	0.5
22–10	Heater/ventilator air flow control cable—remove and refit	1.9
22–11	Heater water valve control cable—remove and refit	0.6
22–12	Heater water valve—remove and refit	0.5
22–13	Heater fan switch—remove and refit	0.4
	DEMISTERS AND AIR INTAKE	
22–14	Demister hoses—remove and refit	0.4
22–15	Demister nozzles—remove and refit:	
	Driver's side	0.9
	Passenger side	0.4
22–17	Ventilator grille panel—one—remove and refit	0.5
22–18	Fresh air intake—remove and refit	0.3
	HEATER UNIT	
22–19	Heater box complete—remove and refit	0.7
22–21	Heater/blower fan motor—remove and refit	0.6
22–20	Heater radiator—remove and refit	0.8
	HEATER PIPES	
22–22	Pipe—feed to heater—remove and refit	0.5
22–23	Pipe—return from heater—remove and refit	0.5
	WINDSCREEN WASHER	
22–1	Washer reservoir—remove and refit	0.2
22–2	Washer jets—remove and refit	1.6
22–3	Washer tubes—remove and refit	2.0
22–4	Washer pump—remove and refit	0.2
	WINDSCREEN WIPER	
22–5	Wiper arms—remove and refit	0.2

Operation Number	Description	Time allowed Hours
22–6	Wiper motor and drive—remove and refit	0.4
22–7	Wiper motor drive and wheel boxes—remove and refit	3.4
22–8	Wiper motor—overhaul	1.0
	ALTERNATOR	
6–1	Alternator—remove and refit	0.7
6–2	Alternator—overhaul	2.2
	BATTERY	
6–44	Battery—remove and refit	0.4
	Battery lead—positive—remove and refit	0.3
	Battery lead—negative—remove and refit	0.5
	HORNS	
6–45	Horn—remove and refit	0.4
	IGNITION SYSTEM	
	Sparking plugs—remove—clean—adjust and refit	0.6
	Sparking plugs—remove and refit	0.3
6–10	Distributor—remove and refit	0.8
6–11	Distributor—overhaul	2.1
6–12	Ignition coil—remove and refit	0.3
	LAMPS, EXTERNAL	
6–34	Headlamp assembly—single—remove and refit	0.9
	Headlamp sealed beam unit—remove and refit	0.5
	Headlamps—pair—align beam	0.6
	Front side lamp lens—remove and refit	0.2
	Front side lamp bulb—remove and refit	0.2
6–35	Front side lamp assembly—remove and refit	0.5
	Front flasher lamp lens—remove and refit	0.2
	Front flasher lamp bulb—remove and refit	0.2
6–36	Front flasher lamp assembly—remove and refit	0.5
	Rear flasher lamp lens—remove and refit	0.2
	Rear flasher lamp bulb—remove and refit	0.2
6–37	Rear flasher lamp assembly—remove and refit	0.5
	Tail lamp lens—remove and refit	0.2
	Tail lamp bulb—remove and refit	0.2
6–38	Tail lamp assembly—remove and refit	0.5
	LAMPS, INTERNAL	
6–42	Panel illumination lamp bulb—each—remove and refit	0.4
6–43	Inspection sockets—remove and refit	0.5
6–42	Flasher warning indicator bulb—remove and refit	0.4
6–42	Ignition warning lamp bulb—remove and refit	0.4
6–42	Headlamp high beam indicator bulb—remove and refit	0.4
6–42	Oil pressure indicator bulb—remove and refit	0.4
6–42	Choke warning lamp bulb—remove and refit	0.4

Operation Number	Description	Time allowed Hours
	FLASHERS	
6–46	Flasher unit—remove and refit	0.4
	STARTER MOTOR	
6–7	Starter motor—remove and refit	1.3
6–8	Starter solenoid—remove and refit	0.5
6–9	Starter motor—overhaul	2.6
	SWITCHES	
6–24	Ignition starter switch—remove and refit	1.2
6–26	Lighting switch—remove and refit	0.4
6–27	Panel light switch—remove and refit	0.4
6–28	Windscreen wiper switch—remove and refit	0.4
6–30	Stop light switch—remove and refit	0.3
6–32	Choke warning light switch—remove and refit	0.3
6–33	Combined direction indicator/headlight/horn switch—remove and refit	0.7
	FUSE BOX	
6–49	Fuse box—remove and refit	0.5
	INSTRUMENT PANEL	
6–14	Instrument panel—remove and refit	0.8
	Voltage stabilizer—remove and refit	0.3
	OIL, COOLANT AND FUEL GAUGES	
6–17	Oil pressure warning switch—remove and refit	0.5
6–18	Coolant temperature gauge—remove and refit	0.5
	Coolant temperature transmitter—remove and refit	0.5
6–19	Fuel contents gauge—remove and refit	0.5
6–20	Fuel tank gauge unit—remove and refit	0.9
	SPEEDOMETER	
6–21	Speedometer—remove and refit	0.6
6–22	Speedometer cable complete—remove and refit	1.2
6–23	Speedometer inner cable—remove and refit	0.7

Optional Equipment

Description	Time allowed Hours	Remarks
Adaptor plate for towing, fit	0.7	
Altitude compensator, fit to carburetter, $2\frac{1}{4}$ Litre	0.4	
Flyscreen, fit to front ventilators	2.0	
Fog lamp, fit to front bumper, wire up to switch	1.8	

Description	Time allowed Hours	Remarks
Gaiters, fit to swivel bearing housings	2.3	
Grommet, fit to propeller shaft	0.8	
Hand throttle, fit	1.5	
Horns, fit twin tone horns	0.8	
With switch	1.5	
Immersion heater, fit to cylinder block, 2¼ Litre	4.0	
Jerry cans, fit to front bumper	3.5	
Lifting rings, fit to front	1.0	
Mud flaps, fit to front or rear	1.1	
Mud shields, fit to front and rear anchor plates	14.0	
Oil cooler, fit. (Includes oil and thermo gauge and engine tie rod). 2¼ Litre	14.0	
Oil and thermo gauge, fit	2.8	
Power take off, fit gearbox, PTO	3.1	
Fit rear PTO. Includes gearbox PTO	3.7	
Fit bottom PTO	3.2	
Reverse lamp (with pull on-off switch). Fit	2.0	
Side steps, fit left and right hand	2.0	
Step, rear, fit	1.0	
Tie rod, fit engine tie rod	0.9	
Towing ball and bracket, fit	1.0	
Trim, de-luxe, fit	7.0	Paint extra
Vizor, fit exterior sun vizor	1.0	
Winch, fit front capstan winch	12.2	
Winch, fit front hydraulic type winch, test and fit rope and guide	21.9	