TRIUMPH

Repair Operation Manual

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SERVICE TOOLS 99

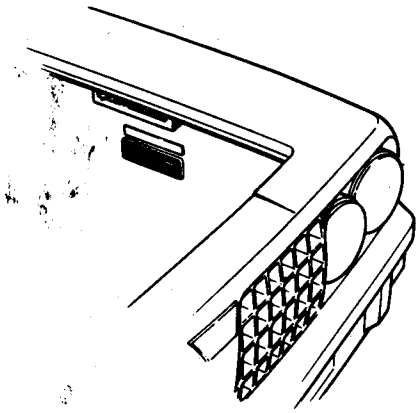
ABBREVIATIONS AND SYMBOLS

Across flats (bolt size)	A.F.
After bottom dead centre	A.B.D.C.
After top dead centre	A.T.D.C.
Alternating current	a.c.
Amperes	amp
Ampere-hour	Ah
Atmospheres	Atm
Before bottom dead centre	B.B.D.C.
Before top dead centre	B.T.D.C.
Bottom dead centre	B.D.C.
Brake horse-power	b.h.p.
Brake mean effective pressure	b.m.e.p.
British Standards	B.S.
Carbon Monoxide	CO
Centigrade (Celsius)	C
Centimetres	cm
Cubic centimetres	cm^3
Cubic inches	in^3
Cycles per minute	c/min
Degree (angle)	deg. or °
Degree (temperature)	deg. or °
Diameter	dia.
Direct current	d.c.
Fahrenheit	F
Feet	ft
Fifth	5th
Figure (illustration)	Fig.
First	1st
Fourth	4th
Gallons (Imperial)	gal
Gallons (U.S.)	U.S. gal
Grammes (force)	gf
Grammes (mass)	g
High compression	h.c.
High tension (electrical)	h.t.
Horse-power	hp
Hundredweight	cwt
Inches	in
Inches of mercury	inHg
Independent front suspension	i.f.s.
Internal diameter	i.dia.
Kilogrammes (force)	kgf
Kilogrammes (mass)	kg
Kilogramme centimetre	kgf cm
Kilogramme metres	kgf m
Kilogrammes per square centimetre	kg/cm^2
Kilometres	km
Kilometres per hour	km/h
Kilovolts	kV
King pin inclination	k.p.i.
Left-hand	L.H.
Left-hand steering	L.H. Stg.
Left-hand thread	L.H. Thd.
Low compression	l.c.
Low tension	l.t.
Maximum	max.
Metres	m
Miniature Edison Screw	MES
Miles per gallon	m.p.g.
Miles per hour	m.p.h.
Millimetres	mm
Millimetres of mercury	mmHg
Minimum	min.
Minus (of tolerance)	−
Minute (of angle)	′
Negative (electrical)	−
Newton metres	Nm
Number	No.
Ounces (force)	ozf
Ounces (mass)	oz
Ounce inch (torque)	ozf in
Outside diameter	o.dia.
Overdrive	O/D
Paragraphs	para.
Part Number	Part No.
Percentage	%
Pints (Imperial)	pt
Pints (U.S.)	U.S. pt
Plus or minus	±
Plus (tolerance)	+
Positive (electrical)	+
Pounds (force)	lbf
Pounds (mass)	lb
Pounds feet (torque)	lbf ft
Pounds inches (torque)	lbf in
Pounds per square inch	lb/in^2
Radius	r
Ratio	:
Reference	ref.
Revolutions per minute	rev/min
Right-hand	R.H.
Right-hand steering	R.H. Stg.
Second (angle)	″
Second (numerical order)	2nd
Single carburetter	SC
Society of Automobile Engineers	S.A.E.
Specific gravity	sp. gr.
Square centimetres	cm^2
Square inches	in^2
Standard	std.
Standard wire gauge	s.w.g.
Synchronizer/synchromesh	synchro.
Third	3rd
Top dead centre	T.D.C.
Twin carburetters	TC
United Kingdom	UK
Volts	V
Watts	W

Screw Threads

American Standard Taper Pipe	N.P.T.F.
British Association	B.A.
British Standard Fine	B.S.F.
British Standard Pipe	B.S.P.
British Standard Whitworth	B.S.W.
Unified Coarse	U.N.C.
Unified Fine	U.N.F.

LOCATION OF COMMISSION AND UNIT NUMBERS

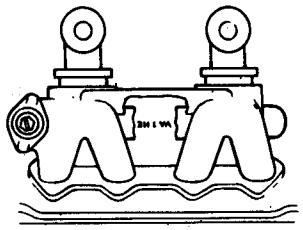


The Commission Number is the identification number which is required for registration and other purposes. It is stamped on a plate attached to the left-hand engine bay valance panel and is visible when the bonnet is raised.

The significance of the Commission Numbers and suffix is as follows:

VA —this prefix denotes 'Dolomite Sprint' model range.
1234 —is the accumulated total build of this model.
L —denotes Left-Hand Steering. (No letter is given to Right-Hand Steering models).
DL —denotes body type, e.g. Saloon.
O —denotes that an Overdrive unit is fitted.
A —denotes that an Automatic transmission is fitted.
S —denotes that a limited slip differential is fitted.

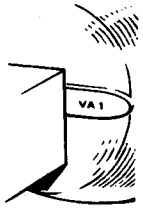
The commission number plate also bears code symbols for identification of the vehicle's exterior colour, trim material and trim colour. Refer to page 04-3.

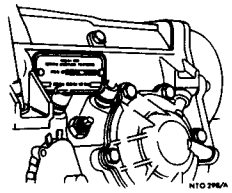


The Engine Number is stamped on the cylinder head (earlier models) or the cylinder block (later models), and may be seen by looking down between the carburetters.

The significance of the Engine Numbers and suffix is as follows:

VA —this prefix denotes the model range.
1234 —is the accumulated total built of this type.
H —denotes High compression. Alternatively:
L —denotes Low compression.
E —denotes Engine unit:



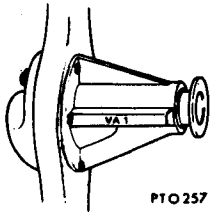


The Gearbox Number (SYNCHROMESH) **The Gearbox Number (AUTOMATIC)**

The Gearbox (Synchromesh) Number is stamped on the right-hand side of the casing.

The gearbox letters denote model and the numbers the accumulated total build.

The Gearbox (Automatic) Number appears on a nameplate on the left-hand side of the transmission case. The prefix numbers 017 denote specification and are followed by the accumulated total build numbers.



The Rear Axle Number is stamped on the hypoid housing flange.

The letters denote model and the numbers the accumulated total build.

A suffix letter 'S' after the axle number indicates that a limited slip differential unit is fitted.

IMPORTANT: In all communications relating to Service and Spares it is essential to quote commission number, paint and trim codes and unit numbers (if applicable).

GENERAL SPECIFICATION DATA

ENGINE

Numbers of cylinders	4, in line—inclined at 45 degrees
Bore of cylinders	3·56 in (90·3 mm)
Stroke of crankshaft	3·07 in (78 mm)
Displacement	122 in³ (1998 cm³)
Maximum power	127 b.h.p. nett at 5,700 rev/min
Maximum torque	1,465 lbf in at 4,500 rev/min, equivalent to 151 lbf/in² b.m.e.p.

Lubrication

Oil warning light	Extinguishes at 3 to 5 lbf/in² (0·21 to 0·35 kgf/cm²) oil pressure

COOLING SYSTEM

Thermostat	82°C (180°F) normal
Pressure	13 lbf/in² (0·91 kgf/cm²)

FUEL SYSTEM

Fuel pump	Mechanically operated, diaphragm type
Carburetters	Two SUHS6 sidedraught

CLUTCH

Driven plate: Diameter	8½ in (216 mm)
Facing material	Thermoid 11046

GEARBOX

Manual	*O/D Top*	*Top*	*O/D 3rd*	*3rd*	*2nd*	*1st*	*Reverse*
Gear ratios	0·797	1·000	1·11	1·39	2·10	2·99	3·37
Overall ratios	2·75	3·45	3·82	4·78	7·25	10·31	11·62

Overdrive (where fitted)

Make/type	Laycock Type J
Operative on	Top and 3rd gears
Overall ratios	0·797 : 1

AUTOMATIC

Converter ratio	1·91 : 1

	1st	*2nd*	*3rd*	*Reverse*
Gearbox ratios	2.39	1.45	1.00	2.09
Overall ratios	8.25	5.00	3.45	7.21

PROPELLER SHAFT

Two-piece, shaft supported in centre bearing, with universal and constant velocity joints

FINAL DRIVE

Ratio	3·45 : 1

EFFECTIVE GEARING (MANUAL TRANSMISSION)

Engine speeds in rev/min at road speeds of:

	O/D Top	*Top*	*O/D 3rd*	*3rd*	*2nd*	*1st*
10 m.p.h.	423	529	586	735	1111	1582
10 km/h	262	329	364	456	690	982

Road speed at 1,000 rev/min: O/D Top	23·6 m.p.h. (38 km/h)
Top gear:	18·9 m.p.h. (30·5 km/h)
Road speed at 2,500 ft/min piston speed:	
Top gear	92·3 m.p.h. (149 km/h)

EFFECTIVE GEARING (AUTOMATIC TRANSMISSION)

Road speed in top gear at engine speed of 1,000 rev/min	9·9 to 18·9 m.p.h. (16 to 30 km/h)

STEERING

Steering-wheel diameter	14·5 in (368 mm)
Steering-wheel turns (lock to lock)	3½ nominal
Steering-column adjustment	4 in (102 mm) approx. axially 3·5 in (90 mm) approx. vertically

BRAKE SYSTEM

Front	Caliper disc type
Disc diameter	8¾ in (222 mm)
Lining material	FERODO 2430F
Rear	Drum type, self-adjusting, 9 in dia. × 1¾ in wide (228·6 mm × 44·5 mm), leading and trailing shoe. Load sensitive pressure reducing valve incorporated into system
Lining material	DON 202
Servo	Direct acting servo providing 3·02 : 1 nominal boost ratio
Front lining area	17·4 in² (112·2 cm²)
Rear lining area	49·5 in² (319·5 cm²)
Total lining area	66·9 in² (431·7 cm²)
Front swept area	165 in² (1065 cm²)
Rear swept area	99 in² (639 cm²)
Total swept area	264 in² (1704 cm²)

WHEELS

Type	Cast alloy, spigot mounted, 13 × 5½J flat ledge safety rims

TYRES

Type	175/70 HR 13 radial ply
Pressures: Front	22 lbf/in² (1·55 kgf/cm²) (1·5 bars)
Rear	24 lbf/in² (1·69 kgf/cm²) (1·7 bars)

CHASSIS DATA

Wheelbase	8 ft 0⅝ in (2454 mm)		
Track: Front	4 ft 5⅜ in (1356 mm)		
Rear	4 ft 2¾ in (1290 mm)		
Wheel alignment (unladen): Front	0 to $\frac{1}{16}$ in toe-in (0 to 1·59 mm) toe in		
Camber and castor	*Camber*	*Castor*	*King-pin inclination*
Kerb: Front	¾° positive ± 1°	2¼° ± 1°	6¼° ± 1°
Ground clearance (4-up condition)	4¼ in (108 mm)		
Turning circle (between kerbs)	30 ft 9 in (9·4 m)		

ELECTRICAL EQUIPMENT

Spark plugs	Champion BN9Y
Gap	0·025 in (0·63 mm)
Battery	12 volt
Capacity	40 Ah at 20-hour rate
Polarity	Negative earth
Alternator	Lucas 17ACR, nominal output 36 amps, Vee belt drive
Distributor	Lucas, with centrifugal and vacuum advance control
Coil	Lucas type 15C6, 6-volt used with ballast resistor cable in harness
Starter motor	Lucas M100, pre-engaged type

OVERALL DIMENSIONS (approx.)

Length	13 ft 6¼ in (4122 mm)
Width	5 ft 2½ in (1588 mm)
Height	4 ft 6 in (1372 mm)

WEIGHTS (approx.)

Shipping—basic	2200 lb (998 kg)
Shipping—with options	2211 lb (1003 kg)
Basic kerb (includes tools, fuel, oil and water)	2295 lb (1041 kg)
Kerb (includes options)	2306 lb (1046 kg)
Gross vehicle weight	3031 lb (1375 kg)
Maximum axle load: Front	1466 lb (665 kg)
Rear	1598 lb (725 kg)

TOWING INFORMATION

Towing capacity
Recommended maximum trailer and gross train weights
Braked trailers
General purpose trailers and caravans

Towing vehicle load condition	2 up	
Restart gradient at sea level	1 in 8	12½%
Trailer weight	1270 kg	2800 lb

Where additional payload is carried such as luggage, additional occupants, etc, this extra weight should be deducted from the recommended maximum trailer weight.
With extra care braked trailers in excess of the above weight may be towed up to a Gross Train

Weight of	2750 kg	6063 lb
Restart gradient at sea level is then	1 in 10	10%

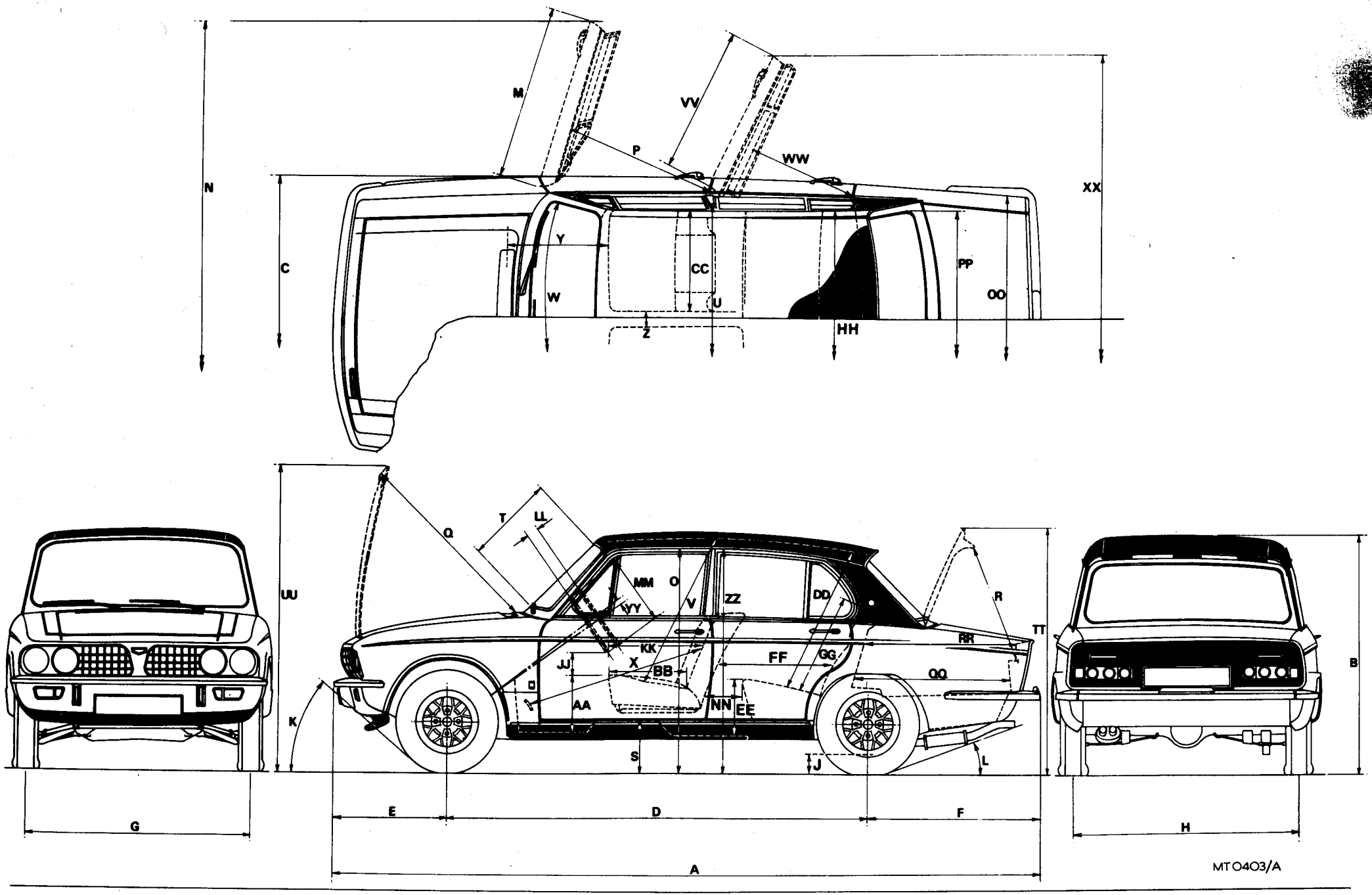
Unbraked trailers

Towing vehicle load condition	1 up	G.V.W.
Trailer weight	610 kg (1345 lb)	344 kg (758 lb)
Gross train weight — with manual transmission	1719 kg	3790 lb
The recommended static vertical nose load at the trailer hitch is	50 ± 5 kg	110 ± 11 lb

When towing a trailer the towing vehicle maximum rear axle load must not be exceeded.

O/S 96 7/8 = 2460 5m long.
N/S 96 1/4 = 2445 2454
10m short.

5/8


M
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MT0403/A

VEHICLE DIMENSIONS (APPROXIMATE)

Dim.	Description	inches	mm
A	Overall length	162·20	4122
B	Overall height	54·00	1372
C	Overall width	62·50	1588
D	Wheelbase	96·63	2454
E	Front overhang	26·50	674
F	Rear overhang	39·14	993
G	Front track	53·375	1356
H	Rear track	50·75	1290
J	Ground clearance, laden	4·25	108
K	Front clearance angle	41°	——
L	Rear clearance angle	20°	——
M	Front door opening width	39·63	1007
N	Front overall width, doors open	131·13	3331
O	Ground to top of front door	51·50	1308
P	Front door open aperture	32·50	825
Q	Bonnet aperture	45·38	1153
R	Boot aperture	25·75	644
S	Door step height	14·00	356
T	Windscreen depth	19·63	499
U	Shoulder room	49·25	1251
V	Front head-room	38·00	965
W	Windscreen width (mean)	50·38	1280
X	Pedals to squab	Max. 38·50	978
		Min. 32·50	826
Y	Front bulkhead to seat cushion	22·00	559
Z	Width between seats (minimum)	1·75	44

Dim.	Description	inches	mm
AA	Front seat height	12·00	305
BB	Front seat depth	19·00	483
CC	Front seat width	23·00	584
DD	Rear head-room	36·00	914
EE	Rear seat height	14·00	356
FF	Rear seat squab to front seat squab	Max. 32·00	813
		Min. 26·00	661
GG	Height of rear seat squab	20·50	521
HH	Width of rear seat squab (between arm-rests)	46·00	1170
JJ	Steering-wheel to cushion	Max. 9·0	229
		Min. 5·0	127
KK	Steering-wheel to seat squab	Max. 19·0	483
		Min. 10·0	254
LL	Steering-wheel reach adjustment	3·50	89
MM	Steering-wheel diameter	14·50	368
NN	Rear knee room	10·00	254
OO	Maximum boot width	52·50	1334
PP	Minimum boot width	39·50	1003
QQ	Maximum boot length	37·00	939
RR	Minimum boot length	34·50	877
SS	Boot capacity	13·25 ft³	0·38 m³
TT	Maximum height, boot lid open	56·75	1442
UU	Maximum height, bonnet open	68·75	1746
VV	Rear door opening width	31·81	808
WW	Rear door open aperture	24·00	610
XX	Rear overall width, door open	170·38	2981
YY	Steering-column angle	2°	——
ZZ	Ground to top of rear door	51·00	1295

Unless otherwise stated, all measurements are for an unladen car, seats in mid position.

PAINT AND TRIM CODING SYSTEM

The commission number plate bears code symbols for identification of the vehicle's exterior colour, trim material and trim colour.

Colour Code

Nine basic colours are allocated a number as shown in the table. Shades of these colours are classified in 1st shade, 2nd shade, 3rd shade, etc. The number of each shade change prefixes the basic colour to indicate the shade colour.

Thus: Paint 19 Trim 11 denotes that the vehicle is painted 'White', and trimmed black.

NOTE: Acrylic paints bear the suffix 'A'.

Basic colour	Basic colour number	1st shade	2nd shade	3rd shade	4th shade	5th shade	6th shade	7th shade	8th shade	9th shade	10th shade	11th shade	12th shade	13th shade	14th shade
Black	01	11													
Red	02	12 Matador	22 Cherry	32 Signal	42 Burgundy	52 Scarlet	62 Inca Red	72 Pimiento	82 Carmine	92 Magenta					
Brown	03	13 Light Tan	23 Sienna	33 New Tan	43 Saddle Tan	53 Dark Brown	63 Chestnut		83 Maple	93 Russet					
Yellow	04	14 Jonquil	24 Wimpey	34 Jasmine	44 Beige	54 Saffron	64 Mimosa	74 Beige		94 Inca					
Green	05	15 Cactus	25 Conifer	35 Olive	45 Lichfield	55 Laurel	65 Emerald	75 British Racing Green							
Blue	06	16 Midnight	26 Wedgwood	36 Dark Blue	46 Renoir	56 Royal	66 Valencia	76 Print Blue	86 Navy Blue	96 Sapphire	106 Mallard	116 Ice	126 French	136 Delft	146 Tahiti
Purple	07	17 Damson	27 Shadow Blue												
Grey	08	18 Gunmetal	28 Dark Grey	38 Phantom	48 Dolphin	58 Shadow Blue	68 Slate	78 Grey							
White	09	19 White	29 Sebring White	39 Honey-suckle											

ENGINE TUNING DATA

ENGINE

Type	O.H.V. in line, 4 cylinders inclined at 45 degrees from vertical
Capacity	1998 cm³
Compression ratio	9·5 : 1
Idle speed	650 to 850 rev/min
Fast idle (hot), Manual cars	1700 to 1900 rev/min
Fast idle (hot), Automatic cars	1500 to 1700 rev/min
No. 1 cylinder	Front
Valve clearance: Inlet	0·018 in (0·46 mm)
Exhaust	0·018 in (0·46 mm)
Valve clearance adjustment	Pallets between valve and cam followers
Location of ignition timing marks	Scale on front cover—notch on pulley
Ignition timing: Static	10° B.T.D.C.
Valve timing: Inlet:	Opens 14° B.T.D.C.
	Closes 50° A.B.D.C.
Exhaust	Opens 50° B.B.D.C.
	Closes 14° A.T.D.C.

IGNITION DISTRIBUTOR

Manufacturer	Lucas		
Type	44D4		
	Type A	**Type B**	**Type C**
Lucas part No.	41402	41589	41655
Stanpart No.	313177	RKC 0695	RKC 3034

Contact gap	0·014 to 0·016 in
Rotation—viewed on rotor	Anti-clockwise
Firing angle	90 ± 1 degree
Dwell angle	51 ± 5 degree
Open angle	39 ± 5 degree
Moving contact spring tension	18 to 24 ozf
Capacitor capacity	0·18 to 0·23 microfarad
Engine firing order	1—3—4—2

Check at decelerating speeds

Centrifugal advance

Distributor r.p.m.	Degs. distributor advance						Crankshaft r.p.m.	Degs. crankshaft advance					
	Minimum			Maximum				Minimum			Maximum		
	A	B	C	A	B	C		A	B	C	A	B	C
Below 350	No advance to occur						Below 700	No advance to occur					
450	0	0	0	0·5	0·5	1·5	900	0	0	0	1	1	3
550	0	0	0·5	2·0	2·0	2·5	1,100	0	0	1	4	4	5
800	3·5	4·0	2·75	5·5	6·0	4·75	1,600	7	8	5·5	11	12	9·5
1,000	6·0	7·5	4·5	8·0	9·5	6·5	2,000	12	15	9	16	19	13

Vacuum advance

Inches of mercury vacuum	Degs. distributor advance						Degs. crankshaft advance					
	Minimum			Maximum			Minimum			Maximum		
	A	B	C	A	B	C	A	B	C	A	B	C
2	No advance to occur											
3	0	—	—	1·0	—	—	0	—	—	2·0	—	—
4	—	0	0	—	0	0	—	0	0	—	0	0
6	0·5	—	—	3·5	—	—	1·0	—	—	7·0	—	—
8	—	—	7·0	—	—	7·0	—	—	14·0	—	—	14·0
10	3·0	—	—	5·5	—	—	6·0	—	—	11·0	—	—
13	—	5	—	—	5	—	—	10·0	—	—	10·0	—
18	4·0	—	—	6·0	—	—	8·0	—	—	12·0	—	—

SPARK PLUGS

Make/type	Champion BN7Y
Gap	0·025 in (0·63 mm)

IGNITION COIL

Make/type	Lucas 15C6
Primary winding resistance	1·30 to 1·45 ohms

BALLAST RESISTOR

Make/type	Lucas 15C6

CARBURETTER

Make/type	Two, SU HS6
Main jet	0·100 in (2·54 mm)
Venturi	1·75 in
Needle: AUD 545 specification	BCM
Tamperproof carburetters FZX 1257	BDQ

Refer to 19.00.00. *for Tamperproof carburetters*

TORQUE WRENCH SETTINGS

Operation	Description	Specified Torque lbf ft	kgf m
ENGINE			
Alternator to timing cover	5/16" U.N.C. bolt	20	2·8
Adjusting link to alternator	5/16" U.N.C. setscrew	20	2·8
Bearing caps to block	7/16" U.N.F. bolt	65	9·0
Camshaft bearing cap and rocker pedestal	5/16" U.N.C. bolt	14	1·9
Camshaft cover to cylinder head	1/4" U.N.C. setscrew	5	0·7
Carburetter flexible mounting to manifold	5/16" U.N.C. bolt	16	2·2
Carburetter linkage mounting bracket	1/4" U.N.F. setscrew	9	1·2
Carburetter to flexible mounting	5/16" U.N.F. stud	14	1·9
Chain wheel to camshaft	1/4" U.N.F. setscrew	10	1·4
Chain wheel to jackshaft	3/8" U.N.F. setscrew	38	5·2
Clutch to flywheel	5/16" U.N.F. setscrew	22	3·0
Connecting rod	3/8" U.N.F. bolt	45	6·2
Cylinder head to block	7/16" U.N.C. stud	55	7·6
Cylinder head to block	7/16" U.N.C. bolt	55	7·6
Drain plug to sump	3/8" Dryseal plug	25	3·5
Engine mountings:			
Engine stay assembly to angle stay	3/8" U.N.F.	34	4·7
Front mounting to cross-member	3/8" U.N.F.	34	4·7
Mounting rubber to mounting bracket	3/8" U.N.F.	34	4·7
Rear mounting cross-member to floor	5/16" U.N.F. setscrew	20	2·8
Rear mounting rubber to bracket (Manual—non-overdrive only)	7/16" U.N.F. bolt	38	5·2
Engine to transmission unit	5/16" U.N.F. bolt	20	2·8
Exhaust manifold to cylinder head—inner	3/8" U.N.C. setscrew	34	4·7
Exhaust manifold to cylinder head—outer	3/8" U.N.C. setscrew	22	3·0
Exhaust manifold to front pipe	3/8" U.N.C. stud	20	2·8
Fan to coupling	1/4" U.N.F. bolt	9	1·2
Flywheel to crankshaft	3/8" U.N.F. bolt	45	6·2
Idler shaft keep plate to cylinder block	5/16" U.N.F. c'sk screw	22	3·0
Inlet manifold attachment	5/16" U.N.C. setscrew	20	2·8
Oil pump to cylinder block	5/16" bolt	20	2·8
Oil sump to cylinder block and timing cover	5/16" U.N.F.	20	2·8
Should maintain a minimum of 8 lbf ft (1·1 kgf m) after a settling period			
Plug to cylinder block	3/4" B.S.P. plug	25	3·4
Plug (water transfer housing)	3/8" U.N.F. plug	20	2·8
Pulley to crankshaft	5/8" crankshaft bolt	120	16·6
Sparking plug into cylinder head	10 mm sparking plug	8	1·1
Starter motor attachment	3/8" U.N.F. bolt	34	4·7
Support bracket and chain guides to cylinder block	5/16" U.N.F. setscrew	20	2·8
Timing chain tensioner to cylinder block	1/4" U.N.F. bolt	9	1·2
Timing cover to cylinder block and head	5/16" bolt	20	2·8
Water pump cover to cylinder block	5/16" U.N.F.	20	2·8
Water pump retaining bolt	5/16" U.N.C. bolt	14	1·9
Water transfer housing to cylinder head	5/16" setscrew	20	2·8
GEARBOX			
Adaptor attachment to engine	7/16" U.N.F. stud	14	1·9
Adaptor to engine plate and cylinder block	5/16" U.N.F. bolt/setscrew	20	2·8
Cap to cover	1/4" U.N.F. setscrew	9	1·2
Countershaft and reverse shaft to gearbox	5/16" U.N.C. screw	14	1·9
End cover to gearbox	5/16" U.N.C. screw	20	2·8
Flange to mainshaft	3/4" on shaft	120	16·6
Front cover countershaft to gearbox	5/16" U.N.C. setscrew	20	2·8
Fulcrum pin to gearbox cover	3/8" U.N.F. pin	24	3·4
Gearbox extension to gearbox	5/16" U.N.C. setscrew	20	2·8
Gearbox to adaptor plate	3/8" U.N.F. setscrew	34	4·4
Gearbox to adaptor plate	5/16" U.N.F. bolt	20	2·8
Selectors to selector shaft	1/4" setscrew	9	1·2
Top cover to gearbox case	5/16" U.N.C. bolt	20	2·8
OVERDRIVE—'J' TYPE			
Adaptor to gearbox	1/4" U.N.F. setscrew	9	1·2
Overdrive to adaptor	1/4" stud	7	1·0
Overdrive to rear engine mounting	3/8" U.N.F./U.N.C. stud	25	3·5
Rear engine mounting attachment	7/16" U.N.F. bolt	38	5·2
Steady strap to overdrive unit	5/16" U.N.F. stud	20	2·8
AUTOMATIC TRANSMISSION			
Accelerator mounting bracket to dash panel	1/4" U.N.F. setscrew	9	1·2
Accelerator pedal stop	5/16" U.N.F. setscrew	14	2·0
Accelerator support to bracket	1/4" U.N.F. setscrew	9	1·2
Coupling flange nut	3/8" U.N.F. Nyloc	60	8·3
Coupling flange nut	M20	86	12·0
Drive plate attachment	3/8" U.N.F. bolt	45	6·2
Drive plate to torque converter	3/8" U.N.F. setscrew	34	4·7
Extension housing to case	7/16" U.N.C.	55	7·6
Flange and stoneguard assembly to main shaft	3/8" U.N.F.	60	8·3
Front and rear servo adjustment screw lock-nuts	9/16" U.N.C.	40	5·5
Front servo cover	M8	25	3·5
Governor retaining bolt	M24	18	2·5
Heat shield to transmission unit	M6 setscrew	7	1·0
Lower valve body to case	1/4" U.N.C.	9	1·2
Governor retaining bolt	——	18	2·5
Oil cooler and mounting bracket to radiator mounting	5/16" U.N.F. setscrew	20	2·8
Oil pan drain plug	3/8" Dryseal	12	1·7
Oil pan to case	M6	7	1·0
Parking brake cam plate to main case	M6	6	0·8
Pressure point on case	1/8" Dryseal	8	1·1
Pump adaptor/front pump housing	5/16" U.N.C.	22	3·0
Pump adaptor to transmission case	M8	25	3·5
Rear engine mounting to cross-member	5/16" U.N.F. setscrew	20	2·8
Rear engine mounting to transmission unit	5/16" U.N.F. setscrew	20	2·8
Rear servo cover	M8	25	3·5
Starter motor attachment	3/8" U.N.F. bolt	34	4·7

Operation	Description	Specified Torque lbf ft	kgf m
Transmission adaptor to transmission	5/16" U.N.F. bolt	20	2·8
Transmission case to converter housing lower	M12	50	6·9
Transmission case to converter housing upper	M10	30	4·1
Tube location plate	M5	2	0·3
REAR AXLE			
Bearing cap to hypoid housing	3/8" U.N.F. bolt	38	5·2
Bearing housing and brake backplate to axle tube ends	5/16" U.N.F. bolt	20	2·8
Brake drum to hub	1/4" U.N.F. screw	7	1·0
Crown wheel attachment	3/8" U.N.F. bolt	46	6·4
Hub to axle shaft	5/8" U.N.F.	120	16·6
Hypoid pinion flange to pinion	5/8" U.N.F.	Tighten to pre-load of 29 lbf in (4·0 kgf m) with oil seal fitted	
Rear cover assembly to hypoid housing	5/16" U.N.F. setscrew	20	2·8
Road wheel to hub	3/8" U.N.F. stud	50	6·9
Road wheel to hub	7/16" U.N.F. stud	70	9·7
FRONT SUSPENSION			
Anti-roll bar to front strut	5/16" U.N.F.	14	1·9
Anti-roll bar to front sub-frame	3/8" U.N.F. setscrew	34	4·7
Ball pin to vertical link	1/2" U.N.F.	50	6·9
Caliper to vertical link	7/16" U.N.F. bolt	65	9·0
Damper plate to wishbone	3/8" U.N.F. bolt	34	4·7
Damper to upper wishbone	3/8" U.N.F. bolt	34	4·7
Dust shields to vertical link	5/16" U.N.F. setscrew	65	9·0
Friction disc to front hub	3/8" U.N.C. bolt	32	4·4
Front sub-frame to body mountings	1/2" U.N.F. bolt	48	6·6
I.F.S. mounting bracket attachment	3/8" U.N.F. bolt	32	4·4
I.F.S. mounting bracket attachment	5/16" U.N.F. bolt	20	2·8
Lower ball pin to wishbone	7/16" U.N.F.	45	6·2
Lower wishbone to I.F.S. mounting bracket	3/8" U.N.F. bolt	38	5·2
Strut to lower wishbone	7/16" U.N.F. bolt	65	9·0
Strut to sub-frame	7/16" U.N.F. on strut	38	5·2
Stub axle to vertical link	9/16" U.N.F. stub axle	80	11·1
Tie-rod lever and ball joint to vertical link	7/16" U.N.F. special bolt	65	9·0
Upper ball joint and damper plate to upper wishbone	3/8" U.N.F. bolt	34	4·7
Upper wishbone to fulcrum shaft	7/16" U.N.F. on shaft	38	5·2
Upper wishbone to fulcrum shaft	7/16" U.N.F. jam nut	34	4·7
Wheel to hub	3/8" stud	60	8.3
Wheel to hub	7/16" stud	80	11.1
REAR SUSPENSION			
Anti-roll bar attachment	3/8" U.N.F. bolt	34	4·7
Bump rubber bracket to body	5/16" U.N.F. setscrew	20	2·8
Bump rubber to mounting bracket	3/8" U.N.F. stud	25	3·5
Damper assembly to body	1/4" U.N.F.	9	1·2
Damper assembly to lower link	7/16" U.N.F. bolt	38	5·2
Lower link to body and axle	7/16" U.N.F. bolt	48	6·2
Mounting bracket attachment	5/16" U.N.F. setscrew	20	2·8
Propeller shaft attachment	3/8" U.N.F. bolt	34	4·7
Propeller shaft bearing	5/16" U.N.F. setscrew	20	2·8
Upper link to body bracket	7/16" U.N.F. volt	38	5·2
Upper link to axle	7/16" U.N.F.	38	5·2
STEERING			
Flexible joint to steering unit and 'U' joint shaft	5/16" U.N.F. bolt	14	2·0
Flexible joint coupling bolt	1/4" U.N.F.	9	1·2
Grease plug	3/8" plug	14	1·9
Lower support tube to body	5/16" U.N.F. setscrew	20	2·8
Lower support tube to support bracket	1/4" U.N.F. setscrew	9	1·2
Rack and pinion assembly to sub-frame	5/16" U.N.F. 'U'-bolt	14	1·9
Steering-column clamp	3/8" U.N.F. stud	20	2·8
Steering-column lock to housing	Shear head bolt	Tighten to shear	
Support bracket to lower fascia rail	1/4" U.N.F. setscrew	9	1·2
Support lower column	1/4" U.N.F. setscrew	9	1·2
Universal joint to steering column	5/16" U.N.F.	20	2·8
BODY			
Automatic seat belts fixing to BC post	7/16" U.N.F. setscrew	32	4·4
Brake pedal mounting to body	3/8" U.N.F. bolt	34	4·7
Brake pedal support bracket to scuttle	1/4" U.N.F. setscrew	9	1·2
Brake pedal support bracket to scuttle	7/16" U.N.F. setscrew	45	6·2
Clutch pedal to support bracket	3/8" U.N.F. bolt	32	4·4
Clutch pedal mounting	5/16" U.N.F. setscrew	20	2·8
Drain tap to radiator (when fitted)	Drain tap	14	1·9
Fuel tank drain plug	5/8" U.N.F.	38	5·1
Safety harness attachment	7/16" U.N.F. bolt	32	4·4
Seat slides to floor	5/16" U.N.F. setscrew	14	2·0
Steering lock to column	Shear head bolt	Tighten to shear	

RECOMMENDED LUBRICANTS, FUEL AND FLUIDS — CAPACITIES

RECOMMENDED LUBRICANTS — BRITISH ISLES

(The products recommended are not listed in order of preference)

Component	BP	CASTROL	DUCKHAMS	ESSO	MOBIL	PETROFINA	TEXACO	SHELL
Engine Carburetter Dashpots and Oil Can	BP Super Visco-Static 20W-50	Castrol GTX	Duckhams Q Motor Oil	Esso Uniflo 15W/50	Mobiloil Super 15W/50	Fina Super Grade Motor Oil S.A.E. 20W/50	Havoline Motor Oil 20W/50	Shell Super Multigrade 20W/50
†Gearbox and Overdrive Rear Axle	BP Gear Oil S.A.E. 90 EP	Castrol Hypoy	Duckhams Hypoid 90	Esso Gear Oil GX 85W/140	Mobilube HD 90	Fina Pontonic MP S.A.E. 90	Multigear Lubricant EP 90	Shell Spirax 90 EP
Front Hubs	—	—	—	—	Mobilgrease Super	—	—	—
Rear Hubs Brake Cables Grease Gun	BP Energrease L2	Castrol LM Grease	Duckhams LB 10	Esso Multi-purpose Grease H	Mobilgrease MP or Mobilgrease Super	Fina Marson HTL 2	Marfak All Purpose Grease	Shell Retinax A
Borg-Warner Automatic Transmission	BP Autran B	Castrol TQF	Duckhams 'Q'-matic	Esso Glide	Mobil ATF 210	Fina Purfimatic 33F	Texamatic Type 'F'	Shell Donax T7

RECOMMENDED LUBRICANTS — OVERSEAS

(The products recommended are not listed in order of preference)

Component	Air temp. °C	Air temp. °F	API Designation	BP	CASTROL	DUCKHAMS	ESSO	MOBIL	PETROFINA	SHELL	TEXACO
Engine Carburetter Dashpots and Oil Can	over 30	over 80	SD or SE	* BP Super Visco-Static	Castrol GTX or Castrol Super 20/40	Q 20-50 Q10-50	Esso Extra Motor Oil 20W/50 UNIFLO	Mobiloil Super 10W/50 Mobiloil Special 20W/50	Fina Supergrade Motor Oil 20W/50	Shell Super Motor Oil 20W/50	Havoline 20W/50
	30 to 0	80 to 30	SD or SE								
	0 to −20	30 to −4	SD or SE		Castrolite or Castrol GTZ	Q 10-40	Esso Extra Motor Oil 10W/30	Mobiloil Super 10W/50	Fina Supergrade Motor Oil 10W/30	Shell Super Motor Oil 10W/30	Havoline 10W/30
	below −20	below −4	SD or SE		Castrol 5W/20	Q 5W-30	Esso Extra Motor Oil 5W/20	Mobiloil 5W/20	Fina Supergrade 5W/20	Shell Super Motor Oil 5W/20	Havoline 5W/20
†Gearbox and Overdrive Rear Axle	over 0	over 30	GL4	BP Gear Oil S.A.E. 90 EP	Castrol Hypoy	Duckhams Hypoid 90	Esso Gear Oil GX 90	Mobilube HD 90	Fina Pontonic MP S.A.E. 90	Shell Spirax 90 EP	Multigear Lubricant EP 90
	below 0	below 30	GL4	BP Gear Oil S.A.E. 80 EP	Castrol Hypoy 80	Duckhams Hypoid 80	Esso Gear Oil GX 80	Mobilube HD 80	Fina Pontonic MP S.A.E. 80	Shell Spirax 80 EP	Multigear Lubricant EP 80
Front Hubs				—	—	—	—	Mobilgrease Super	—	—	—
Rear Hubs Brake Cables Grease Gun				BP Energrease L2	Castrol LM Grease	Duckhams LB 10	Esso Multi-purpose Grease H	Mobilgrease MP or Mobilgrease Super	Fina Marson HTL 2	Shell Retinax A	Marfax All-purpose
Borg-Warner Automatic Transmission				BP Autran B	Castrol TQF	Duckhams 'Q'-matic	Esso Glide	Mobil ATF 210	Fina Purfimatic 33F	Shell Donax T7	Texamatic Type 'F'

* Oils marked thus are available in multigrade forms with viscosity characteristics appropriate to ambient temperature range in individual markets.

† Where a limited slip differential unit is fitted refer to 51.15.00.

RECOMMENDED HYDRAULIC FLUIDS

Clutch and brake reservoirs: Castrol Girling Brake and Clutch Fluid—Green or Unipart 550 Brake Fluid.

Where this proprietary brand is not available, other fluids which meet the S.A.E. J1703 specification may be used.

RECOMMENDED FUEL

The Triumph Sprint engine is designed to operate on fuel having a minimum octane rating of 97 (Research Method); this is equivalent to the British 4-star rating.

Where such fuels are not available and it is necessary to use fuels of lower or unknown rating, the ignition timing must be retarded from the specified setting, just sufficiently to prevent audible detonation (pinking) under all operating conditions, otherwise damage to the engine may occur.

The use of lower octane fuels will result in loss of engine power and efficiency.

In the interests of public health and to assist in keeping undesirable exhaust emissions as low as possible do not use fuel of an octane rating in excess of that recommended.

ANTI-FREEZE SOLUTIONS

Only solutions which meet B.S.I. 3152 specification may be used.

ANTI-FREEZE CONCENTRATION		25%	30%	35%	50%
SPECIFIC GRAVITY OF COOLANT AT 15·5°C (60°F)		1·039	1·048	1·054	1·076
ANTI-FREEZE QUANTITY	PINTS IMP.	2·4	2·9	3·3	4·8
	LITRES	1·4	1·7	1·9	2·7
DEGREE OF PROTECTION — **Complete** Car may be driven away immediately from cold		−12°C 10°F	−16°C 3°F	−20°C −4°F	−36°C −33F°
Safe Limit Coolant in mushy state. Engine may be started and driven away after short warm-up period		−18°C 0°F	−22°C −°8F	−28°C −18°F	−41°C −42F°
Lower Protection Prevents frost damage to cylinder head, block and radiator. Thaw out before starting engine		−26°C −15°F	−32°C −26°F	−37°C −35°F	−47°C −53°F

CAPACITIES

Fuel tank	12·5 gal (57·0 litres)
Engine sump and oil filter	8 pints (4·5 litres)
Engine sump (drain and refill)	7 pints (4·0 litres)
Gearbox (from dry)	2 pints (1·15 litres)
Gearbox and overdrive (from dry)	3·3 pints (1·90 litres)
Rear axle (from dry)	2 pints (1·15 litres)
Cooling system (including heater)	9·5 pints (5·4 litres)
Heater	1 pint (0·57 litre)
Automatic transmission including oil cooler	8·75 pints (5·0 litres)

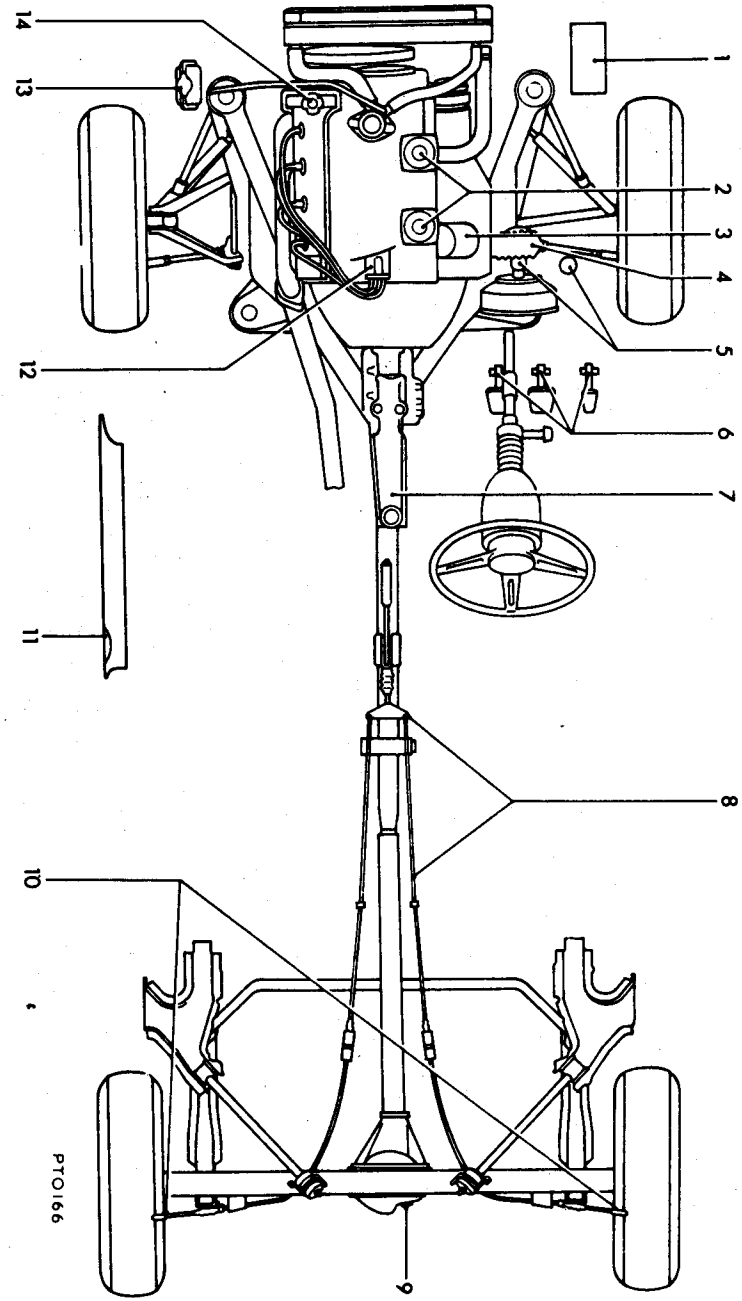
LUBRICATION CHART

Weekly or before a long journey
13 Check/top up cooling system level.
14 Check engine oil level.

Every 6,000 miles (10000 km)
1 Coat battery terminals with petroleum jelly (vaseline).
2 Check/top up carburetter piston dampers and lubricate carburetter linkage.
3 Renew oil filter element.
4 Lubricate steering unit (grease gun).
5 Check/top up brake and clutch master cylinders.
7 Check/top up gearbox oil level.
8 Lubricate hand brake linkage and cable.
9 Check/top up rear axle oil level.
10 Lubricate rear hubs.
12 Lubricate distributor.
13 Check/top up cooling system level.
14 Change engine oil.

Every 3,000 miles (5000 km)
5 Check/top up brake and clutch master cylinders.
13 Check/top up cooling system level.
14 Check/top up engine oil level.

Every 12,000 miles (20000 km)
1 Lubricate battery terminals (petroleum jelly).
2 Check/top up carburetter piston dampers and lubricate carburetter linkage.
3 Renew oil filter element.
4 Lubricate steering unit (grease gun).
5 Check/top up brake and clutch master cylinders.
6 Lubricate accelerator, brake and clutch pedal pivots (oil can).
7 Check/top up gearbox oil level.
8 Lubricate hand brake linkage and cable.
9 Check/top up rear axle oil level.
10 Lubricate rear hubs.
11 Lubricate all locks and hinges.
12 Lubricate distributor.
13 Check/top up cooling system level.
14 Change engine oil.

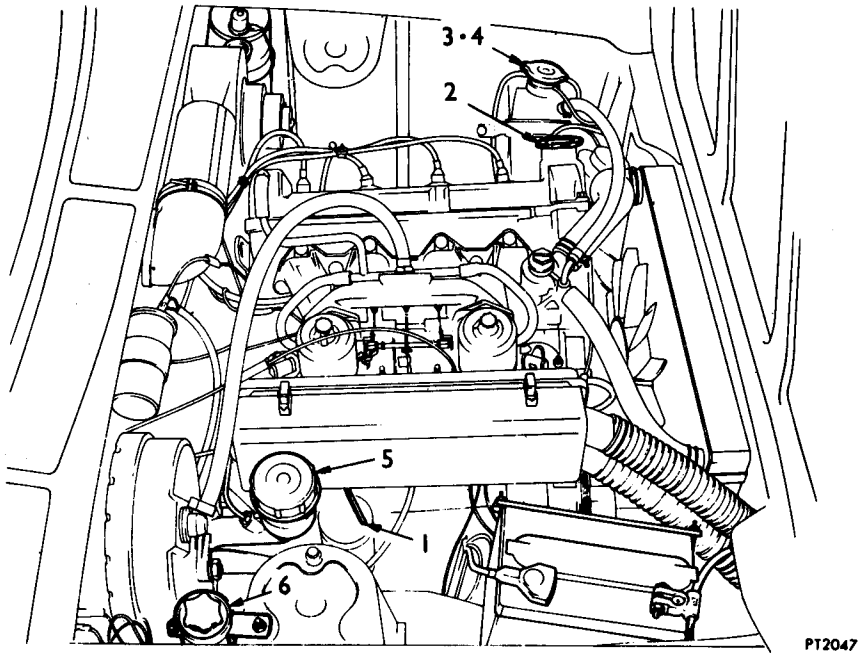


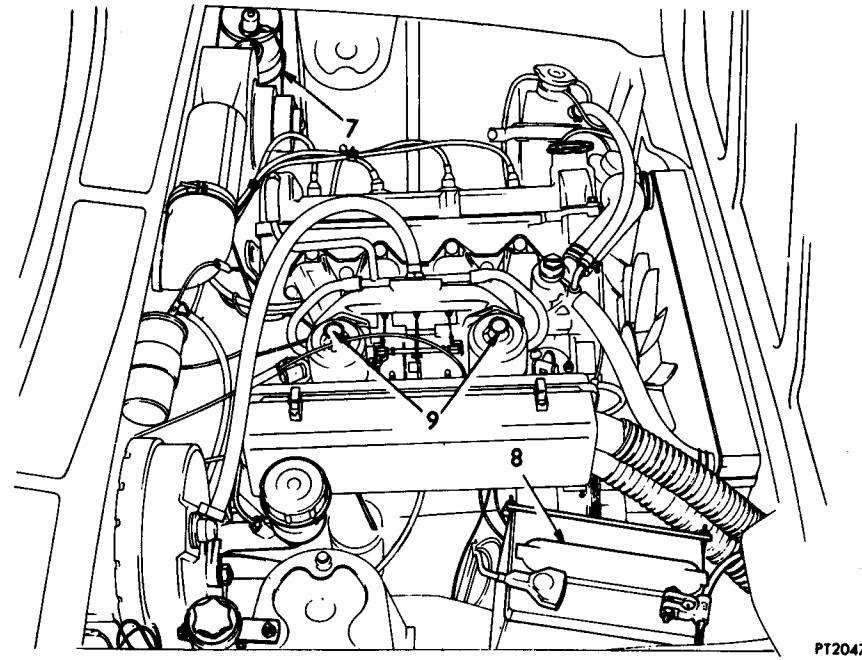
SUMMARY CHART

Operation Number	10.10.03	10.10.06	10.10.12	10.10.24
Intervals in Miles × 1000	1	3	6	12
Intervals in Kilometres × 1000	1·6	5	10	20
Operation description				
ENGINE COMPARTMENT				
1 Check/top up engine oil level		X		
2 Check/top up cooling system	X	X	X	X
3 Check/top up brake fluid reservoir	X	X	X	X
4 Check/top up clutch fluid reservoir	X	X	X	X
5 Check/top up windscreen washer fluid reservoir	X	X	X	X
6 Check/top up battery	X	X	X	X
7 Check/top up carburetter pistons dampers	X		X	X
8 Drain engine oil and refill	X		X	X
9 Renew oil filter element			X	X
10 Clean fuel pump filter gauze	X			X
11 Lubricator distributor and check automatic advance	X		X	X
12 Check/adjust/report condition of distributor points	X		X	X
13 Check/adjust ignition timing using electronic equipment	X		X	X
14 Clean/adjust spark plugs			X	
15 Renew spark plugs				X
16 Check/adjust torque of cylinder head nuts/bolts	X			
17 Clean carburetter air cleaner elements			X	
18 Renew carburetter air cleaner elements				X
19 Check/adjust/report condition of driving belt	X	X	X	X
20 Check security of starter motor and alternator retaining bolts	X			
21 Check security of engine mountings	X			
22 Check/adjust carburetter settings	X		X	X
23 Lubricate accelerator linkage/pedal fulcrum and check operation	X		X	X
24 Check battery condition; clean and grease connections			X	X
25 Check/report oil/fuel/fluid leaks and leaks from cooling and heater systems	X	X	X	X
26 Check brake servo hoses for security and condition	X	X	X	X
UNDERBODY				
27 Check/top up level of gearbox oil	X		X	X
28 Check/top up level of final drive unit oil	X		X	X
29 Lubricate rear hubs				X
30 Lubricate steering rack and pinion			X	X
31 Lubricate hand brake linkage and cable guides			X	X
32 Check engine, transmission and final drive for oil leaks, and report	X	X	X	X
33 Check visually brake, fuel and clutch pipes, hoses, unions for chafing, leaks and corrosion, and report	X	X	X	X
34 Check/report exhaust system for leakage and security		X	X	X
35 Check tightness of suspension fixings, tie-rod levers, steering unit attachments and steering universal joint coupling bolts	X			X
36 Check tightness of propeller shaft coupling bolts				X
37 Check tightness of sub-frame to body mountings	X			
38 Check/report condition of steering unit/joints for security, backlash and gaiter condition	X	X	X	X

Operation Number	10.10.03	10.10.06	10.10.12	10.10.24
Intervals in Miles × 1000	1	3	6	12
Intervals in Kilometres × 1000	1·6	5	10	20
Operation description				
EXTERIOR				
39 Adjust front hubs				X
40 Check/adjust front and rear wheel alignment with tracking equipment	X			
41 Check/report front and rear wheel alignment with tracking equipment			X	X
42 Inspect brake pads for wear, and discs for condition		X	X	X
43 Inspect and report brake linings for wear, and drums for condition			X	X
44 Check tightness of road wheel fastenings	X	X	X	X
45 Check that tyres are in accordance with specification*		X	X	X
46 Check visually and report tread depth, cuts in tyre fabric, exposure of ply or cord structure, lumps or bulges*	X	X	X	X
47 Check/adjust tyre pressures, including spare	X	X	X	X
48 Check/adjust headlamp alignment	X			
49 Check/report headlamp alignment		X	X	X
50 Check, if necessary replace, windscreen wiper blades		X	X	X
INTERIOR				
51 Check brake pedal travel and hand brake operation; adjust if necessary	X		X	X
52 Check/report brake pedal travel and hand brake operation		X		
53 Check operation of window controls, locks and bonnet release	X			X
54 Check function of all electrical systems and windscreen washer	X	X	X	X
55 Lubricate clutch and brake pedal pivots				X
56 Lubricate all locks, door hinges, strikers and bonnet release	X		X	X
57 Check/report condition and security of seats and seat belts and operation of inertia reel mechanism (where fitted)		X	X	X
58 Check/report rear-view mirrors for looseness, cracks and crazing		X	X	X
ROAD TEST				
59 Road/roller test and report additional work required	X		X	X
60 Ensure cleanliness of controls, door handles, steering-wheel, etc.	X	X	X	X
AUTOMATIC TRANSMISSION				
61 Check/top up fluid level	X		X	X
62 Clean cooling apertures on base of unit	X	X	X	X
63 Lubricate exposed selector linkage			X	X

* **Important:** If the tyres do not conform with legal requirements, report to the owner.





The maintenance summary list on page 10–2 gives details of mile and kilometre intervals for the following operations. The figure in parentheses to the left of each heading refers to the item number on the summary list. Figures without parentheses refer to illustration(s) on page.

(1) Check/top up engine oil level

NOTE: Allow time for oil to drain back into sump after running engine.

Stand vehicle on level ground.

1 Withdraw the dipstick, wipe it clean and push it fully home again before withdrawing it for reading.

2 Add oil via the filler cap until the level reaches the 'High' mark on the dipstick. DO NOT OVERFILL and ensure that the dipstick and filler cap are replaced.

(2) Check/top up cooling system

WARNING: Do NOT remove cooling system filler caps or plugs when engine is hot.

3 Slowly turn the pressure cap anti-clockwise until the resistance of the safety stop is felt. Leave the cap in this position until all pressure is released. Press the cap downwards against the spring to clear the safety stops and continue turning until it can be lifted off.

4 Maintain the level of the coolant in the expansion tank at half full by topping-up as necessary whilst the system is cool.

NOTE: Ensure that the specific gravity of the coolant is maintained.

(3) Check/top up brake fluid reservoir

5 Top up when required with new fluid of the correct type recommended, see 09. Do not allow the fluid level to drop below the 'Danger' mark on the reservoir.

(4) Check/top up clutch fluid reservoir

6 Top up when required with new fluid of the type recommended, see 09.

WARNING: Use only new fluid of the correct specification. Do NOT use fluid of unknown origin, or fluid that has been exposed to the atmosphere, or discharged during bleeding operations.

CAUTION: Paintwork can be damaged by direct contact with brake or clutch fluid.

(5) Check/top up windscreen washer fluid level

7 Replenish the container with clean soft water. The addition of a small amount of mild detergent will prevent smearing on the windscreen.

(6) Check/top up battery

8 Using DISTILLED WATER ONLY, top up the electrolyte when required. The electrolyte level is correct when it just covers the separators.

(7) Check/top up carburetter piston damper

9a Unscrew the oil cap from the top of each carburetter suction chamber and withdraw the cap with its attached plunger. Top up with clean engine oil to bring the level $\frac{1}{2}$ in (13 mm) above the top of the hollow piston rod. Push the damper assembly back into position and screw the cap firmly into the reservoir. Under no circumstances should heavy-bodied lubricant be used. Failure to lubricate the piston damper may cause the piston to flutter and reduce acceleration.

9b *Tamper proof carburetters*

Ball bearing suction chambers: Unscrew the cap and CAREFULLY raise the piston and damper together to the top of their travel. Fill the recess in the damper retainer with clean engine oil, lower the damper until the cap contacts the suction chamber; repeat this procedure until the oil level is just visible at the bottom of the retainer recess. If retainer is inadvertently displaced it should be refitted by pressing fully into piston rod. Screw the cap firmly into the suction chamber. **IT IS ESSENTIAL THAT THE DAMPER RETAINER IS NOT DISPLACED FROM ITS POSITION IN THE PISTON ROD.**

Refer to 19.00.00.

(8) Drain engine oil and refill
NOTE: This operation is best carried out when the engine is warm and with the vehicle standing level on a ramp or over a pit.
To drain the sump, unscrew the drain plug three complete turns to direct the oil stream into a receptacle while the engine is warm. When the rate of flow lessens, remove the plug completely. Refit the plug and refill the sump with the appropriate grade of engine oil. **The use of additives is unnecessary.**
If the vehicle is used for competitive sports events or subjected to sustained high speeds, use oil of a higher viscosity than those listed under 'Recommended Lubricants'.

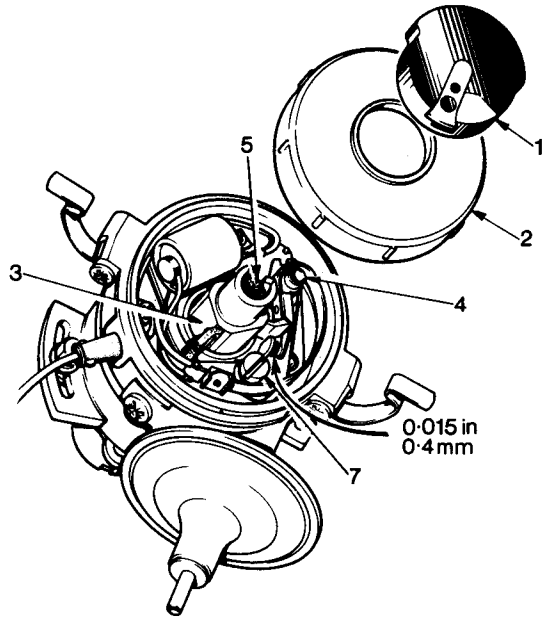
(9) Renew oil filter element
See 12.60.08.

(10) Clean fuel pump filter gauze
See 19.45.05.

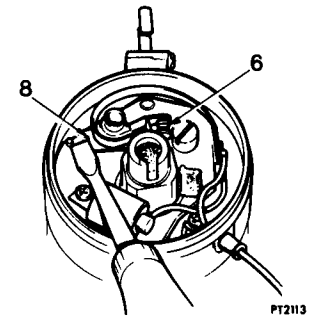
(11) Lubricate distributor and check automatic advance

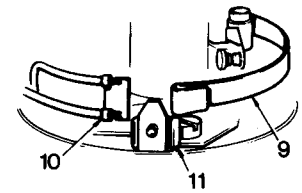
Checking advance mechanism
Remove the distributor cover and grasp the rotor arm (1) firmly. Turn the rotor in the direction of rotation and release it. The rotor arm should return to its original position without showing any tendency to stick.

Lubrication
Remove the rotor arm (1) and dust cover (2). Lightly smear the cam (3) and the outside of the hollow pivot post (4) with Retinax 'A' or equivalent grease. Apply two drops of clean engine oil to the exposed felt pad in the top of the cam (5).



(12) Check/adjust/report condition of distributor points
Contact breaker gap adjustment
Turn the crankshaft until the contacts are fully open. Using a 0·015 in (0·4 mm) feeler gauge, check the gap; the gauge should be a sliding fit in the gap. If the gap varies appreciably from the gauge thickness, slacken the contact plate securing screw (7) and adjust the gap by inserting a screwdriver in the notched end of the plate (8) as shown. Turn the screwdriver anti-clockwise to increase, or clockwise to decrease the gap. Retighten the securing screw.





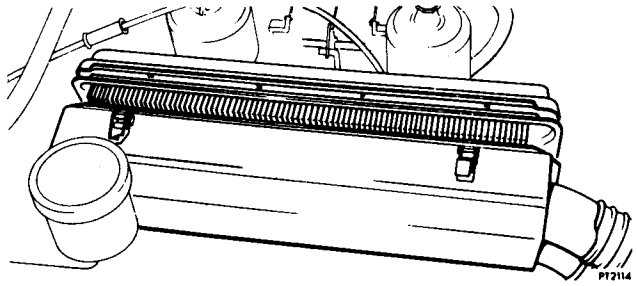
Renewing contacts
Push the moving contact spring (9) inwards and slide the L.T. terminal plate (10) clear of a loop at the end of the spring. Remove the securing screw (7) and lift out the old contact assembly.
Insert a new contact assembly, locating the hollow pivot post over a pin protruding from the base plate. Secure the assembly by fitting the screw (7) with a spring and plain washer. Attach the terminal plate (10) to the spring loop and ensure that the blade (9) properly locates between the flanges of the insulating piece (11). Adjust the contact gap as described previously. Refit the dust cover, rotor arm and distributor cap.

(13) Check/adjust ignition timing
See 86.35.15.

(14) Clean/adjust spark plugs

(15) Renew spark plugs
Remove the plugs, using the special tube spanner provided in the tool kit, and clean the plugs preferably with an air-blast service unit. Check the plug gaps and, if necessary, re-adjust to 0·025 in (0·64 mm) by use of a special Champion spark plug gauge and setting tool. Move the side electrode, never the centre one.
Wipe clean the outside of the plug before refitting. This type of plug is not fitted with a sealing washer and a leakproof joint is made by a taper seating on the plug. Refit the plug and tighten to finger-tightness. Turn the plug approximately one-sixteenth of a turn to achieve a final torque tightening value of 8 lbf ft (1·1 kgf m).
Do not overtighten the plug otherwise great difficulty will be experienced when the plug is next removed and damage may result to the cylinder head.
When new plugs are required refer to 05.

(16) Check/adjust torque of cylinder head nuts/bolts
See 12.29.27



(17) Clean carburetter air cleaner elements

(18) Renew carburetter air cleaner elements
Release the two clips on the top edge of the air cleaner cover and open the cover. Remove the element, and using a soft brush or low-pressure air-line, clean between the folds of the element or renew the element, according to service.
Fit the element and close the cover, ensuring that the bottom lip of the cover is engaged correctly and that the clips are secure.

(19) Check/adjust/report condition of driving belts
1 Check and adjust, see 86.10.05.
2 Report condition where belt is visibly worn or damaged.

(20) Check security of starter motor and alternator retaining bolts
1 Check security of starter motor retaining bolts, which are correct when tightened to 34 lbf ft (4·7 kgf m).
2 Check security of alternator to adjusting link bolt, which is correct when tightened to 20 lbf ft (2·8 kgf m).
3 Check security of alternator mounting bracket bolt, which is correct when tightened to 20 lbf ft (2·8 kgf m).

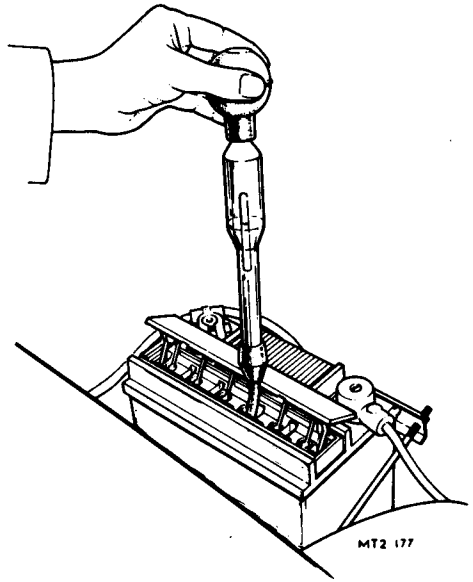
(21) Check security of engine mountings
Check the security of both front and rear engine mountings using the torques figures shown in 06.

(22) Check/adjust carburetter settings
See 19.15.02.

(23) Lubricate accelerator linkage/pedal fulcrum and check operation

Lubricate
Using an oil can, lubricate the accelerator linkage on the carburetter and the accelerator pedal pivot. Wipe away any surplus oil to avoid drips or any possibility of staining the carpet inside the car.

Check operation
Check carburetter throttle response to initial movement of the accelerator pedal.
Check carburetter throttle position with accelerator pedal fully depressed.



(24) Check battery condition; clean and grease connections
With battery in location:
1 Check battery and surrounding area for corrosion from battery chemicals.
2 Clean off any corrosion found.
3 Check visually for cracks in battery case.
4 Report any case cracks found.
5 Check security of terminal connections.
6 Coat terminals with petroleum jelly.

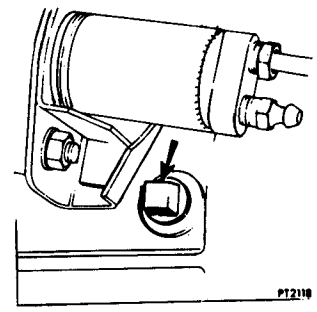
For each cell in turn:
7 Check electrolyte specific gravity, using an hydrometer.

(25) Check/report oil/fuel/fluid leaks and leaks from cooling and heater systems

(26) Check brake servo hoses for security and condition

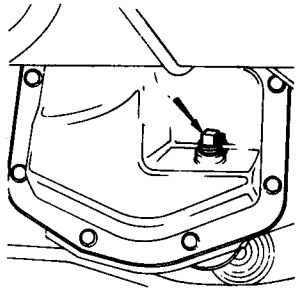
NOTE: Operations 27 to 38 are best carried out with the car on a ramp or over a pit.

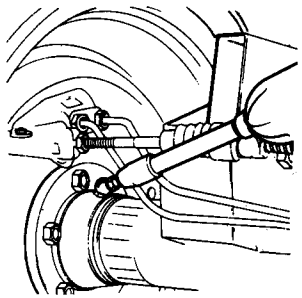
(27) Check/top up level of gearbox and overdrive oil

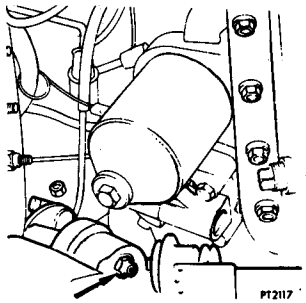


With the vehicle standing on level ground, remove the oil level plug (arrowed) and, using a suitable dispenser such as a pump-type oil can with flexible nozzle filled with an extreme pressure (hypoid) lubricant, top up the gearbox until the oil is level with the bottom of the filler plug threads.
Allow surplus oil to drain away before refitting the level plug and wiping clean.

Overdrive (where fitted)
An oil transfer hole between the gearbox and overdrive unit provides a common oil level. Maintenance of the overdrive unit is thus limited to ensuring that the correct oil level is maintained in the gearbox.







(28) Check/top up level of final drive unit oil
With the vehicle standing on level ground, remove the oil level plug (shown arrowed), and top up the rear axle until the oil is level with the bottom of the filler plug threads. Allow surplus oil to drain before fitting the plug and wiping clean.

(29) Lubricate rear hubs
Apply a grease gun to each of the rear hub grease nipples, giving five strokes only.

(30) Lubricate steering rack and pinion
Apply a grease gun to the grease nipple shown arrowed, giving five strokes only.

(31) Lubricate hand brake linkage and cables
Smear the hand brake compensator and cable guides with grease, forcing it into the guide tubes and cable tracks.

(32) Check engine, transmission, final drive, suspension and steering unit for oil leaks, and report

(33) Check visually brake, fuel and clutch pipes, hoses and unions for chafing, leaks and corrosion, and report

(34) Check/report exhaust system for leakage and security

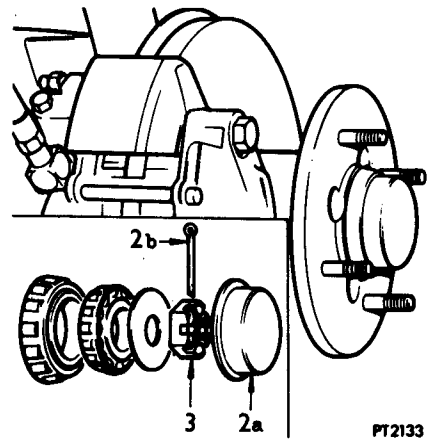
(35) Check security of suspension fixings, tie-rod levers, steering unit attachment and steering universal joint coupling bolts
Refer to section 06 for torque value details.

(36) Check security of propeller shaft and drive shaft universal coupling bolts
Refer to section 06 for torque value details

(37) Check security of sub-frame to body mountings
Refer to Section 06 for torque value details

(38) Check/report condition of steering unit/joints for security, backlash and gaiter condition

(39) Adjust front hubs

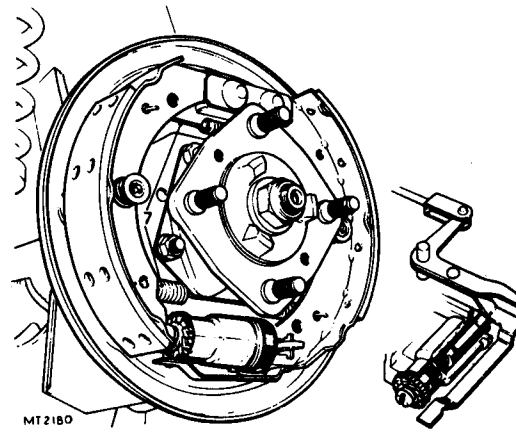


1 Jack up the front of the car and remove one front road wheel.
2a Remove the hub grease cap and
b withdraw the split pin.
3 Spin the hub and tighten the nut until slight resistance to hub rotation is felt, then slacken the nut one half flat and insert a new split pin.
4 Refit the grease cap, road wheel and lower the jack.
5 Repeat the procedure on the opposite wheel.

(40) (41) Check/adjust/report front and rear wheel alignment with tracking equipment
Front wheel alignment, see 57.65.01.

(42) Inspect brake pads for wear, and discs for condition
Jack up the front of the car and place safely onto stands before removing the disc brake pads, see 70.40.02.
CAUTION: Do NOT depress the brake pedal while the pads are removed.
Report pad condition if the friction lining has been reduced to 0·125 in (3 mm) or if there is not sufficient material to provide a thickness of 0·125 in (3 mm) at the completion of a further 3,000 miles (5000 km) motoring.
Check the brake discs for excessive scoring and run-out, and report this if present.

(43) Inspect and report brake linings for wear and drums for condition



Jack up the car and place safely on stands before removing the road wheel (held by four nuts) and the brake drum, see 70.10.03. Check the brake linings for wear and report if they are excessively worn, damaged or contaminated by oil or grease. Remove surplus oil or grease and any brake lining dust before replacing the brake drum.

(44) Check security of road wheel fastenings
Refer to Section 06 for torque value details.

(45) Check that tyres are in accordance with manufacturer's specification
Report any deviations that may influence the car performance or the accuracy of the speedometer.

(46) Check visually and report depth of tread, cuts in tyre fabric, exposure of ply or cord structure, lumps or bulges.

(47) Check/adjust tyre pressures (including spare wheel)

WARNING: It is illegal in the U.K. and can be dangerous:

a To use a car fitted with tyres in a damaged condition.
b To mix cross-ply and radial-ply tyres on the same axle or to fit radial-ply tyres to the front wheels only.
c To use a car of this type fitted with tyres that have a tread depth below the legal minimum or tyres on which the tread is worn level with the wear indicator bars.
d To use a car with the tyres inflated to a pressure that is not suitable for the use to which the vehicle is put.

(48) (49) Check/adjust/report headlamp alignment

See 86.40.18.

(50) Check, if necessary replace, windscreen wiper blades

Examine each wiper blade in turn for damage before wetting the windscreen and operating the wiper motor control.
Replace wiper blades if they are damaged or if the screen is smeared.

(51) Check brake pedal travel and hand brake operation, adjust if necessary.

If brake pedal has spongy operation, bleed and adjust brakes, see 70.25.01.
If handbrake travel is excessive, adjust handbrake, see 70.35.10.

(52) Check/report brake pedal travel and hand brake operation

(53) Check operation of window controls, locks and bonnet release.

(54) Check function of all electrical systems and windscreen washer

(55) Lubricate clutch and brake pedal pivots

Wipe away any surplus oil that may lead to stains on the carpet.

(56) Lubricate all locks, door hinges, strikers and bonnet release.

Using an oil can, sparingly lubricate the items as detailed. Wipe away any surplus oil to avoid staining paintwork or interior fittings.

(57) Check/report condition and security of seats and seat belts

(58) Check/report rear-view mirrors for looseness, cracks and crazing

(59) Road/roller test and report additional work required

(60) Ensure cleanliness of controls, door handles, steering-wheel, etc.

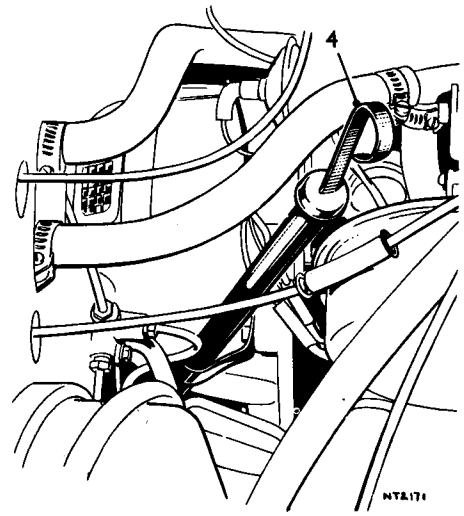
AUTOMATIC TRANSMISSION

Routine maintenance of the Borg-Warner Automatic Transmission unit is limited to three operations.

(61) Check/top up fluid level

This operation is best completed with the transmission unit at normal operating temperatures, i.e. after the car has been driven for about 5 miles (8 kilometres). If this is not possible and the fluid level is checked with the unit cold, the level must NOT BE LESS than 1·2 inches (30·5 mm) below the 'High' mark on the dipstick, otherwise it will be too high when the unit reaches normal operating temperature.
The difference between the 'Low' and 'High' marks on the dipstick is equivalent to 1 imperial pint (0·57 litre). The dipstick is located just in front of the bulkhead in the engine compartment, to the right of the engine unit.

1 Stand the vehicle on level ground.
2 Put the gear selector to 'P' position and apply the hand brake.
3 Run the engine at idling speed for approximately two minutes.



4 With the engine still running, remove the dipstick and wipe it clean with a clean, non-fluffy rag or clean paper.
5 Insert the dipstick and withdraw it immediately to check the fluid level.
6 Add fluid via the filler tube, as necessary, to bring it to the correct level.
7 Wipe the dipstick clean and replace it in the filler tube.
8 Stop the engine.

CAUTION: Every precaution must be taken before, during and after this operation to ensure that no dirt, dust or other foreign matter enters the transmission unit down the filler tube.

(62) Clean cooling apertures

1 Place the car on a ramp or over a pit.
2 Clean mud, dirt or other foreign matter from the cooling apertures and surrounding area.
3 Check the unit for fluid leaks.

(63) Lubricate exposed selector linkage

ADDITIONAL PREVENTIVE MAINTENANCE FOR THE BRAKING SYSTEM

In addition to the recommeded periodical inspection of brake components it is advisable as the car ages, and as a precaution against the effects of wear and deterioration, to make a more searching inspection and renew parts as necessary.
It is recommended that:

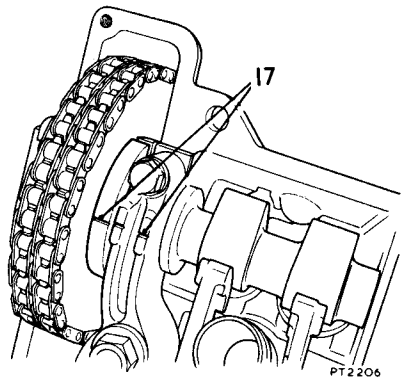
1 Disc brake pads, drum brake linings, hoses, and pipes should be examined at intervals no greater than those laid down in the Passport to Service.
2 Brake fluid should be changed completely every 18 months or 18,000 miles (30 000 km) whichever is the sooner.
3 All fluid seals in the hydraulic system and all flexible hoses should be renewed every 3 years or 36,000 miles (60 000 km) whichever is the sooner. At the same time the working surface of the pistons and of the bores of the master cylinder, wheel cylinders, and other slave cylinders should be examined and new parts fitted where necessary. The brake servo filter element and load conscious valve should also be renewed.

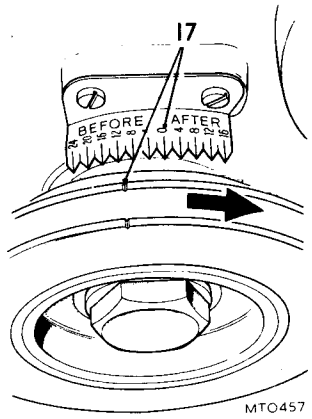
JACKSHAFT

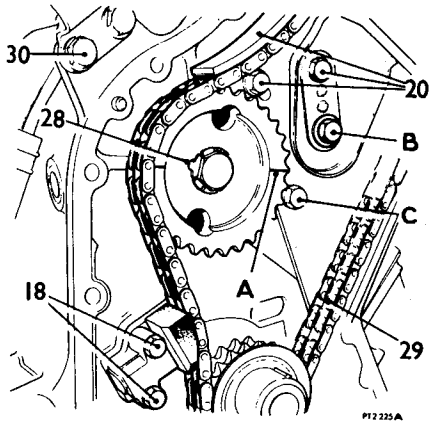
Remove and refit **12.10.14**

Removing

1 Remove the bonnet, see 76.16.01.
2 Disconnect the battery.
3 Drain the cooling system, see 26.10.01.
4 Remove the radiator, see 26.40.01.
5 Remove the engine and gearbox assembly, see 12.37.01.
6 Remove the alternator.
7 Remove the fan belt and torquatrol unit, see 26.25.21.
8 Remove the crankshaft pulley, see instructions 4 and 5, 12.21.01.
9 Remove the timing chain cover, see instructions 5 to 11, 12.65.01.
10 Remove the front lifting eye.
11 Remove the inlet manifold complete with carburetters and air cleaner.
12 Remove the water pump cover retaining bolts and lift off the cover and discard the water pump to manifold connecting tube.
13 Remove the water pump assembly, see instruction 7, 26.50.01.
14 Remove the fuel pump.
15 Remove the rocker cover.
16 Temporarily locate the timing chain cover and crankshaft pulley.
17 Turn the engine over so that the timing mark on the camshaft flange is in line with the groove on the camshaft front bearing cap and the groove on the crankshaft pulley coincides with the zero mark on the timing cover scale.
18 Withdraw the two bolts and remove the hydraulic timing chain tensioner.
19 Remove the distributor and cap, see 86.35.20.
20 Remove the two bolts securing the adjustable chain guide and remove the guide.
21 Lift the chain from the jackshaft sprocket and turn the sprocket to gain access through the holes to the two Allen screws securing the jackshaft keeper plate to the cylinder block.
22 Remove the screws and withdraw the keeper plate.



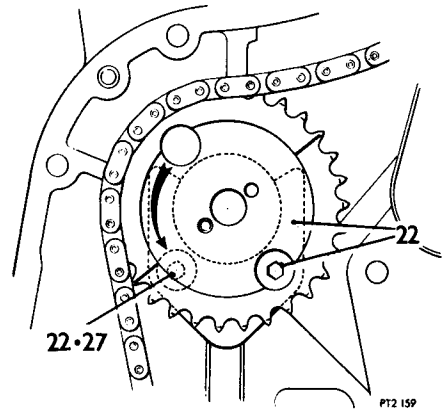


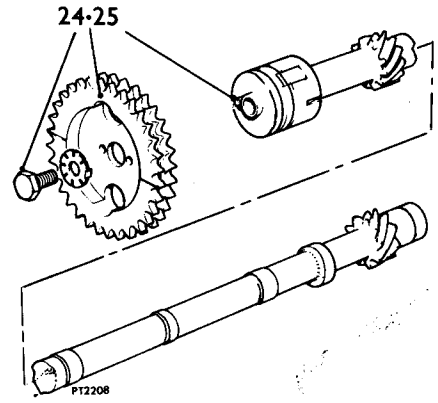


23 Hold the timing chain clear of the sprocket and withdraw the jackshaft complete with the sprocket.
24 Secure the jackshaft in a vice and unlock and remove the sprocket retaining bolt and withdraw the sprocket.

Refitting

25 Hold the jackshaft in a vice and fit the sprocket to the shaft, locating it on the single dowel. Secure the sprocket with the lock washer and bolt.
26 Fit the jackshaft into the cylinder block and lift the chain to engage the sprocket.
27 Fit the jackshaft keeper plate and secure in position with the two Allen screws.
28 While holding the chain clear of the sprocket, turn the jackshaft until the scribed line 'A' is equidistant between bolts 'B' and 'C' with the dowel to the left (looking at the engine from the front).
29 Check that the timing chain is taut on the drive side — i.e. the run between the camshaft and crankshaft sprocket — and fit the hydraulic tensioner, see instructions 11 to 19 omitting instruction 16, 12.65.28.
30 Fit the engine lifting eye.
31 Fit the timing chain cover and crankshaft pulley, see instructions 12 to 16, 12.65.01.
32 Fit the alternator.
33 Fit the fan and Torquatrol unit.
34 Fit and adjust the fan belt.
35 Fit the water pump and cover assembly, see instructions 8 to 13, 26.50.01.
36 Fit the inlet manifold complete with carburetters and air cleaner, ensuring that a new water pump to manifold tube is fitted, see 30.15.02.
37 Fit the fuel pump and connect the outlet to the carburetters.
38 Fit the distributor, see 86.35.20.
39 Fit the rocker cover and connect the H.T. leads to the spark plugs.
40 Fit the engine and gearbox assembly, see 12.37.01.
41 Fit the radiator and fill the cooling system, see 26.40.01.
42 Fit the bonnet, see 76.16.01.
43 Connect the battery.



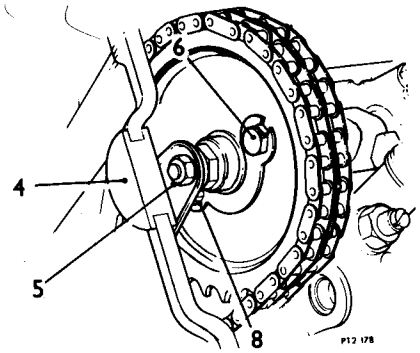


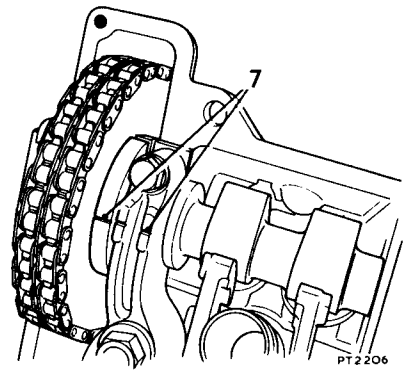
CAMSHAFT

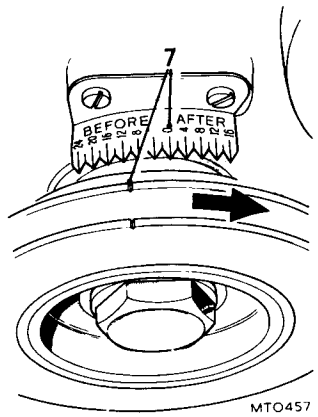
Remove and refit **12.13.02**

Removing

1 Disconnect the battery, and drain the coolant including the block.
2 Remove the rocker cover, see 12.29.42.
3 Turn the engine over so that the timing mark on the camshaft flange is 180° distant from the groove on the camshaft front bearing cap.
4 Remove the semi-circular grommet from the cylinder head.
5 Using a 'slave' nut, firmly secure the camshaft sprocket to the chain wheel support bracket.
6 Unlock and remove one camshaft sprocket retaining bolt.
7 Turn the engine until the timing mark on the camshaft flange is in line with the groove on the camshaft front bearing cap, i.e. No. 1 piston T.D.C. firing and the crankshaft pulley timing mark coinciding with the zero on the timing cover scale. Remove the distributor cap and check that the rotor arm points to the segment in the cap for No. 1 cylinder. Refit the cap.
8 Unlock and remove the remaining bolt retaining the camshaft sprocket.
9 Remove the rocker shaft assembly, see 12.29.54.
10 Withdraw the camshaft from the cylinder head.

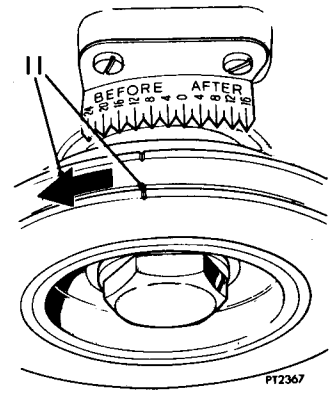


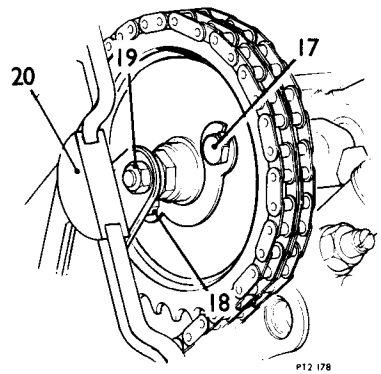




Refitting

11 Turn the crankshaft back 90° from T.D.C. to prevent the valves touching the pistons whilst fitting the camshaft and carrying out instruction 14.
12 Fit the camshaft to the cylinder head.
13 Fit the rocker shaft assembly, see 12.29.54.
14 Check, and if necessary adjust, the valve clearances, see 12.29.48.
15 Turn the engine back to T.D.C. to the condition in instruction 7.
16 Turn the camshaft so that the timing mark on the flange is in line with the groove on the camshaft front bearing cap, i.e. No. 1 piston T.D.C. firing as in instruction 7.
17 Locate the sprocket on the camshaft flange, fit a new lock washer and secure with the retaining bolt. Tighten the bolt to a torque of 10 lbf ft (1·4 kgf m) and bend a locking tab into position against the bolt head. **Do not** hammer the locking tabs as this could lead to loss of bolt torque.
18 Turn the engine (using the crankshaft) to enable the remaining camshaft sprocket retaining bolt to be fitted, torqued and locked.
19 Remove the 'slave' nut securing the sprocket to the support bracket.
20 Fit the semi-circular grommet to the cylinder head.
21 Fit the rocker cover, see 12.29.42.
22 Reconnect the battery.
23 Refill the cooling system.

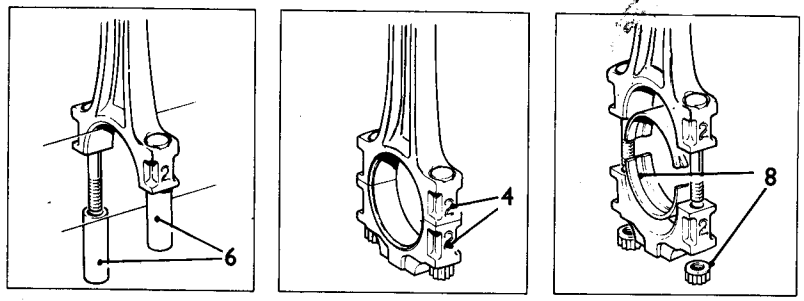


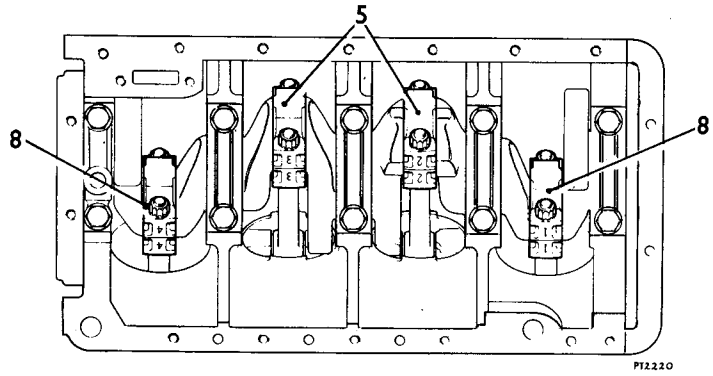


CONNECTING RODS AND PISTONS

Remove and refit **12.17.01**

Service tool: 38 U3 — piston ring compressor.

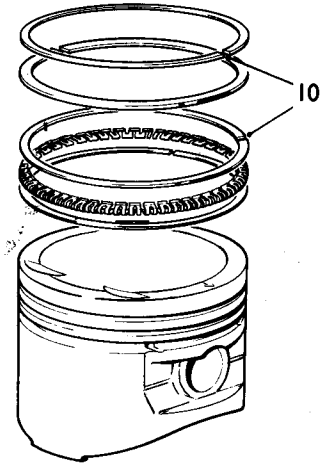




CAUTION: Do not mix any components during this operation.

Removing

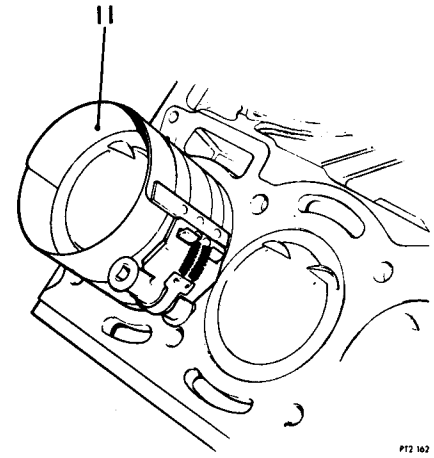
1 Isolate the battery.
2 Remove the cylinder head, see 12.29.10.
3 Remove the sump, see 12.60.44.
4 Check the identification numbers on the connecting rods and caps.
5 Turn the crankshaft to bring Nos. 1 and 4 pistons to T.D.C. and remove the nuts of Nos. 2 and 3 connecting rods.
6 Withdraw the bearing caps and lower shells and fit plastic or rubber sleeves over the connecting rod bolts to prevent damage to the crankpins.

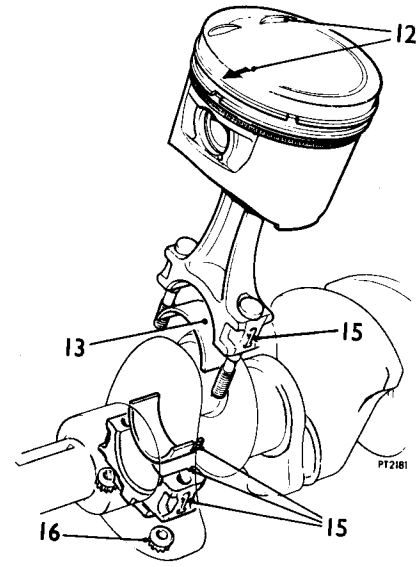


7 Push the piston and connecting rod assemblies upwards and withdraw through the top of the bores and remove the upper shells.
8 Turn the crankshaft to bring Nos. 1 and 4 connecting rod bolts to an accessible position and remove the nuts and withdraw the bearing caps and lower shells.
9 Push the piston and connecting rod assemblies upwards and withdraw as instruction 7.

Refitting

10 Stagger the piston ring gaps.
11 Lubricate the pistons and rings and compress the rings with service tool No. 38 U3.
12 Insert the connecting rod and piston assemblies into their respective bores ensuring that the arrow on top of the piston crown is pointing towards the front of the engine and the valve indents towards the right-hand side of the engine (as from the driver's position).
13 Fit the upper bearing shells to the connecting rods, ensuring that the keeper tags locate correctly in the connecting rod recesses.
14 Fit the lower bearing shells to the caps, ensuring that the keeper tags locate in the recesses.
15 Pull the connecting rods on to the crankpins and fit the bearing caps to their respective connecting rods, making sure that the identification numbers coincide and are adjacent. Note also that the bearing keeper recesses in the connecting rods and the caps are on the same side.
16 Secure the bearing caps with NEW nuts and tighten evenly to the correct torque, see Division 06.
17 Fit the oil pick-up strainer.
18 Fit the sump, see 12.60.44.
19 Fit the cylinder head, using a new gasket.
20 Refill the sump with the recommended grade of oil to the 'high' mark on the dipstick.
21 Refill the cooling system.





PISTON ASSEMBLY ENGINE SET

Remove and refit **12.17.03**

See operation 12.17.10.

CONNECTING RODS AND PISTONS

Overhaul **12.17.10**

Gudgeon pin bush—each—remove and refit **12.17.13**

Service tool: 335

CAUTION: Do not mix the components during this operation.

Removing

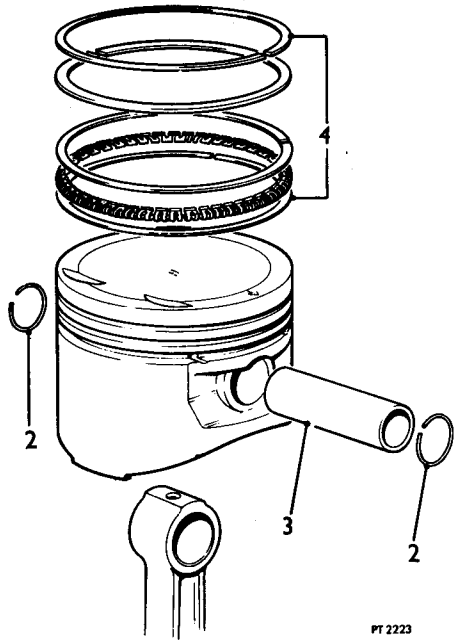
1 Remove the connecting rods and pistons, see 12.17.01.

Dismantling

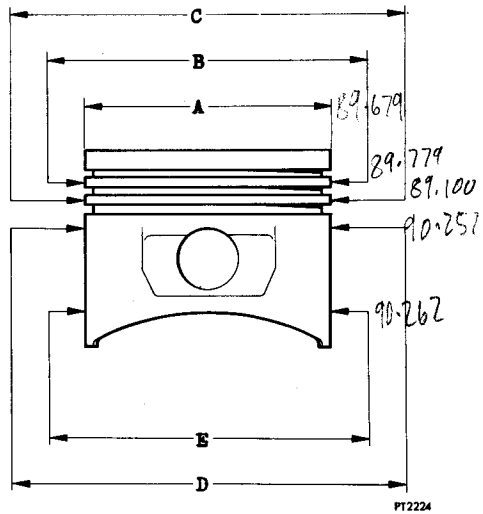
2 Remove the two gudgeon pin retaining circlips.
3 Push out the gudgeon pin and separate the piston from the connecting rod.
4 Remove the top, scraper and oil control rings.
5 Repeat instructions 2 to 4 on the remaining piston and connecting rod assemblies.
6 Degrease all components and remove carbon deposits from the pistons.

Examination — Pistons and gudgeon pins

7 Check the dimensions 'A', 'B' and 'C' at the points indicated on the illustration across the top of the piston at right angles to the gudgeon pin.
8 Check the dimensions 'D' and 'E' across the piston skirt at right angles to the gudgeon pin at the points shown on the illustration.
9 Check the dimension of the piston ring grooves and the gap between the piston ring and groove, see DATA.
10 Examine the gudgeon pin for scores and pitting. Check for wear, see DATA. The gudgeon pin should be a thumb push-fit in the piston at a temperature of 68°F.



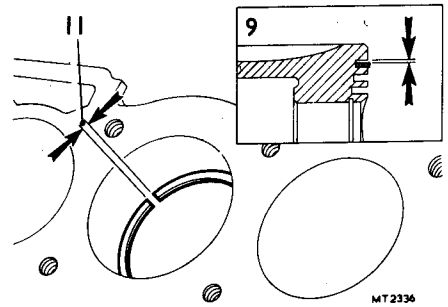
PT 2223



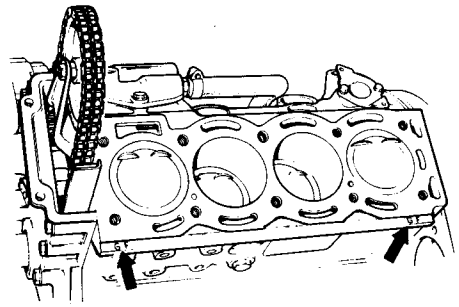
PT2224

11 Check the top and scraper piston ring gaps when inserted squarely into the bores, see DATA.

NOTE: The grade of each cylinder bore, i.e. G or F is stamped on the cylinder block as illustrated. The corresponding piston grades are stamped on the piston crown.



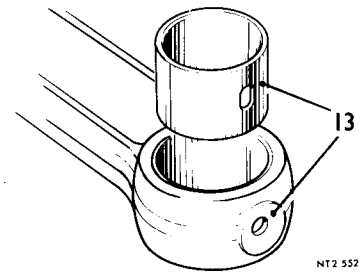
MT 2336


PT2 366

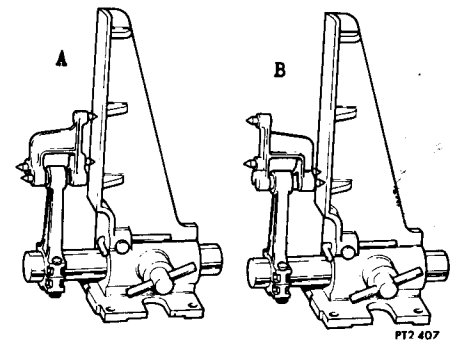
Examination — Connecting rods

12 Using service tool 335, check the connecting rods for:
A. Bend
B. Twist
Rods that exceed the tolerances in DATA should be realigned or renewed.
13 Check the gudgeon pin bush for wear and, if necessary, remove the old bush and fit a new one using a suitable press. Ensure that the oil hole in the bush corresponds exactly with the hole in the connecting rod. Ream the new bush to size, see DATA.

continued



NT2 552



PT2 407

Reassembling

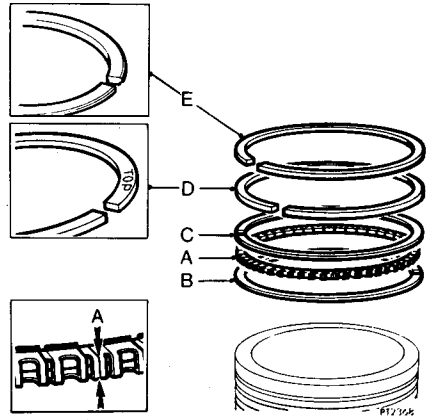
14 Fit the piston rings in the following order:
NOTE: The oil control ring comprises three parts 'A', 'B', and 'C', namely the centre expander rail, flanked by two identical chrome rails.
A. Fit the expander rail into the bottom groove ensuring that the ends butt, but do not overlap.
B. Fit the bottom chrome rail to the bottom groove.
C. Fit the top chrome rail to the bottom groove.
D. Fit the scraper ring to the centre groove in the piston with the word 'TOP' uppermost.
E. Fit the top compression chrome ring to the top groove — stepped edge downwards.

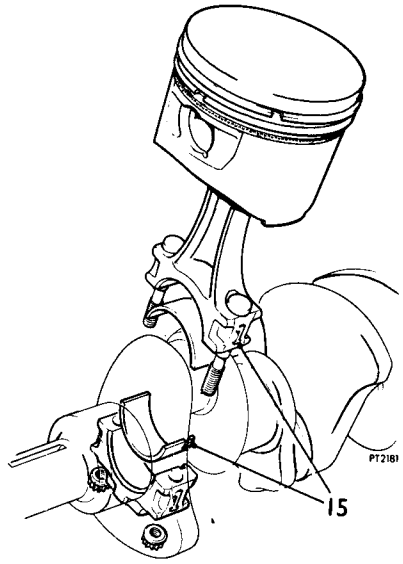
15 Refit the pistons to the connecting rods so that the identification numbers and the shell bearing keeper recesses are on the opposite side to the valve head clearance recesses in the piston crown.

16 Locate the gudgeon pin with the two circlips ensuring that they fit properly in the grooves.

17 Fit the connecting rods and pistons to the engine, see instructions 10 to 21, 12.17.01, ensuring that the sump is refilled with oil to the 'high' mark on the dipstick.

18 Refill the cooling system before connecting the battery.





DATA

Piston grades and dimensions

Bore size: Grade F	3·5546 in (90·287 mm) 3·5551 in (90·300 mm)
Grade G	3·5552 in (90·302 mm) 3·5557 in (90·315 mm)
Piston dia. 'A': Grade F	3·5307 in (89·679 mm) 3·5319 in (89·709 mm)
Grade G	3·5313 in (89·694 mm) 3·5324 in (89·724 mm)
Piston dia. 'B': Grade F	3·5346 in (89·779 mm) 3·5358 in (89·809 mm)
Grade G	3·5354 in (89·799 mm) 3·5364 in (89·824 mm)
Piston dia. 'C'	3·5079 in (89·100 mm) 3·5158 in (89·300 mm)
Piston skirt dia. 'D': Grade F	3·5534 in (90·257 mm) 3·5539 in (90·270 mm)
Grade G	3·5540 in (90·272 mm) 3·5545 in (90·285 mm)
Piston skirt dia. 'E': Grade F	3·5536 in (90·262 mm) 3·5541 in (90·275 mm)
Grade G	3·5542 in (90·277 mm) 3·5547 in (90·290 mm)
Pistons available oversize	0·020 in (0·508 mm)
Piston groove width:	
Top compression	0·0705 in (1·790 mm) 0·0713 in (1·810 mm)
Second compression	0·0689 in (1·750 mm) 0·0709 in (1·800 mm)
Oil control	0·1579 in (4·010 mm) 0·1587 in (4·030 mm)

Piston rings

Top compression: Width	0·3071 in (7·8 mm)
Thickness	0·0680 to 0·0685 in (1·728 to 1·740 mm)
Diameter	3·5551 in (90·3 mm)
Gap when fitted	0·0138 to 0·0217 in (0·35 to 0·55 mm)
Scraper: Width	0·3071 in (7·8 mm)
Thickness	0·0680 to 0·0685 in (1·728 to 1·740 mm)
Diameter	3·5551 in (90·3 mm)
Gap when fitted	0·0138 to 0·0217 in (0·35 to 0·55 mm)
Oil control — chrome rail: Width	0·135 to 0·141 in (3·429 to 3·581 mm)
Thickness	0·0250 to 0·0230 in (0·635 to 0·584 mm)
Diameter	3·555 in (90·297 mm)
Gap when fitted	0·015 to 0·055 in (0·381 to 1·397 mm)
Oil control — expander rail: Thickness	0·1035 to 0·1075 in (2·629 to 2·731 mm)
Diameter	3·591 to 3·619 in (91·211 to 91·923 mm)
Gap when fitted	Ends to butt
Oversize rings	0·010+0·020 in (0·254+0·508 mm)

Gudgeon pin:

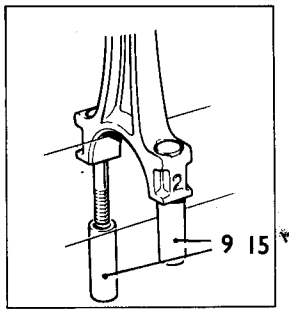
Length	66·70 to 67·00 mm (2·626 to 2·638 in)
Diameter	23·811 to 23·815 mm (0·9374 to 0·9376 in)

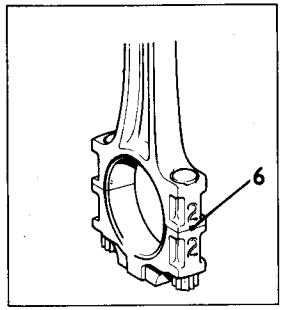
Connecting rod:

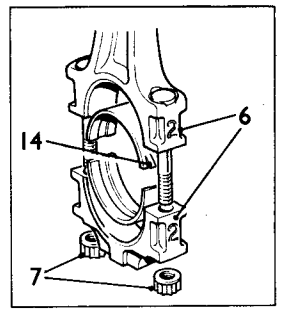
Small-end bush fitted internal diameter	0·9377 to 0·9380 in (23·818 to 23·825 mm)
Bush external dia.	1·0015 to 1·0025 in (25·438 to 25·464 mm)
Small-end dia. less bush	0·9995 to 1·0005 in (25·387 to 25·413 mm)
Big-end dia. less shells	1·8955 to 1·8960 in (48·146 to 48·158 mm)
Length between centres	5·123 to 5·127 in (130·12 to 130·23 mm)
Maximum bend	0·0015 in (0·038 mm) for length of the gudgeon pin
Maximum twist	0·0015 in (0·038 mm) per inch length of gudgeon pin

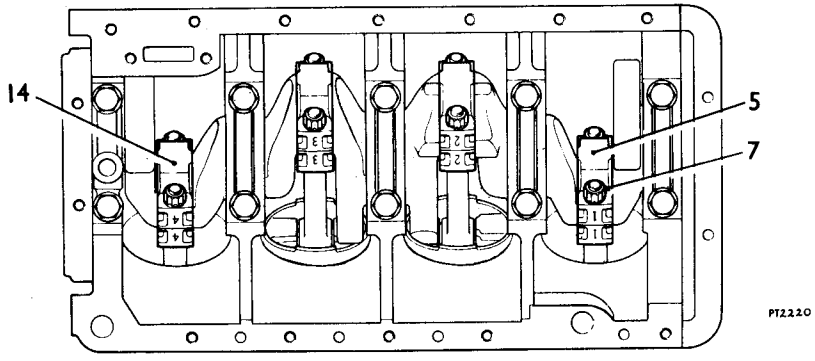
CONNECTING ROD BEARINGS

Remove and refit — set **12.17.16**









Removing

1 Drive the car on to a ramp.
2 Disconnect the battery.
3 Drain the sump oil, and remove the dipstick.
4 Remove the sump and oil strainer, see 12.60.44.
5 Turn the engine until Nos. 1 and 4 big-end bearings are in an accessible position.
6 Check that the connecting rods and caps are numbered correctly.

CAUTION: Do not mix components whilst carrying out the following instructions.

7 Remove the two special nuts securing each big-end cap and withdraw the caps complete with lower shells.
8 Push the connecting rod upwards sufficiently to enable the upper shell bearing to be removed.
9 Fit rubber or plastic sleeves over the big-end bolts to prevent damage being caused to the crankpins.
10 Turn the crankshaft sufficiently to bring Nos. 3 and 4 big-end bearings to an accessible position.
11 Repeat instructions 6 to 9 on Nos. 2 and 3 big-ends.

Refitting

12 Clean Nos. 2 and 3 crankpins and corresponding bearings and caps.
13 Fit the upper bearing shell to the connecting rod, ensuring that the keeper tags locate in the connecting rod recess and pull the rod onto the crankpin.
14 Fit the lower bearing shell to the cap, ensuring that the keeper tag locates correctly in the connecting rod recess.
15 Remove the protective sleeves from the connecting rod bolts and fit the bearing cap, checking that:
   a the correct number cap is being fitted to the connecting rod concerned.
   b the keeper tags are adjacent, i.e. on the same side of the bearing.
16 Fit and evenly tighten new nuts to the correct torque figure, see Division 06.
17 Turn the crankshaft to bring Nos. 1 and 4 big-ends to an accessible position.
18 Repeat instructions 12 to 16 on Nos. 1 and 4 big-ends.
19 Fit the sump and oil strainer, see 12.60.44.
20 Lower the ramp and fill the sump to the 'high' mark on the dipstick with oil of a recommended grade.
21 Reconnect the battery.
22 Drive the car from the ramp.

CRANKSHAFT PULLEY

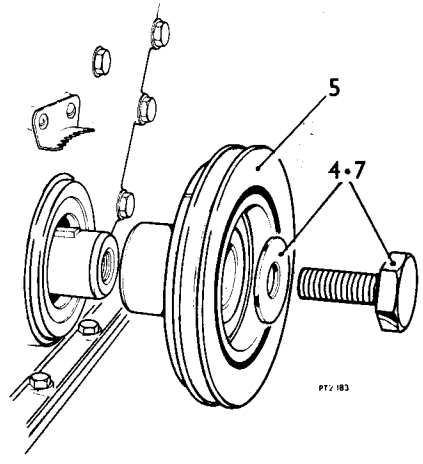
Remove and refit **12.21.01**

Removing

1 Isolate the battery.
2 Remove the radiator, see 26.40.01.
3 Remove the fan and Torquatrol unit, see 26.25.06.
4 Remove the crankshaft pulley retaining bolt and plain washer.
5 Withdraw the pulley.

Refitting

6 Remove any burrs from the pulley key-way and crankshaft key and fit the pulley.
7 Secure the pulley with the special bolt and plain washer.
8 Reverse instructions 1 to 3.



CRANKSHAFT REAR OIL SEAL

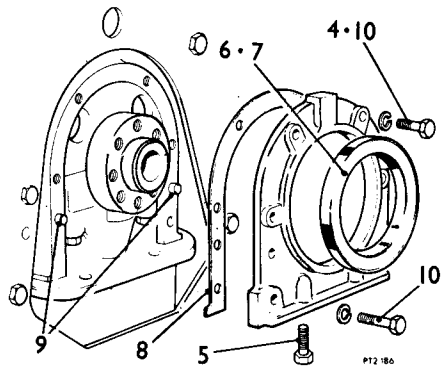
Remove and refit **12.21.20**

Removing

1 Remove the gearbox, see 37.20.01.
2 Remove the clutch assembly, see 33.10.01.
3 Remove the flywheel, see instructions 4 to 6, 12.53.07.
4 Remove the six bolts securing the rear main oil seal housing to the crankcase.
5 Remove the two rear, sump to seal housing, bolts, and remove the housing.
6 Press out the old oil seal from the housing.

Refitting

7 Press a new seal into the housing so that the lip faces the crankcase.
8 Clean the crankcase and seal housing mating faces and using sealing compound, fit a new gasket.
9 Lubricate the crankshaft and carefully ease the seal into position, locating the housing on the two dowels.
10 Fit the six retaining bolts loosely, noting that the two lower opposing bolts are longer.
11 Evenly tighten the bolts to the correct torque, see Section 06.
12 Fit and tighten the two rear, sump to seal housing, bolts.
13 Fit the flywheel, see instruction 7 and 8, 12.53.07.
14 Fit the clutch assembly, see 33.10.01.
15 Fit the gearbox, see 37.20.01.

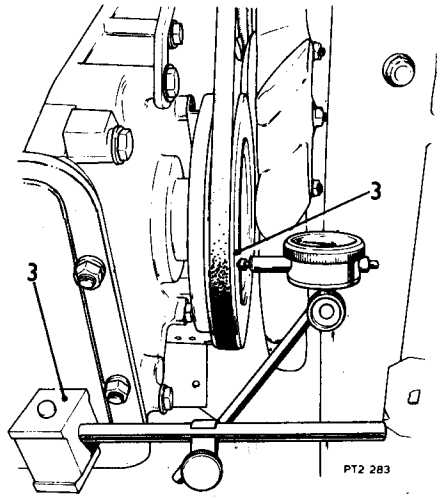


CRANKSHAFT END-FLOAT

Check and adjust **12.21.26**

Checking

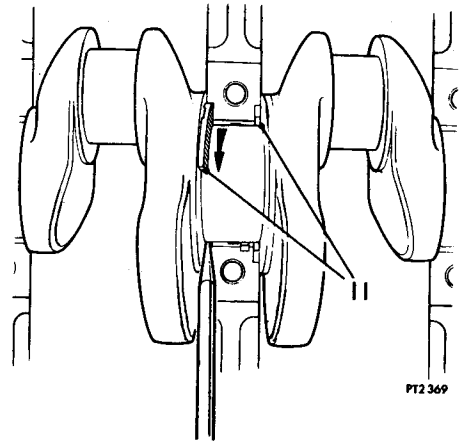
1 Raise the car on a ramp.
2 Disconnect the battery.
3 Attach the magnetic base of a dial gauge stand to the underside of the sump and arrange the dial gauge so that the stylus rests in a loaded condition on the front face of the crankshaft pulley.

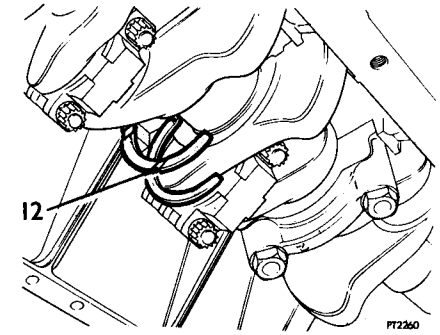


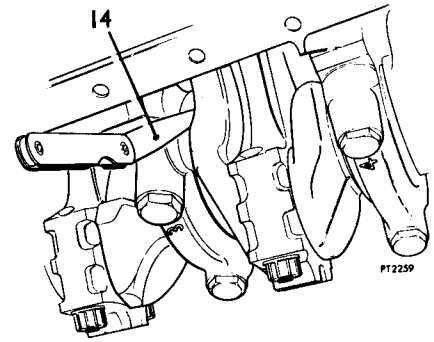
4 Lever the crankshaft rearwards.
5 Zero the dial gauge and lever the crankshaft forward and note the reading.
6 Repeat instructions 4 and 5 several times until a constant reading is achieved, see DATA.
7 Remove the dial gauge and magnetic base.

Adjusting

8 Drain the sump oil and remove the dipstick.
9 Remove the sump, see 12.60.44.
10 Remove two bolts and withdraw No. 3 main bearing cap and lower shell.
11 Using the blade of a thin screwdriver and taking care not to damage the crankshaft, remove the two crankshaft thrust bearings.
12 Lubricate and feed the thrust bearings of the appropriate size into the channel, reversing the method of removal. Ensure, however, that the two grooves in the thrust bearing face outwards away from the bearing cap.
13 Fit the main bearing cap and lower shell, ensuring that the keeper recesses in the cap and crankcase are adjacent. Temporarily tighten the two retaining bolts.
14 Using a feeler gauge or clock gauge check the crankshaft end-float by levering the crankshaft forwards or rearwards.
15 Repeat instructions 10 to 14 if necessary to achieve the correct end-float.
16 Finally tighten the No. 3 main bearing cap bolts to the correct torque figure, see Division 06.
17 Refit the sump, see 12.60.44.
18 Refill the sump to the 'high' mark on the dipstick with oil of a recommended grade.
19 Lower the car.
20 Connect the battery.







DATA

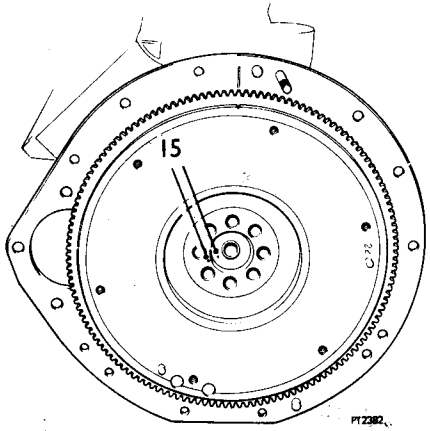
Crankshaft end-float	0·003 to 0·011 in (0.07 to 0·28 mm)
Adjustment	By selective thrust bearings 0·005 in (0·127 mm)

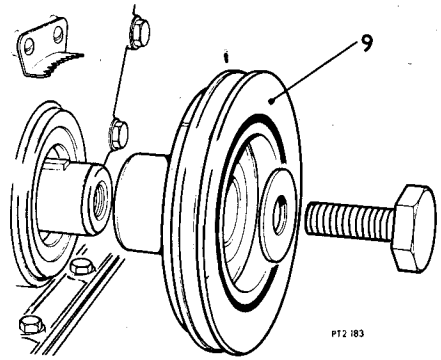
CRANKSHAFT

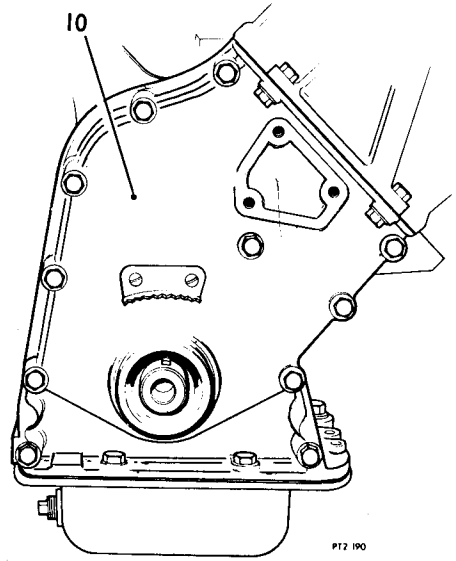
Remove and refit **12.21.33**

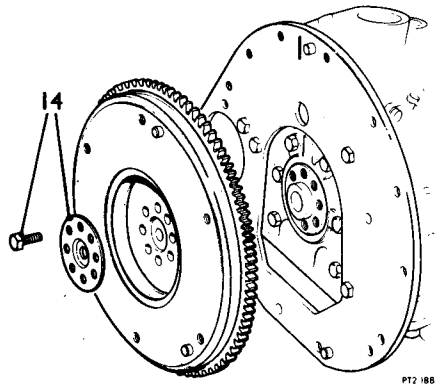
Removing

1 Remove the engine and gearbox assembly from the car, see 12.37.01.
2 Lift the assembly onto a workbench.
3 Remove the gearbox.
4 Remove the six bolts and withdraw the clutch assembly and centre plate.
5 Remove the starter motor.
6 Remove the exhaust manifold complete with front pipe.
NOTE: The above two items are removed to enable the engine to be positioned safely on its side.
7 Remove the fan units and drive belt.
8 Remove the alternator and adjustment link.
9 Remove the crankshaft pulley.
10 Remove the timing cover, noting the position of all the attachment bolts for reassembly.
11 Remove the rocker cover, see 12.29.42.
12 Lay the engine over on its L.H. side.
13 Remove the sump and dipstick.
14 Remove the eight bolts securing the flywheel to the crankshaft and withdraw them complete with the spigot bush retaining plate.
15 Using a centre punch, mark for reassembly the relationship of the flywheel to the crankshaft flange, and withdraw the flywheel.





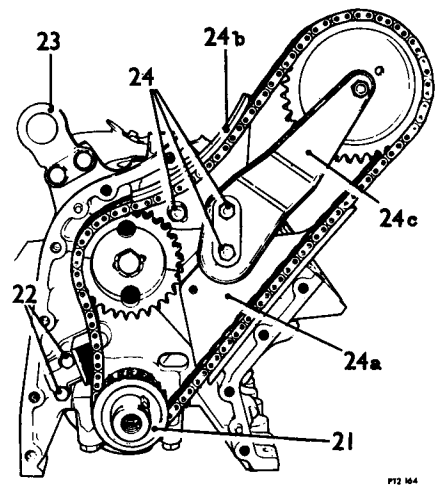


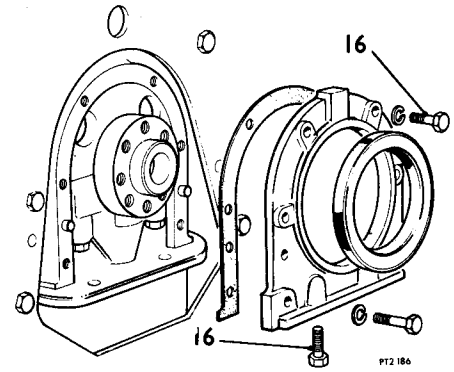


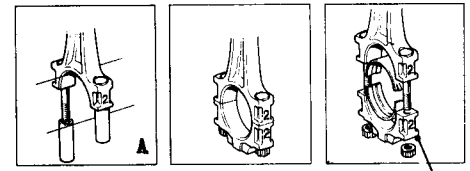
16 Withdraw the six bolts and the two rear sump bolts and remove the rear main oil seal housing and, if necessary, remove the seal for renewal.

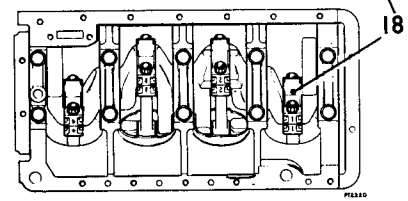
17 Remove the oil pick-up pipe.
18 Remove the bearing caps and lower shells of Nos. 1 and 4 connecting rods, and push the pistons up the bores. **DO NOT MIX.**
CAUTION: Fit suitable plastic or rubber protective sleeves over the exposed connecting rod bolts to prevent damage being caused to the crankshaft journals, see Illustration 'A'.
19 Turn the crankshaft over and repeat instruction 18 on Nos. 2 and 3 connecting rods taking note of the caution.
20 Turn the crankshaft until the timing mark on the camshaft flange is in line with the groove on the camshaft front bearing cap.
21 Remove the oil thrower.
22 Remove the two bolts and withdraw the hydraulic timing chain tensioner.
23 Remove the front lifting eye.
24 Withdraw the chain guide attachment bolts and remove:
a the fixed guide
b the adjustable guide
c the camshaft sprocket support bracket.

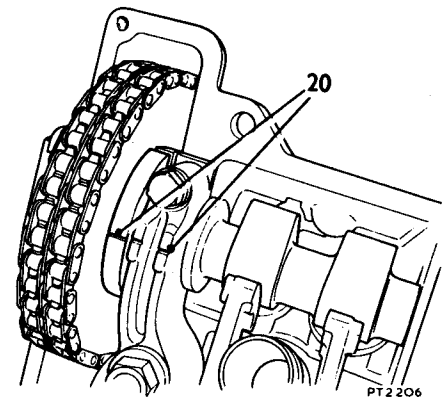
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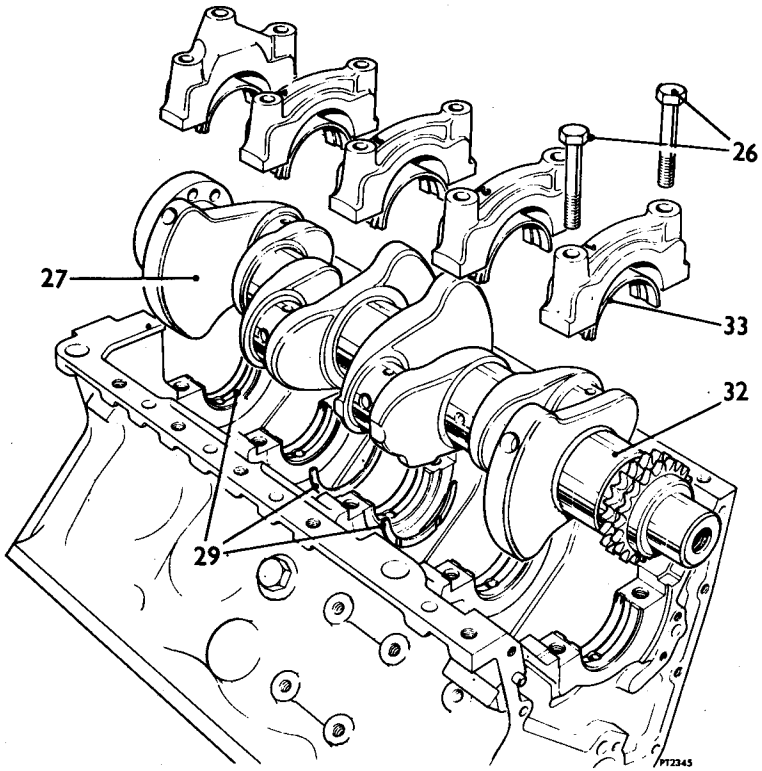












25 Ease the crankshaft sprocket forward whilst removing the timing chain from the jackshaft sprocket.

26 Remove the main bearing cap retaining bolts and withdraw the caps complete with the lower shells. **DO NOT MIX.** Note that the caps are numbered 1 to 4 from the front of the cylinder block.

27 Lift out the crankshaft.

28 Remove from the crankshaft:
- a the sprocket
- b the key
- c the shims
- d the spigot bush.

29 Remove the thrust washers and the upper shells from the crankcase.

Refitting

30 Clean and fit the upper shells to the crankcase ensuring that the keeper tags locate in the recesses.

31 Fit the thrust washers to No. 3 main bearing, ensuring that the oil grooves face outwards.

32 Clean and lubricate the main bearing journals and lower the crankshaft into the crankcase.

33 Clean and fit the main bearing shells to the caps ensuring that the keeper tags locate in the cap recesses.

34 Fit the main bearing caps to the crankcase, and partially tighten the securing bolts, ensuring that the caps are fitted to their correct crankcase bearings.

35 Check the crankshaft end-float, see DATA, by inserting a feeler gauge between the crankshaft and the thrust washers in No. 3 bearings, see 12.21.26, instruction 14.

36 Tighten the ten main bearing bolts to the correct torque.

37 Clean and lubricate the crankshaft journals, pull the connecting rods and upper shells on to the journals and remove the protective sleeves from the bolts.

38 Clean and fit the connecting rod caps, ensuring:
- a the caps are fitted to their correct connecting rods
- b the keeper tags in the rods and caps are adjacent
- c the nuts are tightened to the correct torque.
- d the pistons are not pushed up to where they could foul open valves.

39 If necessary fit a new seal to the rear main oil seal housing, ensuring that the lip faces the crankshaft flange.

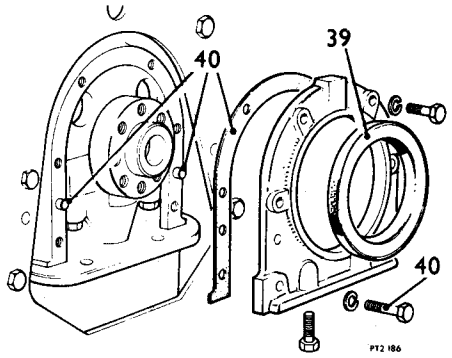
40 Using a new gasket fit the oil seal housing, locating it on the two dowels. Secure with the six bolts and spring washers noting that the two lower bolts are longer.

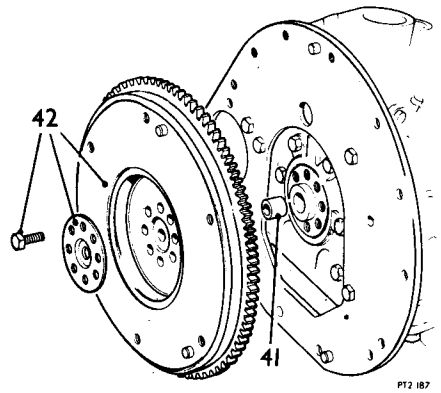
41 Fit the spigot bush.

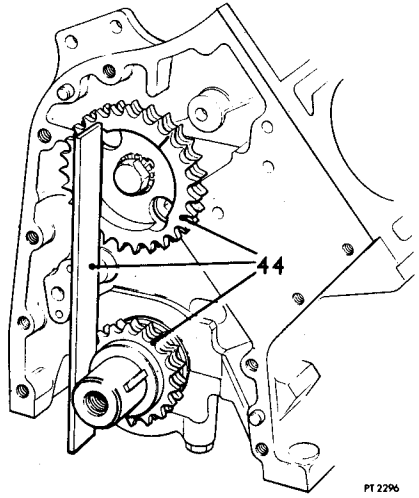
42 Fit the flywheel so that the punch marks align and secure with the retaining plate and eight bolts.

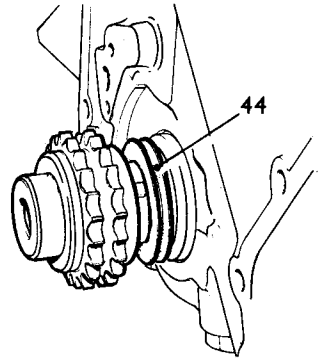
43 Turn the flywheel to bring Nos. 1 and 4 pistons to T.D.C. indicated by the mark on the flywheel coinciding with the vertical line on the adaptor plate.
CAUTION: To prevent the pistons fouling the valves ensure that Nos. 2 and 3 pistons are not allowed to reach T.D.C. whilst turning the crankshaft.

44 Temporarily fit the crankshaft sprocket and check its alignment with the jackshaft sprocket, using a straight-edge. Adjust by fitting shims behind the crankshaft sprocket.

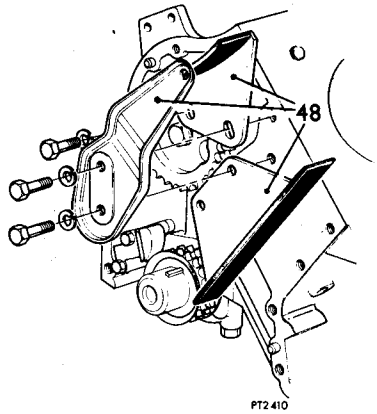


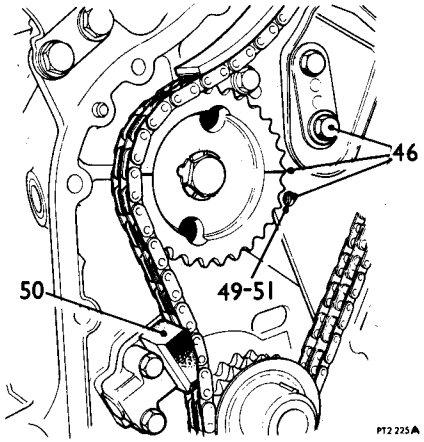






45 Fit the crankshaft key and sprocket.
46 Check that the flywheel and camshaft marks are still in their correct positions and adjust the position of the jackshaft sprocket so that the scribed line is horizontal and equidistant between the two bolts as illustrated.
47 Fit the chain to the crankshaft and camshaft sprockets keeping it taut on the drive side.
48 Fit the chain guides and camshaft sprocket support bracket leaving the bolts slack.
49 Fit a 'slave' bolt to the centre hole to facilitate fitting the timing cover.
50 Fit the hydraulic tensioner and backplate, see instructions 35 and 36, 12.65.12.
51 Tighten the remaining guide bolts and remove the 'slave' bolt.
52 Fit the oil thrower and timing chain cover, ensuring that the centre bolt has a fibre washer under the head.
53 Fit the timing cover to cylinder head nuts and bolts.
54 Fit the engine lifting eye.
55 Fit the crankshaft pulley.
56 Fit the sump and dipstick.
57 Move the engine to an upright position and fit the alternator and adjusting link.
58 Fit the fan unit and drive belt and adjust the tension.
59 Fit the starter motor.
60 Fit the exhaust manifold complete with the front pipe.
61 Check that the camshaft sprocket threaded spigot does not foul the support bracket, and fit the rocker cover and H.T. leads to the plugs.
62 Check the static ignition timing, and adjust if necessary.
63 Fit the clutch assembly, see instructions 4 to 7, 33.10.01.
64 Fit the gearbox to the engine.





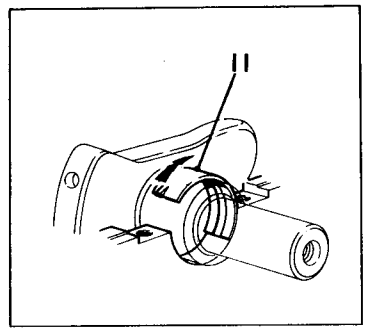
65 Fit the engine and gearbox assembly to the car, see 12.37.01.
66 Fill the sump with oil of the recommended grade to the 'high' mark on the dipstick.

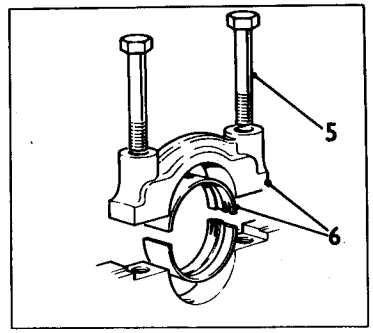
DATA

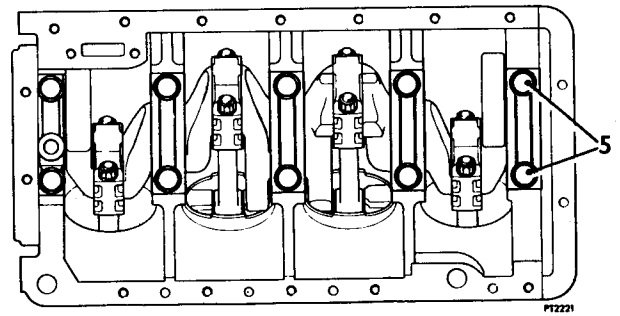
Main bearing journal diameter	2·1260 to 2·1265 in (54·000 to 54·013 mm)
Crankpin diameter	1·7500 to 1·7505 in (44·450 to 44·463 mm)
Crankshaft pulley end diameter	1·3743 to 1·3748 in (34·907 to 34·920 mm)

MAIN BEARINGS

Remove and refit — set **12.21.39**







Removing
1 Drive the car on to a ramp.
2 Disconnect the battery.
3 Drain the oil sump and remove the dipstick.
4 Remove the sump and oil strainer, see 12.60.44.

CAUTION: It is important that during the following instructions the bearing caps, shells and bolts are not mixed but are kept identified with their respective bearings. It will be noted that the bearing caps are numbered 1 to 5 commencing at the front of the engine.

5 Remove the two bolts securing a bearing cap to the crankcase.
6 Withdraw the bearing cap complete with the lower shell.
7 With the tag end leading, carefully slide the upper shell bearing out from between the crankshaft journal and crankcase.
8 Remove the lower shell bearing from the bearing cap.
9 Repeat instructions 5 to 8 on the remaining bearings.

Refitting
10 Lubricate with clean engine oil all bearing shells.
11 With the tag end trailing, feed an upper shell bearing between the crankshaft journal and the crankcase. Ensure that the keeper tag locates properly in the crankcase recess.
12 Fit the lower shell bearing into the bearing cap ensuring that the keeper tag locates correctly in the cap recess.

continued

13 Fit the cap to the crankcase, noting that the keeper tag is fitted adjacent to its counterpart in the crankcase.
14 Secure the cap with the bolts and tighten evenly to the correct torque figure, see Division 06.
15 Repeat instructions 11 to 14 on the remaining bearings.
16 Check, and if necessary adjust, the crankshaft end-float, see 12.21.26.
17 Fit the sump and oil strainer pipe, see 12.60.44.
18 Lower the ramp and fill the sump with oil of a recommended grade to the 'high' mark on the dipstick.
19 Reconnect the battery.
20 Drive the car from the ramp.

SPIGOT BUSH

Remove and refit **12.21.45**

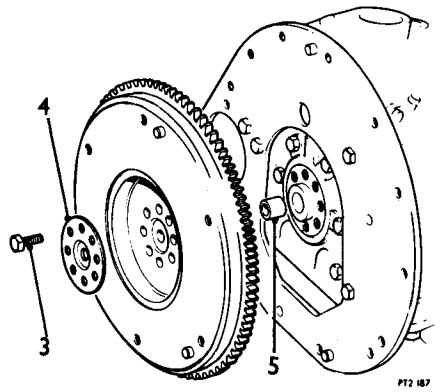
Removing
1 Remove the gearbox, see 37.20.01.
2 Remove the clutch assembly, see 33.10.01.
3 Remove the eight flywheel retaining bolts.
4 Remove the spigot bush retaining plate.
5 Remove the spigot bush.

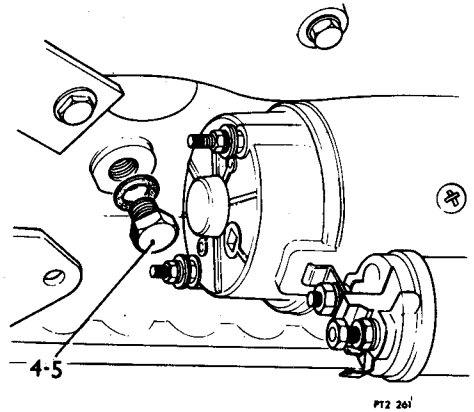
Refitting
6 Insert the spigot bush into the crankshaft bore.
7 Fit the spigot bush retaining plate and the eight flywheel securing bolts; tighten to the correct torque figure, see Division 06.
8 Refit the clutch assembly, see 33.10.01.
9 Refit the gearbox, see 37.20.01.

CYLINDER BLOCK DRAIN PLUG

Remove and refit **12.25.07**

Removing
1 Drive the car on to a ramp and disconnect the battery.
2 Drain the radiator.
3 Raise the ramp.
4 Slowly unscrew the cylinder block plug, allowing the coolant to flow into a suitable container.





5 When the coolant flow lessens, remove the plug and sealing washer completely.

Refitting
6 Clean the plug and cylinder block mating face and fit the plug and a new sealing washer and tighten.
7 Lower the ramp and refill the cooling system, see 26.10.01.
8 Reconnect the battery.

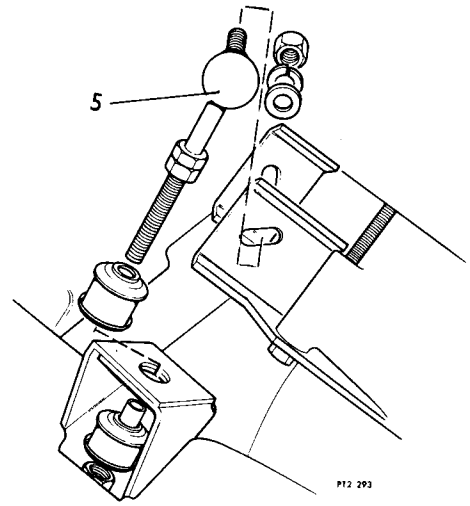
CYLINDER HEAD GASKET

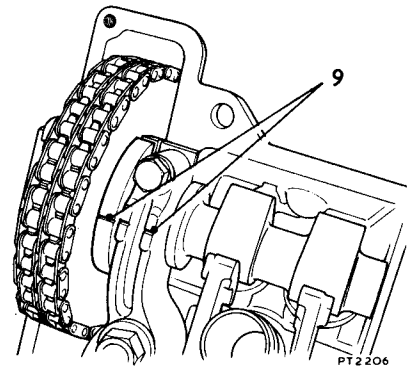
Remove and refit **12.29.02**

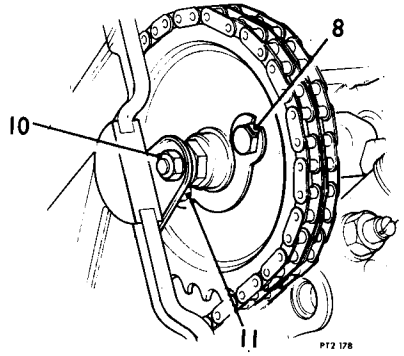
Cylinder head **12.29.11**

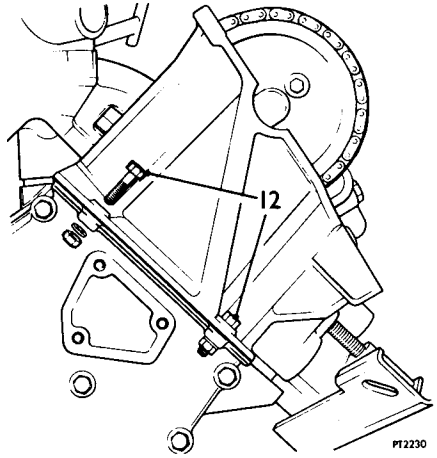
Removing
1 Disconnect the battery.
2 Drain the cooling system.
3 Remove the inlet manifold complete with carburetters and air cleaner, see 30.15.02.
4 Remove the rocker cover, see 12.29.42.
5 Disconnect the engine stabilizer from the exhaust manifold bracket.
6 Disconnect the exhaust pipe from the manifold flange.
7 Turn the engine over so that the timing mark on the camshaft flange is 180° distant from the groove on the camshaft front bearing cap, thus bringing one of the sprocket retaining bolts to an accessible position.
8 Unlock the tab washer and remove the one accessible sprocket retaining bolt.
9 Again turn the engine over so that the timing mark on the camshaft flange is in line with the groove on the camshaft front bearing cap.

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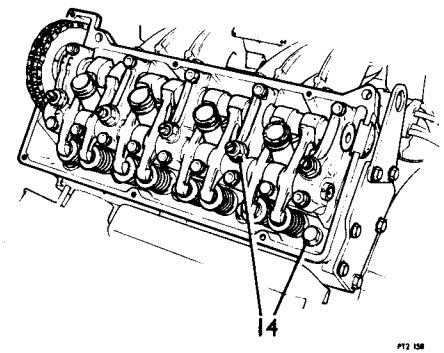


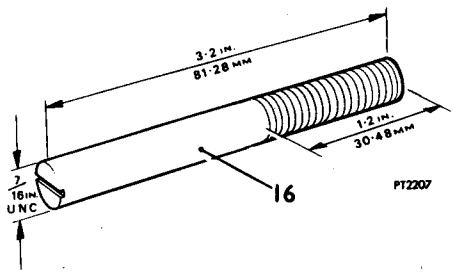




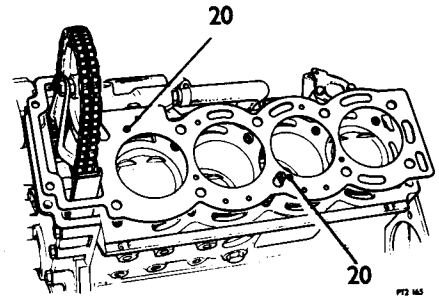


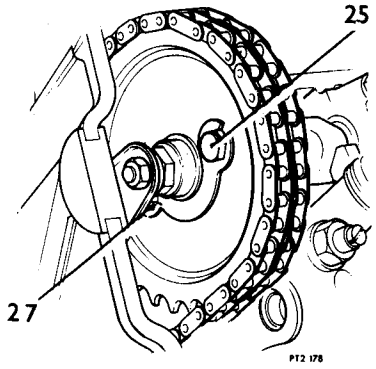
10 Anchor the camshaft sprocket to the support bracket.
11 Bend back the lock plate tab and remove the remaining sprocket retaining bolt.
12 Remove the two nuts and bolts securing the cylinder head to the timing cover.
13 R.H.Stg. cars only: To enable the rearmost cylinder head stud to be removed, disconnect the two fan motor harness leads and remove the three bolts securing the motor to the blower unit and withdraw the motor.
14 Slacken the cylinder head nuts and bolts in the reverse order to that shown in operation 12.29.27.
15 Remove the nuts and plain washers and remove the studs.
16 Remove the centre bolt and washer and in its place fit a special guide stud to facilitate the removal and replacement of the cylinder head.
NOTE: A suitable guide stud may be made to the dimensions illustrated. To enable the stud to be inserted and withdrawn, a slot, to accommodate a screwdriver blade, should be made in one end.
17 Remove the remaining bolts and plain washers and lift off the cylinder head.
18 Remove and discard the cylinder head gasket.





Refitting
19 Clean the cylinder block and cylinder head mating faces.
20 Place a new cylinder head gasket in position on the cylinder block, locating it over the temporary guide stud.
21 Check that the timing mark on the camshaft flange is in line with the groove on the camshaft front bearing cap and lower the cylinder head into position.
22 Fit the five cylinder head studs and loosely fit the nuts and washers.
23 Remove the guide stud and fit the five cylinder head bolts and plain washers, leaving them loose.
24 Tighten the nuts and bolts to the correct torque, see Division 06, in the sequence shown in operation 12.29.27.
25 Secure the camshaft sprocket to the camshaft with one of the two retaining bolts, using a new lock plate.
26 Release the sprocket from the support bracket and check that the threaded spigot does not foul the bracket.
27 Turn the engine over sufficiently to enable the second retaining bolt to be fitted and locked.
28 Turn the engine over again to enable the first bolt to be finally tightened and locked.
29 Fit the two bolts and nuts securing the cylinder head to the timing cover.
30 Reconnect the exhaust pipe to the manifold flange.
31 Fit the heater blower motor.
32 Fit the inlet manifold complete with carburetters and air cleaner, see 19.15.15.
33 Reconnect the engine stabilizer.
34 Refit the rocker cover, see 12.29.42.
35 Fill the cooling system and reconnect the battery.





NOTE: After 1,000 miles (1600 km) running, check the cylinder head fixings for tightness as follows:
36 a Remove the rocker cover, see 12.29.42.
b Working in the sequence shown in operation 12.29.27, slacken each nut/bolt by approximately one flat (one-sixth turn) and then tighten it to the correct torque, see Division 06.
c Refit the rocker cover, see 12.29.42.

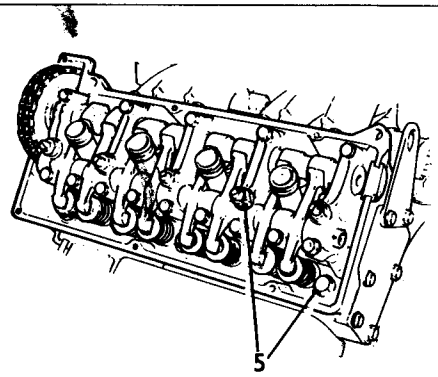
CYLINDER HEAD

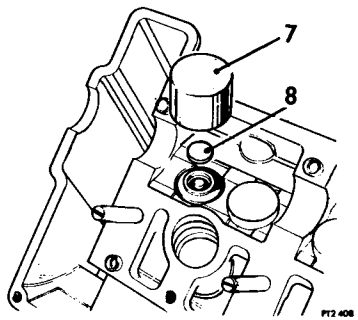
Overhaul	**12.29.19**
Which includes:	
Valves — exhaust — remove and refit	**12.29.64**
Valves — inlet and exhaust — remove and refit	**12.29.62**
Valves — inlet — remove and refit	**12.29.63**
Valve guides — inlet — remove and refit	**12.29.70**
Valve guides — exhaust — remove and refit	**12.29.71**
Inlet valve seats — remove and refit	**12.29.76**
Exhaust valve seats — remove and refit	**12.29.77**

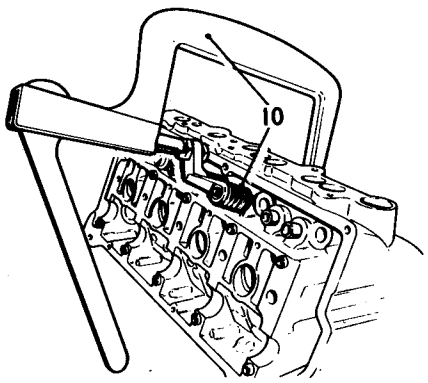
Service tools: 60A with S 60A-9, 18G 106 and S 352

Removing

1 Remove the cylinder head, see 12.29.10.
2 Remove the exhaust manifold.
3 Withdraw the spark plug tubes.
4 Remove the spark plugs.
5 Remove the fourteen bolts and five nuts and lift off the rocker shaft assembly.
6 Remove the camshaft.
7 Withdraw the tappets, identifying for reassembly.
8 Remove the pallets from the inlet valves ensuring that they are identified for reassembly.
9 Remove the exhaust valve pallets, identifying for reassembly.
NOTE: A convenient method of identifying the pallets is to stick them to a strip of gummed tape or paper, numbering 1 to 8, using separate strips for the inlet and exhaust pallets.
10 Using the valve spring compressor remove the exhaust valves, springs and collars. Identify the valves for reassembly.
11 Remove the inlet valves, springs and collars using the same tool.







Valve guides — checking

12 Check the inlet and exhaust valve guides for wear by inserting a new valve in each guide in turn and tilting it. If movement across the valve seat — dimension 'A' — exceeds 0·20 in (5·08 mm), the valve guide should be renewed.

Valve guides — removing inlet and exhaust

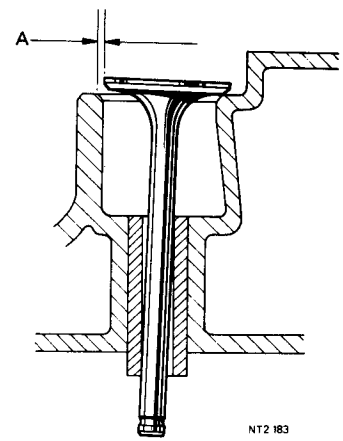
NOTE: The removal and fitting of valve guides is best carried out using service tool 60A with the appropriate adaptors S 60A-9.

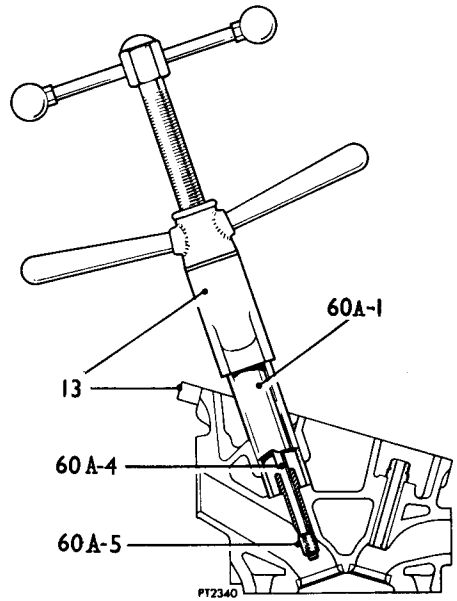
13 Assemble the main tool 60A on the top face of the cylinder head with adaptors numbers S 60A/1/4/5 as illustrated. Tension the assembly with the top handle and withdraw the valve guide by turning the lower handle clockwise.

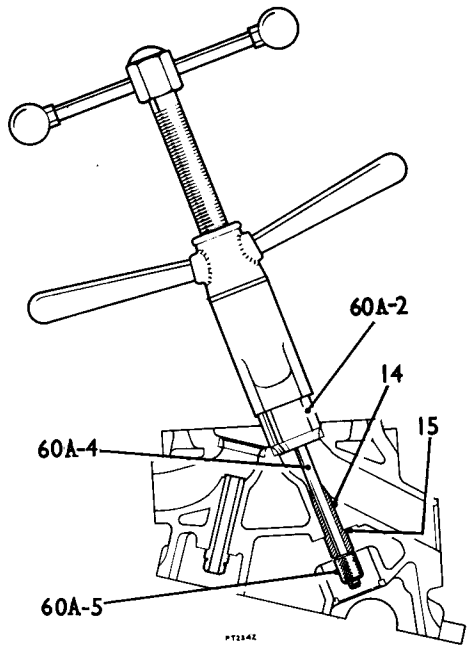
Valve guides — fitting — inlet

14 Apply graphite grease to the cylinder head and valve guide and assemble the main tool 60A on the combustion face with adaptor numbers S 60A/2/4/5 and the new valve guide positioned as illustrated.

15 Tension the assembly with the top handle and draw in the new guide by turning the lower handle, until the shoulder butts against the cylinder head mating face.







Valve guide — fitting — exhaust

16 Apply graphite grease to the cylinder head and valve guide and assemble the tool and adaptor numbers S 60A—3/4/5 and the new guide as illustrated. Draw in the guide as in instruction 15 until the shoulder butts against the cylinder head mating face.

Valve guides — reaming — inlet and exhaust

17 Ream the new valve guides to size, using a $\frac{17}{64}$ in (6·74 mm) taper reamer followed by a parallel $\frac{9}{32}$ in (7·14 mm) reamer.

CAUTION: It is essential that after fitting new valve guides the corresponding valve seats are re-cut or the inserts renewed and machined concentric with the new guides.

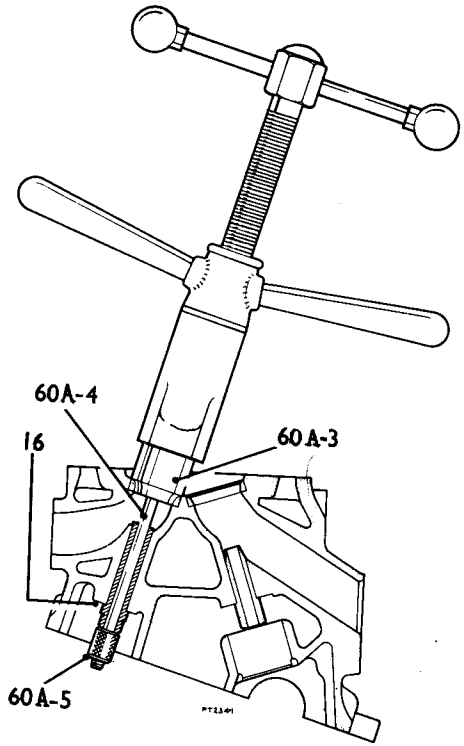
NOTE: On some engines, seals are fitted with the exhaust valve guide.

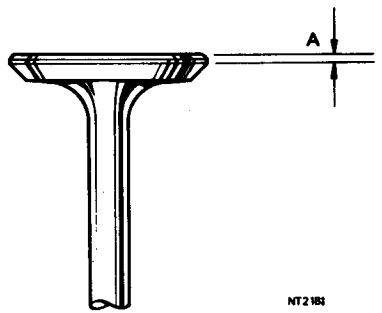
Valves

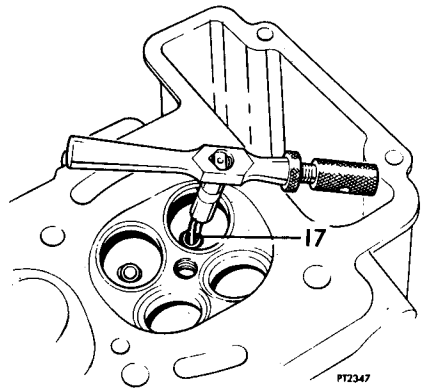
18 Examine the valves and discard any with worn or bent stems and badly pitted or burnt heads. Valves with the head thickness reduced to 0·015 in (0·40 mm) — dimension 'A' — should be renewed. Valves in an otherwise satisfactory condition may be refaced.

Valve Springs

19 Examine the valve springs for cracks and distortion. Check the springs against the information in DATA and discard any that do not meet these requirements.







Valve seat inserts

20 Examine the valve seat inserts for wear, pits, scores and pocketing. Reface where necessary, removing only the minimum of material to obtain a gas-tight seal and a correctly seating valve.
A. Correctly seating valve.
B. Incorrectly seating valve.

21 Valve seat inserts that cannot be restored by machining to provide a correctly seating valve must be renewed as follows:

22 Machine out the existing inserts, taking care not to damage the insert bores in the cylinder head.

23 Machine the INLET valve seat bore in the cylinder head, dimension 'A', to 1·430 to 1·429 in (36·32 to 36·29 mm) diameter to a depth of 0·250 to 0·255 in (6·35 to 6·45 mm), dimension 'B'.

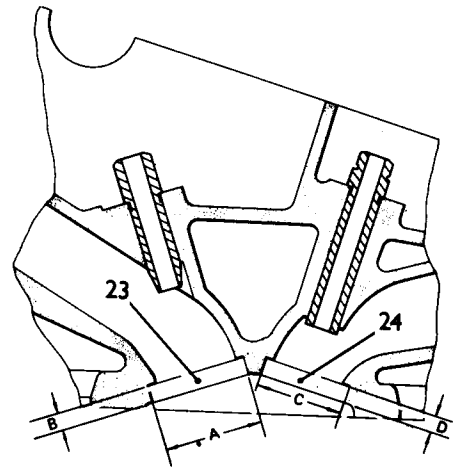
24 Machine the cylinder head EXHAUST valve seat bore, dimension 'C', to 1·282 to 1·281 in (32·56 to 32·53 mm) diameter to a depth of 0·250 to 0·255 in (6·35 to 6·45 mm), dimension 'D'.

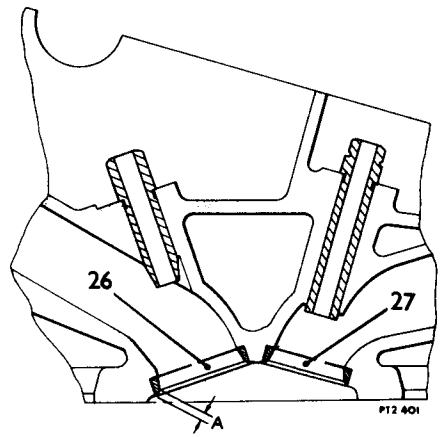
25 Heat the cylinder head uniformally to a maximum temperature of 180°C and immediately fit the new inlet and exhaust valve seat inserts.

26 Allow the cylinder head to cool and machine the INLET valve seat insert to an inclusive angle of 89° and a seat width of 0·080 in (2·03 mm), dimension 'A'.

27 Machine the EXHAUST valve seat insert to an inclusive angle of 89° and a seat width of 0·080 in (2·03 mm), i.e. dimension 'A' as in instruction 26.







Lapping-in the valves

28 Insert each valve in turn in its guide and lap in using coarse followed by fine carborundum compound, until a continuous narrow band is obtained round the valve face and its seating.

29 Clean off all traces of compound from the valves and inserts.

Reassembly

30 Lubricate and fit the INLET valves, illustration 'A', and assemble as follows:
- a Lower collar
- b Spring
- c Top collar.

Compress the springs using service tool 18G106 and retain with the split collets.

31 Lubricate and fit the EXHAUST valves, illustration 'B', and assemble as follows:
- a Lower collar
- b Seal
- c Spring
- d Top collar.

Compress the springs and secure with the split collets.

32 Fit the pallets and tappets to the inlet valves.

33 Fit the pallets to the exhaust valves.

34 Fit the camshaft, see 12.13.01.

35 Fit the rocker shaft assembly and tighten the retaining bolts to the correct torque, see instructions 9 to 13, 12.29.54, omitting instruction 10.

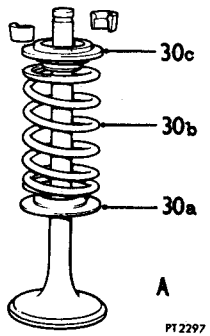
36 Fit the exhaust manifold.

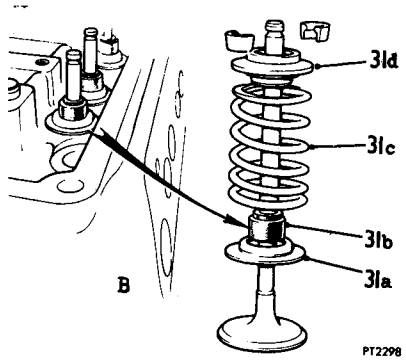
37 Fit the cylinder head, see instructions 19 to 24, 12.29.10.

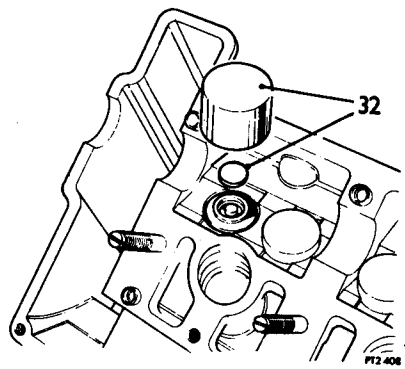
38 Check, and if necessary adjust, the valve clearances, see 12.29.48.

39 Refill the cooling system.

40 Reconnect the battery.







DATA

	Inlet	Exhaust
Valves		
Head diameter	1·38 in (35·05 mm)	1·21 in (30·73 mm)
Stem diameter	0·2794 to 0·2800 in (7·097 to 7·112 mm)	0·2787 to 0·2793 in (7·078 to 7·094 mm)
Length	4·422 to 4·432 in (112·31 to 112·57 mm)	4·518 to 4·528 in (114·75 to 115·01 mm)
Seat angle	45°	45°

Valve springs	
Free length (approx.)	1·60 in (40·64 mm)
Solid length	1·013 in (25·73 mm)
Fitted length	1·44 in (36·58 mm)
Number of working coils fitted	3¾
Wire diameter	0·162 in (4·11 mm)
Inside diameter of coils	0·800 in (20·32 mm)

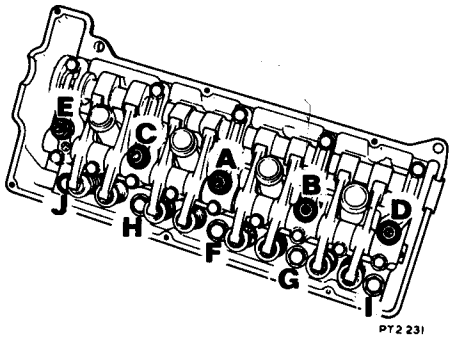
Cylinder head machining dimensions	
Inlet valve seat bore — dimension 'A'	1·430 to 1·429 in (36·32 to 36·29 mm)
Inlet valve seat bore depth — dimension 'B'	0·250 to 0·255 in (6·35 to 6·45 mm)
Exhaust valve seat bore — dimension 'C'	1·281 to 1·282 in (32·53 to 32·56 mm)
Exhaust valve seat bore depth—dimension 'D'	0·250 to 0·255 in (6·35 to 6·45 mm)

	Inlet	Exhaust
Valve seat inserts		
Outside diameter	1·4235 to 1·4245 in (36·157 to 36·182 mm)	1·2755 to 1·2765 in (32·397 to 32·413 mm)
Height	0·248 to 0·250 in (6·29 to 6·35 mm)	0·248 to 0·250 in (6·29 to 6·35 mm)
Seat angle	89° inclusive angle	89° inclusive angle
Seat width	0·060 in (1·524 mm)	0·080 in (2·032 mm)

CYLINDER HEAD NUTS

Tighten **12.29.27**

1 Remove the rocker cover, see 12.29.42.
2 To avoid distortion, tighten the five cylinder head retaining nuts and five bolts to the correct torque, see Division 06, in the following sequence:
A, B, C, D, E, F, G, H, I, J.
3 Refit the rocker cover, see 12.29.42.



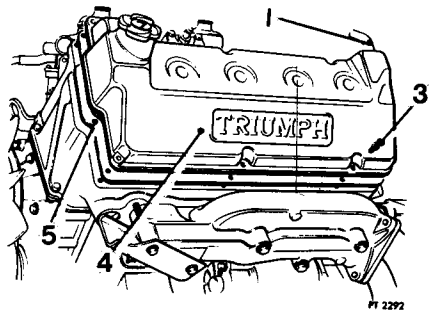
PT2 231

ROCKER/CAMSHAFT COVER

Remove and refit **12.29.42**

Removing
1 Disconnect the breather pipe from the rocker/camshaft cover elbow.
2 Withdraw the four H.T. leads and connectors.
3 Remove the six screws securing the rocker/camshaft cover to the cylinder head.
4 Lift off the rocker/camshaft cover.

Refitting
5 Reverse instructions 1 to 4. Ensure that the rocker/camshaft cover gasket is in sound condition and is properly located.

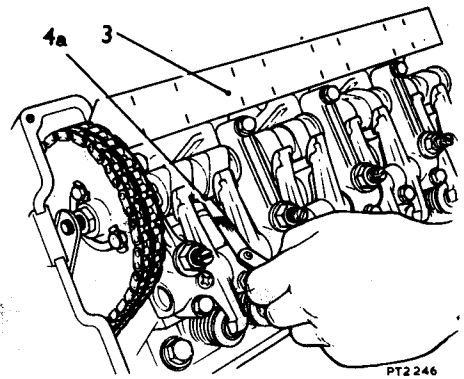


PT 2292

VALVE CLEARANCES

Check and adjust **12.29.48**

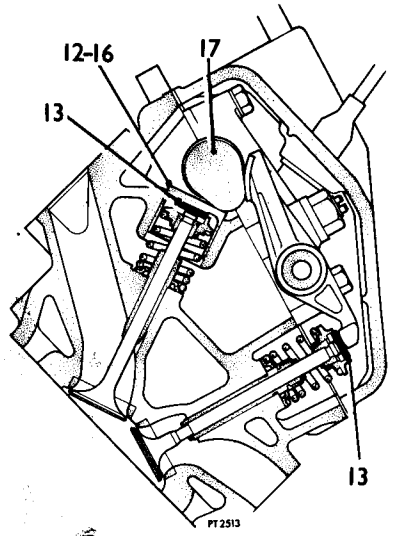
Check
1 Remove the rocker cover, see 12.29.42.
2 Pull out the spark plug tubes.
3 To assist in checking the valve clearances stick a length of gummed paper along the top edge of the cylinder head as illustrated and make suitable marks or record the clearances as the valves are checked.
4 Turn the engine to close No. 1 cylinder inlet valves and check and record:
a No. ONE inlet, see DATA
b No. THREE exhaust.



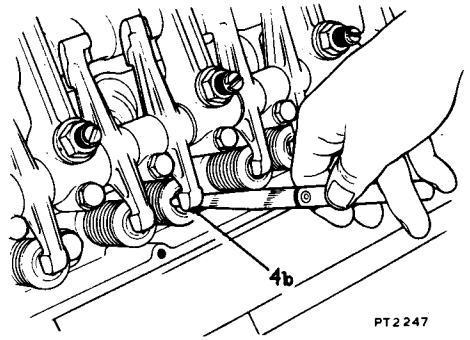
PT2 246

5 Close No. 3 inlet valves and check and record:
a No. THREE inlet
b No. FOUR exhaust.
6 Close No. 4 inlet valves and check and record:
a No. FOUR inlet
b No. TWO exhaust.
7 Close No. 2 inlet valves and check and record:
a No. TWO inlet
b No. ONE exhaust.

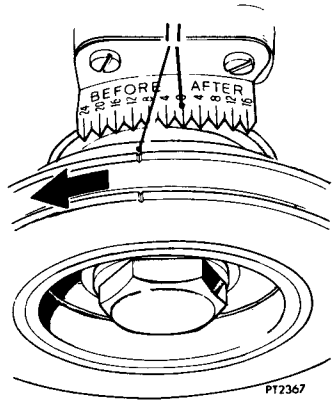
Adjusting
8 Disconnect the battery.
9 Drain the cooling system.
10 Remove the camshaft and rocker shaft, see instructions 3 to 10, 12.13.01.
11 Turn the engine **back** 90° from T.D.C., thereby positioning the pistons half-way in the bores to prevent them being fouled by the valves during ensuing instructions.
12 Remove the tappets of the inlet valves that require adjustment.
13 Remove the pallets of the inlet and exhaust valves that require adjustment. Using a micrometer, measure and record the thickness of each pallet taken out.



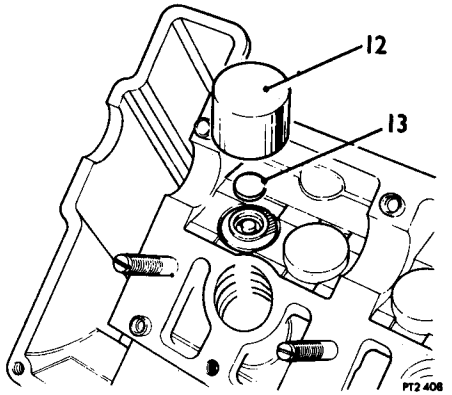
PT2513



PT2247



PT2367



PT2408

14 Using the following procedure as an example, select the appropriate new pallet to give the correct valve clearance, see DATA. The procedure is the same for both inlet and exhaust valves.

a Excessive clearance:

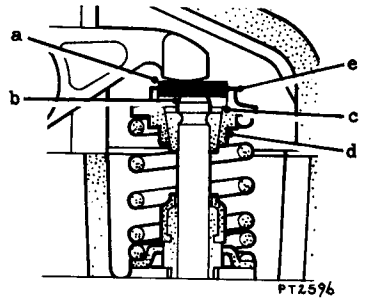
	inch
Valve clearance recorded	0·023
Valve clearance required	0·018
Valve clearance excess	+0·005
Plus pallet thickness recorded	0·090
	0·095
=Pallet thickness required	0·095

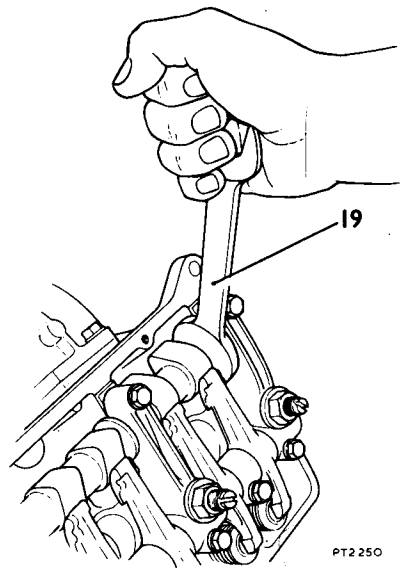
b Insufficient clearance

	inch
Valve clearance recorded	0·015
Valve clearance required	0·018
Insufficient clearance	−0·003
Pallet thickness recorded	0·100
	0·097
=Pallet thickness required	0·097

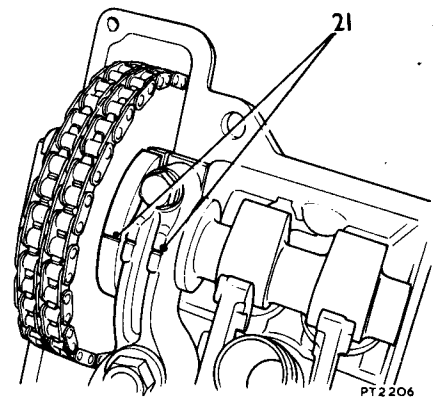
CAUTION: As a result of continued grinding, after prolonged service, the valves will protrude further into the cylinder head and may make it impossible to select a pallet thin enough to achieve the correct clearance, see DATA. Grinding of the valve tip to reduce the overall length of the valve is permissible provided that the valve tip still protrudes above the internal shoulder of the collar and that the selected pallet is proud of the collar top edge. **Under no circumstances must the height of the valve collar be reduced** otherwise an inadequate location for the pallet would result.

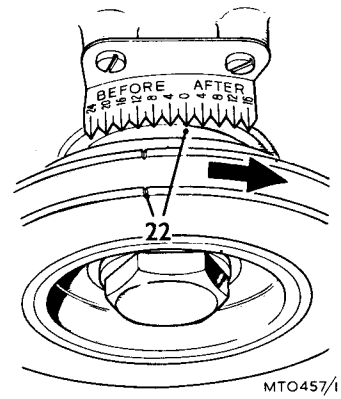
a pallet
b valve tip
c internal shoulder
d collar
e collar top edge





15 Fit the new pallets where required.
16 Fit the tappets to the inlet valves where the clearances have been adjusted.
17 Locate the camshaft in position on the cylinder head — do not connect to chain wheel.
18 Fit the rocker shaft assembly, see instructions 9 to 13, 12.29.54, ensuring that all the retaining bolts and cylinder head nuts are tightened to the correct torque.
19 Turn the camshaft by means of an open-ended spanner on the hexagon at the rear of the camshaft until No. 1 cylinder inlet valves are closed.
20 Check the valve clearances as described in instructions 3 to 6.
21 Turn the camshaft so that the timing mark on the flange is in line with the groove on the front bearing cap.
22 Turn the crankshaft FORWARD 90° so that the timing mark on the crankshaft pulley coincides with the zero on the timing cover scale.
23 Remove the distributor cap and check that the rotor arm points to the segment in the cap that feeds No. 1 cylinder spark plug. Refit the cap.
24 Secure the camshaft sprocket to the camshaft using a new lock plate, see instructions 17 to 20, 12.12.01.
25 Fit the spark plug tubes.
26 Fit the rocker cover, see 12.29.42.
27 Refill the cooling system.
28 Reconnect the battery.





DATA

Inlet valve clearance	0·018 in (0·46 mm)
Exhaust valve clearance	0·018 in (0·46 mm)
Pallet thickness available	0·90 in to 0·130 inch in increments of 0·001 inch

ROCKER SHAFT ASSEMBLY

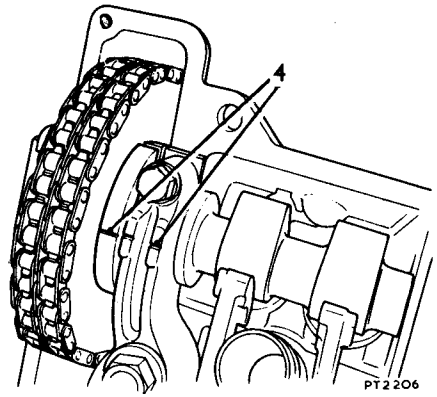
Remove and refit **12.29.54**

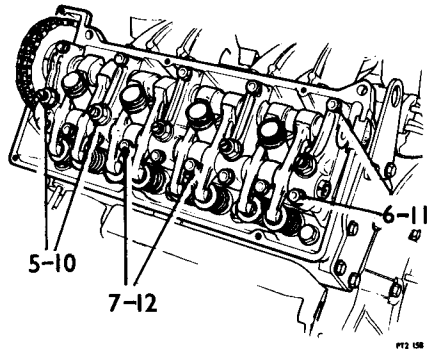
Removing

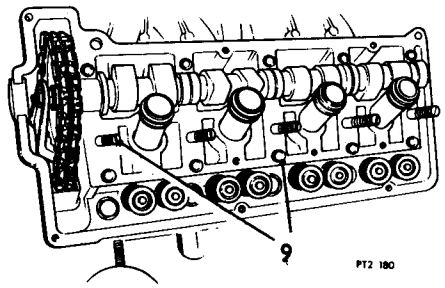
1 Disconnect the battery.
2 Drain the cooling system, see 26.10.01.
3 Remove the rocker cover, see 12.29.42.
4 Turn the engine over so that the timing mark on the camshaft flange is in line with the groove on the camshaft front bearing cap.
5 Remove the five cylinder head retaining nuts and washers.
6 Remove the ten bearing cap bolts.
7 Remove the four rocker shaft pedestal bolts.
8 Lift off the rocker shaft assembly.

Refitting

9 Fit the rocker shaft assembly, locating it on the cylinder head retaining studs, and ten hollow dowels.
10 Fit the cylinder head retaining nuts and plain washers, leaving them loose.
11 Loosely fit the ten bearing cap bolts and spring washers.
12 Loosely fit the four rocker shaft pedestal bolts and spring washers.
13 Progressively tighten the five nuts and fourteen bolts to the correct torque figure, see Division 06, starting at the centre and working outwards.
14 Check, and if necessary adjust, the valve clearances, see 12.29.48.
15 Fit the rocker cover and connect the H.T. leads to the spark plugs.
16 Fill the cooling system, see 26.10.01.
17 Reconnect the battery.

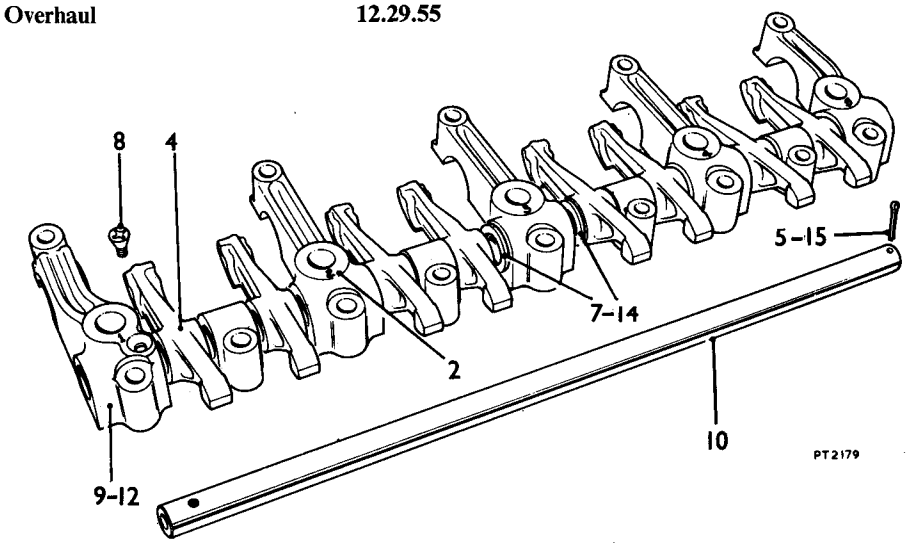






ROCKER SHAFT ASSEMBLY

Overhaul **12.29.55**



1 Remove the rocker shaft assembly, see 12.29.54.

CAUTION: It is important that, during the following instructions, the components are not mixed.

2 Check that the camshaft bearing caps are stamped '1' to '5', beginning at the chain drive end.
3 Check that the rocker shaft pedestals are stamped 'A' to 'D', beginning at the chain drive end.
4 Mark or stamp the rockers '1' to '8', starting at the chain drive end, if necessary.
5 Remove the split pin from the rocker shaft.
6 Remove the bearing caps, rockers and pedestals from the shaft.
7 Remove the spacers from both sides of No. 3 bearing cap.
8 Remove the locating screw from No. 1 bearing cap.
9 Remove No. 1 bearing cap from the rocker shaft.

Examination

10 Examine the rocker shaft for scores and pitting and check for wear, see DATA. Check that the oil-ways are clear.
11 Examine the rocker pads for wear and pitting and renew if unserviceable. Do not grind the pads as a method of restoration. Check the rocker bores for wear and renew if excessive.

Reassembling

CAUTION: Ensure that the blanking plug is not fitted too far into the rocker shaft, otherwise the oil feed may be obstructed.

12 Fit No. 1 bearing cap to the shaft and secure in position with the locating screw.
13 Assemble the remaining rockers, pedestals and bearing caps as illustrated.
14 Insert the two spacers each side of No. 3 bearing cap.
15 Fit the components to the shaft and secure the assembly with a new split pin.
16 Refit the rocker assembly, see 12.29.54.

DATA

Diameter of rocker shaft	0·7482 to 0·7487 in (28·148 to 28·160 mm)
Length of shaft	16·47 in (418·33 mm)
Internal diameter of rocker bore	0·7492 to 0·7497 in (19·030 to 19·042 mm)

TAPPETS — INLET VALVES

Remove and refit **12.29.57**

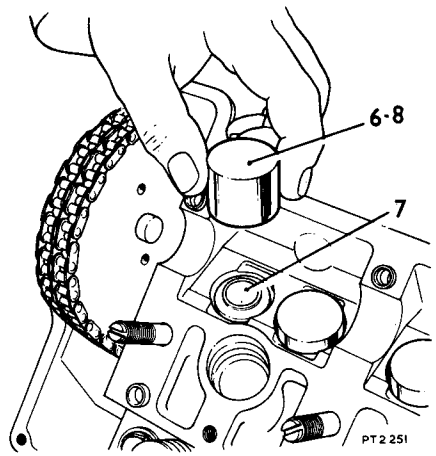
Removing

1 Disconnect the battery.
2 Drain the cooling system.
3 Remove the rocker cover, see 12.29.42.
4 Remove the rocker shaft assembly, see 12.29.54.
5 Remove the camshafts, see instructions 3 to 18, 12.13.01.
6 Lift out the tappets, identifying them for reassembly if they are to be refitted.
NOTE: Sometimes the pallet adheres to the underside of the tappet and will be withdrawn as well. Ensure that the pallet is replaced in its correct position.

Refitting

7 Ensure that eight pallets are in position on the valve assemblies.
8 Lubricate and fit the tappets squarely into their respective locations.
9 Refit the camshaft and rocker shaft assembly, see instructions 11 to 20, 12.13.01, omitting instruction 14.
10 Refit the rocker cover, see 12.29.42.
12 Reconnect the battery.

NOTE:
Operations 12.29.64 to 12.29.77 are included under operation 12.29.19.



SPARK PLUG TUBES

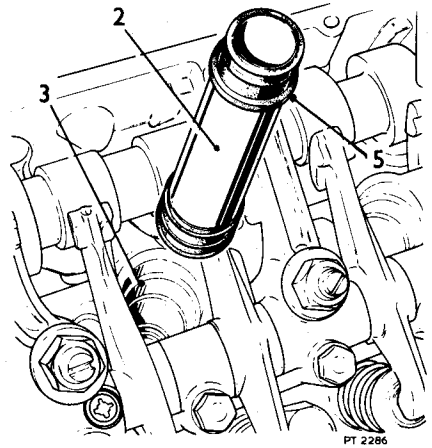
Remove and refit **12.29.81**

Removing

1 Remove the rocker cover, see 12.29.42.
2 Pull the tubes from their locations.

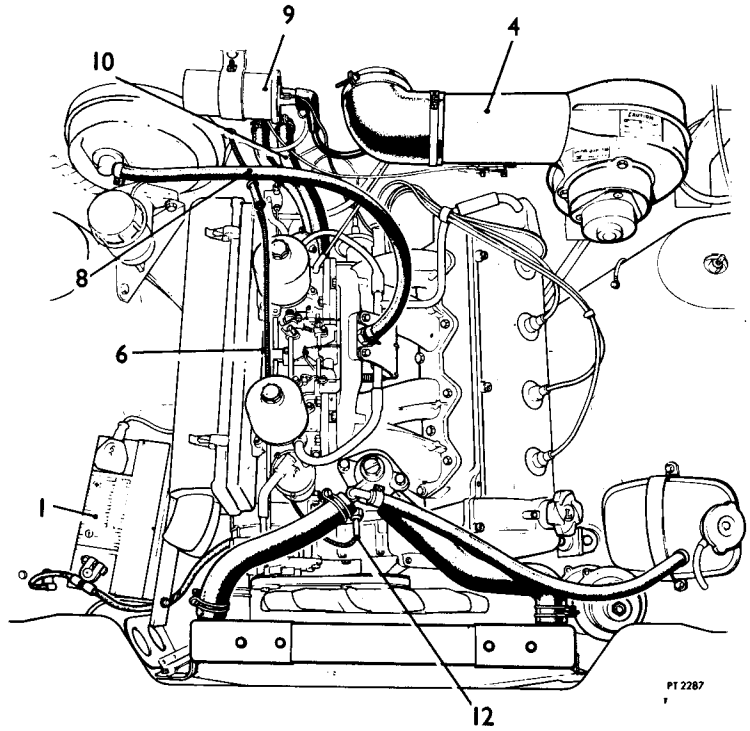
Refitting

3 Clean the cylinder head location.
4 Smear the rubber seals at both ends of the tubes with rubber grease.
5 Insert the tubes into the cylinder head with the larger of the two seals uppermost.
6 Refit the rocker cover, see 12.29.42.



ENGINE AND GEARBOX

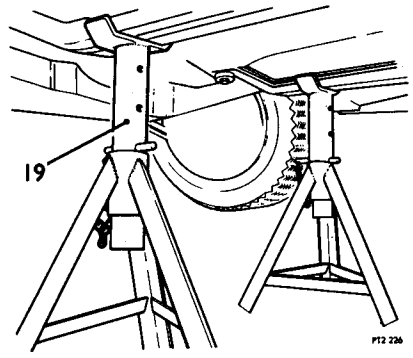
Remove and refit **12.37.01**

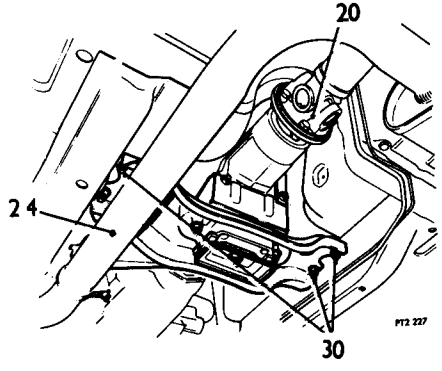


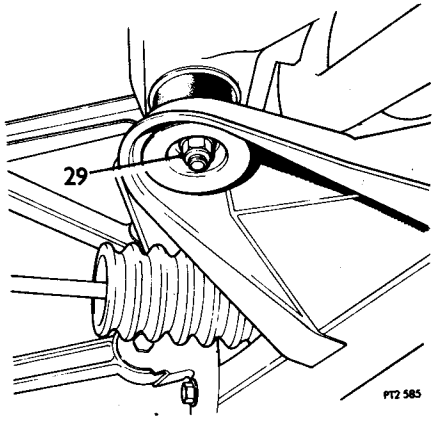
Removing

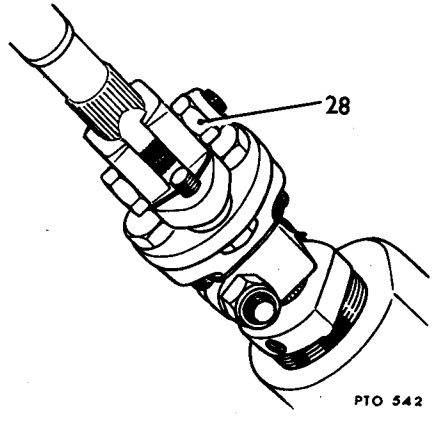
1 Disconnect the battery.
2 Remove the bonnet, see 76.16.01.
3 Remove the radiator, see 26.40.01.
4 Disconnect the electrical leads and remove the heater fan motor, see 80.20.15.
5 Disconnect the throttle cable from the carburetter linkage.
6 Disconnect the mixture control cable from the front carburetter.
7 Disconnect the main line feed to the fuel pump at the pump.
8 Disconnect the servo vacuum hose from the inlet manifold.
9 Disconnect from the ignition coil:
a the low tension lead
b the high tension lead.
10 Disconnect the heater hoses from the engine and mark for reassembly.
11 Disconnect the oil pressure lead from the switch mounted on the oil transfer housing.
12 Disconnect the water temperature transmitter lead from the thermostat housing switch.
13 Disconnect the harness plug from the alternator.
14 Remove the engine stabilizer, see 12.45.16.
15 Remove the footwell carpets.
16 Remove the gear-lever knob and locknut, and lift off the tunnel carpet.
17 Remove the four screws and withdraw the gear-lever grommet.

18 Remove the gear-lever from the gearbox extension cover, see 37.16.04.
19 Jack up the car and lower onto four axle stands — two at the front as illustrated and two at the rear under the rear axle half-shaft tubes.
20 Disconnect the propeller shaft from the gearbox.
21 Disconnect the speedometer drive from the gearbox.
22 Unhook the exhaust system suspension rubbers from their respective brackets, see 30.10.01.
23 Slacken the clip securing the front pipe to main exhaust system.
24 Move the exhaust system rearwards, releasing it from the front pipe.
25 Disconnect the starter motor connections — two Lucars and one nut and terminal.
26 Attach slings to the engine lifting eyes and using a hoist, release the weight of the engine from the mountings.
27 Support the gearbox on a trolley-jack.
28 Slacken the upper pinch bolt of the steering intermediate shaft flexible coupling.
29 Slacken the two rear sub-frame attachment nuts and bolts sufficiently to lower the rear of the sub-frame approximately $\frac{3}{4}$ in (19 mm).
30 Remove the four nuts and spring washers securing the gearbox mounting support member.

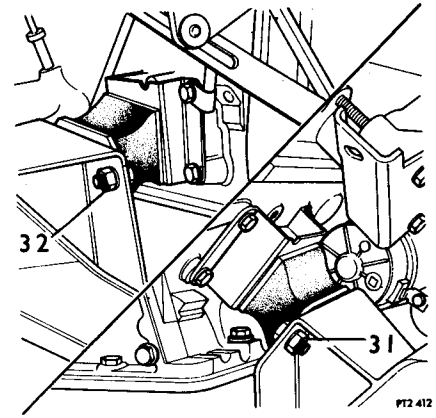




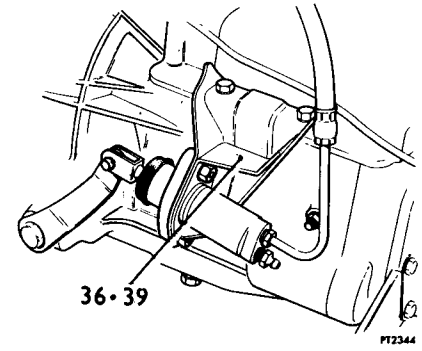


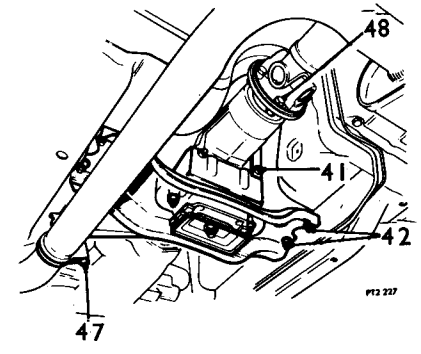


31 Remove two nuts and bolts and release the L.H. engine mounting from the sub-frame location.
32 Remove two nuts and bolts and release the R.H. engine mounting from the sub-frame.
33 Disconnect the gearbox electrical harness from the engine bay harness.
34 Disconnect the earth strap from the R.H. side of the cylinder block.
35 Lower the gearbox and remove the gearbox mounting support member complete from the gearbox — two nuts and spring washers — leaving the vertical strap in position.
36 Remove the clutch slave cylinder and support bracket from the L.H. side of the gearbox, leaving the piston thrust rod on the withdrawal lever.
NOTE: Instruction 36 is best carried out when the engine and gearbox assembly has been partially withdrawn.
37 Hoist and manoeuvre the engine and gearbox assembly clear of the car.

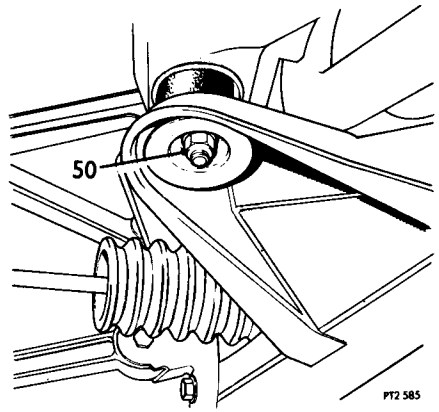


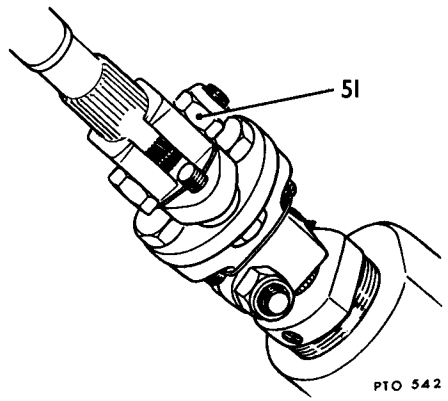
Refitting
38 Fasten slings to the engine lifting eyes and hoist the engine and gearbox assembly and partly lower it into the engine compartment.
39 Fit the clutch slave cylinder and support bracket to the gearbox casing with the two bolts and spring washers.
40 Continue lowering the assembly into position whilst supporting the gearbox with a trolley-jack and keeping the engine supported by the hoist.
41 Secure the gearbox mounting support cross-member and the vertical strap to the gearbox extension with the two nuts and spring washers.
42 Raise the gearbox sufficiently to locate the gearbox mounting cross-member on the body studs and secure with four nuts and plain washers.
43 Remove the jack from the gearbox and by means of the hoist, adjust the position of the engine to enable the engine mounting to sub-frame bolts to be located.
44 Secure the L.H. and R.H. engine mountings with the two nuts and spring washers (two each side).





45 Connect the earth strap to the R.H. engine mounting bracket.
46 Remove the slings and hoist.
47 Fit the exhaust system to the front pipe and leave the clamp loose. Fit the seven suspension rubbers to their respective hanger brackets, line up the system and tighten the clamp bolt.
48 Secure the propeller shaft to the gearbox flange coupling using new Nyloc nuts.
49 Connect the speedometer cable to the gearbox.
50 Tighten the sub-frame rear bolts to the correct torque.
51 Tighten the upper pinch bolt of the steering intermediate shaft flexible coupling.
52 Connect the electrical leads to the starter motor — two Lucars and one terminal and nut.
53 Jack up the car and remove the axle stands front and rear and lower the car.
54 Connect the heater hoses ensuring that they are fitted to the correct pipes.
55 Connect the brake servo vacuum hose to the inlet manifold.
56 Connect the main line feed to the fuel pump inlet.
57 Connect to the ignition coil:
a the H.T. lead
b the L.T. lead.
58 Connect the throttle cable to the carburetter linkage.
59 Connect the mixture control cable to the front carburetter.
60 Reconnect the harness plug to the alternator.
61 Connect the lead to the oil pressure switch located on the oil transfer housing.
62 Connect the water temperature transmitter lead to the thermostat housing switch.
63 Fit the engine stabilizer to the manifold bracket, see 12.45.16.
64 Fit the radiator and hoses, see 26.40.01.
65 Fit the heater blower assembly and reconnect the electrical leads, see 80.20.15.
66 Fit the gear-lever, see 37.16.04.
67 Fit the gear-lever grommet and secure with the four screws.
68 Fit the footwell carpets.
69 Fit the bonnet, see 76.16.01.



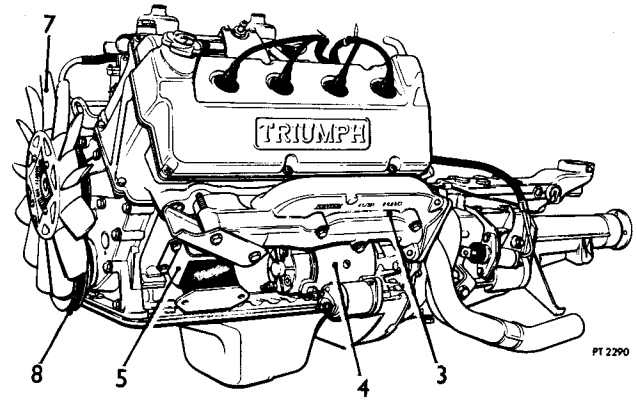


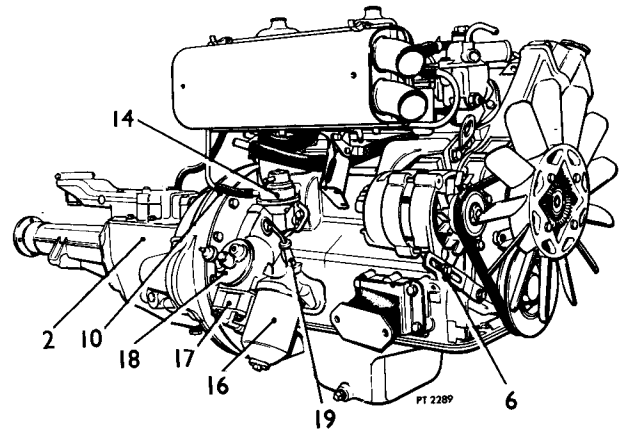
70 Check the following:
a The sump oil level, and top up if required
b The gearbox oil level, and top up if necessary.
71 Fill the cooling system, see instructions 7 and 8, 26.10.01.
72 Re-connect the battery and follow instructions 9 and 10, 26.10.01.
73 Check for oil and coolant leaks.

ENGINE ASSEMBLY

Strip and rebuild **12.41.05**

Service tool: 38 U3 piston ring compressor



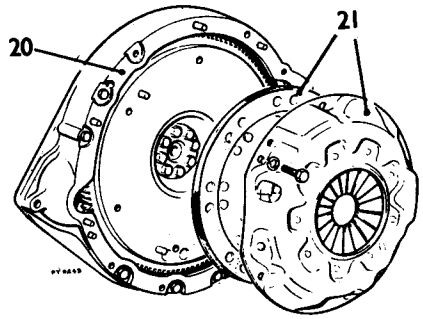


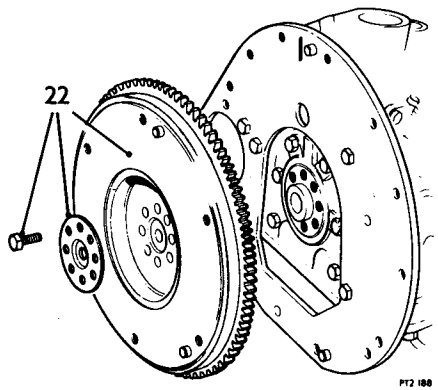
Stripping

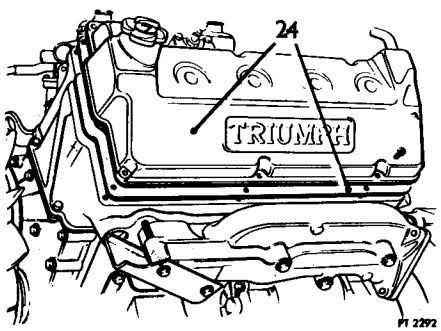
1 Remove the engine and gearbox assembly from the car, see 12.37.01, and drain the sump.
2 Remove the gearbox assembly from the engine.
3 Remove the exhaust manifold complete with the front pipe.
4 Remove the starter motor.
5 Remove the L.H. engine mounting complete with bracket.
6 Remove the alternator and adjusting link.
7 Remove the fan unit, see instructions 3 and 4, 26.25.21.
8 Remove the fan belt.
9 Remove the R.H. engine mounting complete with the bracket.
10 Disconnect the fuel pipe from the pump to the carburetters.

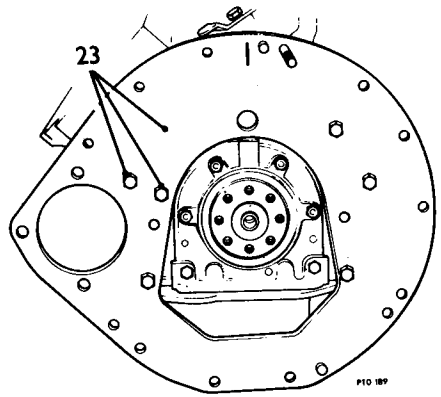
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11 Disconnect the heater hose to the inlet manifold and water pump to heater hose.
12 Disconnect the engine breather pipe from the rocker cover.
13 Remove the ten bolts and lift off the inlet manifold complete with the carburetters and lift out the water pump to manifold connecting tube, see 26.30.25.
14 Remove the fuel pump.
15 Remove the distributor complete with the H.T. leads and location plate.
16 Remove the oil filter bowl and sealing ring.
17 Remove the oil pump and hexagon drive shaft.
18 Remove the oil transfer adaptor with pressure switch.
19 Remove the dipstick.
20 Remove the flywheel housing, see 12.53.01.
21 Remove the clutch assembly.
22 Remove the eight bolts and spigot bush retaining plate, mark for reassembly the relationship of the flywheel hub to the crankshaft flange, and withdraw the flywheel.
23 Withdraw the six bolts and remove the rear adaptor plate.
24 Remove the rocker cover and gasket.



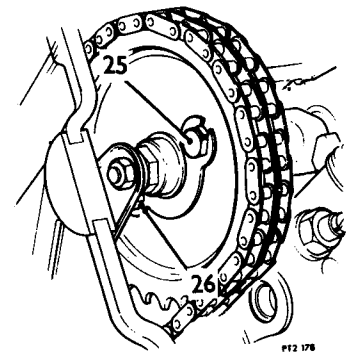


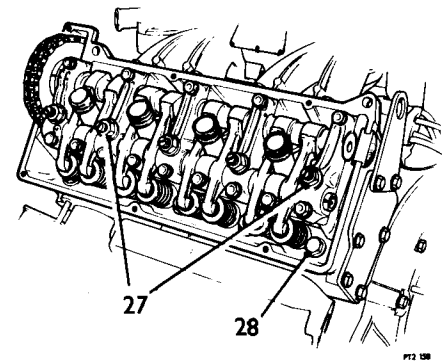


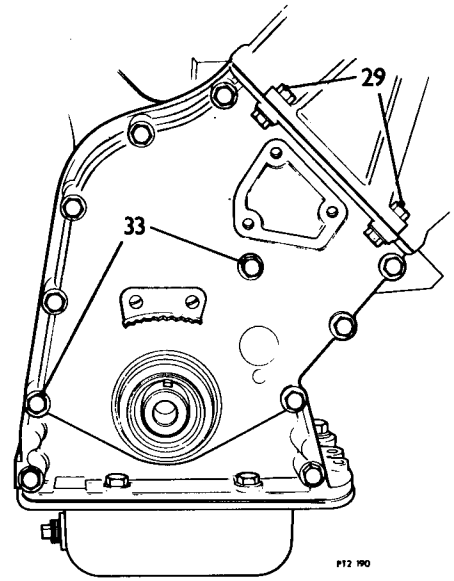


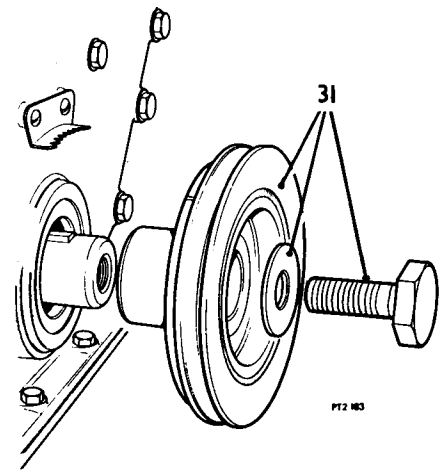
25 Turn the engine over to bring one of the camshaft sprocket retaining bolts to an accessible position. Unlock the washer and remove the bolt.
26 Turn the engine over to expose the remaining bolt, and secure the camshaft sprocket to the support bracket. Unlock the washer and remove the bolt.
27 Remove the five cylinder head retaining nuts and washers and remove the studs.
28 Remove the five cylinder head retaining bolts and washers.
CAUTION: Release the cylinder head nuts and bolts in the reverse sequence to that shown in operation 12.29.27 to avoid distortion of the cylinder head.
29 Remove the two nuts and bolts securing the cylinder head to the timing cover.
30 Lift off the cylinder head and remove the gasket.
31 Remove the retaining bolt and washer and withdraw the crankshaft pulley.
32 Position the engine on its side and remove the sump and oil pick-up pipe.
33 Remove the twelve remaining bolts retaining the timing cover and withdraw the cover and gasket halves.

continued

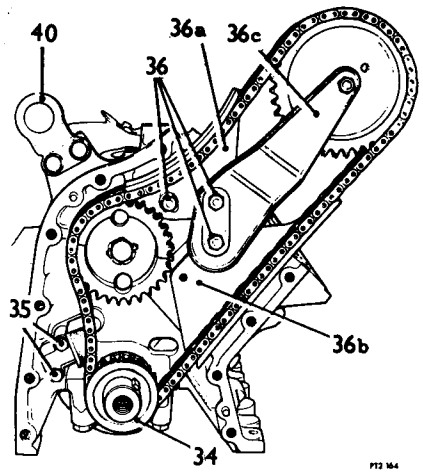


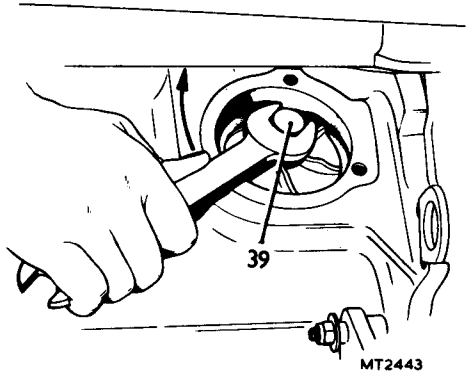


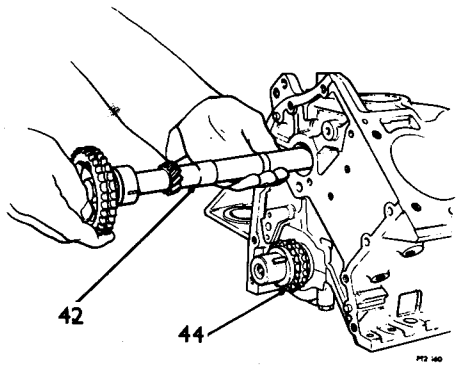


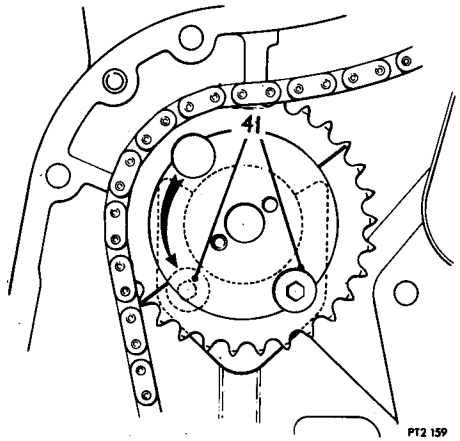


34 Remove the oil thrower.
35 Withdraw the two retaining bolts and remove the hydraulic timing chain tensioner.
36 Remove the three bolts securing:
   a the adjustable guide
   b the fixed guide
   c the camshaft sprocket support bracket.
37 Remove the guides and support bracket complete with the camshaft sprocket and timing chain. Remove the sprocket from the bracket.
38 Remove the three bolts and lift off the water pump cover.
39 Turn the water pump impeller clockwise to release it from the jackshaft gear, and remove the assembly from the cylinder block.
40 Remove the engine lifting-eye.
41 Turn the jackshaft sprocket to expose the two Allen screws securing the keeper plate; remove the screws and withdraw the plate.



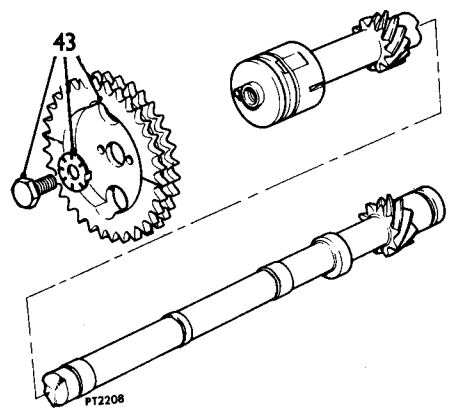


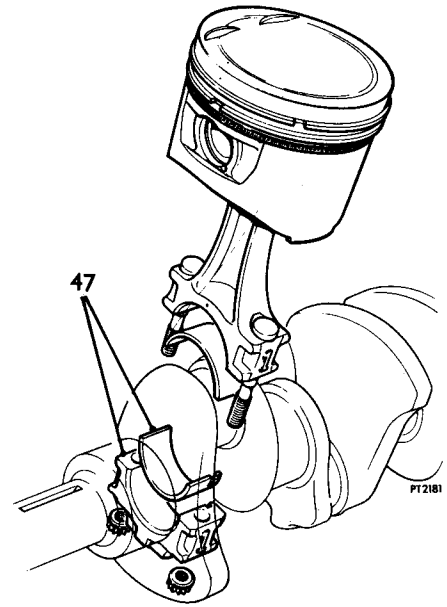


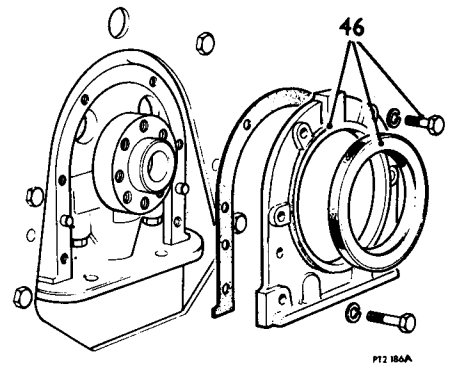


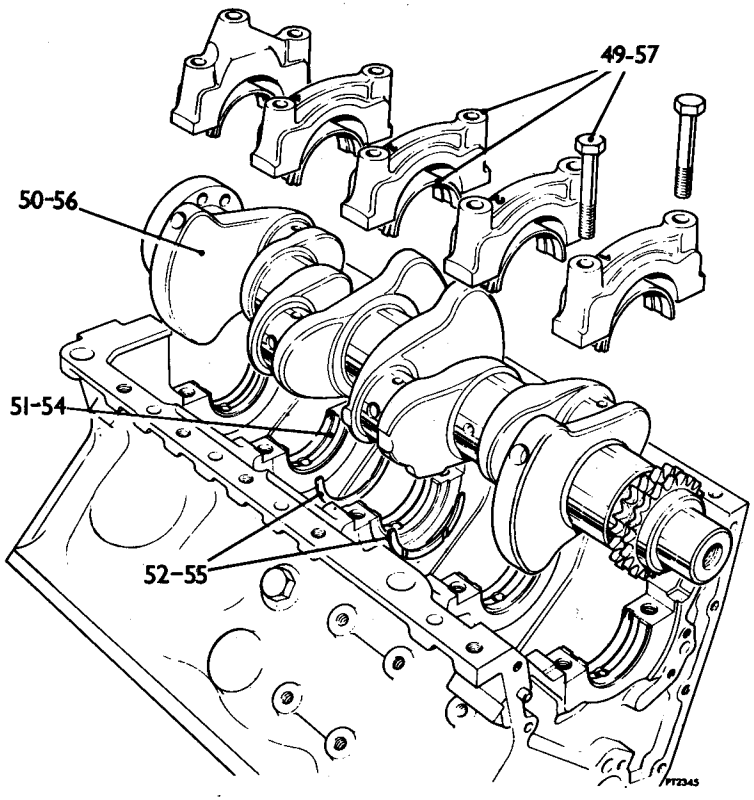
42 Withdraw the jackshaft complete with the sprocket from the cylinder block.
43 Unlock the tab washer and remove the bolt and sprocket from the jackshaft.
44 Withdraw the crankshaft sprocket.
45 Remove the drive key and shims from the crankshaft.
46 Remove the six bolts and withdraw the rear main oil seal and housing.
47 Remove the nuts securing Nos. 1 and 4 connecting rods, remove the caps and lower shells and withdraw the pistons and rods through the top of the bores.
48 Repeat instruction 47 on Nos. 2 and 3 connecting rods.
49 Remove the ten bolts securing the five main bearing caps and withdraw the caps complete with lower shells.
50 Lift out the crankshaft.
51 Remove the upper shells from the crankcase.
52 Remove the thrust washers from No. 3 main bearing.
53 Remove the spigot bush from the crankshaft.

continued









Rebuilding

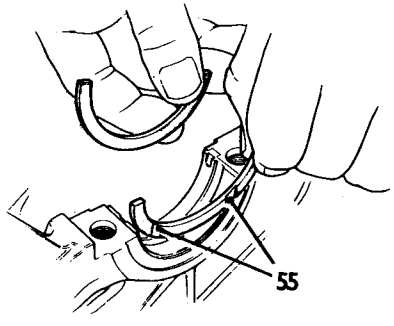
NOTE: The following rebuilding instructions assume that all the individual components and assemblies have been examined, worn parts renewed and assemblies overhauled. Moreover, all joint faces are clean and parts lubricated before assembly.

54 Fit the five main bearing upper shells ensuring that the keeper tags locate in the recesses.

55 Fit the crankshaft thrust washers to No. 3 main bearing ensuring that the oil grooves face outwards.

56 Lower the crankshaft into the crankcase.

57 Fit the lower shells to the main bearing caps and fit them to the crankcase. Partially tighten the securing bolts.



58 Using either a dial gauge or feelers, check the crankshaft end-float, see DATA.

59 Tighten the main bearing cap bolts to the correct torque, see Division 06.

60 Stagger the piston rings gaps, avoiding a gap on the thrust side, and compress the rings using special tool 38 U3.

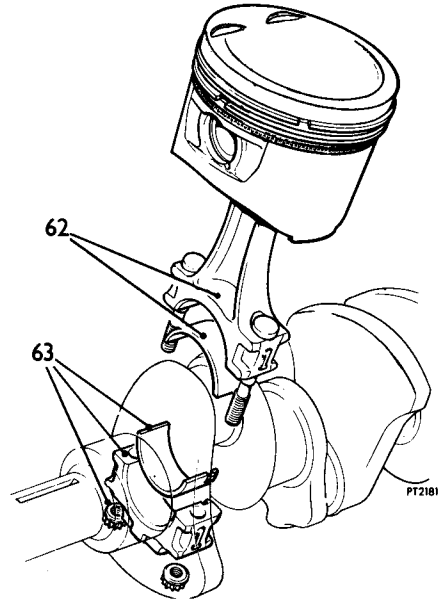
61 Turn the crankshaft to position Nos. 2 and 3 crankpins at B.D.C. Insert the respective connecting rod and piston assemblies into the bores and tap the pistons home ensuring that the valve clearance indents in the piston crowns are fitted to the L.H. side of the engine.

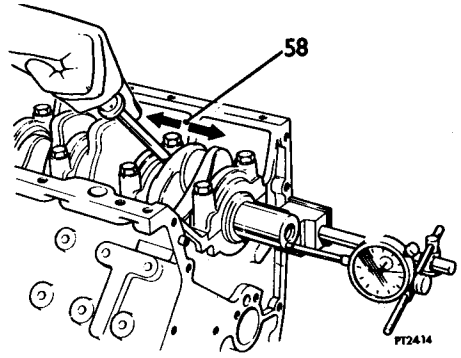
62 Fit the upper bearing shells to the connecting rods, ensuring that the keeper tags locate in the recesses, and pull the connecting rods on to the journals.

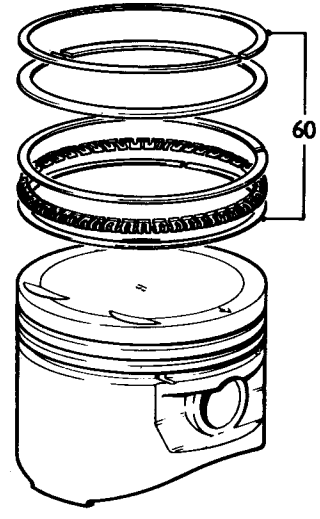
63 Fit the lower shells to the connecting rod caps ensuring that the keeper tags locate in the recesses and fit them to the connecting rods. Tighten new nuts to the correct torque, see Division 06.

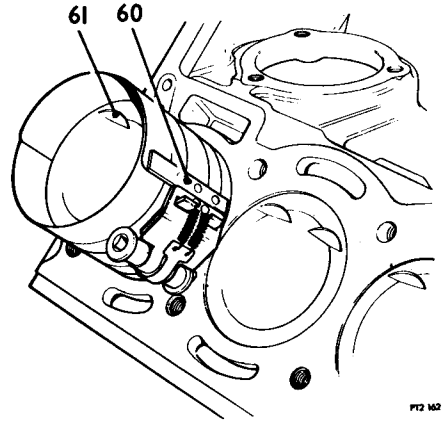
64 Repeat instructions 60 to 63 on Nos. 1 and 4 pistons and connecting rod assemblies.

continued

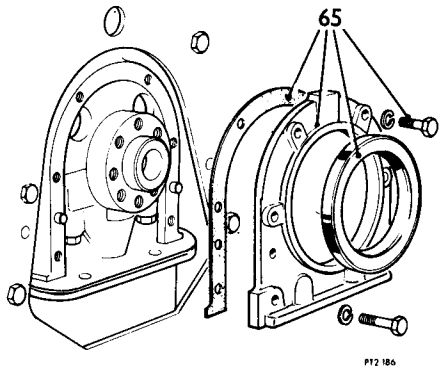


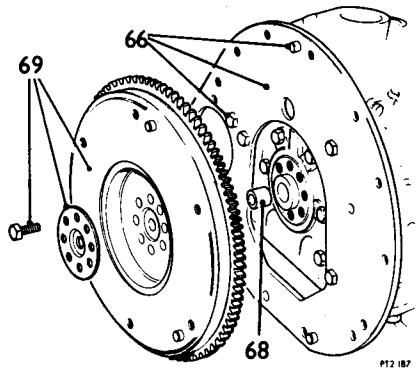


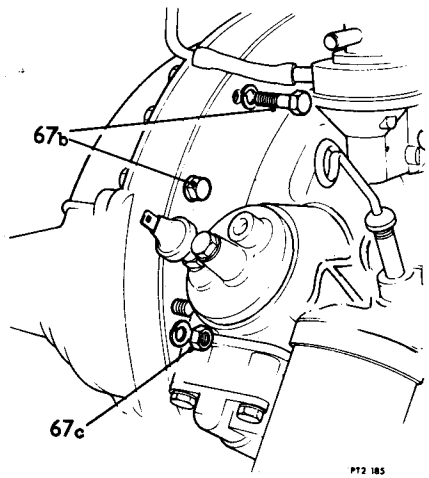


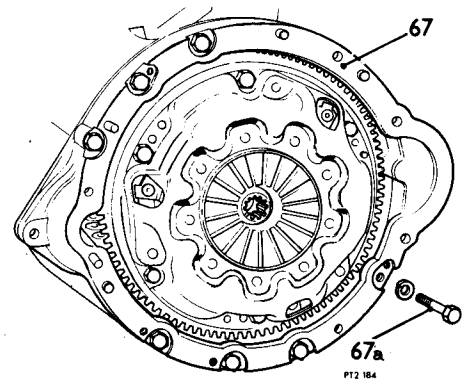


65 Fit a new seal to the rear main oil seal housing and using a new gasket and jointing compound, fit the housing locating it over the two dowels. Secure with the six bolts and spring washers noting that the two longer bolts are fitted at the bottom.
66 Fit the rear adaptor plate, locating it on two dowels, and secure with the six bolts.
67 Fit the flywheel housing using nine bolts:
   a seven at the front
   b two at the rear
   c one nut and washer on a stud at the rear.
68 Fit the spigot bush.
69 Fit the flywheel, lining up the punch marks if the original flywheel or crankshaft is being refitted. Secure with the spigot bush retaining plate and eight bolts and tighten to the correct torque, see Section 06.
70 Check the flywheel for run-out using a dial gauge, see DATA.



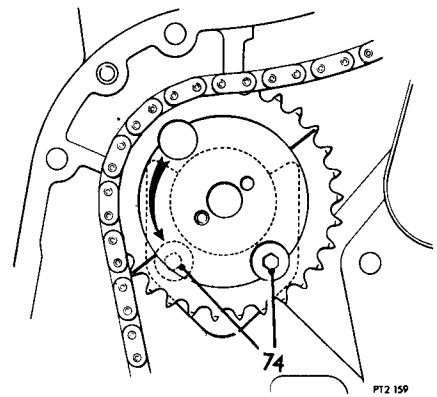


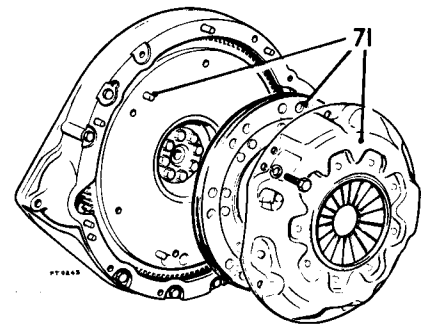


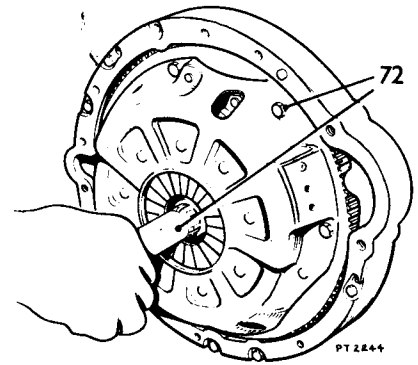


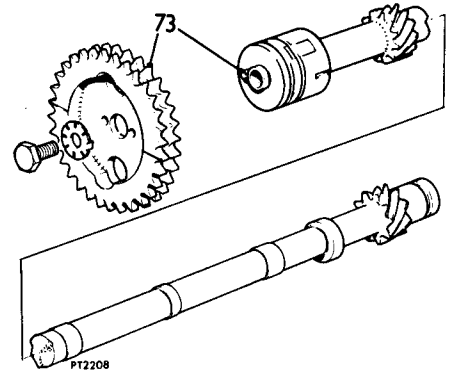
71 Fit the clutch driven and pressure plates, locating the pressure plate assembly over the three dowels.
72 Centralize the driven plate using a dummy primary shaft and evenly tighten the six bolts and spring washers to the correct torque.
73 Fit the sprocket to the jackshaft, locating it over the single dowel, and secure with the bolt and new lock washer.
74 Fit the jackshaft to the cylinder block, locate it with the keeper plate and secure the plate with the two Allen screws.
75 Fit the water pump impeller and cover assembly, checking the clearance as described in the refitting instructions 26.50.01.
76 Fit the distributor mounting plate.

continued









77 Fit the oil transfer adaptor complete with the oil pressure switch ensuring that a new 'O' ring is fitted and correctly located. Secure with the single bolt.

78 Fit two 'slave' guide studs to the bolt holes in the cylinder block to facilitate the fitting of the cylinder head and gasket.

79 Fit the cylinder head gasket locating it over the studs.

80 Fit the cylinder head, easing it over the guide studs.

81 Fit the five cylinder head studs.

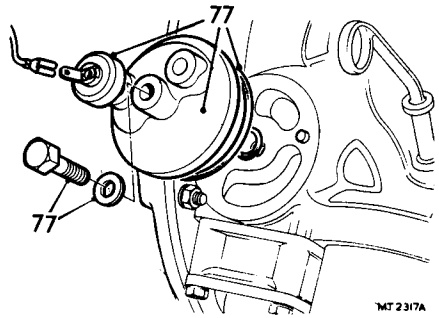
82 Remove the two 'slave' studs and fit the five cylinder head retaining bolts and plain washers.

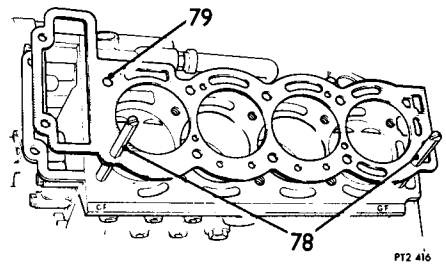
83 Fit the nuts and plain washers to the cylinder head studs.

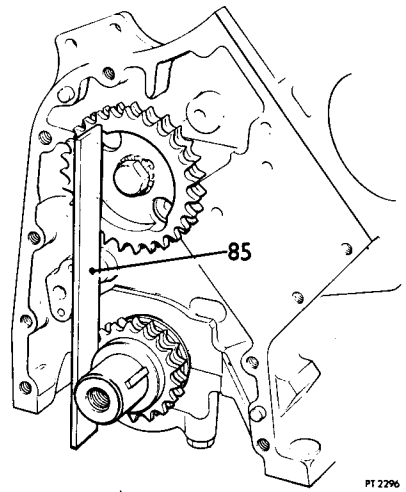
84 Tighten the nuts and bolts to the correct torque and in the correct sequence, see 12.29.27.

CAUTION: Since no clearance exists between the valve heads and piston crowns once the cylinder head is fitted, care must be taken to ensure that the crankshaft is not allowed to turn a complete revolution until the valve timing has been completed otherwise damage to the valves and pistons will occur.

85 Temporarily fit the crankshaft sprocket and check its alignment with the jackshaft sprocket by placing a straightedge across the two sprockets.







86 Adjust any misalignment by removing the crankshaft sprocket and fitting shims of suitable thickness between it and the crankshaft. Ensure that the sprocket is pushed fully home when checking the alignment.

87 Remove the sprocket, fit the crankshaft drive key and refit the sprocket.

88 Turn the camshaft until the timing mark on the flange is in line with the groove on the camshaft front bearing cap.

89 Temporally locate the timing cover and crankshaft pulley and turn the crankshaft (having regard to the above caution) until Nos. 1 and 4 pistons are at T.D.C. Remove the pulley and timing cover.

90 Turn the jackshaft until the scribed line 'D' across the sprocket is equidistant between bolts 'B' and 'C' with the dowel to the left. Remove the pulley and timing cover.

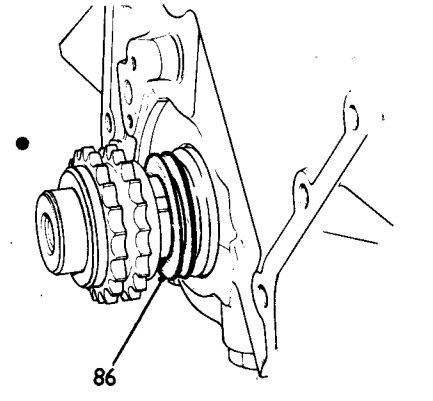
91 Encircle the camshaft sprocket with the timing chain and insert through the cylinder head aperture. Locate the sprocket on the camshaft flange and secure with the lock-plate and one bolt. Do not bend over lock-plate tab at this stage.

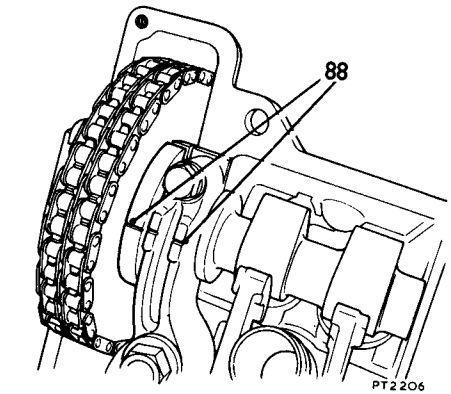
92 Keeping the chain taut on the drive side fit the chain to the crankshaft and jackshaft sprockets. Check and if necessary make any adjustment to the position of the jackshaft sprocket to maintain it in its correct position as in instruction 90.

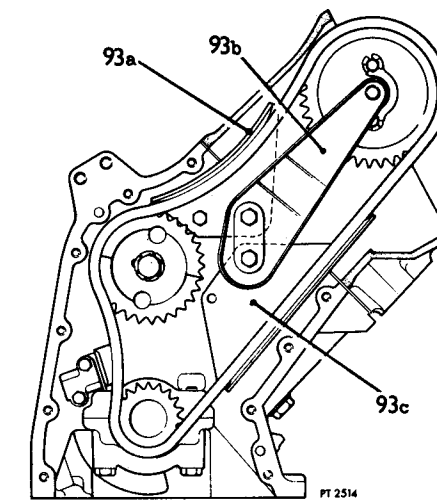
93 Fit and loosely secure the guides as follows:

a the adjustable guide
b the straight fixed guide
c the support bracket.

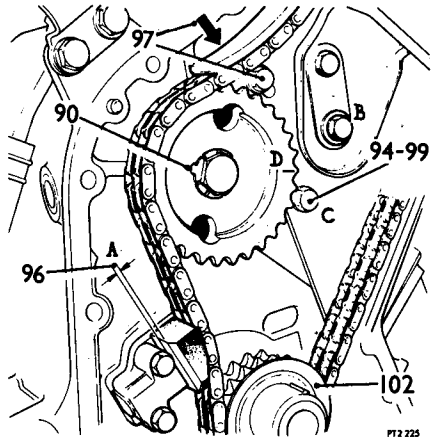
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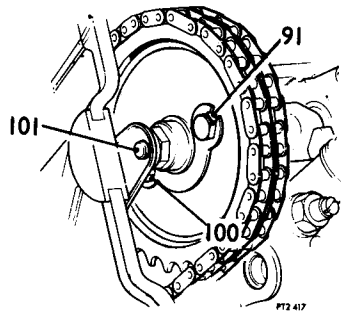


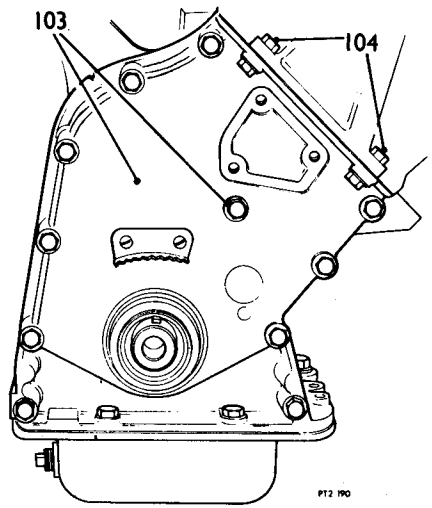




94 Fit a 'slave' bolt to the lower hole in the fixed guide to ensure alignment when fitting the timing cover centre bolt.
95 Fit the timing chain hydraulic tensioner and secure with the two bolts and spring washers, see 12.65.28.
NOTE: To prevent the tensioner releasing while fitting, fit a spacer between the tensioner body and the back of the slipper.
96 Remove the spacer and insert a 0·100 in (2·54 mm) feeler gauge or slip gauge in its place, dimension 'A', see Note following instruction 35, 12.65.12.
97 Adjust the chain tension by applying pressure, in the direction of the arrow, to the adjustable guide while tightening the clamp bolt.
98 Remove the gauge and check that the scribed line on the jackshaft sprocket is still correctly positioned.
99 Tighten all the guide retaining bolts and remove the 'slave' bolt.
100 Turn the engine sufficiently to enable the remaining camshaft sprocket retaining bolt to be fitted. Tighten both bolts to the correct torque and bend over the lock-plate tabs. Refer to 12.13.01, instructions 17 and 18.
101 Check that the threaded spigot on the camshaft sprocket does not foul the support bracket.
102 Fit the oil thrower with the dished face outwards.
103 Using sealing compound, fit the two gasket halves to the cylinder block and locate the timing cover in position on the dowels. Evenly tighten the retaining bolts, ensuring that the centre bolt has a fibre washer under the head.
104 Fit the two nuts and bolts securing the cylinder head to the timing cover.

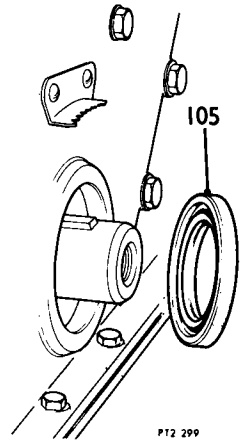


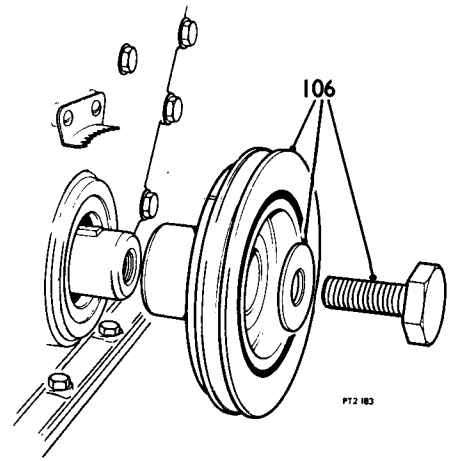


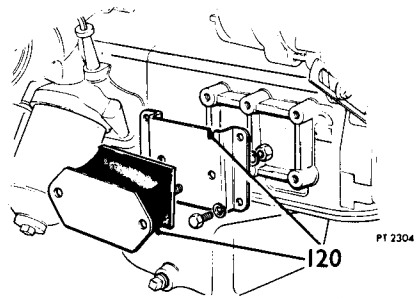


105 With the lip face leading, press in a new timing cover oil seal flush with the cover.
106 Fit the crankshaft pulley, securing it with the bolt and flat washer to the correct torque, see Section 06.
107 Fit the engine front lifting eye.
108 Fit the semi-circular seals to the cylinder head.
109 Turn the engine over so that the timing mark on the camshaft flange is in line with the groove in the camshaft front bearing cap and the mark on the crankshaft pulley coincides with the zero mark on the timing cover scale.
110 Fit the rocker cover, using a new gasket, and secure with the six retaining screws.
111 Fit the distributor, see 86.35.20, instruction 10.
112 Fit the distributor cap and connect the H.T. leads to the spark plugs.
113 Fit the exhaust manifold complete with front pipe.
114 Fit the starter motor.
115 Fit the fan unit.
116 Fit the alternator and adjusting link.
117 Fit and adjust the fan belt.
118 Fit the fuel pump, using a new gasket.
119 Insert the hexagon drive shaft into the oil pump and fit the assembly and 'O' ring to the crankcase ensuring that the drive locates correctly into the distributor drive gear. Secure the pump with the four bolts and spring washers.
120 Fit the R.H. engine mounting bracket complete with mounting, ensuring that the 'U' shaped cut-away is uppermost and forward. Secure with the four bolts and spring washers.

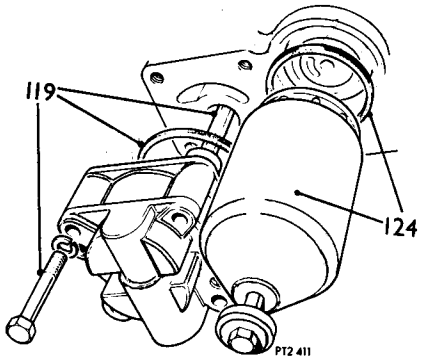
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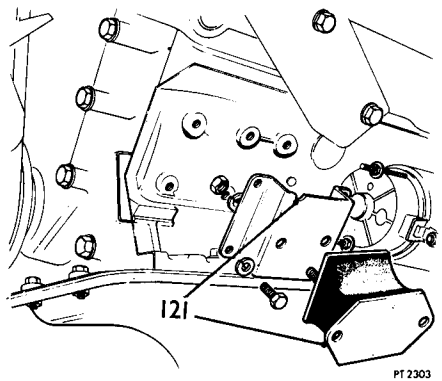






121 Fit the L.H. engine mounting bracket and mounting with the four bolts and spring washers with the 'U' cut-away forward and uppermost.
122 Fit the oil strainer pipe, using a new gasket.
123 Fit the sump, using a new gasket.
124 Fit the oil filter assembly, ensuring that a new sealing ring is correctly located in the crankcase groove.
125 Insert the dipstick.
126 Place a new gasket in position on the cylinder head inlet ports and fit the inlet manifold complete with carburetters and air cleaner. Secure with the ten bolts, tightening evenly and to the correct torque.
127 Remove the thermostat housing cover and thermostat and insert the manifold to water pump connecting tube through the housing and press into position, see 26.30.25. Refit the thermostat and housing cover.
128 Connect the heater hose to the inlet manifold.
129 Connect the water pump to heater hose.
130 Connect the fuel pipe from the pump to the carburetters.
131 Connect the engine breather pipe to the rocker cover.
132 Refit the gearbox assembly to the engine.
133 Fit the engine and gearbox assembly to the car, see 12.37.01.
134 Fill the sump with the correct grade of oil to the 'high' mark on the dipstick.
135 Fill the cooling system.





DATA

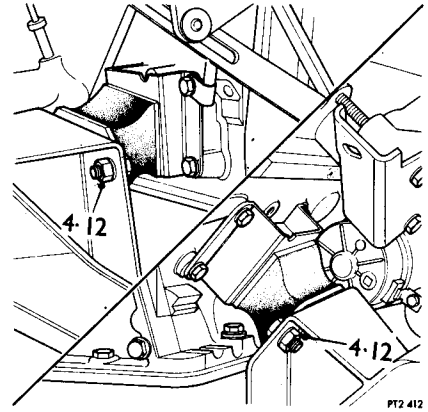
Crankshaft end-float	0·003 to 0·011 in (0·07 to 0·28 mm)
Flywheel run-out maximum	0·002 (0·050 mm) at a radius of 4 in (101 mm) on the friction face

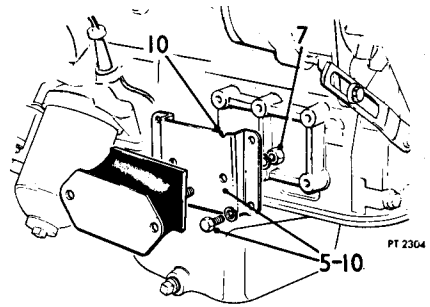
ENGINE MOUNTING — FRONT

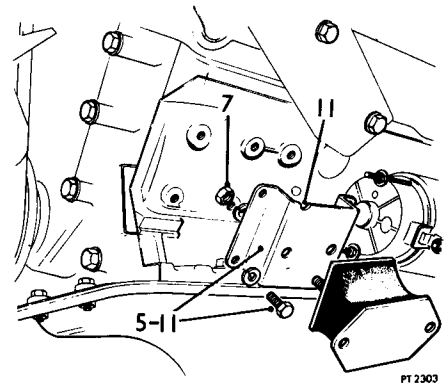
L.H. — remove and refit — omit instructions 8 and 10	**12.45.01**
R.H. — remove and refit — omit instructions 9 and 11	**12.45.03**
Set — remove and refit	**12.45.04**

Removing
1 Disconnect the battery.
2 Support the engine under the sump.
3 Disconnect the engine stabilizer, see 12.45.16.
4 Remove the two nuts and bolts securing the mounting rubbers to the sub-frame (two each side).
5 Remove the four bolts securing the engine mounting bracket to the cylinder block.
NOTE: One of the bolts on the R.H. bracket also secures the earth strap.
6 Raise the engine sufficiently to remove the mounting complete with the bracket.
7 Remove the two nuts and washers securing the mounting to the bracket.

Refitting
8 Fit the engine mounting to the R.H. bracket.
9 Fit the engine mounting to the L.H. bracket.
NOTE: Whilst the engine mounting rubbers are the same, the brackets are handed.
10 Fit the R.H. bracket complete with the mounting to the right-hand side of the engine ensuring that the 'U' shaped cut-away is uppermost and forward. Secure with the four bolts and spring washers.
11 Fit the L.H. bracket complete with the mounting to the left-hand side of the engine ensuring that the 'U' shaped cut-away is uppermost and forward. Secure with the four bolts and spring washers.
12 Lower the engine and whilst maintaining support, secure the engine mounting to the sub-frame location with the two bolts, spring washers and plain nuts.
13 Remove the supporting jack.
14 Reconnect the engine stabilizer, see 12.45.16.
15 Reconnect the battery.







ENGINE MOUNTING — REAR CENTRE

Remove and refit **12.45.08**

Removing

1 Raise the car on a ramp.
2 Disconnect the exhaust silencer system from the hanger brackets by unhooking the suspension rubbers from the brackets.
3 Support the gearbox with a jack.
4 Remove the four Nyloc nuts and plain washers securing the mounting cross-member.
5 Lower the jack to release the cross-member from the studs.
6 Remove the two nuts and spring washers securing the bracket to the gearbox extension.
7 Prise the gearbox steady strap, rearwards, away from the stud.
8 Remove the cross-member complete with the bracket and mounting from the car, taking care not to damage the fuel and brake fluid pipes.

Dismantling

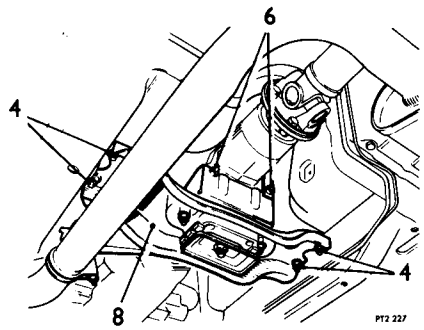
9 Remove the centre bolt and nut securing the bracket to the cross-member and mounting.
10 Remove the two Nyloc nuts and plain washers securing the rubber mounting to the cross-member, thus separating the assembly into its four parts, i.e.:
   a lower dished plate
   b rubber mounting
   c cross-member
   d bracket.

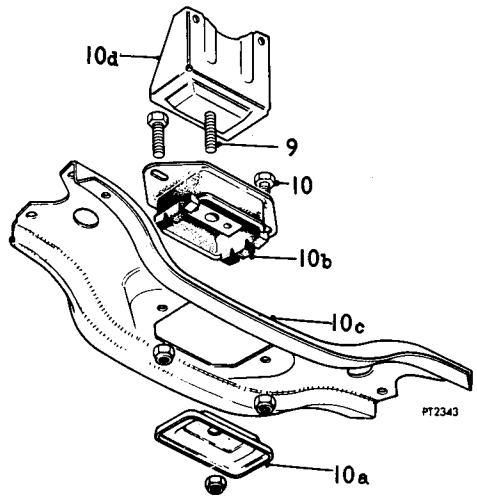
Reassembly

11 Fit the rubber mounting to the cross-member securing with the two Nyloc nuts and plain washers.
12 Fit the bracket and lower dished plate to the cross-member with the centre bolt and Nyloc nut, leaving the nut slack for the time being.

Refitting

13 Offer-up the assembly to the gearbox extension and fit the bracket locating it on the two studs.





14 Fit the gearbox steady strap to the R.H. stud and secure with the two nuts and spring washers.
15 Taking care not to damage the brake fluid and fuel pipes, raise the cross-member assembly by means of the jack until it locates on the four studs.
16 Retain the cross-member with the four Nyloc nuts and plain washers.
17 Finally tighten, to the correct torque, see Division 06, the central nut and bolt.
18 Reconnect the exhaust silencer suspension rubbers to the hanger brackets.
19 Remove the jack.
20 Lower the car.

ENGINE STABILIZER ASSEMBLY

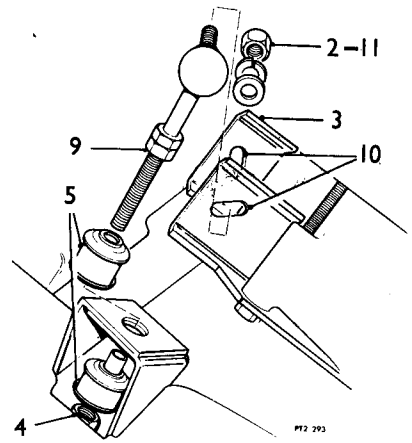
Remove and refit **12.45.16**

Removing

1 Disconnect the battery.
2 Remove the nut, plain and spring washer securing the ball end of the stabilizer to the manifold bracket.
3 Remove the plate.
4 Remove the nut securing the stabilizer to the body bracket.
5 Remove rubber and washer.
6 Withdraw the stabilizer assembly.

Refitting

7 Fit the stabilizer to the body bracket.
8 Fit the rubber and washer and secure with the nuts to the body bracket.
9 Fit the ball end to the manifold bracket, making any necessary adjustments to the length by means of the lock-nuts.
10 Fit the plate to the manifold bracket so that the elongated hole is 90° to the similar hole in the manifold bracket.
11 Secure the ball end to the manifold bracket with the nut, plain and spring washer.
12 Reconnect the battery.



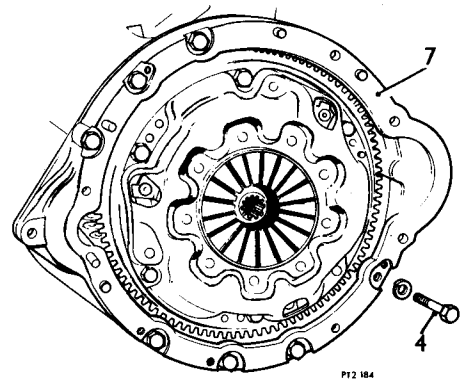
FLYWHEEL HOUSING

Remove and refit **12.53.01**

Removing

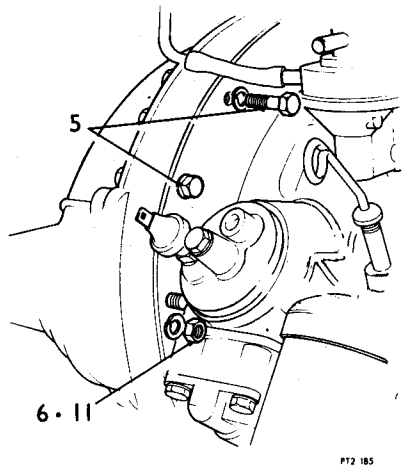
1 Isolate the battery.
2 Remove the gearbox, see 37.20.01.
3 Remove the starter motor, see 86.60.01.
4 Remove the seven bolts on the front face of the housing.
5 Remove the two bolts at the back of the adaptor plate.
6 Remove the nut from the stud at the back of the adaptor plate.
7 Withdraw the flywheel housing.

continued



Refitting

8 Locate the flywheel housing in position on the adaptor plate.
9 Fit and loosely tighten the seven front bolts and washers.
10 Fit and loosely tighten the two rear bolts and washers.
11 Loosely fit and tighten the nut and spring washer.
12 Finally, evenly tighten the nine bolts and one nut.
13 Fit the starter motor, see 86.60.01.
14 Fit the gearbox, see 37.20.01.
15 Reconnect the battery.



ENGINE REAR ADAPTOR PLATE

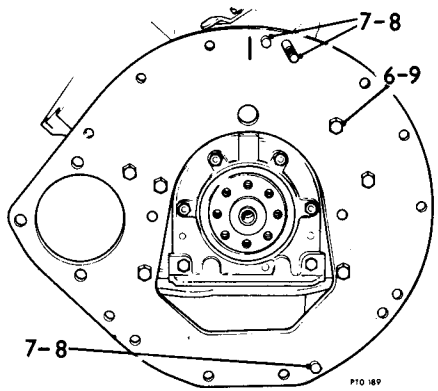
Remove and refit **12.53.03**

Removing

1 Remove the gearbox, see 37.20.01.
2 Remove the starter motor, see 86.60.01.
3 Remove the clutch assembly, see 33.10.01.
4 Remove the flywheel, see instructions 4 to 6, 12.53.07.
5 Remove the flywheel housing, see instructions 4 to 7, 12.53.01.
6 Remove the six bolts securing the adaptor plate to the cylinder block.
7 Remove the plate from the two dowels and one stud location.

Refitting

8 Clean the engine and adaptor plate mating faces and locate the plate in position on the two dowels and stud.
9 Secure the plate with the six bolts.
10 Fit the flywheel housing, see instructions 8 to 12, 12.53.01.
11 Fit the flywheel, see instructions 7 and 8, 12.53.07.
12 Fit the clutch, see 33.10.01.
13 Fit the starter motor, see 86.60.01.
14 Fit the gearbox, see 37.20.01.

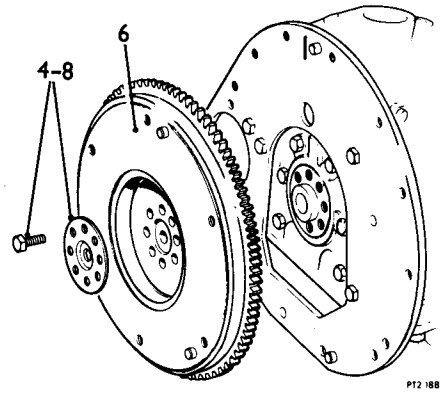


FLYWHEEL

Remove and refit **12.53.07**

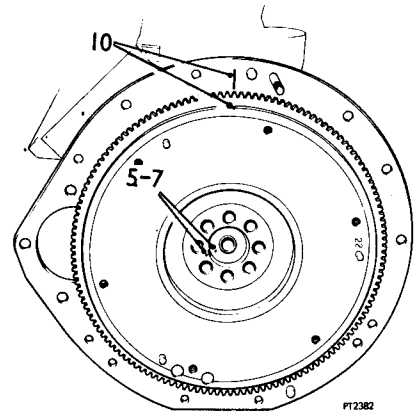
Removing

1 Isolate the battery.
2 Remove the gearbox, see 37.20.01.
3 Remove the clutch assembly, see 33.10.01.
4 Remove the eight bolts and spigot bush retaining plate securing the flywheel to the crankshaft.
5 Mark for reassembly the relationship between the flywheel hub and the crankshaft flange.
6 Withdraw the flywheel and ring gear assembly.



Refitting

7 Locate the flywheel assembly on the crankshaft spigot so that the identification marks line up.
8 Secure the flywheel to the crankshaft with the eight bolts and retaining plate. Tighten the bolts to the correct torque, see Division 06.
9 If a new flywheel has been fitted, turn the engine over so that Nos. 1 and 4 pistons are at T.D.C. with No. 1 cylinder firing.
10 Make a chisel mark on the outside edge of the flywheel in line with the vertical mark on the engine rear adaptor plate.
11 Using a dial gauge, check the flywheel for run-out, see DATA.
12 Refit the clutch, see 33.10.01.
13 Refit the gearbox, see 37.20.01.
14 Reconnect the battery.



DATA

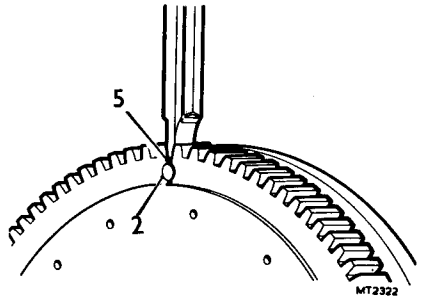
Flywheel run-out maximum	0·002 (0·050 mm) at a radius of 4 in (101 mm) on the friction face.

STARTER RING GEAR

Remove and refit **12.53.19**

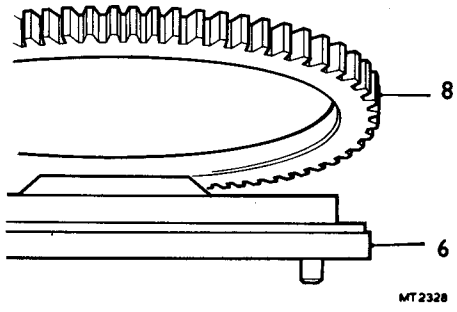
Removing

1 Remove the flywheel, see 12.53.07.
2 Drill a hole approximately 0·375 in (10 mm) between the root of any tooth and the inner rim of the ring gear. Drill sufficiently to weaken the starter ring without drilling the flywheel.
3 Secure the flywheel in a soft-jawed vice.
4 Place a heavy cloth over the ring gear for protection against flying fragments. **WARNING:** Take adequate precautions to avoid injury from flying fragments when splitting the ring gear.
5 Place a chisel immediately above the drilled hole and strike sharply to split the ring gear.



Refitting

6 Place the flywheel, flanged side down, on a flat surface.
7 Heat the starter ring uniformly to between 170 to 175°C (338 to 347°F); do not exceed this temperature.
8 Locate the ring gear in position, and retain in position until it contracts sufficiently to grip the flywheel.
9 Allow the starter ring to cool gradually to avoid stress distortion. A maximum permissible gap of 0·025 in (0·6 mm) is allowed between the flywheel and starter ring on one length of 6 in (15 cm) only.
10 Fit the flywheel, see 12.53.07.



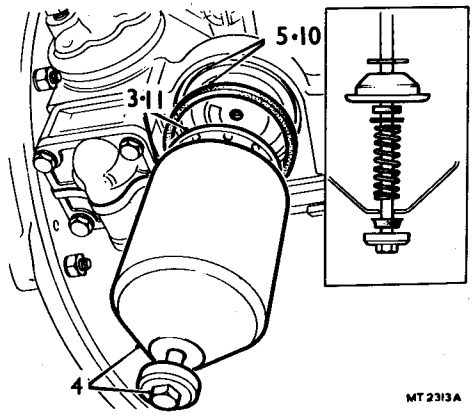
OIL FILTER ASSEMBLY

Element — remove and refit — instructions 1 to 5 and 10 to 13 **12.60.02**

Overhaul — instructions 6 to 9 **12.60.08**

Removing

1 Drive the car onto a ramp and isolate the battery.
2 Raise the ramp.
3 Place a suitable receptacle under the filter bowl to catch surplus oil.
4 Remove the filter bowl centre retaining bolt and withdraw the assembly, complete with element.



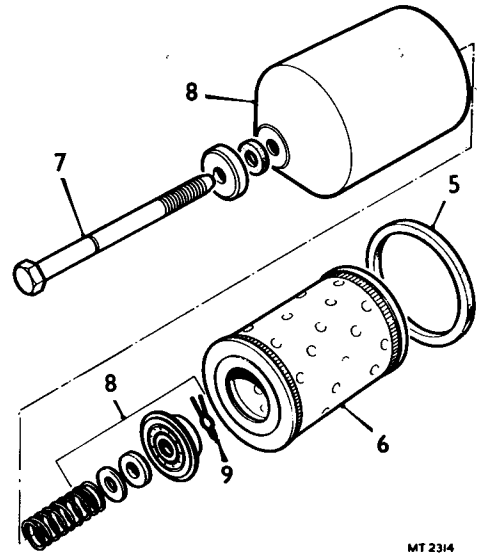
5 Extract the seal from the annular groove in the crankcase.

Overhauling

6 Remove the element and discard it.
7 Dismantle the centre bolt assembly and clean all components including the bowl.
8 Assemble the centre bolt assembly to the bowl as illustrated, using new seals. If necessary, renew the spring.
9 Secure the assembly with the retaining clip ensuring that it locates properly in the annular groove in the centre bolt.

Refitting

10 Clean the crankcase mating face and fit a new seal to the annular groove.
11 Insert a new paper element into the filter bowl and secure the assembly to the crankcase and whilst tightening the centre bolt rotate the bowl to ensure that it seats correctly in the groove. Tighten to 20 lbf ft (2·8 kgf m).
12 Reconnect the battery, start the engine and check for oil leaks from the filter assembly.
13 Lower the ramp, check the oil level in the sump and top up if necessary.



OIL TRANSFER HOUSING

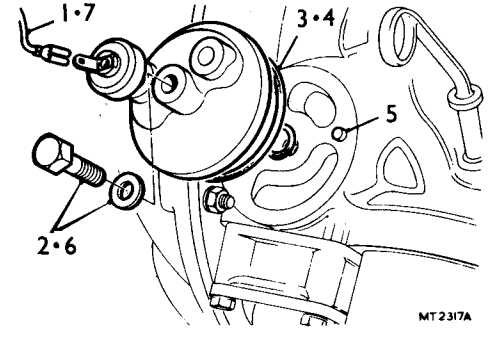
Remove and refit **12.60.14**

Removing

1 Disconnect the electrical cable from the pressure warning switch.
2 Remove the centre retaining bolt and withdraw the transfer housing.
3 Remove the 'O' ring seals from the transfer housing.

Refitting

4 Clean the housing and fit new 'O' ring seals.
5 Refit the housing, engaging the dowel in the cylinder block with the locating hole in the housing.
6 Refit and tighten the centre retaining bolt to the correct torque, see Division 06.
7 Re-connect the cable to the pressure warning light switch.



OIL PICK-UP STRAINER

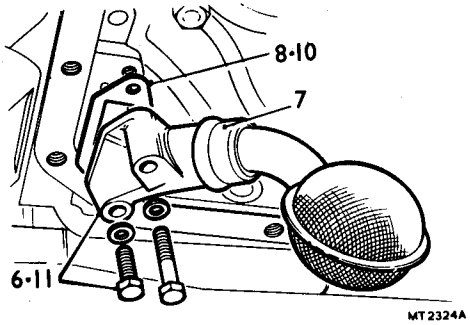
Remove and refit **12.60.20**

Removing

1 Drive the car onto a ramp.
2 Isolate the battery.
3 Drain the sump.
4 Remove the sump retaining nuts, bolts and washers.
5 Lower the sump sufficiently to expose the mounting flange of the oil strainer.
6 Remove the two bolts and plain washers securing the oil strainer to the crankcase.
7 Withdraw the oil pick-up strainer complete.
8 Remove the gasket.

Refitting

9 Clean the crankcase and oil pick-up strainer flange mating faces.
10 Fit a new gasket.
11 Fit the oil strainer to the crankcase, securing with the two bolts and plain washers.
12 Refit the sump, see instruction 15, 12.60.44.
13 Refill the sump to the 'high' mark on the dipstick with a recommended grade of oil.
14 Lower the car and reconnect the battery.

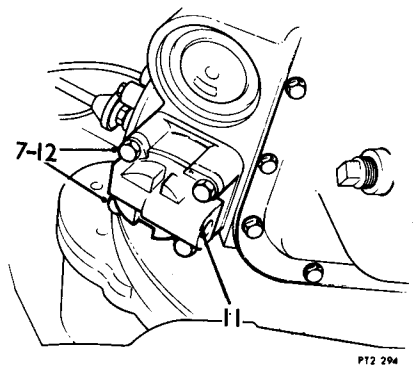


OIL PUMP

Remove and refit **12.60.26**

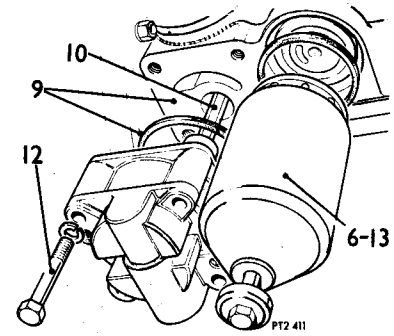
Remove

1 Isolate the battery.
2 Raise the car on a ramp.
3 Disconnect the engine stabilizer from the manifold bracket.
4 Remove the R.H. engine mounting to sub-frame bolts.
5 Jack up the engine on the R.H. side and raise it approximately 1¼ in (32 mm).
6 Remove the oil filter, see 12.60.02.
7 Remove the four bolts and spring washers securing the oil pump to the engine.
8 Withdraw the pump complete with drive shaft.



Refitting

9 Clean the pump and crankcase mating faces and check that the 'O' ring is in position and in sound condition.
10 Insert the pump drive shaft so that it locates fully into the distributor drive gear.
11 Offer up the pump to the crankcase so that the pressure relief valve is towards the crankcase.
12 Secure in position with the four bolts and spring washers.
13 Refit the oil filter.
14 Lower the engine and secure the engine mounting to the sub-frame location and remove the jack.
15 Reverse instructions 1 to 3.
16 Check the level of oil in the sump and replenish if necessary.



OIL PUMP — Hobourn-Eaton type

Overhaul **12.60.32**

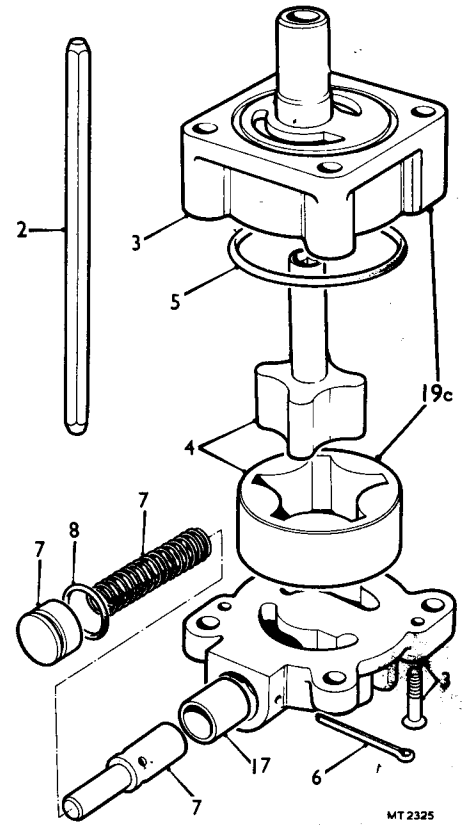
Dismantling

1 Remove the oil pump, see 12.60.26.
2 Withdraw the hexagonal drive shaft.
3 Remove the two screws and lift off the pump cover from the pump body.
4 Remove the rotors.
5 Remove the 'O' sealing ring from the pump body.
6 Remove the split pin from the pump oil pump cover.
7 Remove the locating plug, spring and relief valve.
8 Remove the 'O' sealing ring from the locating plug.

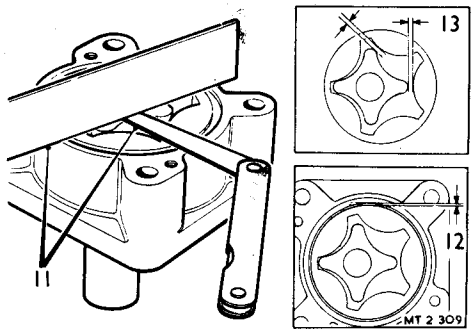
Inspection

9 Clean all components.
10 Install the rotors in the pump body, ensuring that the chamfered edge of the outer rotor is at the driving end of the rotor pocket.

continued



11 Check the end-float of the inner and outer ring.
12 Check the outer ring to pump body diametrical clearance.
13 Check the rotor lobe clearances.
14 Check the length of the relief valve spring.
15 Check the relief valve and its bore for scoring or damage.
16 Renew the pump assembly if the clearances or end-floats measured in operations 11 to 13 exceed the figures given in DATA.
17 Check the bush in the pump cover, renew if scored or worn.



Reassembling

18 Lubricate all parts in clean engine oil before assembling.
19 Reverse the procedure in 1 to 8, noting:
- a Fit the relief valve with its large diameter first, so that its small spigot will engage with the spring.
- b Fit a new 'O' sealing ring to the oil pressure relief valve locating plug.
- c Ensure that the outer rotor is installed in the pump body with its chamfered edge towards the driving end.
- d Fit a new 'O' sealing ring to the pump body.

20 Check the pump for freedom of action.
21 Fit the oil pump, see 12.60.26.

DATA

Oil pump—Hobourn-Eaton

Outer ring end-float	0·004 in (0·1 mm)
Inner ring end-float	0·004 in (0·1 mm)
Outer ring to pump body diametrical clearance	0·008 in (0·2 mm)
Rotor lobe clearance	~~0·010 in~~ (0·25 mm)

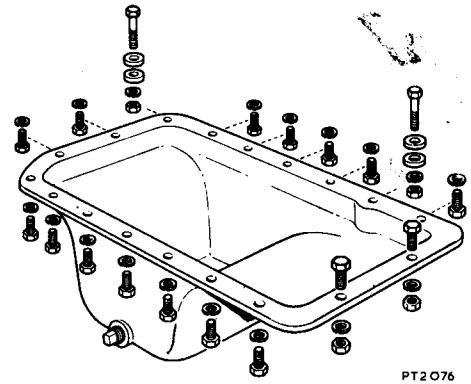
0·002

SUMP

Remove and refit **12.60.44**

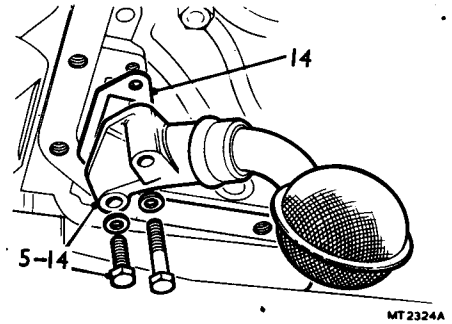
Removing

1 Raise the car on a ramp.
2 Drain the sump.
3 Remove the bolts, washers and nuts securing the sump to the crankcase. The locations of these bolts, washers and nuts are illustrated. Note that there is an aperture at the front of the flywheel. Ensure when removing the rear sump bolts that they do not fall into the bell housing.
4 Lower the sump to expose the mounting flange of the oil strainer.
5 Remove the two bolts and plain washers securing the oil strainer flange to the crankcase.
6 Withdraw the oil strainer.
7 Rotate the sump 90°.
8 Withdraw the sump and gasket.



Refitting

9 Ensure that the sump flange and crankcase are clean.
10 Smear the sump gasket with grease and fit it to the crankcase.
11 Ensure that the crankcase and oil strainer flange are clean.
12 Offer up the sump to the engine 90° out of position.
13 Rotate sump 90° to bring it to its fitted position but do not offer up to crankcase.
14 Renew the sump strainer flange gasket and fit the strainer to the crankcase. Secure with two bolts, and plain washers.
15 Offer up the sump to the crankcase and secure with bolts and nuts as illustrated.
16 Lower the car.
17 Refill the sump.



OIL PRESSURE RELIEF VALVE

Remove and refit **12.60.56**

Removing

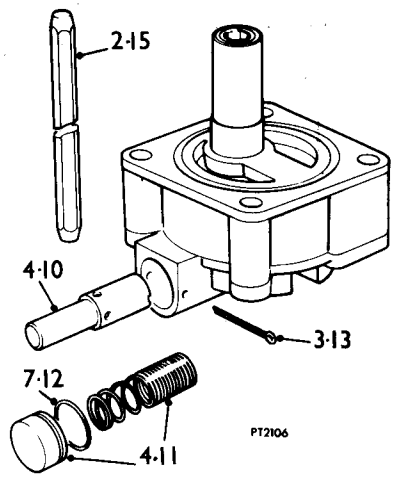
1 Remove the oil pump, see 12.60.26.
2 Withdraw the hexagonal drive shaft.
3 Remove the split pin from the oil pump casing.
4 Remove the locating plug, spring and plunger by tapping the pump cover.
NOTE: Since in some instances the 'O' ring on the locating plug may stick to the bore, in order to accomplish instruction 4 the pump cover will have to be removed and the plug tapped out from the underside of the cover. Follow instructions 5 and 6 if this is necessary.
5 Remove the two screws securing the pump cover to the main body and lift off the cover.
6 Using a suitable soft drift tap out the plug from the underside of the pump cover.
7 Remove the 'O' ring from the locating plug.

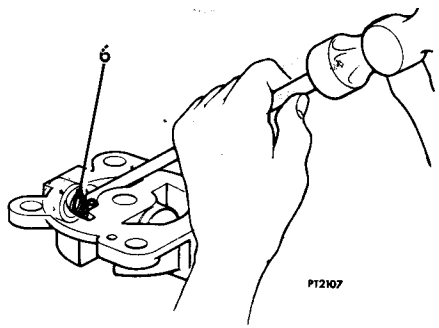
Examination

8 Examine the plunger and its bore for scores or wear.
9 Check the plunger spring length and renew if not in accordance with DATA.

Refitting

10 Observing absolute cleanliness, fit the plunger to the pump cover ensuring that it moves freely in its bore.
11 Fit the spring over the plunger spigot end noting that the close coiled end is inserted first.
12 Fit a new 'O' ring to the locating plug and insert the plug.
13 Fit a new split pin.
14 Fit the cover to the pump and secure with the two screws.
15 Fit the hexagonal shaft to the crankcase.
16 Refit the oil pump to the engine, see 12.60.26.





DATA

Relief valve spring free length . . . . . 1·70 in (43·18 mm)

TIMING CHAIN COVER

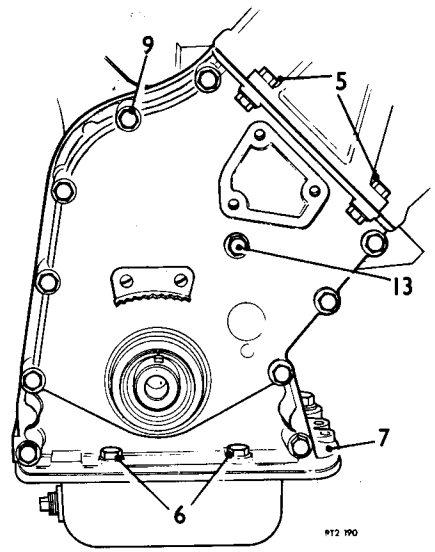
Remove and refit **12.65.01**

Removing

1 Isolate the battery.
2 Remove the radiator, see 26.40.01.
3 Remove the fan unit, see 26.25.06.
4 Remove the alternator, see 86.10.02.
5 Remove the two cylinder head to timing cover nuts and bolts.
6 Remove the two front sump nuts and bolts.
7 Slacken the first four sump bolts both sides of the sump.
CAUTION: Cover the access to the sump to prevent objects falling into the sump.
8 Remove the crankshaft pulley retaining bolt and washer and withdraw the pulley.
9 Remove the ten bolts securing the timing cover to the cylinder block.
10 Remove the alternator adjusting link.
NOTE: There are four different lengths of bolts used to attach the timing cover. To facilitate refitting, keep the bolts in their respective holes in the cover.
11 Withdraw the timing cover and the two halves of the gasket.

Refitting

12 Clean the timing cover and cylinder block mating faces, ensuring that all traces of old gasket and sealing compound are removed.
13 Apply sealing compound to both sides of the gasket halves and fit the timing cover. Secure in position with the ten bolts, ensuring that the centre bolt has a fibre washer under the head. Fit the alternator adjusting link.
14 Refit the crankshaft pulley and secure with the special retaining bolt and plain washer.
15 Refit the two front sump bolts and tighten the eight slackened sump bolts (four each side).
16 Fit and tighten the two cylinder head to timing cover nuts and bolts.
17 Reverse instructions 1 to 4.

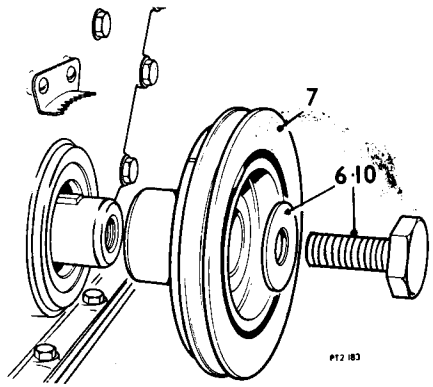


TIMING COVER OIL SEAL

Remove and refit **12.65.05**

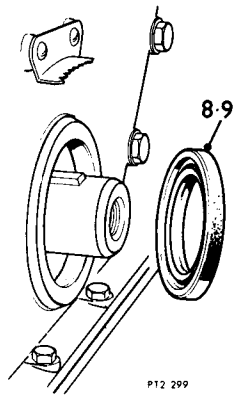
Removing

1 Disconnect the battery.
2 Remove the radiator, see 26.40.01.
3 Slacken the alternator adjustment.
4 Remove the fan belt.
5 Remove the fan unit, see instructions 3 and 4, 26.25.21.
6 Remove the crankshaft pulley retaining bolt and plain washer.
7 Withdraw the crankshaft pulley.
8 Remove the oil seal taking care not to damage the timing cover.



Refitting

9 Grease a new oil seal and with the lip face leading, tap the seal into the timing cover location until flush with the cover.
NOTE: Later-type oil seals are dual lipped.
10 Refit the crankshaft pulley securing with the bolt and washer and tighten to the correct torque.
11 Reverse instructions 1 to 5.

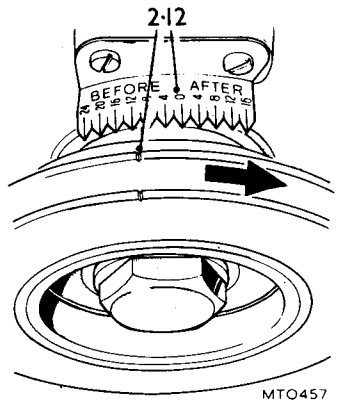


VALVE TIMING

Check and adjust **12.65.08**

Checking

1 Disconnect the battery.
2 Turn the engine over until the timing mark on the crankshaft pulley coincides with the zero mark on the timing cover scale.
3 Remove the distributor cap and check that the rotor arm points to the segment in the cap for No. 1 cylinder.
4 Remove the camshaft rocker cover, see 12.29.42.
5 The valve timing is correct when the timing mark on the camshaft flange is in line with the corresponding groove on the camshaft front bearing cap.

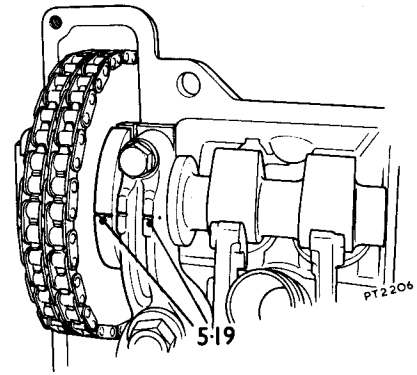


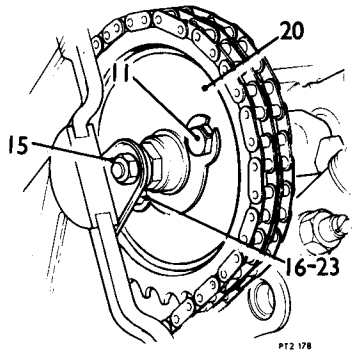
6 Refit the distributor cap.
7 Refit the camshaft rocker cover, see 12.29.42.
8 Reconnect the battery.

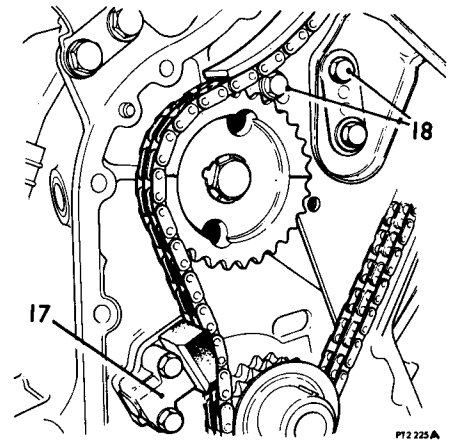
Adjusting

9 Remove the camshaft rocker cover, see 12.29.42.
10 Turn the engine over so that the timing mark on the camshaft flange is 180° distant from the groove on the camshaft front bearing cap.
11 Unlock and remove the exposed bolt securing the camshaft sprocket to the camshaft.
12 Remove the timing chain cover, see 12.65.01.
NOTE: Before actually withdrawing the pulley and removing the cover, turn the engine over so that the timing mark on the crankshaft pulley is in line with the zero mark on the cover scale.
13 Remove the distributor cap and check that the rotor arm points to the segment in the cap that feeds No. 1 cylinder. Refit the cap.
14 Remove the timing cover and pulley.
15 Using a 'slave' nut secure the camshaft sprocket to the support bracket.
16 Unlock and remove the remaining bolt and lock washer securing the camshaft sprocket.
17 Remove the timing chain tensioner, see instructions 2 to 4, 12.65.28.
18 Slacken off the two bolts securing the adjustable guide.
19 Turn the camshaft until the timing mark on the flange is in line with the groove on the front bearing cap.
20 Release the camshaft sprocket from the support bracket, make the necessary adjustment, and whilst keeping the chain taut on the drive side secure the camshaft sprocket to the camshaft flange with one bolt and a new lock washer.
NOTE: Whilst carrying out the above instruction ensure that the position of the jackshaft sprocket does not alter, i.e. the scribe line remains horizontal as described and illustrated in operation 12.65.12, instruction 28.
21 Fit the timing chain tensioner, see instructions 11 to 15, 12.65.28.

continued







22 Fit the timing chain cover, see instructions 12 to 17, 12.65.01, leaving the battery disconnected.
23 Turn the engine over sufficiently to enable the remaining camshaft sprocket retaining bolt to be fitted and locked.
24 Fit the camshaft rocker cover, see 12.29.42.
25 Re-connect the battery.

DATA

Valve timing

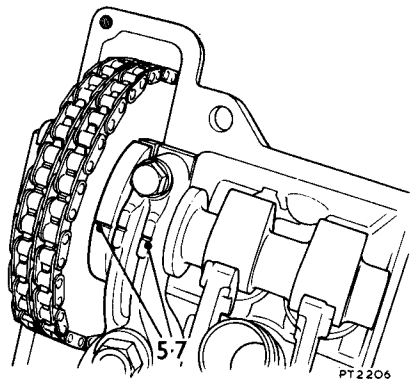
Inlet valves open	14° B.T.D.C.
Close	50° A.B.D.C.
Exhaust valves open	50° B.B.D.C.
Close	14° A.T.D.C.

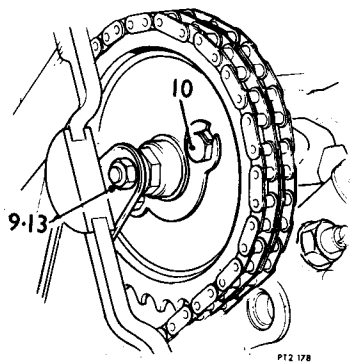
TIMING CHAIN AND SPROCKETS

Remove and refit	**12.65.12**
Timing chain which includes	**12.65.14**
Guides	**12.65.50**

Removing

1 Disconnect the battery.
2 Remove the radiator, see 26.40.01.
3 Remove the rocker cover, see 12.29.42.
4 Remove the timing chain cover, see 12.65.01.
5 Turn the engine over so that the timing mark on the camshaft flange is at the bottom, i.e. 180° distant from the corresponding timing groove in the camshaft front bearing cap. This is necessary to enable the bottom bolt securing the sprocket to the camshaft to be removed.
6 Unlock and remove the bottom bolt securing the sprocket to the camshaft.
7 Turn the engine over until the timing mark on the camshaft flange is in line with the groove in the camshaft front bearing cap, i.e. No. 1 cylinder T.D.C. firing.
8 Remove the crankshaft pulley and timing cover.
9 Secure the camshaft sprocket to the support bracket with a slave nut on the threaded spigot.
10 Unlock and remove the top bolt securing the sprocket to the camshaft.



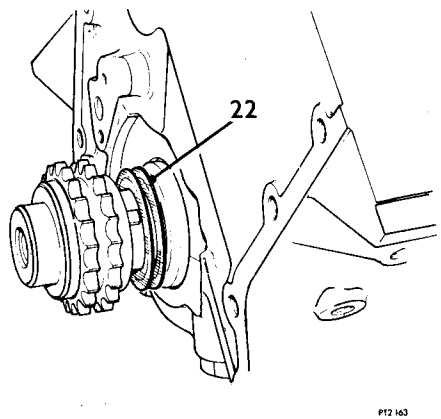


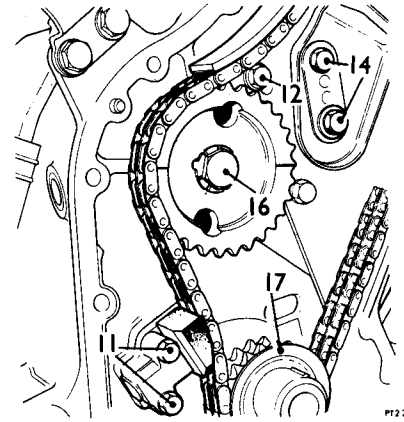
11 Remove the two bolts securing the hydraulic chain tensioner and remove the tensioner and guide plate — the latter being situated between the cylinder block and the tensioner, see 12.65.28.
12 Remove the adjusting bolt from the adjustable chain guide.
13 Remove the 'slave' nut holding the camshaft sprocket to the support bracket.
14 Remove the two bolts securing the support bracket to the cylinder block and withdraw the bracket together with
a the adjustable guide
b the straight fixed guide.
15 Remove the timing chain and camshaft sprocket.
16 Unlock and remove the bolt securing the sprocket to the jackshaft and withdraw the sprocket.
17 Remove the oil thrower from the crankshaft.
18 Withdraw the crankshaft sprocket.
19 Remove the crankshaft key and sprocket alignment shims.

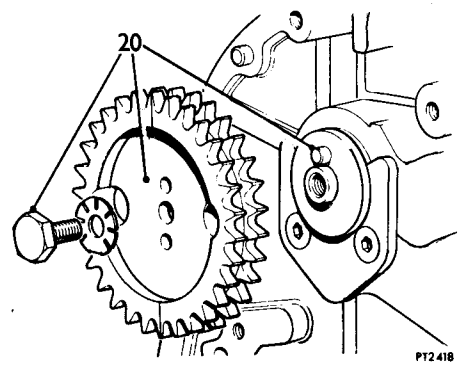
Refitting

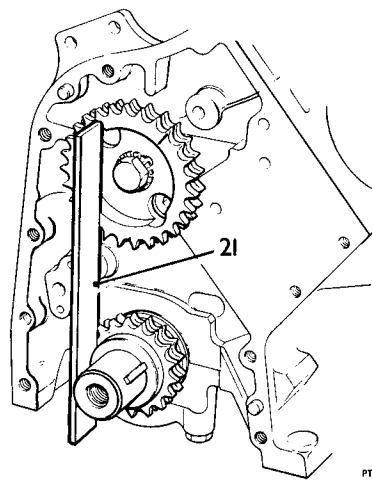
20 Fit the sprocket to the jackshaft, ensuring that the dowel in the jackshaft locates properly in sprocket. Secure with the retaining bolt and new lock washer.
21 Temporarily fit the crankshaft sprocket and check its alignment with the jackshaft sprocket using a straight-edge, as illustrated, across the two sprockets.
22 Adjust any misalignment by the addition of shims behind the crankshaft sprocket.

continued

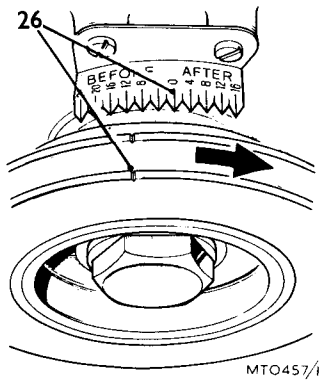


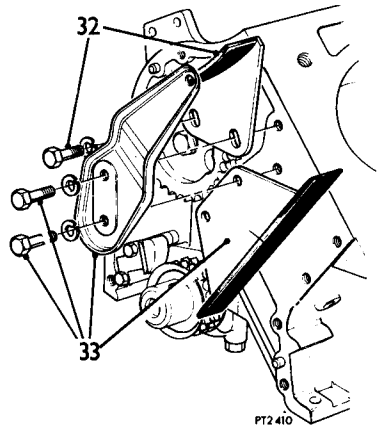


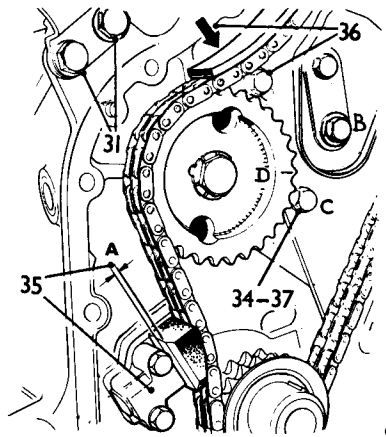




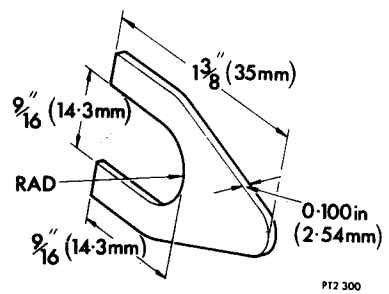
23 Fit the key and the crankshaft sprocket.
24 Fit the oil thrower — dished surface outwards.
25 Check that the timing mark on the camshaft flange is in line with the groove on the camshaft front bearing cap, i.e. No. 1 T.D.C. firing.
26 Temporarily locate the timing cover and crankshaft pulley and check that the timing mark on the pulley coincides with the zero mark on the timing cover scale.
27 Remove the timing cover and pulley and remove the ignition distributor cap.
28 Turn the jackshaft until the scribed line 'D' is equidistant between bolts 'B' and 'C' with the dowel to the left and check that the distributor rotor arm is in line with No. 1 cylinder H.T. lead segment.
29 Encircle the camshaft sprocket with the chain and insert through the cylinder head aperture. Locate the sprocket on the camshaft with the top retaining bolt, see instruction 10.
30 Keeping the chain taut on the drive side (i.e. the run between the camshaft and crankshaft sprocket), fit the chain to the crankshaft and jackshaft sprocket. Check, and if necessary adjust, the position of the jackshaft to maintain the condition in instruction 28.
31 Temporarily remove the engine lifting eye to enable the adjustable chain guide to be fitted.
32 Fit the adjustable chain guide and loosely retain with the adjusting bolt and spring washer.
33 Fit the camshaft sprocket support bracket together with the straight fixed guide and loosely secure with the two bolts and spring washers.
34 Fit a 'slave' bolt to the lower hole in the fixed guide to ensure alignment when fitting the timing cover centre bolt.
35 Fit the timing chain tensioner and guide and insert a 0·100 in (2·54 mm) slip gauge or feeler gauge between the body of the tensioner and the back of the slipper, dimension 'A'.
NOTE: A suitable slip gauge can be made for the purpose by following the dimensioned illustration.

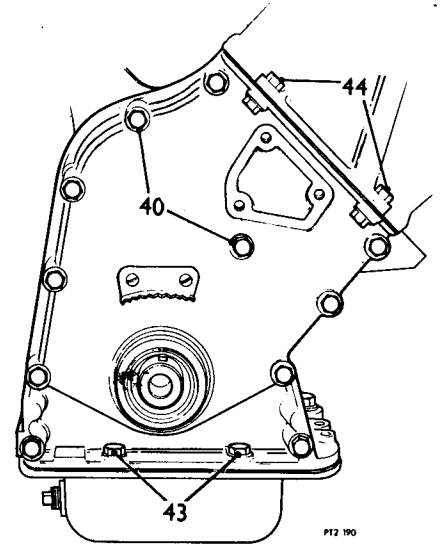


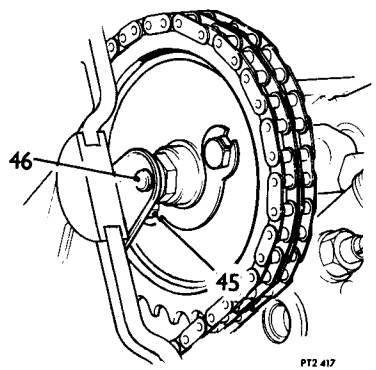




36 Adjust the chain tension by applying pressure to the adjustable guide in direction of arrow and tighten the adjusting bolt. Withdraw the slip gauge.
37 Tighten the remaining chain guide retaining bolts and remove the slave bolt.
38 Check that the scribed line 'D' on the jackshaft sprocket is positioned as described in instruction 28.
39 Apply jointing compound to both sides of both new gaskets and place in position on the cylinder block.
40 Locate the timing chain cover over the two dowels and secure with the retaining bolts. Ensure that the centre bolt is fitted with a fibre washer under the head.
41 Fit the alternator adjusting link.
42 Temporarily fit the crankshaft pulley and check that the timing mark on the pulley is in line with the zero mark on the timing chain cover and the mark on the camshaft flange coincides with the groove on the camshaft front bearing cap. Remove the pulley.
43 Remove the protective material guarding access to the sump and fit the two front sump bolts and tighten the slackened side bolts, see 12.65.01.
44 Fit the two nuts and bolts securing the timing cover to the cylinder head.
45 Turn the camshaft 180° and fit the remaining camshaft retaining bolt. Lock both bolts with the tab washers. Refer to 12.13.01, instructions 17 and 18.
46 Check that the threaded spigot on the camshaft sprocket does not foul the location hole in the support bracket.
47 Fit the rocker cover.
48 Fit the crankshaft pulley.
49 Fit the fan unit assembly.
50 Fit the radiator, see 26.40.01.
51 Re-connect the battery.







TIMING CHAIN TENSIONER

Remove and refit **12.65.28**

Removing

1 Remove the timing chain cover, see 12.65.01.
2 Remove the tensioner retaining bolts and spring washers.
3 Remove the tensioner from the engine.
4 Remove the backplate between the tensioner body and cylinder block.

Dismantling

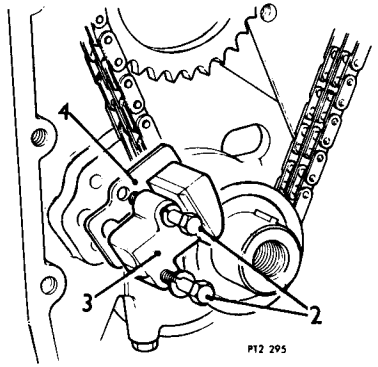
5 Press in the slipper and remove it from the tensioner body.
6 Remove the ratchet and spring.

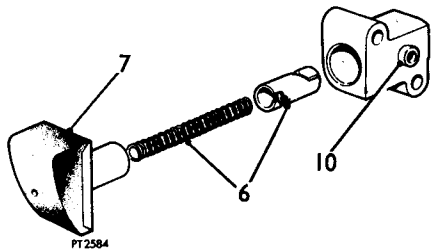
Examination

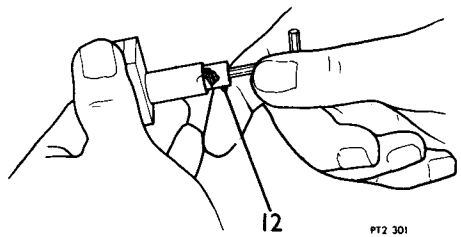
7 Check the slipper pad for wear, and renew if necessary. Check that the oil outlet hole is clear.
8 Examine the ratchet for wear and renew if suspect.
9 Check the spring and renew if broken or not in accordance with DATA.
10 Examine the tensioner body and check that the oil inlet hole is clear.

Reassembling

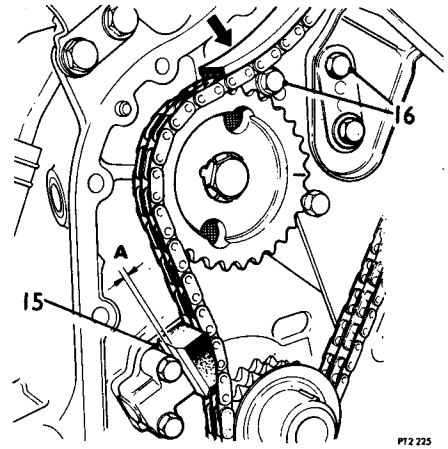
11 Insert the spring into the slipper bore.
12 Fit the ratchet into the bore and turn clockwise with an Allen key to lock it in a retracted position.
13 Fit the slipper assembly to the tensioner body.
NOTE: To prevent the tensioner releasing while fitting, insert a spacer between the tensioner body and the back of the slipper.
14 Fit the tensioner assembly and backplate to the cylinder block, taking care not to allow the tensioner to release. Secure with the two bolts and spring washers.







15 Insert a 0·100 in (2·54 mm) feeler gauge or slip gauge (see Note below) between the slipper and tensioner body, dimension A.
NOTE: A convenient slip gauge can be made for the purpose by following the dimensioned drawing, see 12.65.12.
16 Slacken the two bolts securing the top chain guide.
17 Press down — in direction of arrow — on top of the chain guide until the feeler or special slip gauge is a sliding fit.
18 Whilst holding the guide and tensioner in this position tighten the two guide bolts.
19 Remove the feeler or slip gauge.
20 Refit the timing chain cover, see 12.65.28.



DATA

Tensioner spring — free length	2·750 in (69·8 mm)

TIMING CHAIN GUIDES

Remove and refit **12.65.50**

This operation is included under 12.65.12.

TAMPERPROOF CARBURETTERS

Data and description **19.00.00**

Later vehicles may be fitted with tamperproof carburetters and the amount of attention that can be given to these units can be the subject of legislation in various territories.

They can be identified by a sealed mixture control nut (A), throttle return springs (B) acting directly on the throttle butterfly spindles and may have incorporated in them a capstat temperature compensated jet (C), a ball bearing suction chamber assembly (D) and a sealed slow-running adjustment screw (E).

The purpose of these carburetters is to control more stringently the air/fuel mixture entering the engine combustion chambers and, in consequence, the exhaust gas emissions leaving the engine.

For this reason the only readily accessible external adjustment on these carburetters is to the throttle settings for fast idle speed, using the screw (F).

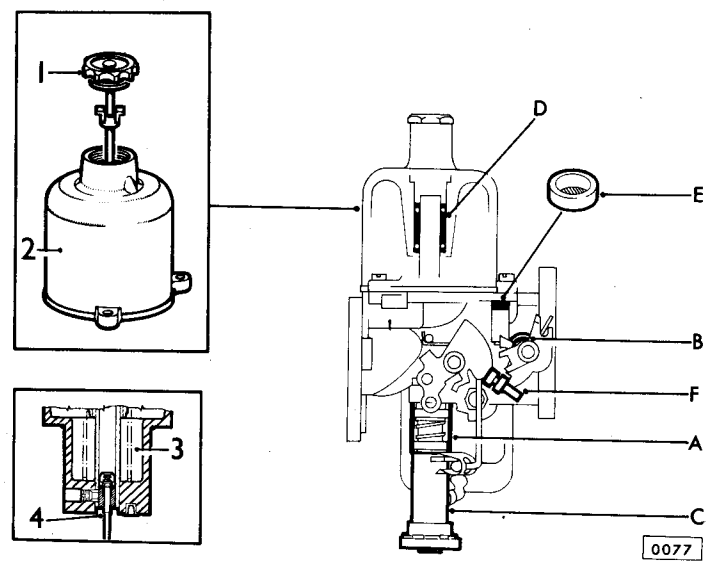
DISMANTLING THE CARBURETTERS

Should it be necessary, the float-chamber cover may be removed for access to the float or the float-chamber needle valve, refer to operation 19.15.24.

Otherwise, dismantling these carburetters is normally limited to removing the piston damper assembly (1), removing the suction chamber (2) and withdrawing the piston (3) complete with needle assembly (4), for the purpose of cleaning these components or replacing the needle assembly.

ONLY THE CORRECT NEEDLE ASSEMBLY FOR THE SPECIFIC MODEL AND OF THE TYPE REMOVED MAY BE FITTED.

CAUTION: Dismantling the carburetter unit beyond that described above; or unauthorized breaking of the mixture control or slow-running control seals and adjustment of the settings; or the fitting of an incorrect needle assembly, may render the vehicle user liable to legal penalties according to local territory legislation.



Should it be unavoidable and be permitted by local territory legislation, the mixture and slow-running adjustments may be altered. Remove the respective seals and adhere strictly to operation 19.15.02. Use an approved type CO meter as a final emissions level check and fit new sealing devices as required by local territory legislation.

NEEDLE ASSEMBLY

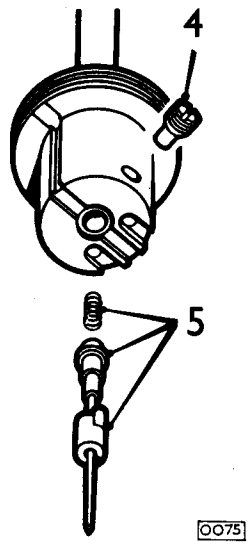
The needle is of a specific type, and with its related components is an assembly which may be peculiar to the model. Therefore it should always be replaced as an assembly.

Removing

1 Mark the suction chamber for reassembly.
2 Remove the suction chamber.
3 Lift off the spring and remove the piston complete with the needle assembly.
NOTE: If the piston damper has not been removed, the suction chamber, spring and piston will lift off together.
4 Release the screw holding the needle assembly.
5 Withdraw the needle assembly.

Refitting

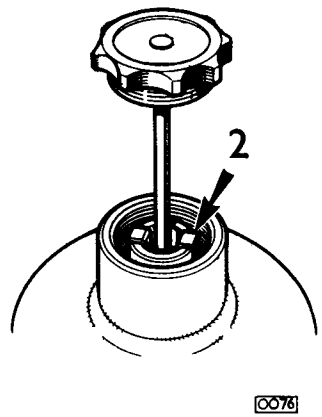
6 Fit the needle assembly to the piston following operation 19.15.18, instruction 37.
7 Reverse instructions 1 to 4, ensuring that the spring is not twisted as the suction chamber is lowered onto the carburetter.



BALL BEARING SUCTION CHAMBER PISTON DAMPER

Removing

1 Unscrew the plug and withdraw the damper to its fullest extent.



2 Force the damper upwards under steady pressure to release the clip from the piston, taking care not to bend the damper rod.

Refitting

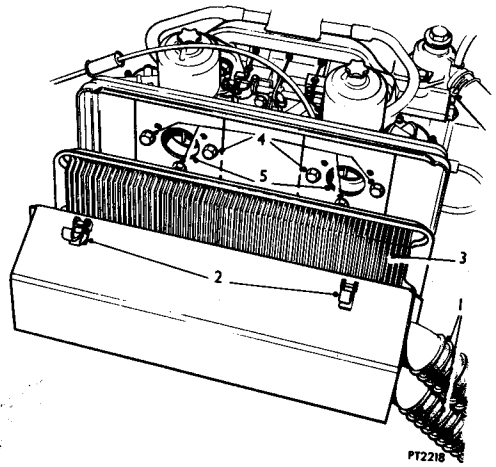
3 Remove the carburetter air cleaner element to give access to the carburetter piston.
4 Using finger pressure to prevent the piston moving downwards, insert the damper assembly into the suction

chamber and engage the clip securely into the piston.
NOTE: It is essential that the clip is securely seated in the piston rod. Should the clip be damaged or broken, it must be replaced.

5 Refit the air cleaner element.
6 Top up the piston damper oil level following the special procedure for this type of carburetter outlined in the Maintenance Section.
7 Screw the plug firmly into position.

AIR CLEANER

Remove and refit **19.10.02**



Removing
1 Disconnect the two hoses from the air cleaner intake.
2 Release the two clips and disengage the lower lip of the cover from the body.
3 Withdraw the element.
4 Remove the body — six bolts.
NOTE: On later models the air cleaner backplate is attached to the throttle linkage bracket with a bolt, washer and nut.

Refitting
5 Refit the body, ensuring that the two gaskets are correctly positioned when installing the bolts.
6 Install the element with the raised edge facing outwards.
7 Reverse instructions 1 and 2.

AIR CLEANER

Renew element **19.10.09**

Access to the element is obtained by raising the two clips securing the cover to the body. When installing a new element ensure that the raised edge faces outwards.

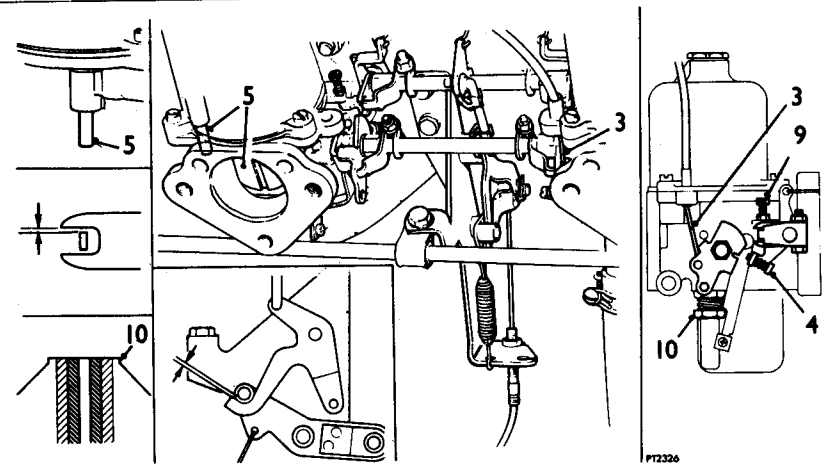
CARBURETTERS

Tune and adjust **19.15.02**

When tamperproof carburetters are fitted refer to 19.00.00.

Idling
It is essential that the ignition timing, tappet clearance, distributor contact breaker and plug gaps are checked and adjusted before tuning the carburetters.
Carburetter tuning must be confined to setting the idle and fast idle speeds and mixture at idle speed. A reliable tachometer and a carburetter intake balance meter should be used.
IMPORTANT: Where a vehicle must conform to exhaust emission control regulations, adjustments should only be carried out if a reliable balancing meter and an exhaust gas analyser (CO meter) are available.

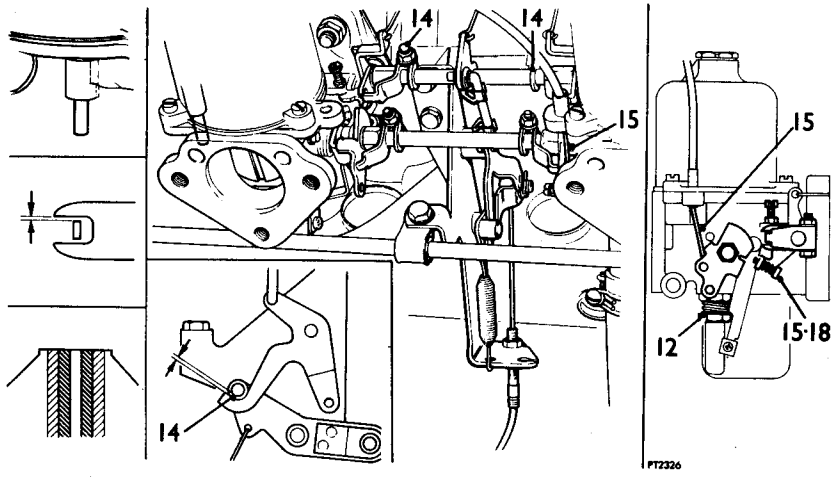
1 Remove the air cleaner element, and top up the carburetter piston dampers if necessary.
2 Check that the throttle functions correctly.
3 Ensure that the mixture control (choke) will return fully, that the cables have $\frac{1}{16}$ in (2 mm) free play before they start to pull on their levers.
4 Check that a small clearance exists between the fast idle screws and their cams.



5 Raise each lifting pin, then release and check that the piston falls freely. If the piston fails to fall freely, see operation 19.15.28.
6 Start the engine, run it at a fast idle speed until it attains normal temperature, and continue for a further five minutes.
7 Increase the engine speed to 2,500 rev/min for 30 seconds.
NOTE: Tuning can now be commenced. If the adjustments cannot be completed within three minutes, increase the engine speed to 2,500 rev/min for 30 seconds and then continue tuning. Repeat this clearing procedure at three-minute intervals until tuning is completed.
8 Check the idle speed, see DATA, and check the carburetters for balanced air intake using a balance meter.
9 If the balance is not correct, adjust by turning the throttle adjusting screw on one of the carburetters. Then adjust the idle speed by turning the throttle adjusting screw on each carburetter by the same amount until the correct idle speed is obtained.
Re-check the carburetter balance.
Check the throttle shaft pin clearance, and adjust if necessary, see item 14.
If a smooth idle at the correct speed and balance is not obtainable, adjust the idle speed mixture setting as follows:

Mixture
10 Stop the engine. Raise each piston in turn and turn the jet adjusting nuts up until the jets are flush with the bridge of the carburetter or as high as possible without exceeding the bridge height. Ensure that both jets are in the same relative position to the bridge of their respective carburetters. Turn the jet adjusting nut on each carburetter down two complete turns. Top up the piston damper oil levels.
NOTE: This operation need not be carried out if it is known that the jets are in the same relative position.
11 Re-start the engine and run it at idle speed.
12 Turn the jet adjusting nut on each carburetter in the same direction, one flat at a time, up to weaken or down to enrich, until the fastest speed is recorded on the tachometer. Now turn both nuts up slowly until the speed just commences to fall. Turn the nuts down equally very slowly by the minimum amount until the maximum speed is regained.
13 Re-check the idle speed and carburetter intake balance; adjust as necessary with the throttle adjusting screws.

continued



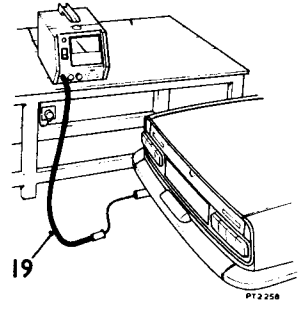
14 Slacken the clamps on the linkshaft. Using feeler gauges to the value of 0·055 to 0·060 in (1·5 mm) between the roller and the corner of the progression lever as shown, and allowing the spring to take up any backlash in the linkage, rotate each lever to touch the lower edge of the forked lever. Re-tighten the clamps.

15 Ensure that the mixture control cable has $\frac{1}{16}$ in (2 mm) free movement before it starts to pull on the lever. Unscrew the fast idle adjusting screws until they are well clear of the cams.

16 Pull out the mixture control knob until the linkage is about to move the carburetter jet, and lock the control in this position.

17 Turn each fast idle adjusting screw until it just contacts its cam and then turn each screw equally to give the correct fast idle speed, see DATA.

18 Unlock and return the mixture control. Stop the engine. Refit the air cleaner element.



19 Insert the exhaust gas analyser probe as far as possible into the exhaust pipe and check the CO reading.

DATA

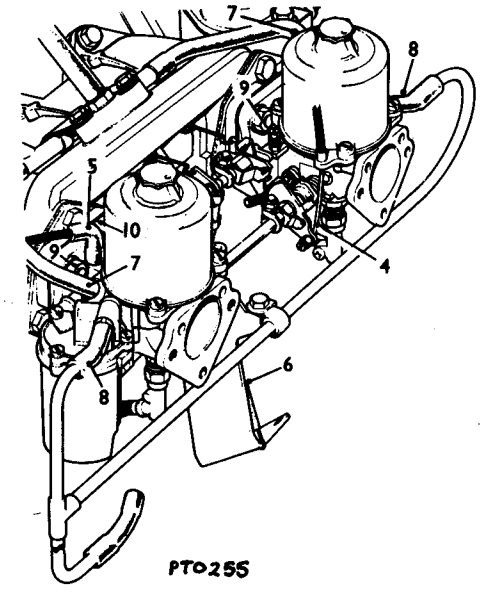
Engine

Idling speed	650 to 850 rev/min
Fast idling speed	1,100 to 1,300 rev/min
CO level at idling speed	2·5 to 4·5%

CAUTION: Emission levels can be the subject of local territory legislation and may be changed from time to time. Ensure that the current local territory standards are applied.

CARBURETTERS

Remove and refit **19.15.11**



Removing

1 Disconnect the battery.
2 Remove the air cleaner, see 19.10.02.
3 Disconnect the throttle cable from the linkage bracket, see 19.20.06, instructions 1 to 4.
4 Disconnect the mixture control cable.
5 Disconnect the vacuum hose from the carburetter.
6 Remove the throttle linkage, see 19.20.07.
7 Disconnect the engine breather hoses from the carburetters.
8 Disconnect the fuel pipes from the carburetters, and on later models only — disconnect the overflow pipe from the front carburetter float-chamber lid.
9 Remove the eight nuts securing the carburetters to the spacers and separate the carburetters from the manifold assembly.
10 Remove the two outer gaskets from the intake manifold.

Refitting

11 Fit new outer gaskets to the inlet manifold.
12 Reverse instructions 1 to 9.
13 Check and adjust the carburetter settings, see 19.15.02.

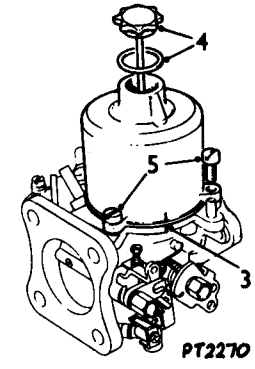
CARBURETTERS

Overhaul and adjust **19.15.18**

Where tamperproof carburetters are fitted refer to 19.00.00

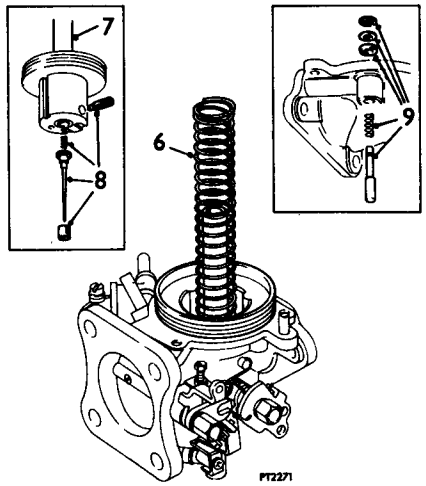
Dismantling

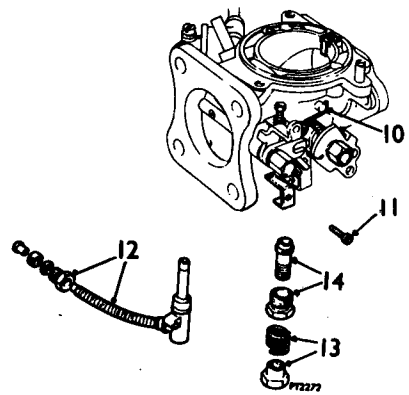
1 Remove the carburetter assembly, see 19.15.11.
2 Thoroughly clean the outside of the carburetter.

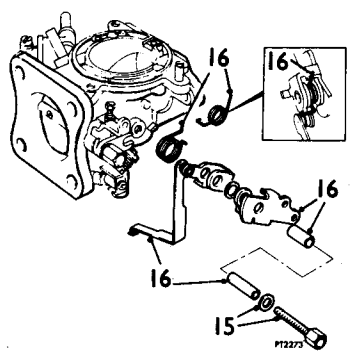


3 Mark the suction chamber to ensure it is refitted to the same body.
4 Remove the damper and its washer.
5 Unscrew the suction chamber securing screws and lift off the chamber.
6 Remove the piston spring.
7 Carefully lift out the piston assembly and empty the oil from the piston rod.
8 Remove the guide locking screw and withdraw the needle assembly, taking care not to bend the needle. Withdraw the needle from the guide and remove the spring from the needle.

9 Where fitted, push the piston lifting pin upwards, detach its securing circlip and washers and withdraw the pin and spring downwards.
10 Release the pick-up lever return spring from its retaining lug.
11 Support the plastic moulded base of the jet and remove the screw retaining the jet pick-up link and link bracket.
12 Unscrew the flexible jet tube sleeve nut from the float-chamber and withdraw the jet assembly. Note the gland, washer and ferrule at the end of the jet tube.
13 Remove the jet adjusting nut and spring.
14 Unscrew the jet locking nut and detach the nut and jet bearing; withdraw the bearing from the nut.
15 Unscrew and remove the lever pivot bolt and spacer.
16 Detach the lever assembly and return springs, noting the pivot bolt tubes and the location of the cam and pick-up lever springs.
17 Unscrew the securing bolt and remove the float-chamber and spacer.
18 Mark the float-chamber lid location.
19 Remove the lid securing screws and detach the lid with its joint washer and float. Retain the part number tag.
20 Hold the float hinge pin at its serrated end and withdraw the pin and float.
21 Extract the float needle from its seating and unscrew the seating from the lid.
22 Close the throttle and mark the relative position of the throttle disc and the carburetter flange.
23 Press the split ends of the disc retaining screws together and remove the screws. Open the throttle and remove the disc from its slot in the throttle spindle.
24 Release the lock washer tabs securing the spindle nut; remove the nut and detach the fork lever, lever arm, washer and throttle spindle; note the location of the lever arm in relation to the spindle and carburetter body.







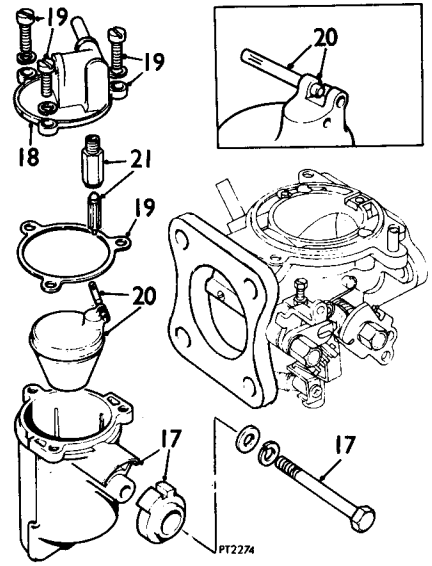
Inspecting

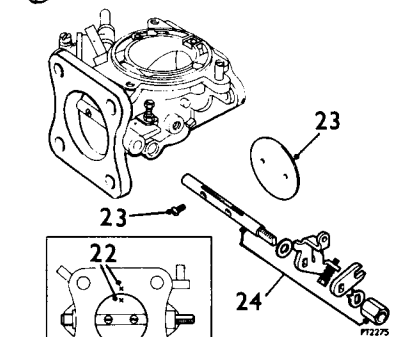
25 Examine the components as follows:
- a Check the throttle spindle in the body for excessive play, and renew if necessary.
- b Examine the float needle for wear, i.e. small ridges or grooves in the seat of the needle, and ensure that the spring-loaded plunger on the opposite end operates freely. Replace the needle and seating if necessary.
- c Inspect all other components for wear and damage; renew unserviceable components.

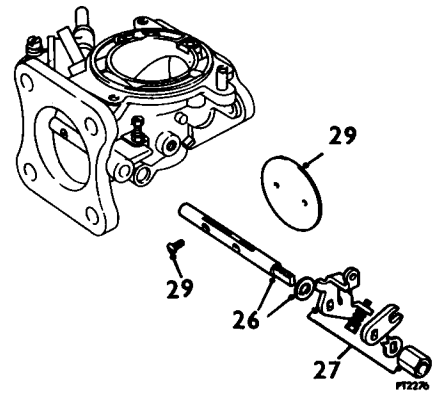
Reassembling

26 Refit the spindle to the body, with the countersunk holes in the spindle facing outwards.
27 Assemble the spacing washer, lever, fork lever, lock washer and securing nut, ensure that the idling stop on the lever is against the idling screw abutment on the body in the closed throttle position. Tighten the spindle nut and lock with the tab washer.
28 Insert the throttle disc into the spindle slot; note the markings for reassembling. Manoeuvre the disc in the spindle until the throttle can be closed, snap the throttle open and closed to centralize it in the bore of the carburetter.
29 Fit new disc retaining screws but do not fully tighten, check that the disc closes fully and adjust its position as necessary. Tighten the screws fully and spread their split ends just enough to prevent them turning.

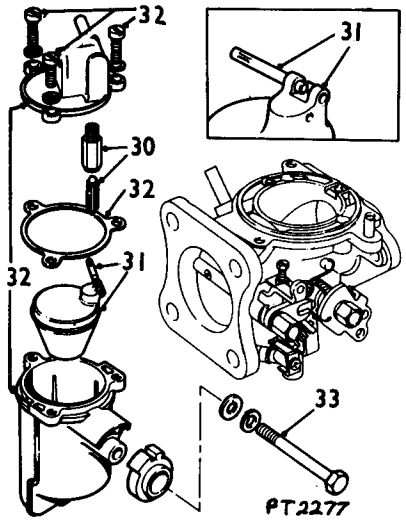
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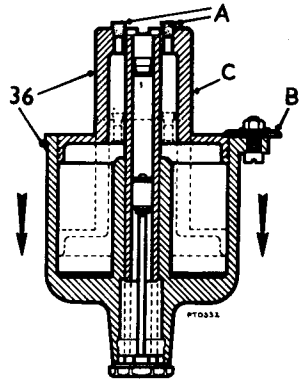


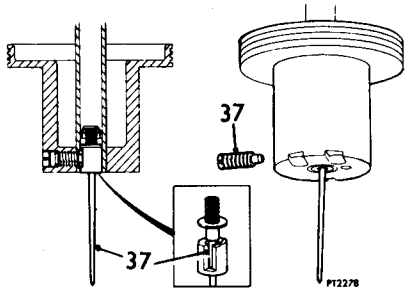


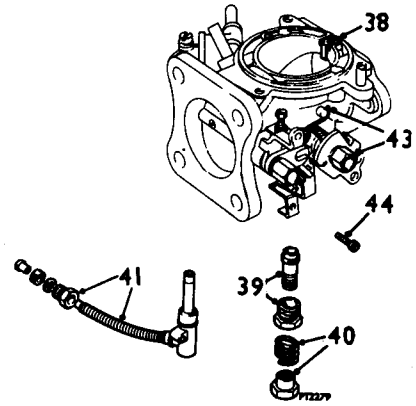


30 Screw the seating into the float-chamber lid; do not overtighten. Insert the needle, coned-end first, into the seating.
31 Refit the float to the chamber lid and insert the hinge pin.
32 Refit the float-chamber lid with a new joint washer, noting the assembly markings; tighten the securing screws evenly.
33 Refit the float-chamber to the body and tighten the retaining bolt.
34 Where fitted, refit the piston lifting pin, spring and circlip.
35 Clean fuel deposits off the suction chamber and piston with fuel or methylated spirit and wipe dry.
CAUTION: Do not use an abrasive.
36 Check the operation of the suction chamber and piston (without the spring fitted) as follows:
   a Refit the damper and washer to the suction chamber; temporarily plug the piston transfer holes with rubber plugs or Plasticine and insert the piston fully into the suction chamber.
   b Secure a large flat washer to **one** of the fixing holes with a screw and nut so that it overlaps the bore.
   c With the assembly upside-down, hold the piston and check the time taken for the suction chamber to fall the full extent of its travel. The time taken should be five to seven seconds; if this time is exceeded, check the piston and chamber for cleanliness and mechanical damage. Renew the assembly if the time taken is still not within these limits.
   NOTE: This operation is not applicable to tamperproof carburetters.
37 Fit the spring and guide to the needle, ensuring that any matching indent in the collar and guide are engaged. Insert the assembly into the piston (with the shoulder of the needle flush with the underside face of the piston) and the slot in the guide positioned adjacent to the needle guide locking screw. Fit a new guide locking screw.
38 Check the piston key in the body for security.









39 Refit the jet bearing; fit and tighten the jet locking nut.
40 Refit the spring and jet adjustment nut; screw the nut up as far as possible.
41 Insert the jet into the bearing, fit the sleeve nut, washer and gland to the end of the flexible tube (if removed). The tube must project a minimum of $\frac{3}{16}$ in (4·8 mm) beyond the gland. Tighten the sleeve nut until the gland is compressed; overtightening can cause leakage.
42 Refit the piston, spring and suction chamber to the body (noting the assembly marks) and tighten the securing screws evenly.
43 Reverse the procedure in 15 and 16.
44 Hold up the choke lever to relieve pressure on the jet pick-up link, refit the link bracket; support the end of the moulded jet and tighten the securing screw.
45 Screw the jet adjusting nut down two complete turns (12 flats) to provide the initial setting.
46 Refit the carburetters, see 19.15.11.
47 Tune and adjust the carburetters, see 19.15.02.

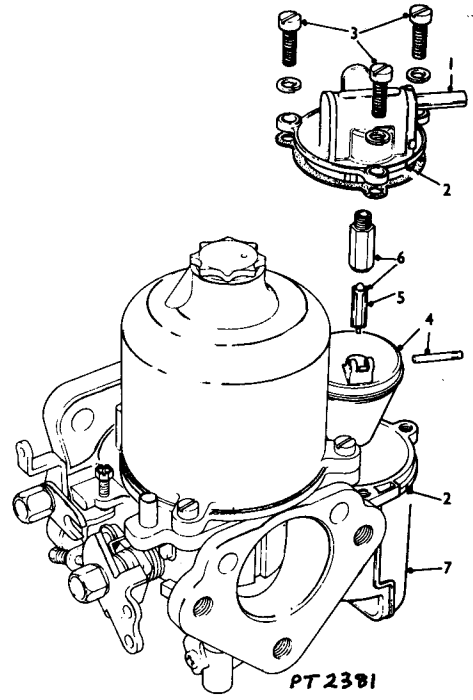
DATA

Carburetters

Mounting angle	Horizontal
Piston springs: AUD 545 specification	Yellow
Jet size—red base	0·100 in (2·54 mm)
Needles: AUD 545 specification	BCM
Tamperproof carburetters FZX 1257	BDQ

FLOAT-CHAMBER NEEDLE AND SEAT

Remove and refit—each **19.15.24**



Removing

1 Disconnect the fuel hose from the float-chamber, and on later models front carburetter only — disconnect the overflow pipe from the float-chamber lid.
2 Mark the lid and float-chamber for assembly.
3 Remove the lid securing screws and detach the lid.
4 Hold the float hinge pin at its serrated end and withdraw the pin and float.
5 Extract the float needle from its seating.

Inspecting

6 Examine the float needle for wear, i.e. small ridges or grooves in the seat of the needle; also check that the spring-loaded plunger on the opposite end operates freely. Renew the needle and seating if the needle is worn.

Refitting

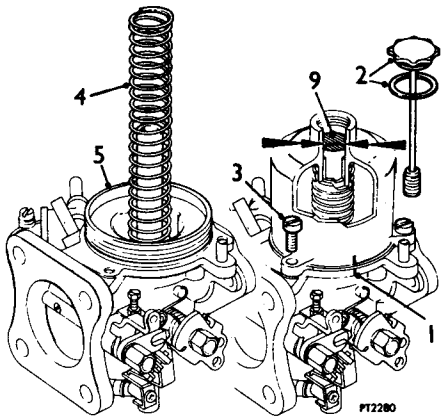
7 Clean any sediment from the float-chamber, and fit a new joint washer if required.

8 Reverse instructions 1 to 5.

PISTON AND SUCTION CHAMBER

Clean and refit **19.15.28**

Where tamperproof carburetters are fitted refer to 19.00.00.



Removing

1 Mark the suction chamber to ensure it is refitted to the same body.

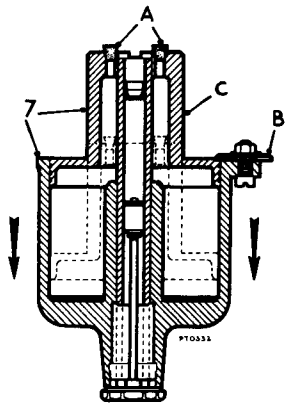
2 Remove the damper and its washer.

3 Unscrew the suction chamber securing screws and lift off the chamber.

4 Remove the piston spring.

5 Carefully lift out the piston assembly and empty the oil from the piston rod.

6 Clean fuel deposits off the suction chamber and piston with fuel or methylated spirit and wipe dry.
CAUTION: Do not use abrasives.



7 Check the operation of the suction chamber and piston (without the spring fitted) as follows:

a Refit the damper and washer to the suction chamber; temporarily plug the piston transfer holes with rubber plugs or Plasticine and insert the piston fully into the suction chamber.

b Secure a large flat washer to **one** of the fixing holes with a screw and nut so that it overlaps the bore.

c With the assembly upside-down, hold the piston and check the time taken for the suction chamber to fall the full extent of its travel. The time taken should be five to seven seconds; if this time is exceeded, check the piston and chamber for cleanliness and mechanical damage. Renew the assembly if the time taken is still not within these limits.

NOTE: This operation is not applicable to tamperproof carburetters.

Refitting

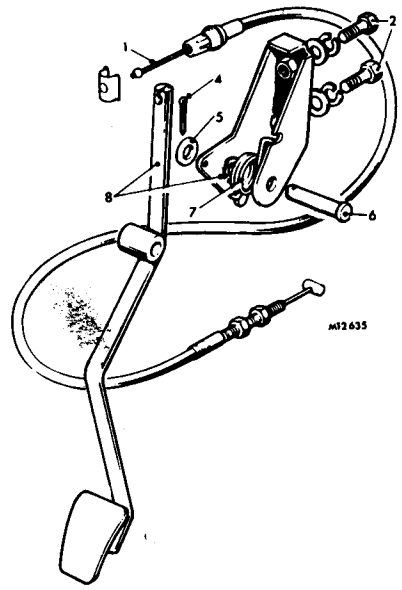
8 Refit the piston, spring and suction chamber to the carburetter (noting the assembly marks) and tighten the screws evenly.

9 Top up each piston damper with the recommended oil until the level is $\frac{1}{2}$ in (13 mm) above the top of the hollow piston rod.

10 Refit each piston damper.

THROTTLE PEDAL

Remove and refit **19.20.01**



Removing

1 Disconnect the throttle cable from the pedal.

2 Working from the engine compartment, remove the two bolts securing the throttle pedal bracket to the bulkhead.

3 Remove the throttle pedal assembly from the inside of the car.

4 Remove the split pin.

5 Remove the plain washer.

6 Remove the clevis pin.

7 Remove the return spring.

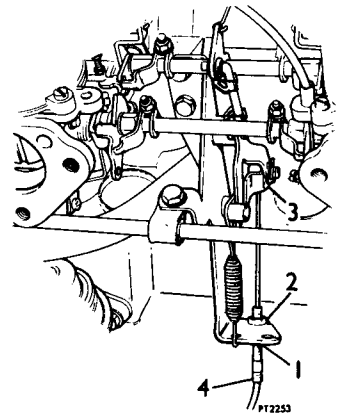
8 Remove the pedal and wavy washer.

Refitting

9 Reverse instructions 1 to 8.

THROTTLE CABLE

Remove and refit **19.20.06**



Removing

1 Slacken the throttle cable adjusting locknut on the carburetter linkage bracket.

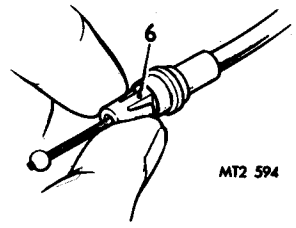
2 Remove the upper nut from the outer cable threads.

3 Disconnect the inner cable from the bell-crank arm.

4 Remove the cable complete from the linkage bracket.

5 Remove the cable retaining clip from the fork of the throttle pedal and lift out the inner cable, see 19.20.01.

continued

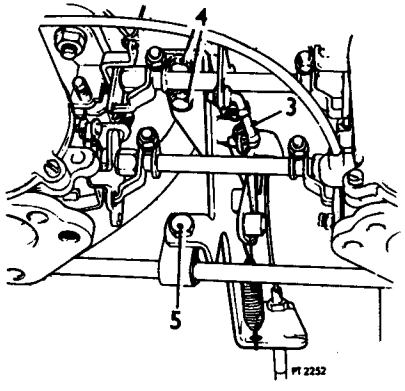


6 Squeeze together the ears of the nylon ferrule securing the outer cable to the bulkhead and push the assembly through the bulkhead from inside the car.
7 Remove the cable complete.

Refitting
8 Push the throttle pedal end of the cable through the hole in the bulkhead from the engine compartment until the ferrule locks the assembly into position.
9 Reverse instructions 1 to 5.

THROTTLE LINKAGE

Remove and refit **19.20.07**

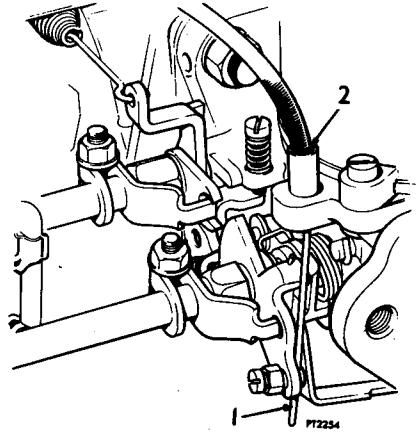


Removing
1 Remove the air cleaner, see 19.10.02.
2 Disconnect the throttle cable, see 19.20.06, instructions 1 to 4.
3 Disconnect the rod between the linkage and the throttle interconnection lever.
4 Remove the two bolts securing the linkage bracket to the manifold.
5 Remove the one nut and bolt securing the linkage bracket to the fuel pipe clip (earlier models) or the air cleaner cover (later models).

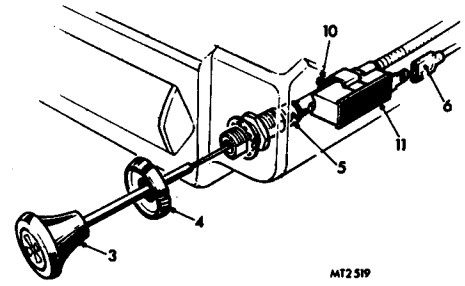
Refitting
6 Reverse instructions 1 to 5.

MIXTURE CONTROL CABLE

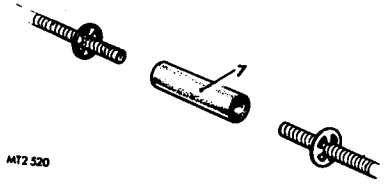
Remove and refit **19.20.13**



Removing
1 Disconnect the exposed end of the inner cable from the trunnion on the carburetter.
2 Release the outer cable from the clip on the carburetter.



3 Working inside the car, pull the mixture control knob and remove the inner cable complete.
4 Carefully remove the bezel securing the outer cable assembly to the heater variable outlet moulding.
5 Remove the cable assembly from the moulding.
6 Disconnect the lead to the choke indicator switch.

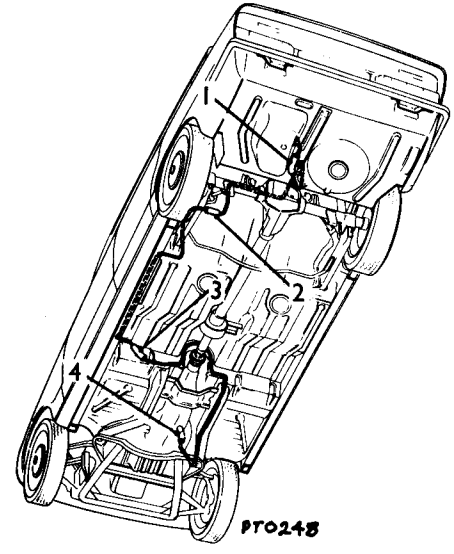


7 Working within the engine compartment, separate the carburetter section of the outer cable from the interior section at the rubber connector.
8 Remove the carburetter section of the cable.
9 Remove the interior section from within the car.
10 Slacken the grub screw securing the choke indicator switch to the outer cable.
11 Remove the switch.

Refitting
12 Reverse instructions 1 to 11.

PETROL PIPE — MAIN LINE ASSEMBLY

Remove and refit **19.40.01**



Removing
1 Disconnect the main line pipe from the fuel tank outlet pipe and drain the tank.
2 Unclip and disconnect the rear pipe section from the centre section.
3 Unclip and disconnect the centre section from the engine end section.
4 Disconnect and unclip the engine end section from the fuel pump.

Refitting
5 Reverse instructions 1 to 4, ensuring that:
a New rubber connectors are fitted if the originals are cracked or damaged.
b The connecting ends of each pipe section are in line, thereby avoiding strain on the connectors.
c Pipes are not chafing or fouling the body or components.
d On later models the fuel pipe clips are securely positioned.

PETROL PIPE — ENGINE END SECTION

Remove and refit **19.40.04**

Removing

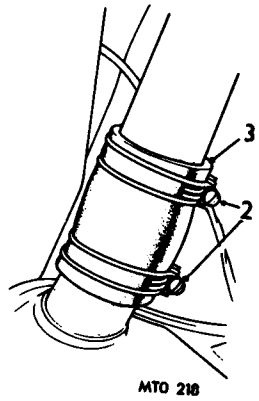
1 Drain the fuel tank.
2 Disconnect the engine end pipe section from the centre section.
3 Disconnect the engine end section from the fuel pump.

Refitting

4 Reverse instructions 1 to 3, ensuring that:
- a New rubber connectors are fitted if the originals are cracked or damaged.
- b The connecting ends of the pipe sections are in line, thereby avoiding any strain on the connectors.
- c The pipe is not chafing or fouling the body or components.
- d On later models the fuel pipe clips are securely positioned.

HOSE — FILLER TO TANK

Remove and refit **19.40.19**



Removing

1 Remove the L.H. luggage compartment trim pad — one screw and one fastener.
2 Disconnect the hose clips.
3 Slide the hose downwards off the filler pipe and pull upwards off the tank extension.

Refitting

4 Reverse instructions 1 to 3.

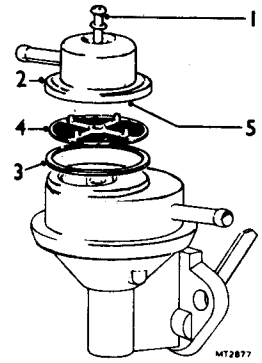
FUEL PUMP

Test on vehicle **19.45.01**

1 Connect a pressure gauge into the pump to carburetter fuel line.
2 Start the engine, and observe the pressure which should be 2·5 lbf/in² (0·17 to 0·35 kgf/cm²).
3 Remove the pressure gauge.
NOTE: Where pressure is high, it may be reduced by fitting extra paper washers between the pump and cylinder block. Where pressure is too low, renew the pump, see 19.45.08.

FUEL PUMP

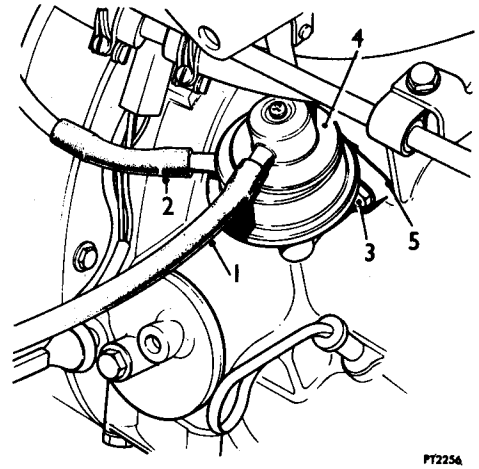
Clean filter **19.45.05**



1 Remove the screw in the top of the pump.
2 Lift off the dome.
3 Remove the dome sealing ring.
4 Lift out the filter.
5 Clean sediment from the pump dome and blow out the filter.
6 Examine the dome seal; renew if necessary.
7 Fit the filter and dome, tighten the retaining screw.

FUEL PUMP

Remove and refit **19.45.08**



Removing

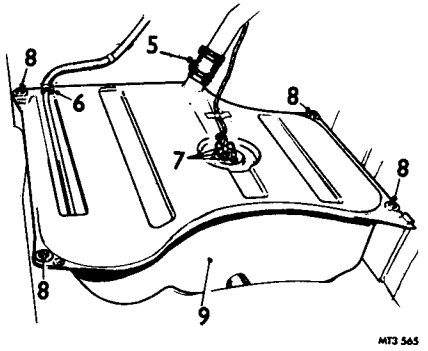
1 Disconnect the pipe from the inlet side of the pump.
2 Disconnect the pipe from the outlet side of the pump.
3 Remove the two bolts complete with washers securing the pump to the cylinder block.
4 Withdraw the pump.
5 Remove the gasket.

Refitting

6 Reverse instructions 1 to 5, ensuring that:
- a The gasket between the pump and the cylinder block is renewed.
- b On later models the fuel pipe clips are securely positioned.
- c The inlet and outlet pump connections are checked for leaks.

FUEL TANK

Remove and refit 19.55.01



Removing

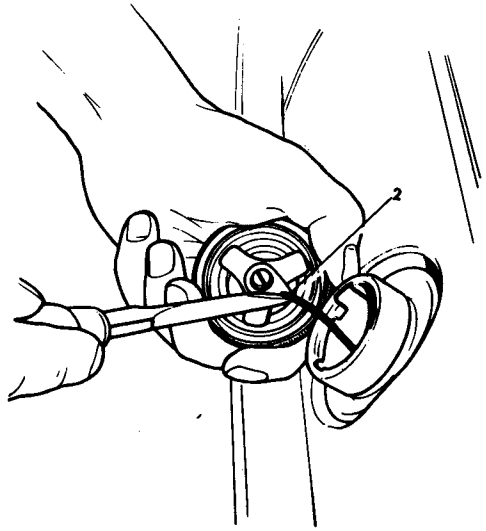
1 Isolate the battery and extinguish all naked lights.
2 Disconnect the main line fuel pipe from the tank outlet pipe and drain the tank.
3 Remove the luggage compartment carpet, spare wheel cover and spare wheel.
4 Remove the trim pad on the L.H. side of the luggage compartment.
5 Disconnect the hose linking the filler pipe to the tank, see 19.40.19.
6 Disconnect the breather hose from the tank breather pipe.
7 Disconnect the leads from the fuel tank gauge unit.
8 Remove the four bolts complete with washers securing the fuel tank to the body.
9 Lift out the tank, taking care not to damage the tank outlet pipe.

Refitting

10 Reverse instructions 1 to 9.

FUEL FILLER CAP

Remove and refit 19.55.08



Removing

1 Release the cap from the filler tube.
2 Release the retaining cable from the under side of cap.
3 Open the cable retaining clip in the filler tube and remove the cable, taking care not to allow the cable to fall into the tank.

Refitting

4 Reverse instructions 1 to 3.

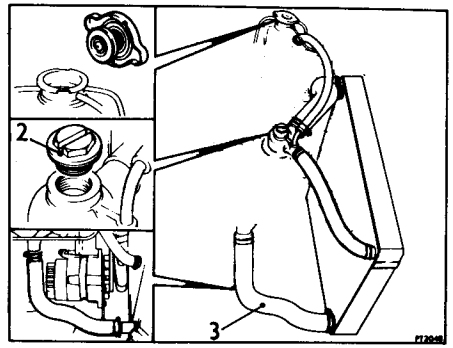
COOLANT

Drain and refill **26.10.01**

Draining

1 Set heater controls to 'HOT'.
2 Remove thermostat housing filler plug.
3 Disconnect the radiator bottom hose at the radiator and allow coolant to drain.
4 Remove the cylinder block drain plug located on left-hand side of engine.

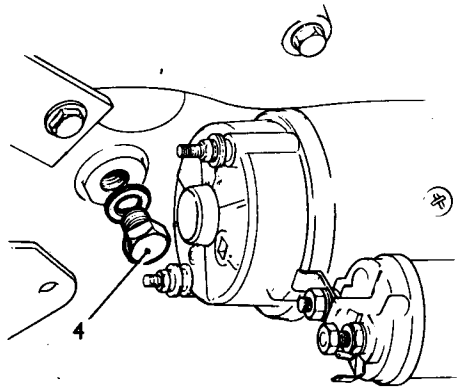
CAUTION: Do not attempt to remove the thermostat housing filler plug while the engine is hot.



Refilling

5 Fit and tighten the cylinder block drain plug.
6 Fit the bottom hose to the radiator, and check the security of all the hose clips.
7 Check that the expansion tank is half-full, and replace the pressure cap.
8 With the heater controls set at 'HOT', fill the cooling system through the thermostat housing filler plug.
9 Refit the filler plug carefully (do not overtighten), and remove the expansion tank pressure cap.
10. Run the engine at 1200 rev/min for approximately three minutes.
11 Stop the engine, refit the expansion tank pressure cap and remove the filler cap from the thermostat housing.
12 Gently squeeze the top hose to expel air from the system.
13 Top up the system to the bottom of the threads in the filler plug housing.
14 Refit the filler plug, using a new sealing washer if necessary; do not overtighten.
15 Re-check the coolant level in the expansion tank, and top up to half-full if necessary.
Replace the pressure cap.

NOTE: Subsequent topping-up of the cooling system should be carried out via the expansion tank which should be maintained at half-full.



EXPANSION TANK

Remove and refit **26.15.01**

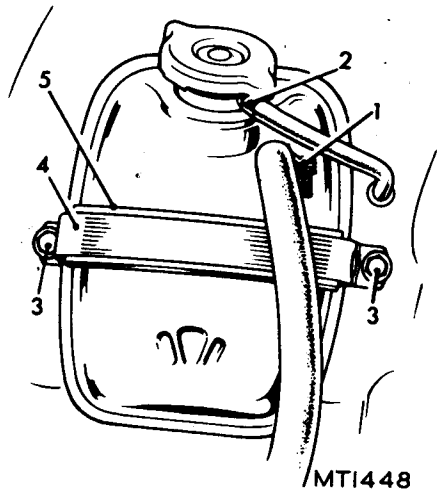
Removing

1 Disconnect the hose between the expansion tank and the thermostat housing.
2 Disconnect the overflow hose from the expansion tank.
3 Remove the two bolts securing the tank retaining strap to the wing valance.
4 Remove the strap and rubber packing piece.
5 Remove the tank and drain the coolant.

Refitting

6 Reverse instructions 1 to 5, and half-fill the expansion tank with coolant.

NOTE: On later models an alternative expansion tank to that illustrated may be fitted. This alternative unit has the main pipe joining the tank at its lower centre area. This alternative tank may be removed and refitted following the instructions above, noting that it is secured direct to the body without a retaining strap.



FAN BELT

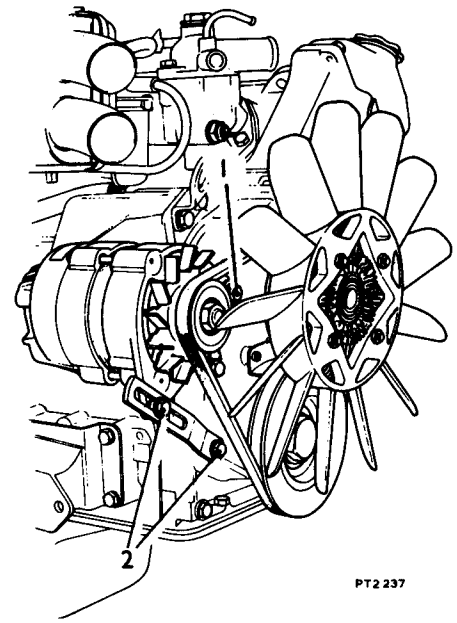
Remove and refit **26.20.07**

Removing

1 Slacken the alternator pivot bolt.
2 Slacken the alternator adjustment bolts.
3 Release belt tension and remove the belt.

Refitting

4 Install the fan belt on the crankshaft, Torquatrol unit, and alternator pulleys.
5 Adjust belt tension and tighten the alternator pivot bolt and the adjusting bolts.



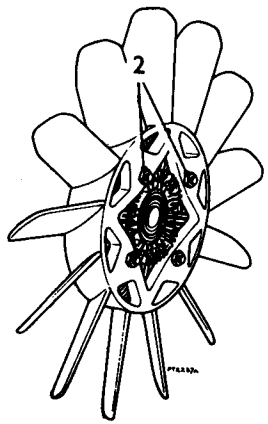
FAN

Remove and refit **26.25.06**

Removing
1 Remove the fan and Torquatrol unit, see 26.25.21.
2 Remove the four bolts, nuts and washers (if fitted) securing the fan to the Torquatrol unit and withdraw the fan.

Refitting
3 Fit the fan to the Torquatrol unit and secure with four bolts, washers (if fitted) and nuts.
4 Fit the fan, Torquatrol unit and bracket to the engine timing cover.
5 Fit the fan belt and adjust belt tension.

NOTE: On some earlier models the fan was secured to the Torquatrol unit by bolts only.

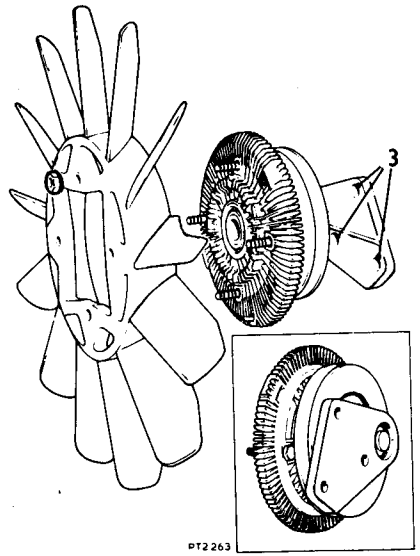


FAN AND TORQUATROL UNIT

Remove and refit **26.25.21**

Removing
1 Slacken the alternator securing bolts and release fan belt tension.
2 Remove the fan belt.
3 Remove the three bolts and spring washers (if fitted) securing the fan bracket to the engine timing cover.
4 Withdraw the fan, Torquatrol unit and bracket assembly.

Refitting
5 Reverse instructions 1 to 4.
6 Adjust fan belt tension.



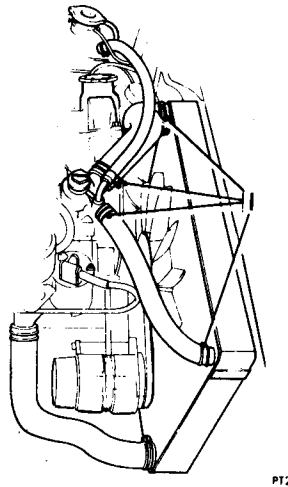
RADIATOR TOP HOSES

Remove and refit **26.30.01**

Removing
1 Slacken the clips securing the top hoses to the radiator and thermostat housing.
2 Remove the hoses.

Refitting
3 Reverse instructions 1 and 2.
4 Remove the filler plug from the thermostat housing and refill the cooling system.

CAUTION: Refer to Caution under 26.30.36.

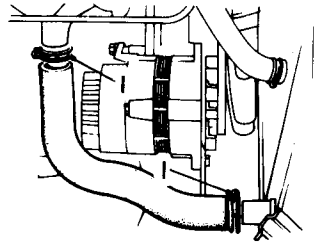


RADIATOR BOTTOM HOSE

Remove and refit **26.30.07**

Removing
1 Slacken the clips securing the bottom hose to the radiator and the water pump cover.
2 Remove the bottom hose.

Refitting
3 Reverse instructions 1 and 2.
4 Remove the filler plug from the thermostat housing and refill the cooling system.



CONNECTING PIPE

Remove and refit **26.30.25**

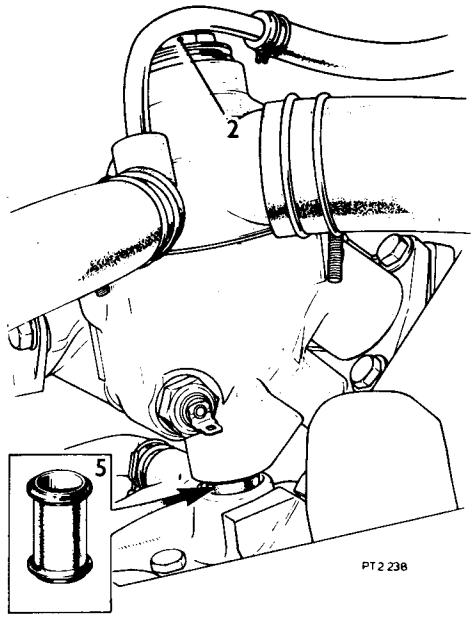
Removing

1 Drain the cooling system, see 26.10.01.
2 Remove the thermostat housing cover and thermostat.
3 Release the fuel hose from the pump outlet.
4 Remove the bolts securing the inlet manifold to the cylinder head and ease the manifold clear of the connecting pipe.
5 Withdraw the connecting pipe.

Refitting

6 Fit the inlet manifold to the cylinder head, renewing gasket as necessary. Secure the manifold with the 10 securing bolts.
7 Pass the connecting pipe through the thermostat housing and carefully press into position between the manifold and water pump cover.
8 Fit the thermostat and thermostat housing cover.
9 Refill the cooling system, see 26.10.01.

CAUTION: Refer to Caution under 26.30.36.



HOSE — THERMOSTAT HOUSING TO EXPANSION TANK

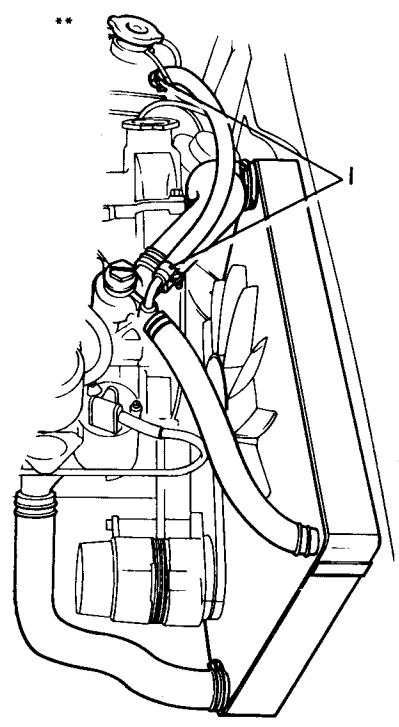
Remove and refit **26.30.36**

Removing

1 Slacken the clips at the expansion tank and thermostat housing.
2 Remove the expansion tank hose.

Refitting

3 Reverse instructions 1 and 2.
CAUTION: The screw part of the thermostat housing clip should be positioned below the pipe to avoid damage to the bonnet when it is closed.



RADIATOR

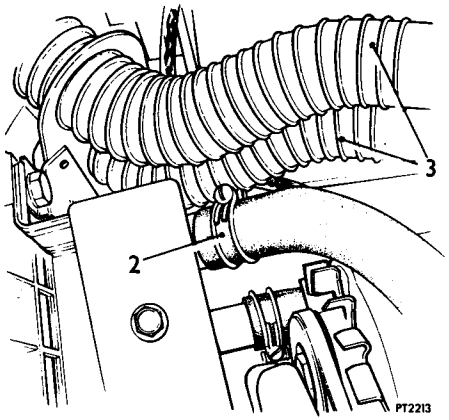
Remove and refit **26.40.01**

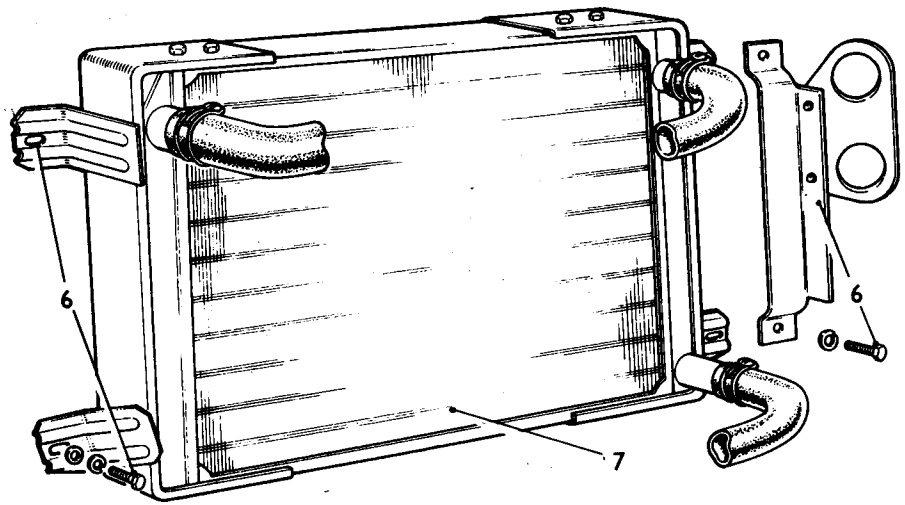
Removing

1 Remove the bonnet, see 76.16.01.
2 Remove the cooling system filler plug, disconnect the radiator bottom hose and drain the coolant.
3 Remove the flexible air inlet hoses.
4 Disconnect the two hoses from top of the radiator.
5 Disconnect the Lucar terminals from the dual horns.
6 Remove the four bolts, plain and spring washers securing the radiator to the body and remove the air inlet hose bracket from the right hand side of the radiator.
7 Withdraw the radiator, taking care that the cooling fan does not damage the radiator core.

Refitting

8 Reverse instructions 1 to 7. Fill the cooling system, see instructions 5 to 10, 26.10.01.





PT 2239

THERMOSTAT

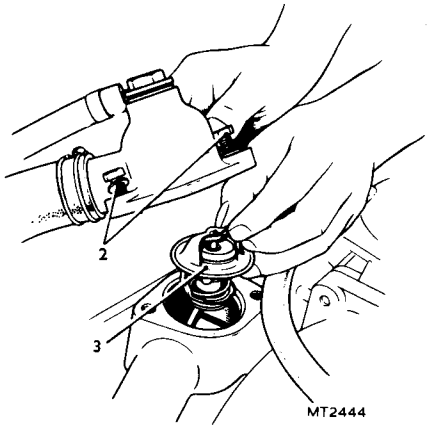
Remove and refit **26.45.01**

Removing

1 Drain the cooling system, see 26.10.01.
2 Remove the two bolts and spring washers securing the thermostat cover.
3 Lift off the thermostat cover and lift out the thermostat.

Refitting

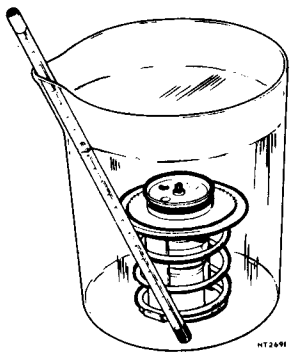
4 Reverse instructions 1 to 3.
5 Refill the cooling system, see 26.10.01.



THERMOSTAT

Test **26.45.09**

1 Determine the opening temperature of the thermostat stamped on the flange or base.
2 Immerse the thermostat in water heated to the opening temperature of the thermostat. Renew the thermostat if it fails to open.



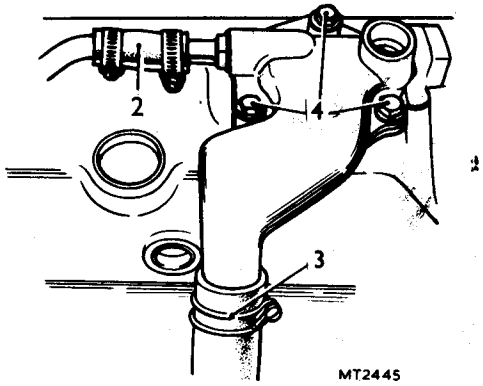
WATER PUMP

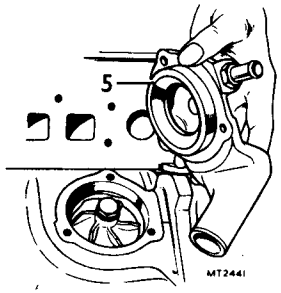
Remove and refit **26.50.01**

Service tools: S 4235A/10, 4235A

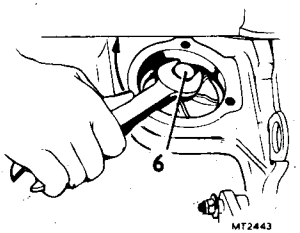
Removing

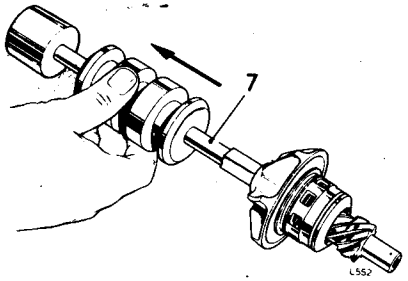
1 Remove carburetters complete with inlet manifold, see 30.15.02.
2 Remove the connecting pipe from the water pump cover.
3 Disconnect the bottom hose from the pump cover.
4 Remove three bolts complete with plain washers securing the pump cover to the cylinder block.
5 Lift off the pump cover complete with the gaskets.





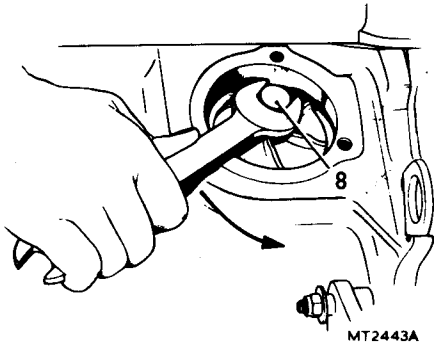
6 Using a spanner on the impeller centre bolt, turn clockwise until either:
   a The water pump is released from the jackshaft gear and can be withdrawn.
   or
   b The centre bolt is removed.
7 If b applies, fit special tool S 4235A/10 and 4235A impact tool and adaptor to remove pump.

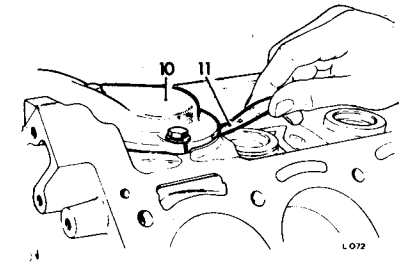


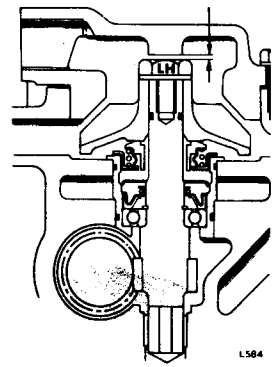


Refitting

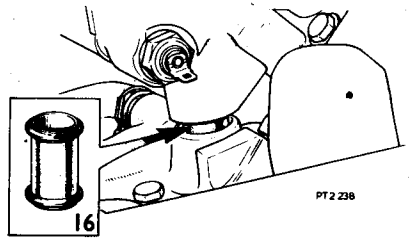
8 Fit the pump into the cylinder block housing ensuring that the gear of the pump meshes correctly with the jackshaft gear and that the pump is fully seated. Turn the pump centre bolt anticlockwise to check correct seating.
   CAUTION: The use of force or impact to seat the pump will damage the pump gears and graphite seal.
9 Ensure that the cylinder block housing and the pump cover mating surfaces are clean.
10 Fit the housing temporarily without the gaskets, fitting and tightening the cover securing bolts finger-tight only.
11 Using feeler gauges, note and check that the gap between the pump cover and the cylinder block mating faces is equal all round the gasket face. Equalize the gap by adjusting the bolts.
12 Select water pump gaskets to equal the gap noted in instruction 11 plus 0·010 to 0·025 in (0·25 mm to 0·5 mm) to obtain the correct running clearance.
   NOTE: Water pump gaskets are available in following thicknesses: 0·010, 0·020, 0·030 in (0·254, 0·508, 0·762 mm).
13 Remove the housing, fit the selected gaskets, fit the cover and evenly tighten the securing bolts to the correct torque.







14 Refit the inlet manifold complete with the carburetters, see 19.15.15.
15 Remove the thermostat housing and thermostat.
16 Pass the sealing connecting pipe through the thermostat housing into position between the inlet manifold and the water pump cover.
17 Fit the thermostat and cover.



WATER PUMP

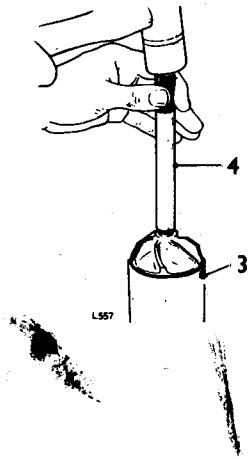
Overhaul **26.50.06**

Service tool: S 348

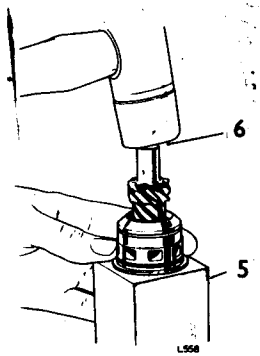
1 Remove the water pump, see 26.50.01.
2 Remove the centre bolt (L.H. Thd.).
3 Insert the assembly into the large bore of 348/1.
4 Drift the unit from the impeller using 348/6.

NOTE: Later models have a straight fluted water impeller and new pump cover.

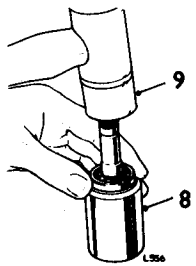
IMPORTANT: These items are not interchangeable and must be fitted in pairs.



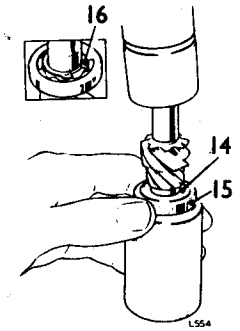
5 Insert the assembly, gear uppermost, into the small bore of 348/1.
6 Drift the unit from the housing.
7 Remove from the shaft (a) 'O' ring, (b) graphite seal, (c) water flinger, (d) oil seal, and (e) circlip, in that order.



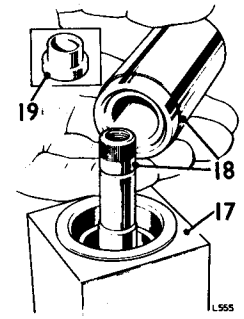
8 Insert the shaft, gear down, into 348/7.
9 Drift the shaft from the bearing.
10 Remove the oil flinger.
11 Remove the 'O' rings from the housing.
12 Discard the 'O' rings, seals and bearing.
13 Examine the shaft housing and impeller for serviceability; renew as necessary.

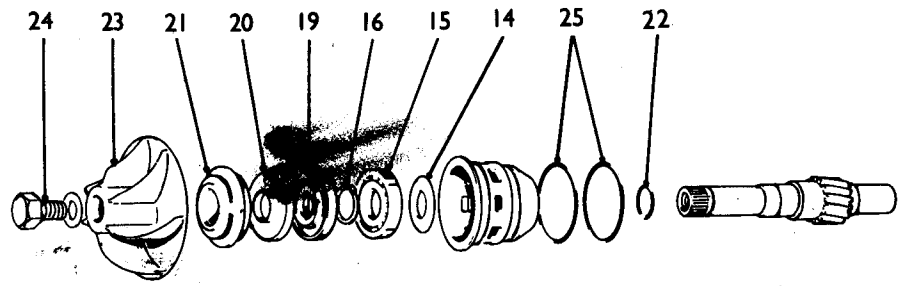


14 Fit the oil flinger to the shaft, dish to gear.
15 Fit the bearing to the shaft, using 348/7 and a soft hammer.
16 Fit the circlip, ensuring correct seating.



17 Fit the water pump body into the small bore of 348/1.
18 Fit the shaft unit, gear down, into the housing; drift gently into position using tool 348/2.
19 Fit the oil seal, flat face to bearing.
20 Fit the water flinger, dish towards the bearing, using tool 348/2.
CAUTION: Water flinger will seal on shoulder of shaft, excessive force, applied when fitting, will cause distortion and fouling of the water pump body.
21 Fit the graphite seal, flat face down, over the shaft and seating in the housing.
22 Fit the 'O' ring to the shaft.
23 Press the impeller onto the shaft.
24 Fit the centre bolt and washer (L.H. Thd.). Torque 2·2 to 2·5 kgf m (16 to 18 lbf ft).
25 Fit the two 'O' rings to the water pump housing (smaller one nearest gear).
26 Refit the water pump, see 26.50.01.

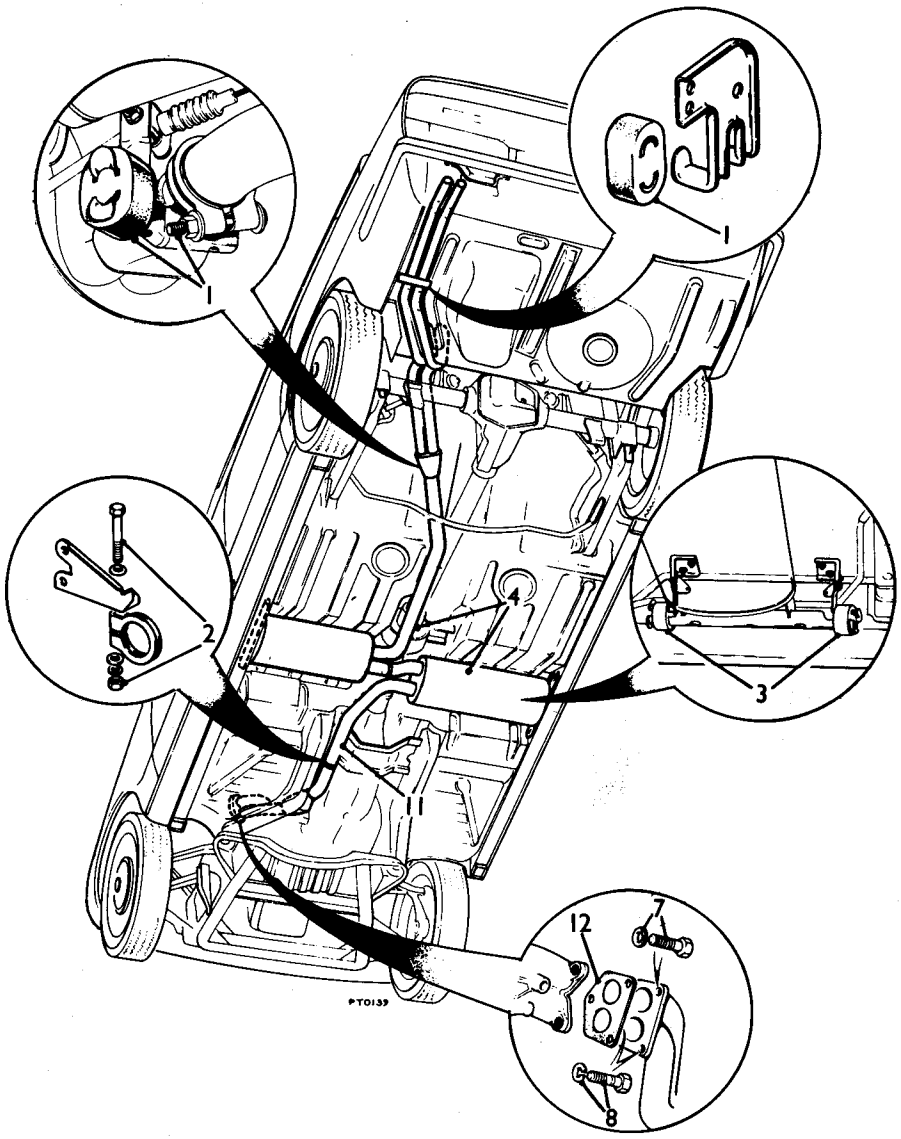




L593

EXHAUST SYSTEM COMPLETE

Remove and refit **30.10.01**



Removing

1 Remove the tail pipe assembly, see 30.10.22.
2 Remove the nut and bolt securing the front pipe and R.H. silencer to the front support bracket.
NOTE: On later models an additional washer is fitted between the support bracket and the pipe clip.
3 Support the silencer assembly and remove the four support rubbers.
4 Pull the silencer assembly rearwards and remove it from the vehicle.
5 Disconnect the two fan motor harness leads.
6 Remove the three bolts and withdraw the fan motor unit from the housing.
7 Remove the uppermost bolt securing the front pipe flange to the manifold.
8 Remove the lower two bolts securing the front pipe flange to the manifold.
9 Remove the nut from the rear L.H. sub-frame mounting.
10 Slacken the nut on the rear R.H. sub-frame mounting.
11 Place a lever between the gearbox and sub-frame and carefully lever upwards to enable the front pipe assembly to be withdrawn from beneath the vehicle.

Refitting

12 Renew the flange gasket and position the front pipe assembly on the manifold.
13 Replace the three bolts 8 and 7.
14 Reverse instructions 10, 9, and 6 to 1, ensuring gas-proof joints at all pipe connections.

FRONT PIPE ASSEMBLY

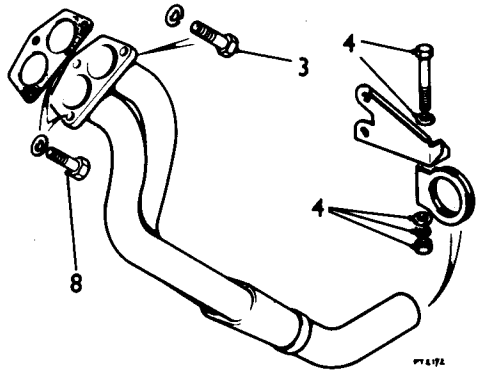
Remove and refit **30.10.09**

Removing

1 Disconnect the two fan motor harness leads.
2 Remove the three bolts and withdraw the fan motor unit from the housing.
3 Remove the uppermost bolt securing the front pipe flange to the manifold.
4 Remove the nut and bolt securing the front pipe and R.H. silencer to the front support bracket.
NOTE: On later models an additional washer is fitted between the support bracket and the pipe clip.
5 Remove the four support rubbers from the silencer assembly.
6 Remove the three support rubbers from tail pipe assembly.
7 Pull the exhaust system clear of the front pipe.
8 Remove the lower two bolts securing the front pipe flange to the manifold.
9 Remove the nut from the rear L.H. sub-frame mounting.
10 Slacken the nut on the rear R.H. sub-frame mounting.
11 Withdraw the front pipe assembly from beneath the vehicle.

Refitting

12 Renew the flange gasket and position the front pipe assembly on the manifold.
13 Replace the three bolts 8 and 3.
14 Reverse instructions 10, 9, 7 to 4, 2 and 1, ensuring gas-proof joint at the pipe connection.



SILENCER ASSEMBLIES

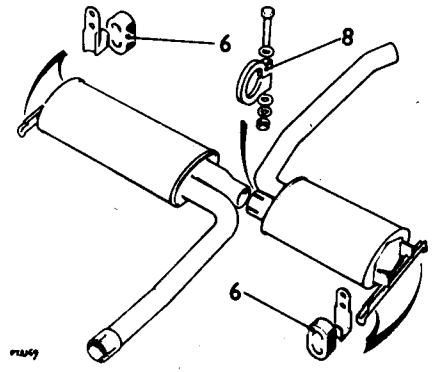
Remove and refit — pair 1 to 7 **30.10.14**
— L.H. **30.10.15**
— R.H. **30.10.16**

Removing

1 Remove the nut and bolt securing the front pipe and R.H. silencer to the front support bracket.
2 Slacken the clip securing the tail pipe assembly to the L.H. silencer.
3 Remove the two support rubbers securing the tail pipe assembly to the wheel arch bracket.
4 Remove the support rubber securing the tail pipe assembly to the front bracket.
5 Pull the tail pipe clear of the silencer.
6 Support the silencer assembly and remove the four support rubbers.
7 Pull the silencer assembly rearwards and remove it from the vehicle.
8 Separate the silencers, if necessary, by slackening the clip securing the L.H. silencer to the R.H. silencer.

Refitting

9 Reverse instructions 1 to 8 as necessary, ensuring gas-proof joints at all pipe connections.



TAIL PIPE ASSEMBLY

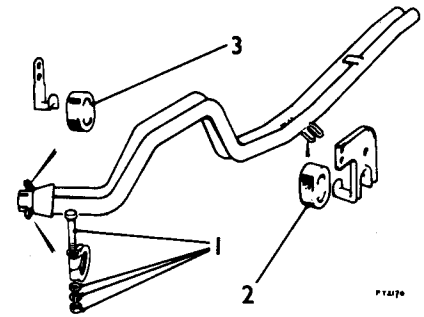
Remove and refit **30.10.22**

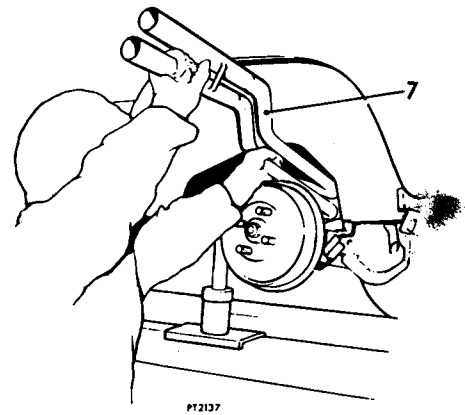
Removing

1 Remove the nut and bolt from the clip securing the tail pipe assembly to the L.H. silencer.
2 Remove the two support rubbers securing the tail pipes to the wheel arch bracket.
3 Remove the support rubber securing the tail pipe assembly to the front bracket.
4 Pull the tail pipe assembly clear of the silencer.
5 Jack up the car and remove the rear nearside road wheel.
6 Remove the rear nearside shock absorber lower mounting bolt.
7 Carefully manoeuvre the tail pipe assembly through the wheel arch.

Refitting

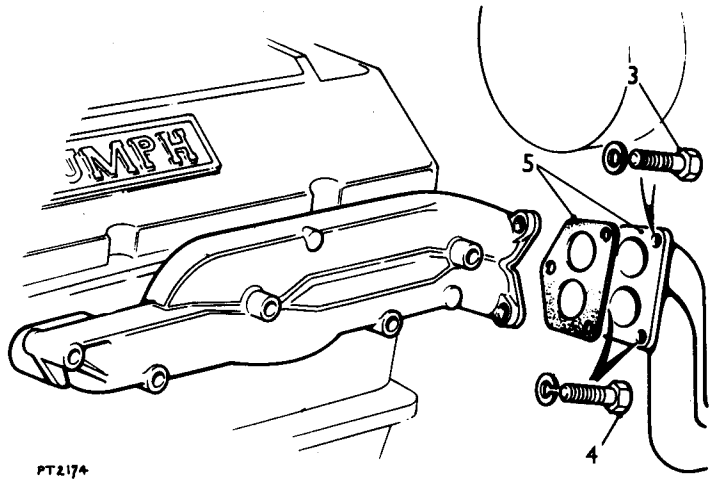
8 Reverse instructions 1 to 7, ensuring gas-proof joint at the pipe connection.





FRONT PIPE FLANGE GASKET

Remove and refit **30.10.26**



Removing

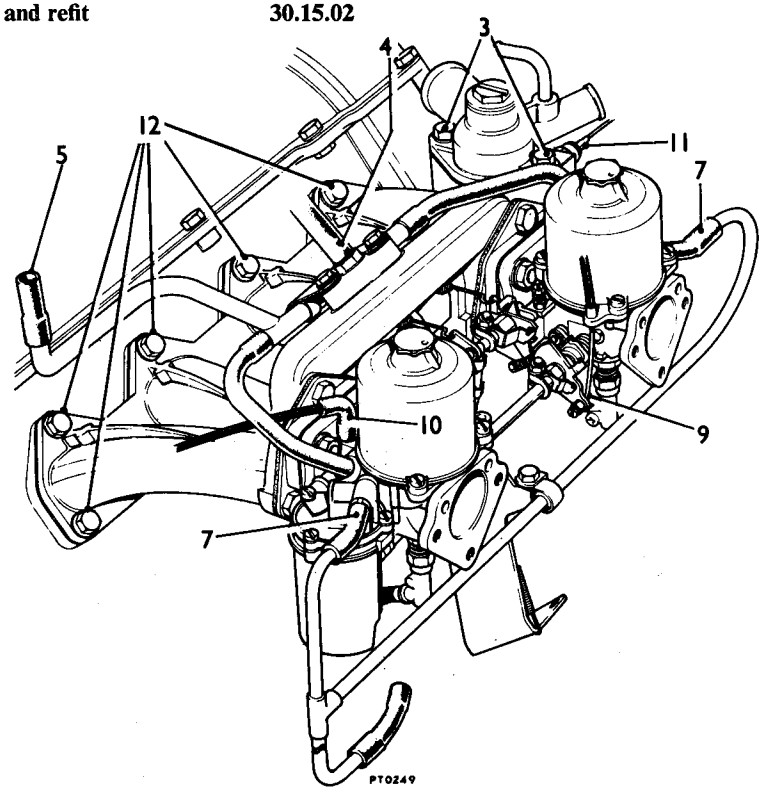
1 Disconnect the two fan motor harness leads.
2 Remove the three bolts and withdraw the fan motor unit from the housing.
3 Remove the uppermost bolt securing the front pipe flange to the manifold.
4 Working beneath the vehicle, remove the lower two bolts securing the front pipe flange to the manifold.
5 Carefully pull the front pipe flange sufficiently clear of the manifold to enable the gasket to be removed from above. Discard the gasket.

Refitting

6 Fit a new gasket and reverse instructions 5 to 1.

INLET MANIFOLD ASSEMBLY

Remove and refit **30.15.02**



Removing

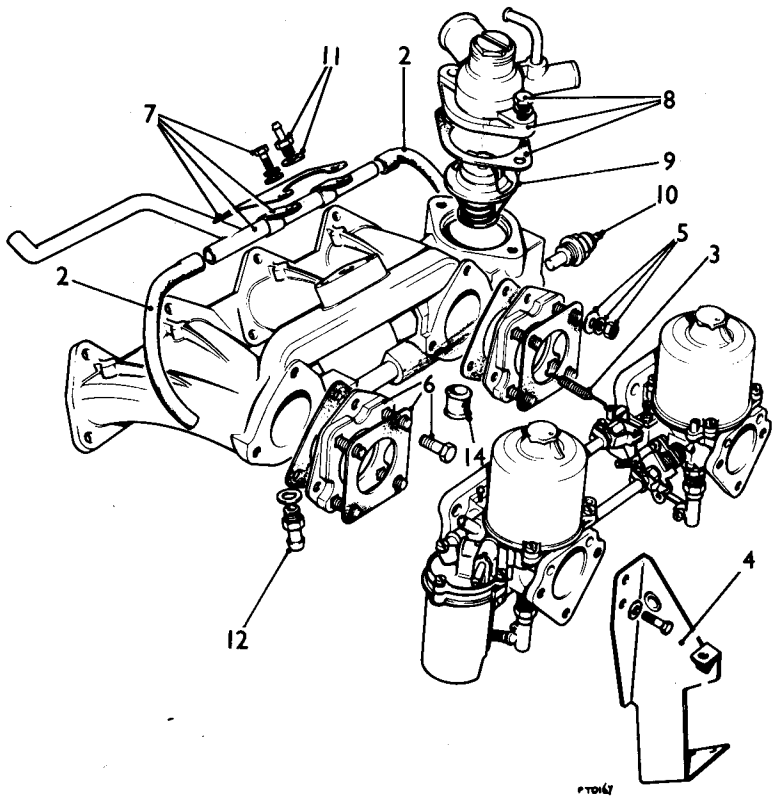
1 Disconnect the battery.
2 Drain the cooling system, see 26.10.01.
3 Remove the two bolts securing the thermostat housing dome to the manifold. Pull the housing to one side and withdraw the thermostat.
4 Disconnect the brake vacuum hose.
5 Disconnect the engine breather hose.
6 Disconnect the manifold heater hose.
7 Disconnect the fuel feed pipe from the carburetters.
8 Disconnect the throttle cable from the linkage bracket, see 19.20.06, instructions 1 to 4.
9 Disconnect the mixture control cable.
10 Disconnect the vacuum hose from the carburetter.
11 Disconnect the water temperature transmitter lead.
12 Remove the ten bolts complete with plain washers securing the inlet manifold to the cylinder head.
13 Lift off the manifold complete with carburetters and air cleaner.
14 Withdraw the manifold to water pump connecting pipe.
15 Remove the manifold gasket.

Refitting

16 Reverse instructions 4 to 15.
17 Carefully install a new connecting pipe via the thermostat housing ensuring that it is pushed downwards to the limit of its travel.
18 Renew the thermostat housing gasket.
19 Reverse instructions 3 to 1.

INLET MANIFOLD

Renew **30.15.05**



Dismantling

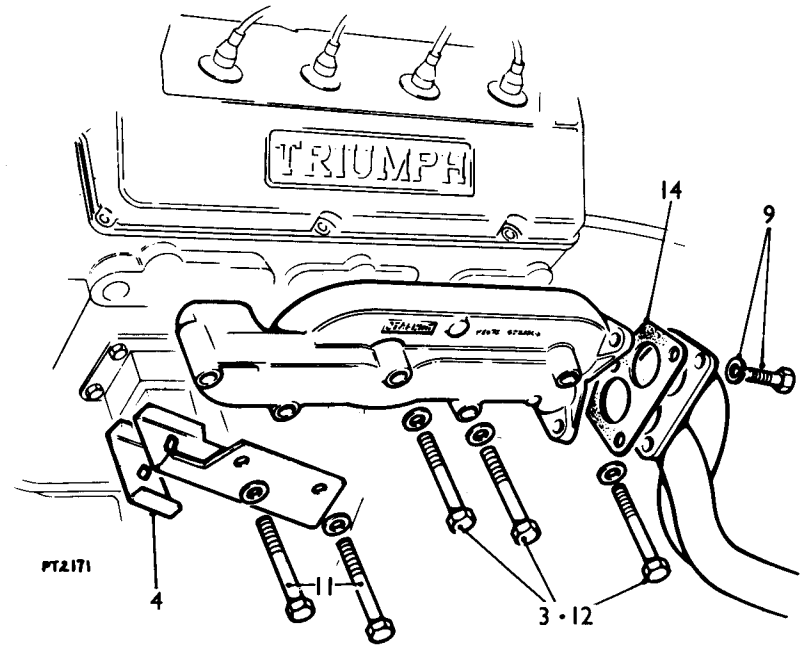
1 Remove the manifold, see 30.15.02.
2 Disconnect the two rubber pipes from the breather pipe assembly.
3 Remove the return springs.
4 Remove the throttle control bracket — two bolts.
5 Remove the eight nuts securing the carburetters to the spacers. Separate the carburetters from the manifold assembly.
6 Remove the spacers and gaskets (where fitted) — eight bolts.
7 Remove the breather pipe assembly, clips, and spring anchor bracket — two bolts.
8 Remove the thermostat housing dome and gasket — two bolts.
9 Withdraw the thermostat.
10 Remove the temperature transmitter.
11 Remove the servo adaptor and fibre washer.
12 Remove the water hose adaptor and fibre washer.

Assembly

13 Reverse instructions 10 to 12 and 1 to 7.
14 Carefully install a new connecting pipe via the thermostat housing ensuring that it is pushed downwards to the limit of its travel.
15 Install the thermostat.
16 Fit the housing dome — two bolts.

EXHAUST MANIFOLD

Remove and refit **30.15.10**



Removing

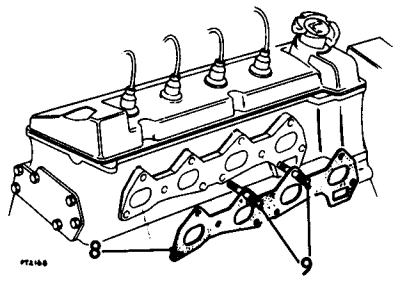
1 Drive the vehicle onto a ramp. Raise the ramp.
2 Remove the two bolts securing the L.H. engine mounting.
3 Slacken the three bolts securing the manifold to the cylinder head.
4 Remove the nuts securing the steady plate and bracket to the stabilizer. Detach the bracket from the stabilizer and remove the steady plate.
5 Remove the lower two bolts securing the front pipe flange to the manifold.
6 Support the L.H. flange of the sump on a jack and raise the engine approximately $\frac{3}{4}$ in (20 mm).
7 Lower the ramp and disconnect the two fan motor harness leads.
8 Remove the three bolts and withdraw the fan motor unit from the housing.
9 Remove the upper bolt securing the front pipe flange to the manifold.
10 Remove the stabilizer, see 12.45.16.
11 Remove the two bolts securing the steady bracket to the manifold.
12 Remove the remaining three bolts securing the manifold to the cylinder head and remove the manifold from the vehicle.

Refitting

13 Assemble the steady bracket and all five bolts to the manifold. Position the manifold on the cylinder head and hand tighten all bolts. Fully tighten the twelve bolts.
14 Reverse instructions 1 to 11, ensuring that the gasket between the manifold and the front pipe flange is in position.

INLET MANIFOLD GASKET

Remove and refit **30.15.15**



Removing

1 Isolate the battery.
2 Partially drain the coolant.
3 Disconnect the fuel pipe from the pump outlet.
4 Remove the two bolts securing the thermostat housing dome to the manifold.
5 Pull the thermostat housing dome to one side and withdraw the thermostat.
6 Remove the ten bolts securing the manifold to the cylinder head.
7 Raise the manifold assembly sufficiently to enable the by-pass tube to be withdrawn. Discard the connecting pipe.
8 Remove and discard the gasket.

Refitting

9 Loosely fit two $\frac{5}{16}$ U.N.C. $\times 1\frac{1}{2}$ in studs to the cylinder head to ensure correct alignment of the gasket.
10 Position the gasket and manifold on the cylinder head.
11 Refit the ten manifold securing bolts and remove the two studs.
12 Carefully install a new connecting pipe via the thermostat housing dome, ensuring that it is pushed downwards to the limit of its travel.
13 Reverse instructions 6 to 1.

CLUTCH ASSEMBLY

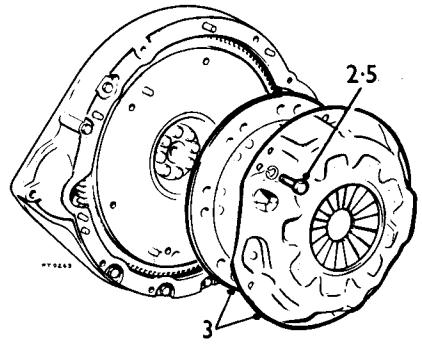
Remove and refit **33.10.01**

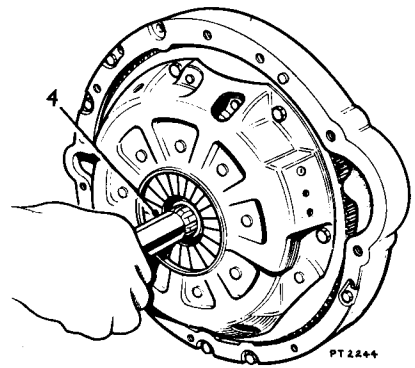
Removing

1 Remove the gearbox, see 37.20.01.
2 Remove the six bolts securing the cover to the flywheel.
3 Remove the clutch cover and drive plate.

Refitting

4 Position the clutch cover and plate on the flywheel and align the splines with the spigot bush using a dummy input shaft.
NOTE: Ensure that the clutch plate is assembled with the longer boss of the splined hub towards the gearbox.
5 Insert the six bolts securing the clutch to the flywheel.
6 Ensure the clutch cover locates correctly on the dowels of the flywheel.
7 Tighten the six bolts holding the clutch cover to the flywheel.
8 Refit the gearbox, see 37.20.01.

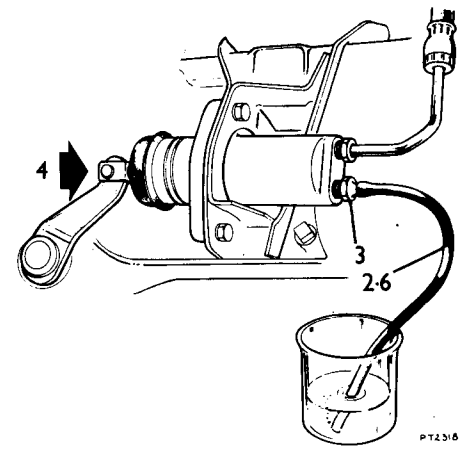




HYDRAULIC SYSTEM

Bleed **33.15.01**

1 Check the level of fluid in the master cylinder reservoir, and top up as necessary.
2 Attach a bleed tube to the nipple on the slave cylinder. Allow the free end of the tube to hang submerged in brake fluid in a transparent container.
3 Slacken the bleed nipple (90 to 180 degrees is usually adequate).
4 Depress the push-rod fully into the slave cylinder and hold during bleeding procedure.
5 Depress the clutch pedal and allow the pedal to return. Continue until fluid free of air issues from the slave cylinder. Hold the pedal depressed, close the bleed nipple and release the pedal.
6 Remove the bleed tube and container.
7 Top-up the reservoir. It is necessary to ensure that the fluid in the reservoir is never permitted to fall to a level whereby air can be admitted to the system. When topping-up the reservoir do not use the aerated and possibly contaminated fluid exhausted from the system during the process of bleeding.



FLUID PRESSURE PIPE

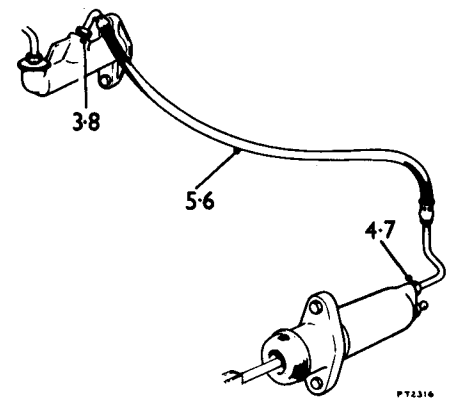
Remove and refit **33.15.09**

Removing

1 Drive the car onto a ramp.
2 Drain the hydraulic system.
3 Unscrew the hydraulic pipe from the master cylinder.
4 Unscrew the pipe from the slave cylinder.
5 Remove the pipe from the car.

Refitting

6 Position the fluid pipe in the car.
7 Connect the fluid pipe to the slave cylinder.
8 Connect the fluid pipe up to the master cylinder.
9 Bleed the hydraulic system, see 33.15.01.
10 Drive the car off the ramp.



FLUID HOSE

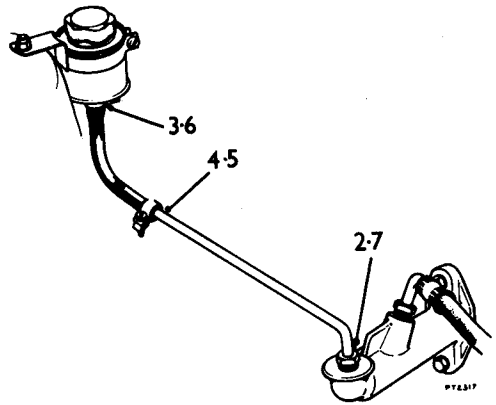
Remove and refit **33.15.13**

Removing

1 Drain the hydraulic system.
2 Remove the hose and pipe from the master cylinder.
3 Remove the clip and pipe from the header tank.
4 Remove the pipe.

Refitting

5 Position the pipe on the header tank.
6 Secure the pipe with the clip.
7 Refit the pipe to the master cylinder.
8 Bleed the hydraulic system, see 33.15.01.



MASTER CYLINDER

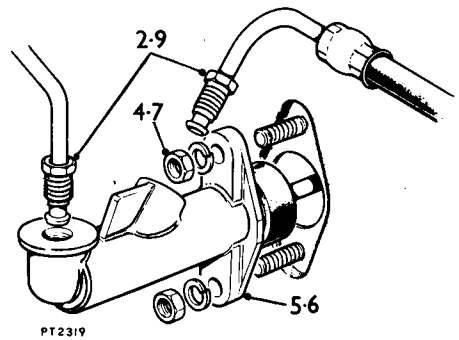
Remove and refit **33.20.01**

Removing

1 Drain the fluid system.
2 Disconnect the fluid pipes from the master cylinder.
3 Remove the clevis pin from the pedal.
4 Remove the two nuts securing the master cylinder.
5 Remove the master cylinder.

Refitting

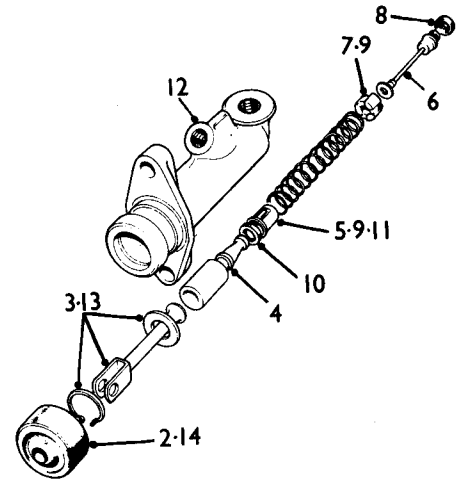
6 Hold the master cylinder in place in the engine compartment.
7 Fit the two nuts securing the master cylinder.
8 Refit the clevis pin.
9 Connect the fluid pipes to the master cylinder.
10 Bleed the system, see 33.15.01.



MASTER CYLINDER

Overhaul **33.20.07**

1 Remove the master cylinder from the car, see 33.20.01.
2 Detach the rubber boot from the master cylinder and withdraw it from the push-rod.
3 Remove the circlip retaining the push-rod to the master cylinder and withdraw the push-rod and washer.
4 Withdraw the piston, spring and seal assembly.
5 Straighten the prong of the spring thimble and remove the thimble and spring from the piston.
6 Release the valve stem from the keyhole slot in the thimble.
7 Slide the valve seal spacer along the valve stem.
8 Remove the valve seal from the valve stem and fit a new seal.
9 Assemble the spacer, and thimble to the valve stem.
10 Remove the seal from the piston and fit a new seal (seal lip towards the spring).
11 Fit the spring thimble to the piston and carefully depress the thimble prong.
12 Lubricate the bore of the master cylinder with clean brake fluid and insert the seal assembly and piston.
13 Fit the push-rod and washer to the master cylinder and secure with a circlip.
14 Fit a new rubber boot to the push-rod and master cylinder.
15 Fit the cylinder to the car, see 33.20.01.
16 Bleed the system, see 33.15.01.

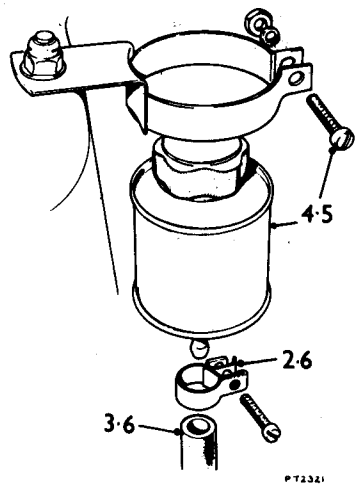


FLUID RESERVOIR

Remove and refit 33.20.08

Removing
1 Drain the hydraulic system.
2 Slacken the hose clip.
3 Remove the pipe from the header tank.
4 Remove the screw and the fluid reservoir.

Refitting
5 Refit the fluid reservoir to the engine bay.
6 Fit the pipe to the header tank and secure it with the clip.
7 Bleed the hydraulic system, see 33.15.01.

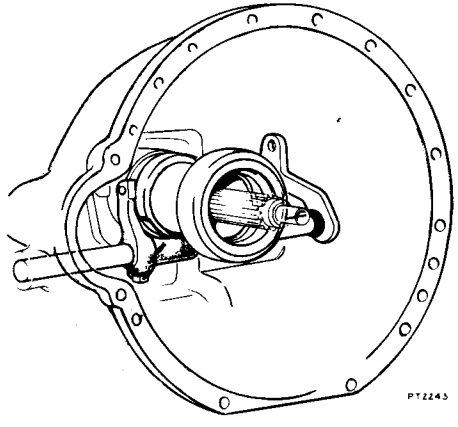


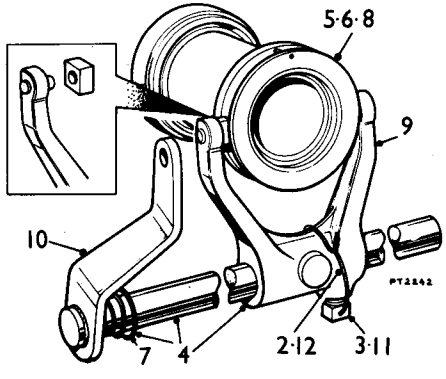
CLUTCH WITHDRAWAL MECHANISM

Remove and refit 33.25.12

Removing
1 Remove the gearbox, see 37.20.01.
2 Remove the locking wire.
3 Remove the wedglok bolt.
4 Remove the cross-shaft, anti-rattle spring and release fork.
5 Withdraw the release bearing and sleeve.

Refitting
6 Slide the release bearing assembly into position on the gearbox front end cover.
7 Fit the anti-rattle spring to the cross-shaft (narrow end of spring adjacent to the operating lever).
8 Rotate the release bearing assembly to position the anti-rotation pin centrally above the gearbox primary shaft.
9 Engage the release fork in the release bearing sleeve.
10 Slide the cross-shaft in the clutch housing and the fork.
11 Fit the wedglok bolt.
12 Secure the bolt with the locking wire.
13 Fit the gearbox to the car, see 37.20.01.

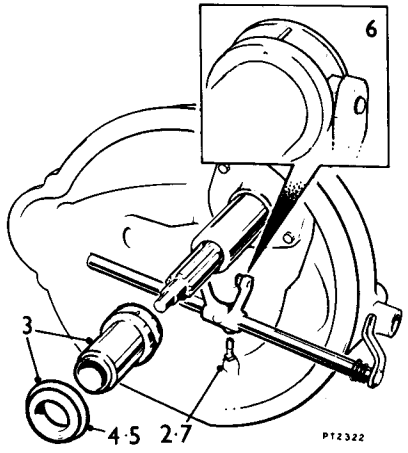




RELEASE BEARING ASSEMBLY

Overhaul 33.25.17

1 Remove the gearbox, see 37.20.01.
2 Remove the locking wire and unscrew the bolt.
3 Withdraw the release bearing assembly.
4 Press the bearing from the sleeve.
5 Press a new bearing onto the sleeve.
6 Engage the release fork in the release bearing sleeve.
7 Fit the bolt and secure with locking wire.
8 Refit the gearbox, see 37.20.01.

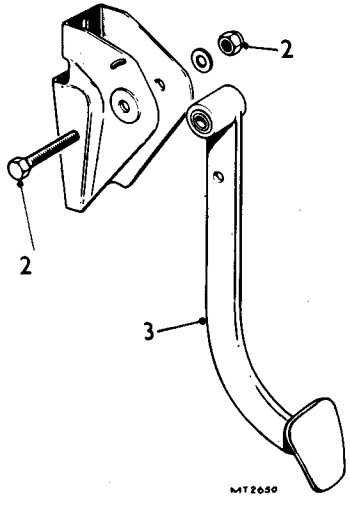


CLUTCH PEDAL

Remove and refit 33.30.02

Removing
1 Remove the clevis pin securing the pedal to the master cylinder push-rod.
2 Remove the pedal pivot bolt and nut.
3 Withdraw the clutch pedal complete with bushes and sleeve.

Refitting
4 Reverse instructions 1 to 3.



CLUTCH PEDAL RETURN SPRING

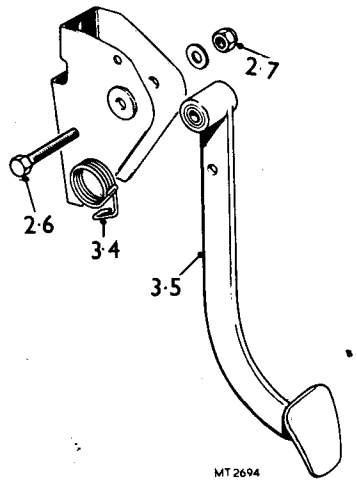
Remove and refit **33.30.03**

Removing

1 Remove the clevis pin securing the pedal to the master cylinder push-rod.
2 Remove the nut and carefully slide out the pivot bolt.
3 Remove the spring from the bracket and remove the pedal and spring.

Refitting

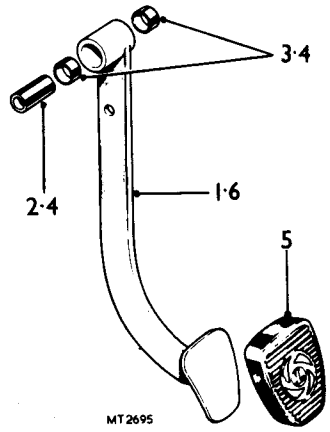
4 Fit the spring to the bracket.
5 Refit the pedal assembly.
6 Lubricate the bolt and insert through the bush.
7 Fit and tighten the nut.
8 Refit the clevis pin, washer and split pin.



CLUTCH PEDAL

Overhaul **33.30.07**

1 Remove the clutch pedal, see 33.30.02.
2 Withdraw the sleeve from the pedal.
3 Remove the pedal bushes.
4 Fit new bushes, lubricate and insert a new sleeve.
5 Replace the pedal pad rubber.
6 Fit the pedal assembly to the car, see 33.30.02.



SLAVE CYLINDER

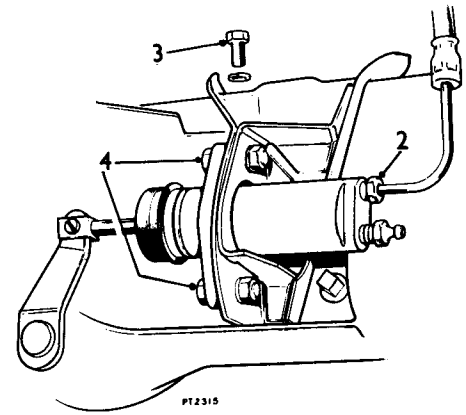
Remove and refit **33.35.01**

Removing

1 Drain the hydraulic system.
2 Disconnect the flexible pipe union from the slave cylinder.
3 Remove the bolts and spring washers.
4 Remove the two nuts, spring washers and bolts securing the slave cylinder flange to the mounting bracket.
5 Withdraw the slave cylinder.

Refitting

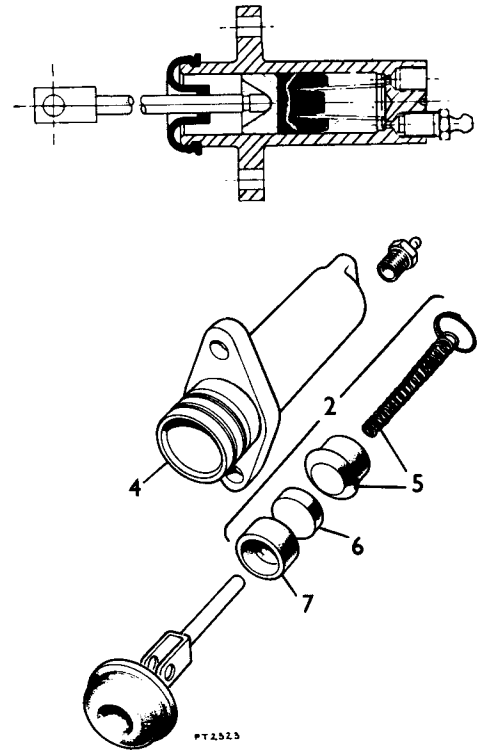
6 Reverse instructions 1 to 4.
7 Bleed the system, see 33.15.01.

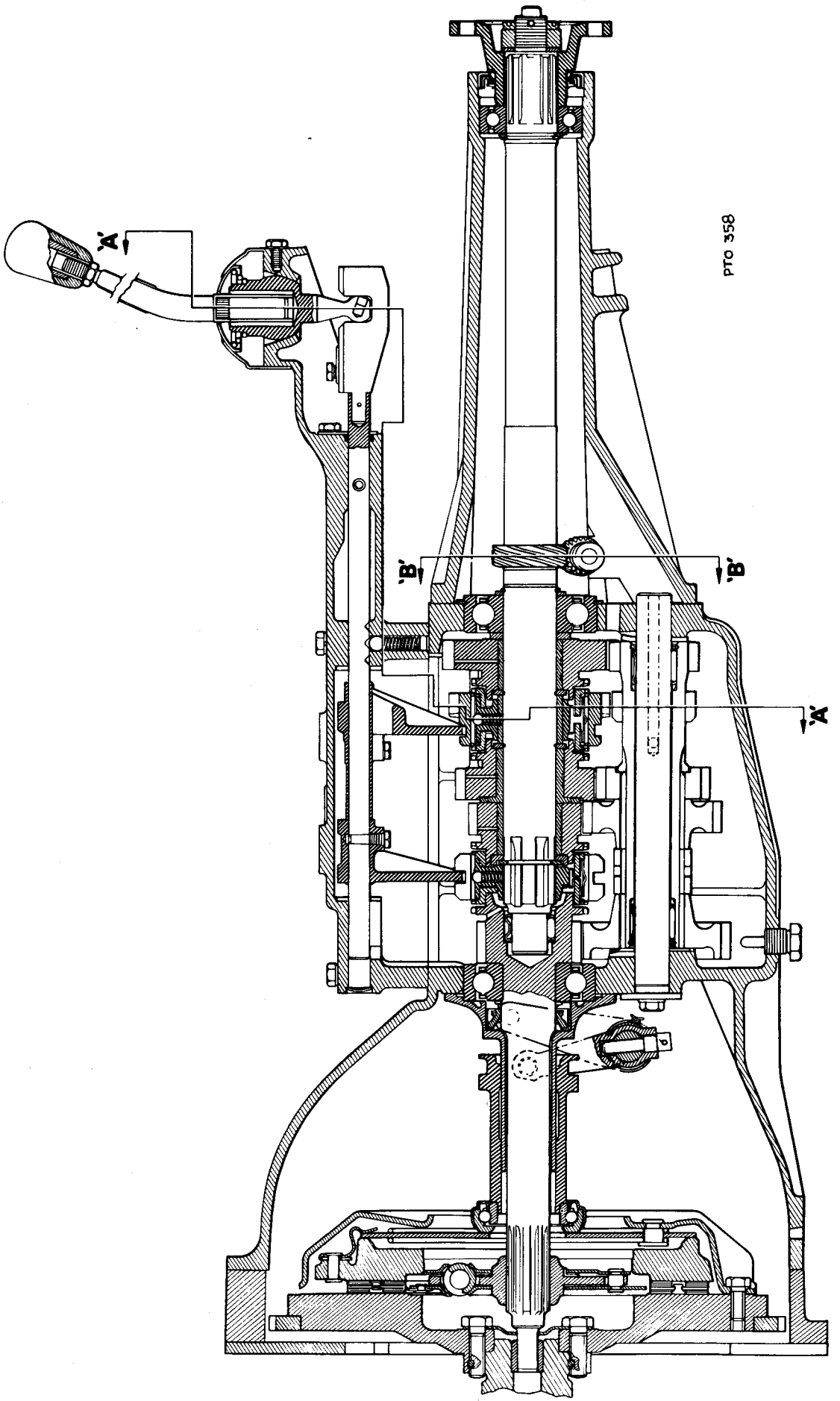


SLAVE CYLINDER

Overhaul **33.35.07**

1 Remove the slave cylinder from the car, see 33.35.01.
2 Withdraw the piston, seal, filler block and spring.
3 Thoroughly clean all components and examine the cylinder bore, piston and filler block for signs of damage, scoring and corrosion. If doubt exists as to their serviceability, a new slave cylinder assembly should be obtained.
4 Lubricate the cylinder bore with clean brake fluid.
5 Fit the spring to the filler block and enter the block (spring leading) into the bore.
6 Fit a new seal (lips leading).
7 Fit the piston (plain face leading).
8 Fit the slave cylinder to the car, see 33.35.01.
9 Bleed the system, see 33.15.01.




'A'
'B'
'B'
'A'
PTO 358

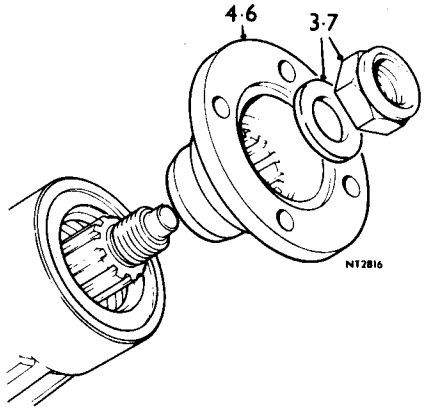
DRIVE FLANGE

Remove and refit **37.10.01**

Service tool: RG 421

Removing

1 Drive the vehicle onto a ramp and raise the ramp.
2 Remove the propeller shaft, see 47.15.01.



3 Using tool RG 421 to retain the drive flange, unscrew and remove the nut and washer.
4 Remove the drive flange.

Refitting

5 Thoroughly clean the mainshaft and drive flange splines.
6 Fit the drive flange.
7 Refit the washer and nut.
8 Using tool RG 421 to retain the flange, tighten the nut to 90 to 110 lbf ft (12·4 to 15·2 kgf m).
9 Refit the propeller shaft, see 47.15.01.

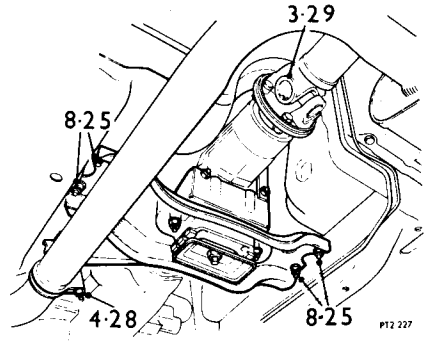
REAR EXTENSION

Remove and refit **37.12.01**

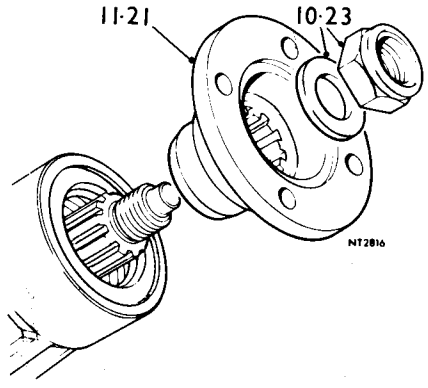
Service tool: RG 421

Removing

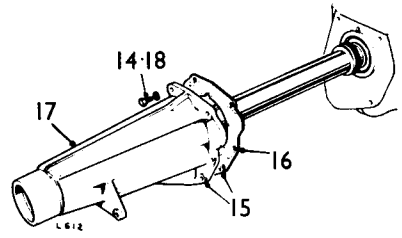
1 Drive the vehicle onto a ramp and raise the ramp.
2 Drain the gearbox oil.



3 Remove the propeller shaft (front end only).
4 Slacken front exhaust clamp.
5 Disconnect seven exhaust mounting rubbers.
6 Push exhaust system to rear of car.
7 Support the gearbox.
8 Remove four gearbox mounting nuts.



9 Lower the gearbox.
10 Using tool RG 421 to retain the drive flange, unscrew and remove the nut and washer.
11 Remove the drive flange.
12 Unscrew and remove the speedometer cable retaining bolt and washer.
13 Withdraw the speedometer drive cable and pinion assembly.



14 Unscrew and remove the six bolts.
15 Withdraw the extension housing, thrust washer and gasket.

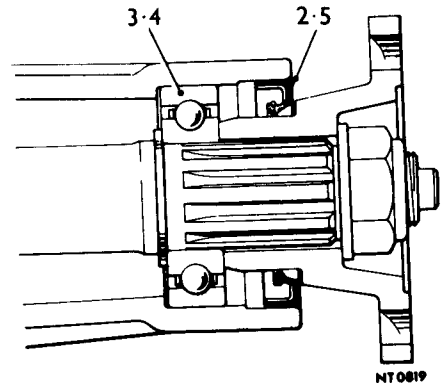
Refitting

16 Clean the mating faces of the gearbox casing and extension housing and fit a new gasket.
17 Refit the extension housing assembly and thrust washer.
18 Fit and tighten the extension housing bolts.
19 Refit the speedometer drive cable and pinion assembly.
20 Locate and tighten the retaining bolt.
21 Refit the drive flange.
22 Fit the nut and washer.
23 Using tool RG 421 to retain the flange, tighten the nut to 90 to 110 lbf ft (12·4 to 15·2 kgf m).
24 Jack up the gearbox.
25 Refit the four mounting nuts.
26 Locate the exhaust system on the front pipe.
27 Connect seven exhaust rubbers.
28 Tighten the front exhaust clamp.
29 Refit the propeller shaft, four bolts and nuts.
30 Top up the gearbox with oil.

REAR EXTENSION

Overhaul **37.12.04**

1 Remove the rear extension, see 37.12.01.



Dismantling

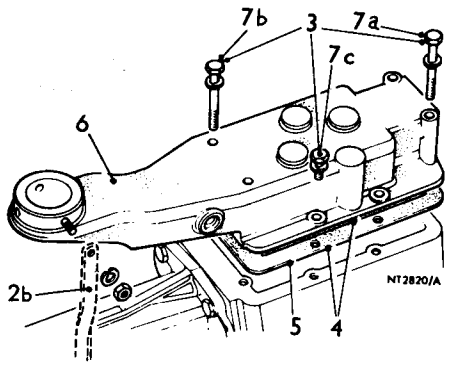
2 Prise out the oil seal.
3 Drive out the bearing.

Reassembling

4 Drift the bearing into the extension.
5 Press a new oil seal into the extension.
6 Refit the rear extension, see 37.12.01.

TOP COVER

Remove and refit 37.12.16



Removing

1 Remove the transmission cover panel, see 76.25.07.
2 a Disconnect the reverse lamp and overdrive isolator switch leads (where applicable).
  b Disconnect the steady bar (where applicable).
3 Remove eight bolts.
4 Lift off the top cover assembly and the gasket.

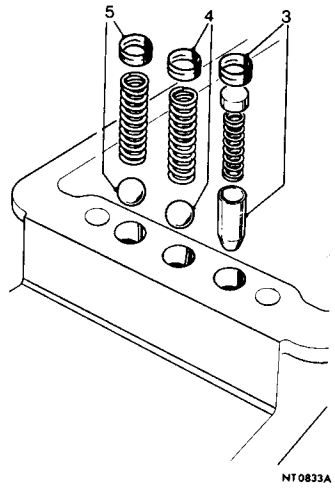
Refitting

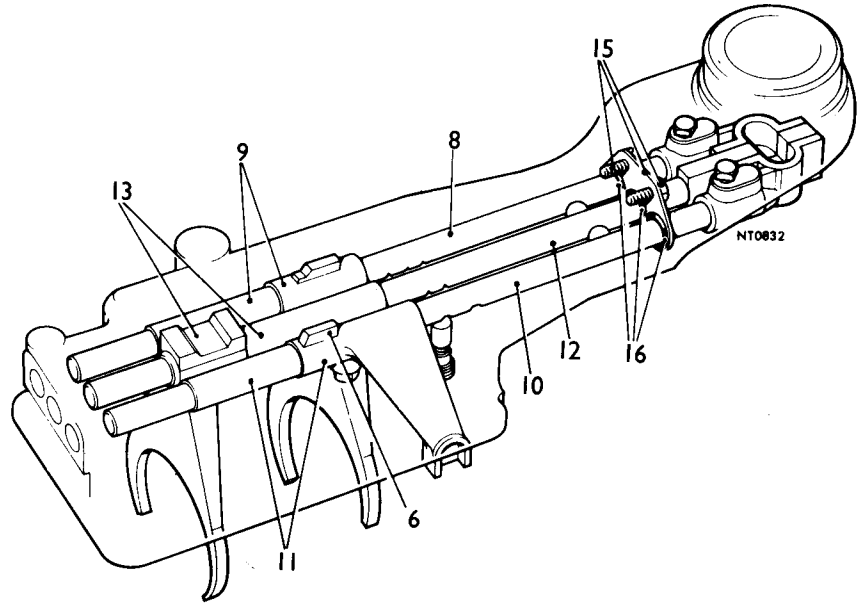
5 Apply grease to the abutment faces and fit the gasket.
6 Place the selector shafts in the neutral position and fit the top cover assembly. Ensure that the reverse lever is correctly engaged.
7 Secure the top cover with the following bolts, each fitted with a lock washer:
  a Two bolts — 67 mm long — to front
  b Two bolts — 73 mm long — to rear
  c Four bolts to sides.
8 Connect the reverse lamp and overdrive isolator switch leads.
9 Refit the transmission cover panel, see 76.25.07.

TOP COVER

Overhaul 37.12.19

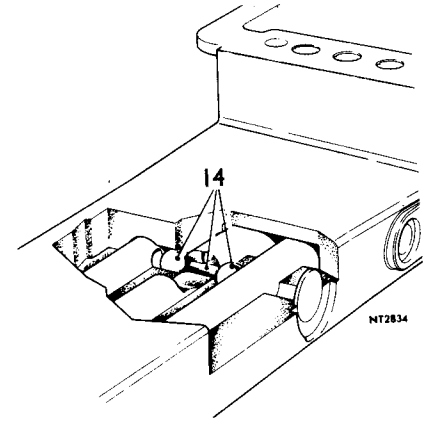
1 Remove the top cover, see 37.12.16.





Dismantling

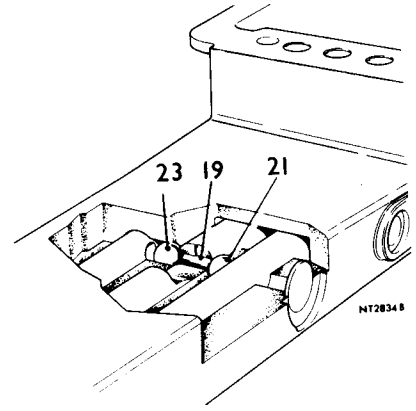
2 Remove the reverse lamp switch and overdrive switch (if fitted).
3 Remove the plug, distance piece, spring and plunger — reverse detent.
4 Remove the plug, spring and steel ball — 3rd/top detent.
5 Remove the plug, spring and steel ball — 1st/2nd detent.
6 Remove three Wedglok bolts — one from each selector shaft.
7 Move the three selector shafts into their neutral positions.
8 Withdraw the 1st/2nd selector shaft.
9 Remove the 1st/2nd selector fork and distance tube.
10 Withdraw the reverse selector shaft.
11 Remove the reverse actuator and distance tube.
12 Withdraw the 3rd/top selector shaft.
13 Remove the 3rd/top selector fork and distance tube.

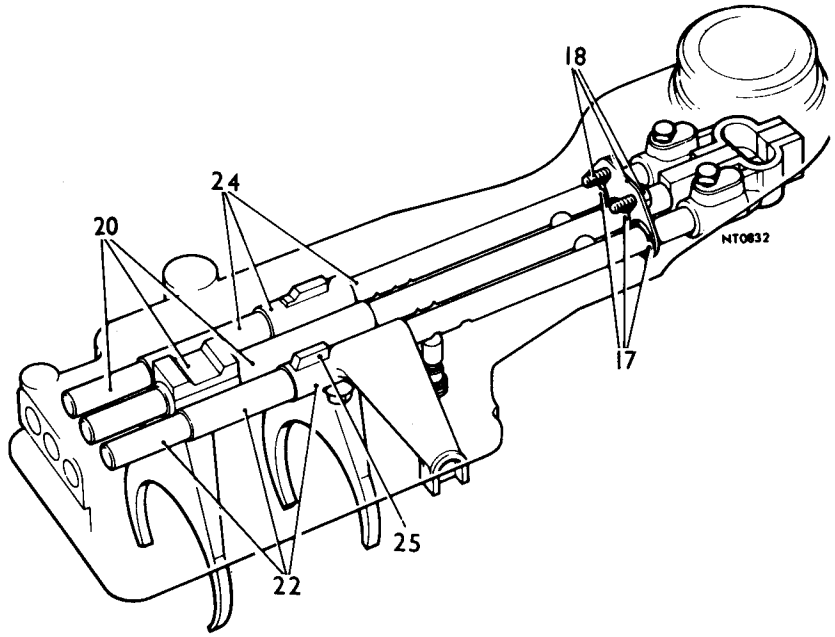


14 Remove the interlock plunger and interlock balls.
15 Unscrew two setscrews and remove the cover plate.
16 Remove the sealing rings.

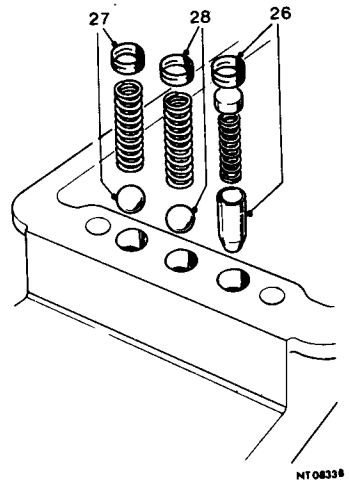
Reassembling

17 Fit a sealing ring into each bore.
18 Fit the cover plate and secure with two setscrews.
19 Fit the interlock plunger into the 3rd/top selector shaft.



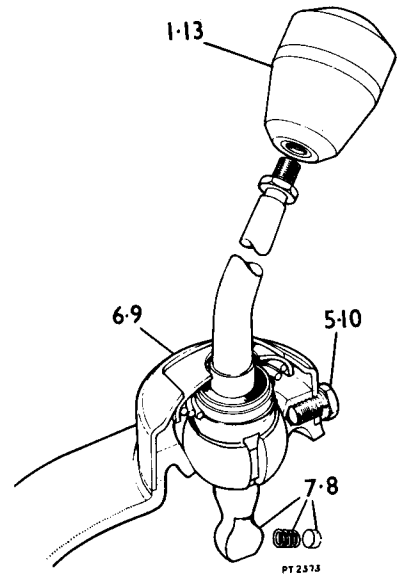


20 Fit the 3rd/top selector shaft, distance tube and fork into the top cover. Push the shaft into the neutral position.
21 Locate an interlock ball in between the 3rd/top and reverse shaft bores and retain with grease.
22 Fit the reverse selector shaft, distance tube and actuator into the top cover. Push the shaft into the neutral position.
23 Locate an interlock ball in between the 3rd/top and 1st/2nd bores and retain with grease.
24 Fit the 1st/2nd selector shaft, distance tube and fork into the top cover.
25 Secure the forks and actuator to the shafts using new Wedglok bolts.
26 Refit the reverse detent plunger, spring distance piece and plug, flush with cover.
27 Refit the 1st/2nd detent ball, spring and plug, flush with cover.
28 Refit the 3rd/top detent ball, spring and plug, flush with cover.
29 Refit the reverse lamp switch and overdrive isolator switches.
30 Refit the top cover assembly.



GEAR-CHANGE LEVER

Remove and refit 37.16.04



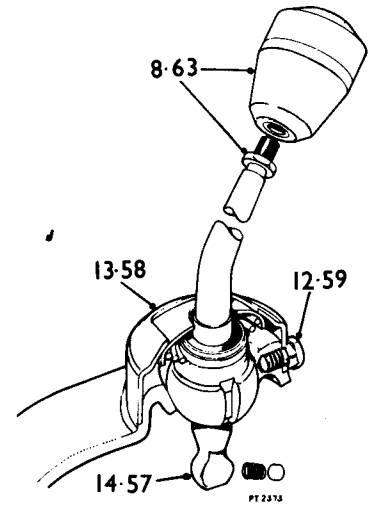
Removing
1 Slacken the locknut and unscrew the gear-lever knob.
NOTE: Refer to operation 86.65.35 if an overdrive switch is incorporated into the gear lever knob.
2 Remove the front carpets.
3 Remove the gearbox cover carpet.
4 Remove the gear-lever grommet.
5 Remove one bolt in back of bayonet cap.
6 Depress and turn the bayonet cap, withdraw the cap, plate and spring.
7 Carefully withdraw the gear-change lever, ensuring that the plunger and spring do not fall out.

Refitting
8 Using heavy grease to retain the plunger and spring, refit the gear-change lever.
9 Refit the spring, plate and cap.
10 Refit the bolt.
11 Refit the grommet.
12 Refit the carpets.
13 Refit the gear-lever knob and locknut.

GEARBOX ASSEMBLY

Remove and refit 37.20.01

Removing
1 Drive the vehicle onto a ramp.
2 Disconnect the battery.
3 Partially drain the radiator.
4 Release the two bolts holding the thermostat housing and manoeuvre clear.
5 Remove the three bolts holding the heater blower in position.
6 Remove the heater blower.
7 Remove the top bolt of the three holding the exhaust down-pipe in position. This should be done under the bonnet.



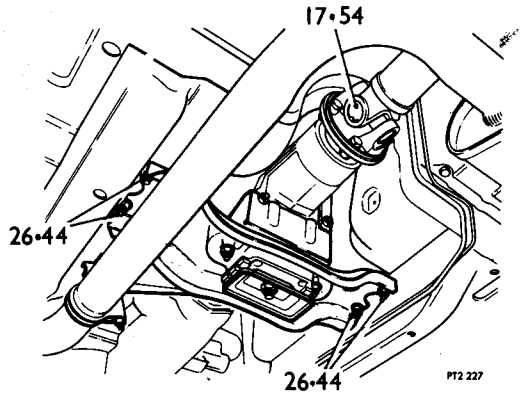
8 Release the gear-lever locknut and remove the knob and nut, see 37.16.04.
9 Remove the gearbox tunnel carpet.
10 Remove the gear-lever gaiter plate — four fixing screws.
11 Remove the gear-lever gaiter.
12 Remove one locating bolt in the back of the gearbox extension.
13 Remove the bayonet cap by twisting and lifting it clear.
14 Remove the gear-lever (do not lose the plunger and spring).

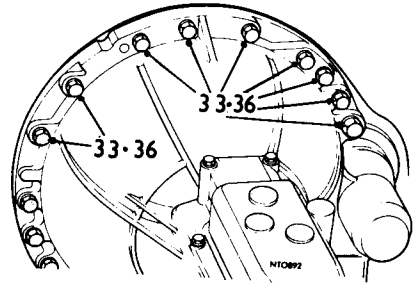
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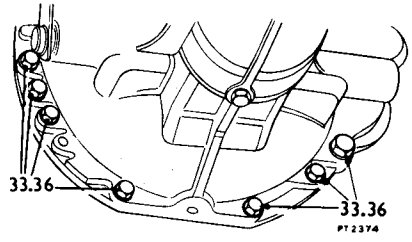
15 Raise the ramp.
16 Working under the car, remove the engine steady tiebar — one nut.
17 Disconnect the front end of the propshaft — four bolts and nuts.
18 Release and remove the pinch bolt from the steering-column universal joint.
19 Lower the rear of the front sub-frame — two bolts and nuts.
20 Release the exhaust clip fixed at the gearbox bracket.
21 Release the seven exhaust rubbers.
22 Remove the exhaust system from the down-pipe to the rear of the car.
23 Remove the centre and bottom exhaust flange nuts.
24 Remove the down-pipe and gasket.
25 Support the engine on the gearbox adaptor plate.
26 Release the four nuts supporting the gearbox rear mounting and (where fitted) release the gearbox steady strap.
27 Carefully lower the gearbox and manoeuvre the mounting bracket past the brake and petrol pipes, taking care not to damage them.
28 Remove the slave cylinder bracket fixings on the gearbox top cover — two bolts.
29 Pull the slave cylinder clear.
30 Disconnect the reverse light leads and clip from the top cover.
31 Position the leads and the slave cylinder around the gearbox adaptor plate to clear the gearbox.
32 Remove the speedometer drive cable at the gearbox.
33 Release the bell-housing bolts.
34 Manoeuvre the gearbox from the car.

Refitting

35 Lift the gearbox back into position.
36 Refit the bell-housing bolts.
37 Tighten all bell-housing bolts.
38 Refit the speedometer drive cable to the gearbox.
39 Connect up the reverse light leads.
40 Refit the reverse light lead clip to the top cover.







41 Position the slave cylinder over the push-rod.
42 Refit the slave cylinder to the top cover (two bolts) and tighten.
43 Carefully raise the gearbox and manoeuvre the mounting bracket past the brake and petrol pipes, taking care not to damage them.
44 Refit and tighten the four nuts supporting the gearbox rear mounting.
45 Remove the support on the gearbox adaptor plate.
46 Refit the down-pipe and gasket.
47 Refit the bottom two flange nuts.
48 Refit the exhaust system to the down-pipe.
49 Refit the seven exhaust rubbers.
50 Refit the exhaust clip to the gearbox bracket.
51 Raise the rear of the front sub-frame.
52 Secure the sub-frame with two washers and nuts.
53 Refit the steering-column universal joint and refit the pinch bolt.
54 Connect up the front end of the propshaft — four nuts and bolts.
55 Refit the engine steady tie-bar — one nut.
56 Lower the ramp.
57 Refit the gear-lever.
58 Refit the bayonet cap by twisting and locating.
59 Refit one securing bolt in the back of the gearbox extension.
60 Refit the gear-lever gaiter.
61 Refit the gear-lever gaiter plate — four fixing screws.
62 Refit the gearbox tunnel carpet.
63 Refit the gear-lever knob and locknut, see 37.16.04.
64 Refit the top bolt of the three holding the exhaust down-pipe in position.
65 Reposition the heater blower unit.
66 Bolt in position with three fixing screws.
67 Refit the thermostat housing — two bolts.
68 Top-up the radiator.
69 Connect the battery.
70 Drive the vehicle off the ramp.

GEARBOX

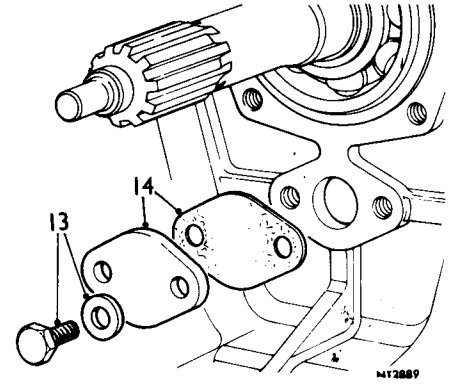
Overhaul **37.20.04**

Service tools: RG 421, S 4235A-2, S 314, S 4221A-15A, S167A

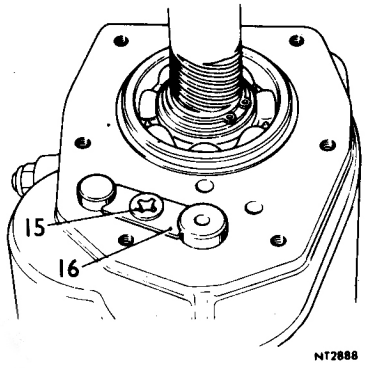
1 Remove the gearbox, see 37.20.01, and drain the oil.

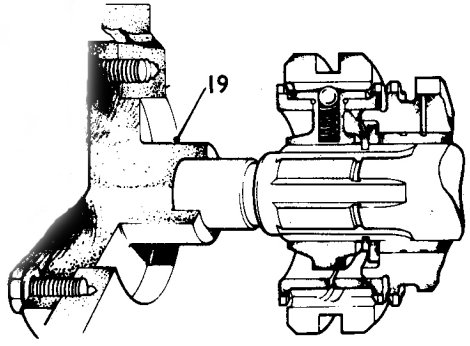
Dismantling

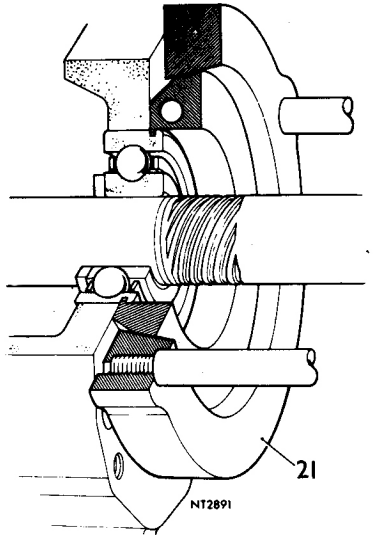
2 Unscrew and remove eight bolts.
3 Lift off the top cover and gasket.
4 Remove the clutch release mechanism, see 33.25.12.
5 Take out four setscrews and washers.
6 Tape over the constant pinion splines and remove the front bearing plate and gasket.
7 Remove the peg bolt and withdraw the speedometer drive pinion assembly. (If overdrive is fitted, perform operation 40.20.07, remove the overdrive cam and adaptor plate and continue from para. 13.)
8 Using tool No. RG 421 to retain the flange, unscrew the nut.
9 Remove the flange.
10 Unscrew the bolts.
11 Remove the rear extension and gasket.
12 Remove the thrust washer.



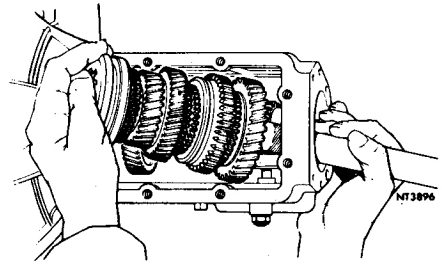
13 Take out two screws.
14 Remove the countershaft front plate and gasket.

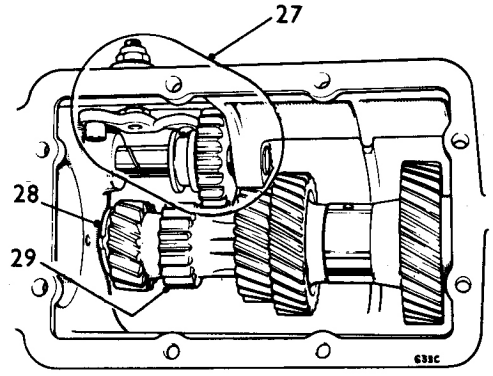


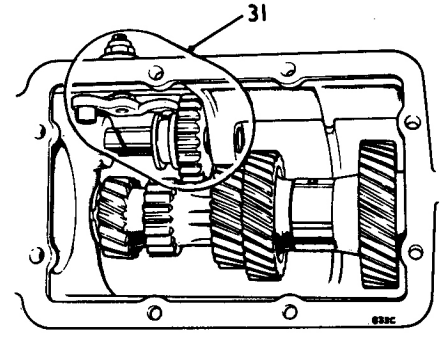


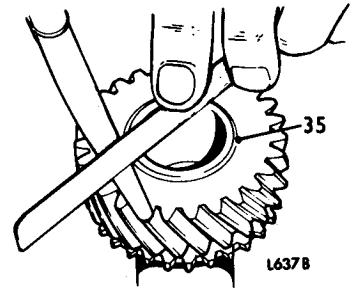


15 Take out the cross recessed-head screw.
16 Remove the retaining plate.
17 Withdraw the countershaft spindle and allow the cluster to drop to the bottom of the box.
18 Withdraw the constant pinion assembly.
19 Fit the abutment tool No. S 314.
20 Remove the centre bearing circlip, washer and snap-ring.
21 Using tool No. S 4221A-15A, withdraw the centre bearing. Remove tool S 314.
22 Remove the mainshaft assembly through the top aperture.
23 Remove the 3rd/top synchro unit and cups.
24 Remove the washer, 1st gear and bush, washer, 1st/2nd synchro unit and cups.
25 Using tool S 167A, remove the circlip.
NOTE: The sectioned washer behind the circlip has three lugs that fit in alternate splines: the longer prongs on tool S 69A fit in the splines between the lugs. Rotate circlip to ascertain position of lugs. Position circlip with ends on adjacent prongs of tool. With tool in position, gently prise between 2nd and 3rd gears to push circlip away from slot.
26 Remove the sectioned washer, 3rd gear and bush, washer, 2nd gear and bush, and washer.
27 Withdraw the reverse idler spindle, reverse gear, lever and pivot.
28 Remove the countershaft rear thrust washer.







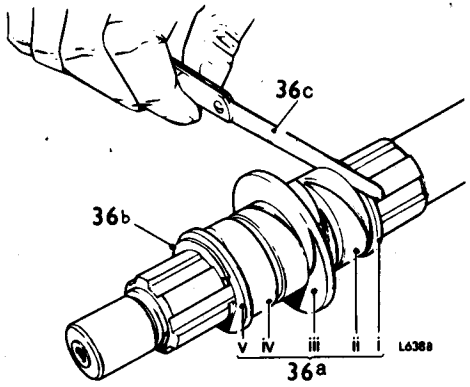


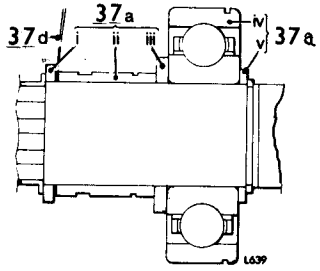
29 Remove the countershaft assembly.
30 Remove the countershaft front thrust washer.

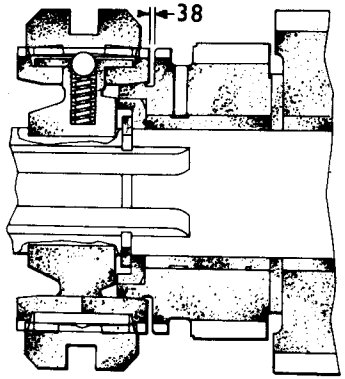
Reassembling

31 Refit the reverse lever with fulcrum pin, washer and nut to the gearbox.
NOTE: Position the lever on the pin so that approximately two screw threads are visible between the gearbox and lever. Replace the reverse idler gear and shaft.
32 Using heavy grease to retain the thrust washers in position, fit the countershaft cluster.
33 Align the thrust washers and fit the spindle.
34 Check the countershaft end-float. The end-float should be 0·007 to 0·012 in (0·18 to 0·30 mm). Adjust by selective use of thrust washers or, if necessary, remove metal from the steel backing face of the thrust washer. Withdraw the spindle.
35 Check the end-float of the 1st, 2nd and 3rd gears on their respective bushes. End-float should be 0·004 to 0·008 in (0·1 to 0·2 mm).
NOTE:
a Interchange of 1st and 3rd gear bushes is permissible to obtain these figures.
b If necessary, reduce the bush length to reduce the end-float or fit a new bush to increase the end-float.

continued





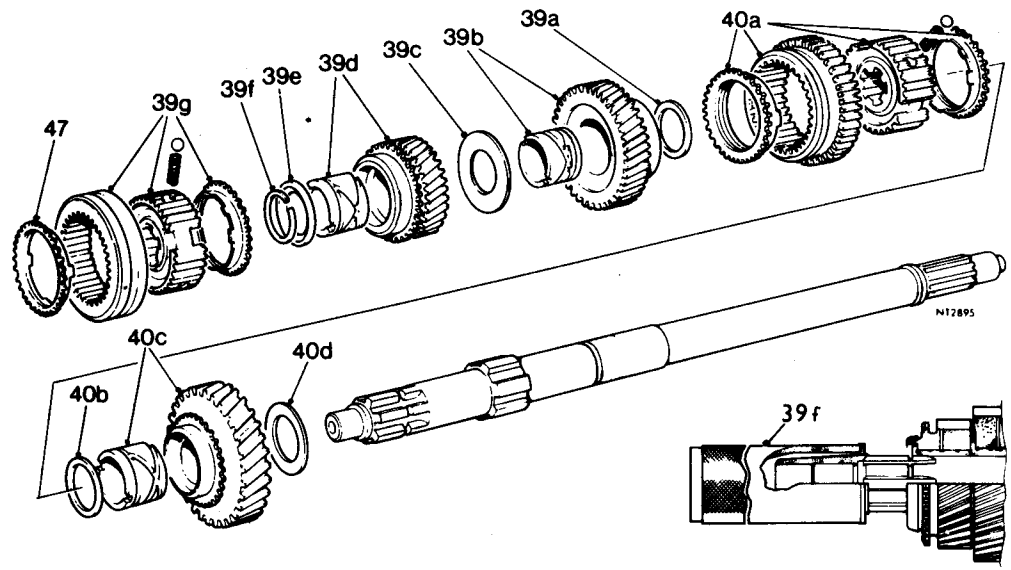


36 Check the total end-float of the 2nd and 3rd gear bushes on the mainshaft.
- a Temporarily fit to the front end of the mainshaft in order:
  - i Adjustment washer.
  - ii Bush — 2nd gear.
  - iii Thrust washer.
  - iv Bush — 3rd gear.
  - v Thrust washer — fit reversed.
  - vi Sectioned washer — fit reversed.
- b Insert the deeper portion of a discarded circlip in its groove in the mainshaft to retain the items.
- c Measure the bush end-float on the mainshaft, using feeler gauges.
- d End-float is to be within 0·003 to 0·009 in (0·08 to 0·23 mm).
- e Adjustment of end-float is to be made by selection of the adjustment washer (a) (i) of appropriate thickness listed as follows:

Part No.	Colour	Thickness in ± 0·001	mm ± 0·25
129941	Metal	0·119	3·02
129942	Green	0·122	3·10
129943	Blue	0·125	3·17
129944	Orange	0·128	3·25
134670	Yellow	0·133	3·38

- f Remove the items from the mainshaft but suitably identify selected adjustment washer for association with 2nd gear.

37 Check the end-float of the 1st gear bush on the mainshaft.
- a Temporarily fit the rear of the mainshaft in order:
  - i Adjustment washer.
  - ii Bush — 1st gear.
  - iii Thrust washer.
  - iv Ball bearing tool S 314.
  - v Washer.
- b Insert the deeper portion of a discarded circlip in its groove in the mainshaft to retain the items.
- c Drift the bearing into close abutment with the washer and circlip.
- d Measure the bush end-float on the mainshaft, using feeler gauges.



- e End-float is to be 0·003 to 0·009 in (0·08 to 0·23 mm).
- f Adjustment to end-float is to be made by selection of the adjustment washer (a) (i) of appropriate thickness given in preceding list (36 e).
- g Remove the items from the mainshaft but suitably identify the selected adjustment washer for association with the 1st gear. Bearing extractor tool S 4221A-15A.

38 Assemble each synchro cup on the respective gear and measure with feeler gauges the clearance between the gear and cup. Should the clearance be less than 0·030 in (0·76 mm), renew the cup.

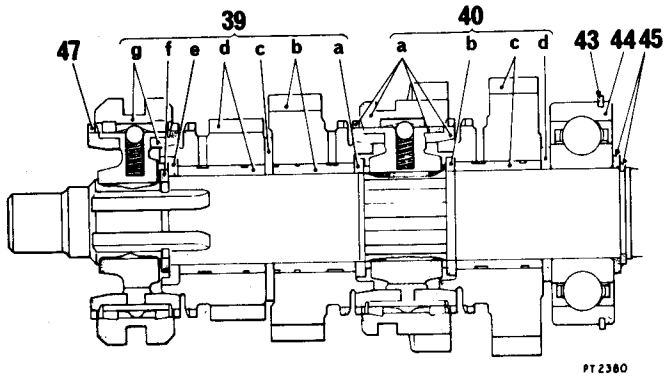
39 Assemble the front of the mainshaft in order:
- a Adjustment washer.
- b Assembled 2nd gear and bush.*
- c Thrust washer.*
- d Assembled 3rd gear and bush.
- e Sectioned washer.
- f Circlip—Tool S 167A.
- g 3rd/4th synchro unit fitted with synchro cups (short boss innermost).

*One piece item on later cars.

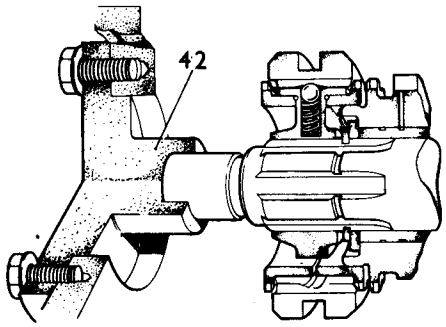
NOTE: Ensure correct assembly of bush and gear (b and d) in that bush and gear oilways align.

40 Assemble to the rear of the mainshaft in order:
- a 1st/2nd synchro unit fitted with synchro cups.
- b Adjustment washer.
- c Assembled 1st gear and bush (see 39 Note).
- d Thrust washer.

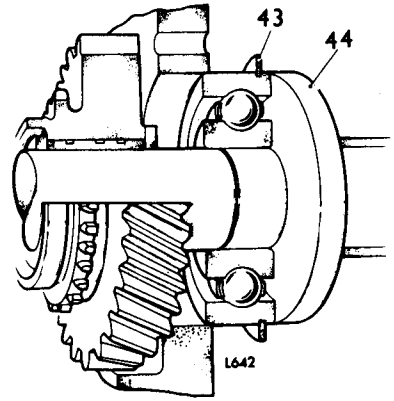
WARNING: IT IS RECOMMENDED THAT SEVERAL WINDINGS OF CORD ARE LASHED AROUND MAINSHAFT TO REAR OF THE 1st GEAR TO PREVENT ITS MOVEMENT, THEREBY AVOIDING ANY POSSIBILITY OF PERSONAL DAMAGE WHEN FITTING THE MAINSHAFT.

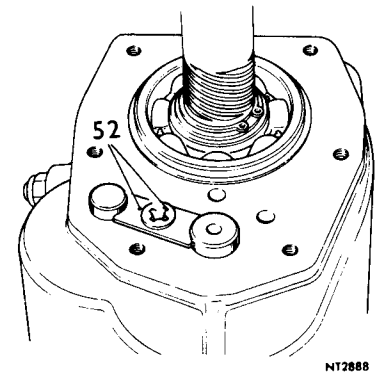


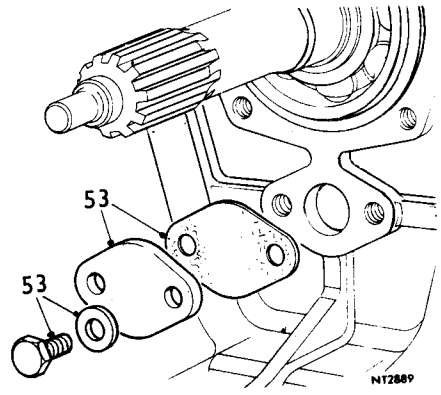
41 Enter the rear of the mainshaft through the top cover and rear apertures of gearbox, respectively, and manoeuvre mainshaft assembly into position.
42 Fit tool S 314 to the gearbox and engage the mainshaft spigot in the tool.
43 Fit the snap-ring to the bearing.
44 Fit the bearing to the mainshaft and gearbox. Tool S 314.
45 Remove tool S 314.
Protect the rear end of the mainshaft (hard brass block,) then tap on the rear end until the inner face of the mainshaft bearing is in close abutment with the washer and circlip.
47 Fit the top gear synchro cup.
48 Fit the constant pinion assembly.



49 Prior to engaging the countershaft gears, free the synchro cups with a screwdriver.
50 Carefully invert the gearbox to engage the countershaft gears, rotating the mainshaft and constant pinion shaft as necessary.
51 Align the countershaft gears and thrust washers, then press home countershaft spindle.
52 Refit the retaining plate, secure with cross recessed-head screw..
53 Refit the countershaft front cover plate and gasket; secure with two screws and copper washers.
54 Refit the mainshaft rear thrust washer and locate the rear extension and gasket. (If overdrive is to be fitted, refit the adaptor plate and cam and continue from 59).
55 Secure the rear extension — six bolts.
56 Refit the drive flange.
57 Fit the washer and tighten the nut to a torque load of 90 to 110 lbf ft (12·4 to 15·2 kgf m), using tool No. R 421 to retain the flange.
58 Refit the speedometer drive pinion assembly and secure with the peg bolt.
59 Refit the front bearing plate and gasket — four setscrews.
60 Refit the clutch release mechanism, 33.25.12.
61 Refit the top cover assembly and gasket — secure with eight bolts.
62 Refit the gearbox.



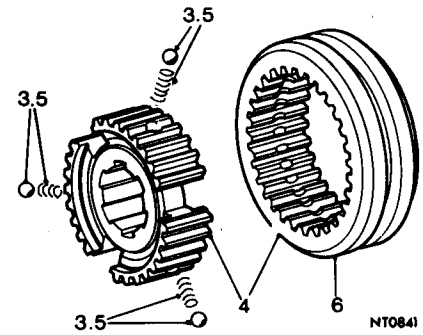




SYNCHRO UNITS

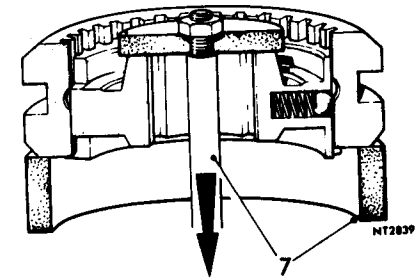
Overhaul **37.20.08**

1 Remove the synchro units, see 37.20.04.



Dismantling
2 Within the walls of a small box to prevent loss of components, carefully push the synchro hub through the sleeve.
3 Collect the three steel balls and springs.

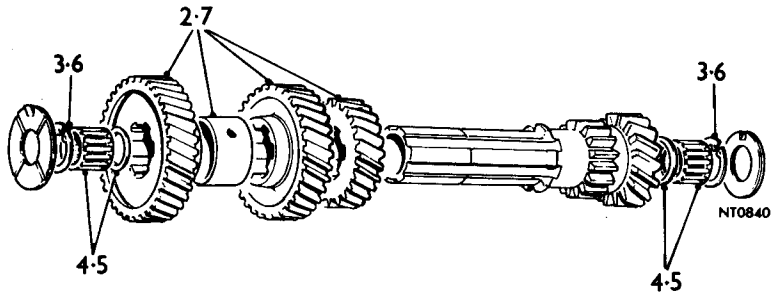
Reassembling
4 Trial fit the sleeve to the hub. The fit should be free sliding.
5 Assemble three springs and steel balls to the hub.
6 Fit the sleeve.



7 Test, using a spring balance, the axial release load which should be:
1st/2nd: 21 to 26 lb (10·1 to 12·5 kg)
3rd/top: 14 to 19 lb (6·7 to 9·1 kg).
If the release loads are below these limits, use new springs. If above, grind down the springs.
8 Refit the synchro units, see 37.20.04.

COUNTERSHAFT CLUSTER

Overhaul **37.20.37**



1 Remove the countershaft cluster, see 37.20.04.

Dismantling

2 Separate the 4th constant gear, spacer, 3rd and 2nd constant gears from the hub.
3 Remove the circlips.
4 Extract the roller bearings and backing washers from the hub.

Reassembling

5 Refit the backing washers and roller bearings.
6 Refit the circlips.
7 Assemble the 2nd and 3rd constant gears, spacer and 4th constant gear to the hub.
8 Refit the countershaft cluster, see 37.20.04.

CONSTANT PINION ASSEMBLY

Overhaul **37.20.54**

Service tool: S 4221A-15A

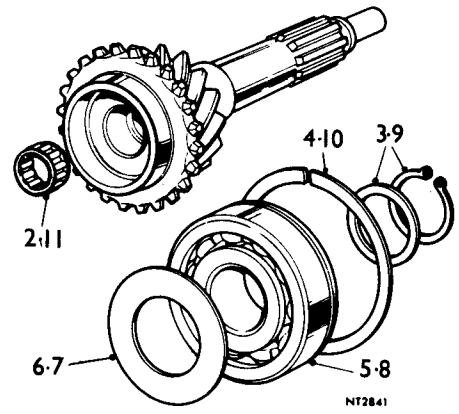
1 Remove the constant pinion assembly 37.20.04.

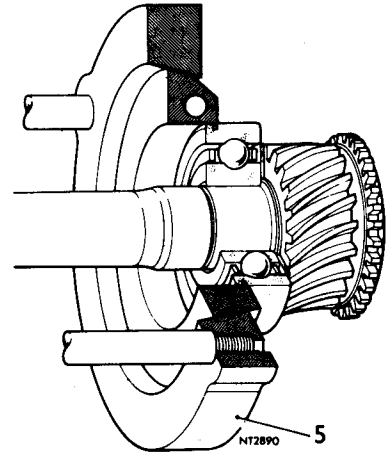
Dismantling

2 Remove the mainshaft spigot bearing.
3 Remove the circlip and washer.
4 Remove the snap-ring.
5 Using tool No. S 4221A-15A, withdraw the bearing.
6 Remove the oil thrower.

Reassembling

7 Fit the oil thrower over the shaft.
8 Using tool No. S 4221A-15A, fit the bearing ensuring that the oil thrower is centralized.
9 Fit the washer and a new circlip.
10 Refit the snap-ring.
11 Refit the mainshaft spigot bearing.
12 Refit the constant pinion assembly, see 37.20.04.





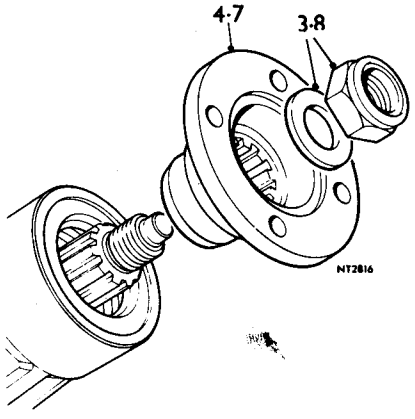
REAR OIL SEAL

Remove and refit **37.23.01**

Service tool: RG 421

Removing

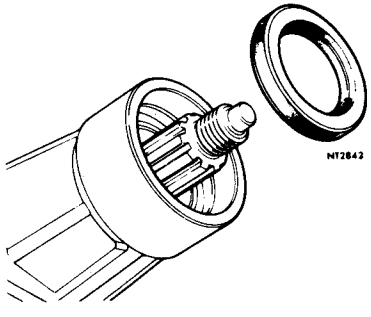
1 Drive the vehicle onto a ramp.
2 Remove the propeller shaft complete, see 47.15.01.



3 Using tool No. RG 421 to retain the flange, unscrew and remove the nut.
4 Remove the drive flange.
5 Prise out the seal.

Refitting

6 Fit a new seal into the rear extension.



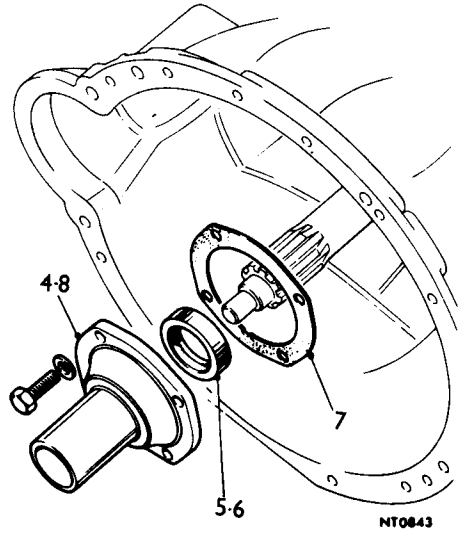
7 Refit the flange.
8 Using tool No. RG 421 to retain the flange, fit and tighten the nut to a torque of 90 to 110 lbf ft (12·4 to 15·2 kgf m).
9 Refit the propeller shaft, see 47.15.01.

FRONT OIL SEAL

Remove and refit **37.23.06**

Removing

1 Remove the gearbox, see 37.20.01.
2 Remove the clutch release mechanism, see 33.25.12.
3 Suitably mask the constant pinion shaft splines.



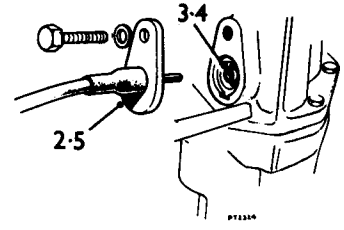
4 Remove the front bearing plate — four setscrews.
5 Prise out the oil seal.

Refitting

6 Press a new oil seal into the bearing plate, ensuring that the seal lip is towards the gearbox.
7 Apply grease to the cover abutment face and fit the gasket.
8 With the constant pinion shaft splines covered (see 3), fit the front end cover — four setscrews and plain washers.
9 Remove the cover from the constant pinion shaft splines.
10 Refit the clutch release mechanism, see 33.25.12.
11 Refit the gearbox, see 37.20.01.

SPEEDOMETER DRIVE PINION ASSEMBLY

Remove and refit **37.25.05**



Removing

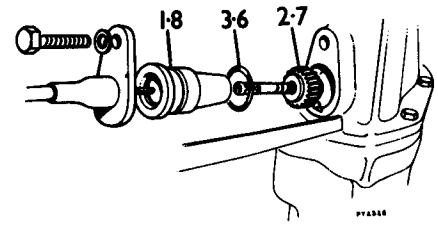
1 Drive the vehicle onto a ramp and raise the ramp.
2 Disconnect the speedometer cable from the gearbox.
3 Withdraw the pinion assembly.

Refitting

4 Refit the pinion assembly.
5 Connect the speedometer cable to the gearbox.

SPEEDOMETER DRIVE PINION ASSEMBLY

Overhaul **37.25.13**



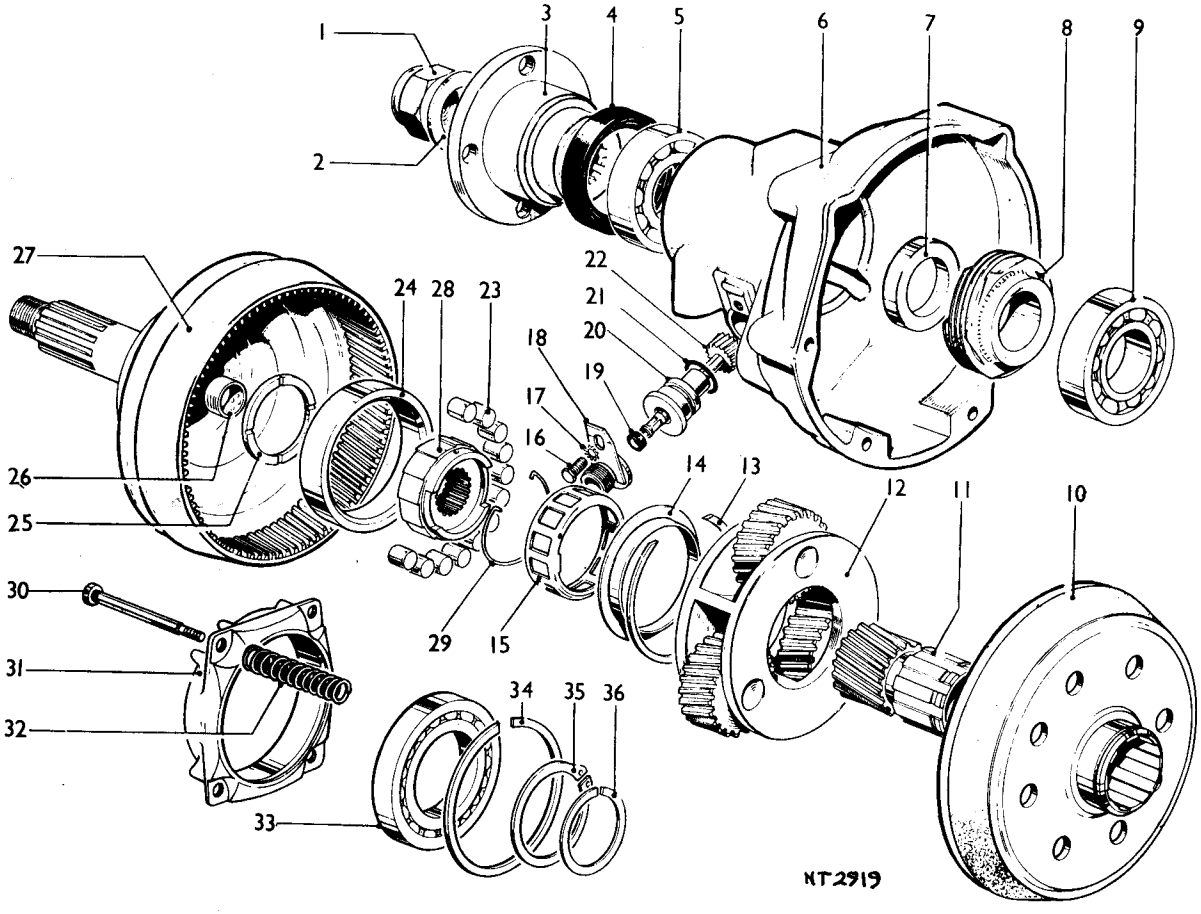
1 Remove the speedometer pinion assembly, see 37.25.05.

Dismantling

2 Withdraw the pinion from the housing.
3 Remove the 'O' ring.
4 Extract the oil seal.

Reassembling

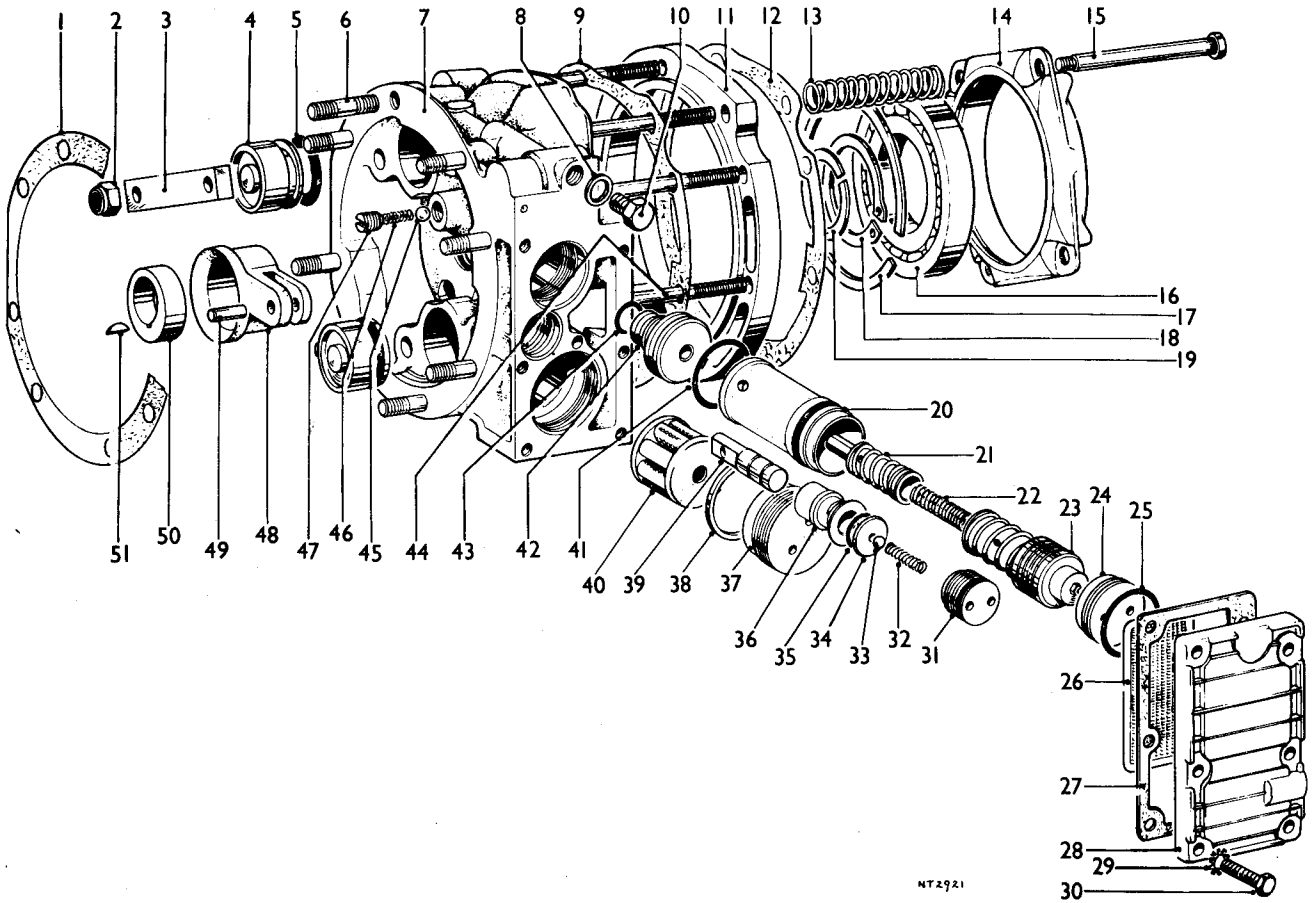
5 Press a new oil seal into the housing.
6 Refit the 'O' ring.
7 Refit the pinion.
8 Refit the pinion assembly, see 37.25.09.



J TYPE OVERDRIVE COMPONENTS

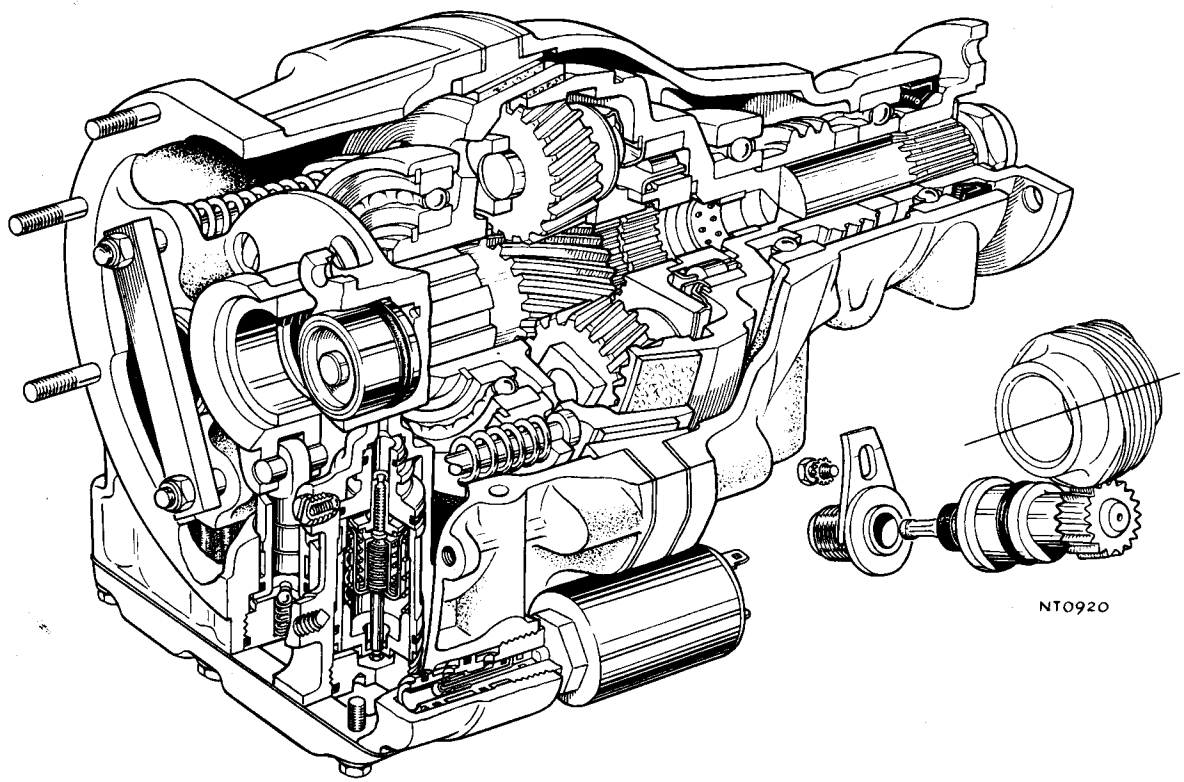
1 Locknut
2 Washer
3 Drive flange
4 Oil seal
5 Annulus rear ball-race
6 Rear case
7 Spacer
8 Speedometer driving gear
9 Annulus front ball-race
10 Clutch sliding member
11 Sun wheel
12 Planet carrier assembly
13 Circlip
14 Oil thrower
15 Uni-directional clutch cage
16 Bolt
17 Star washer
18 Speedometer retaining clamp
19 Oil seal
20 Speedo driven gear housing
21 'O' ring
22 Speedometer driven gear
23 Uni-directional clutch rollers
24 Uni-directional clutch roller track
25 Thrust washer
26 Mainshaft bush
27 Annulus
28 Uni-directional clutch hub
29 Uni-directional clutch spring
30 Thrust pin
31 Thrust ring
32 Clutch return springs
33 Thrust ball-race
34 Retaining circlip
35 Circlip for sliding member
36 Circlip for sun wheel

J TYPE OVERDRIVE COMPONENTS



1	Gasket	27	Sump gasket
2	Locknut	28	Sump
3	Bridge piece	29	Star washer
4	Operating piston	30	Bolt
5	'O' ring	31	Pump plug
6	Stud	32	Non-return valve spring
7	Main case	33	Steel ball
8	Washer (copper)	34	Non-return valve seat
9	Gasket	35	'O' ring
10	Pressure tapping plug	36	Pump body
11	Brake ring	37	Pressure filter plug
12	Gasket	38	Pressure filter washer
13	Clutch return spring	39	Pump plunger
14	Thrust ring	40	Pressure filter
15	Thrust pin	41	'O' ring
16	Thrust ball-race	42	Relief valve body
17	Retaining circlip	43	'O' ring
18	Circlip for sliding member	44	Stud
19	Circlip for sun wheel	45	Steel ball
20	Dashpot sleeve	46	Lubrication relief valve spring
21	Relief valve assembly	47	Lubrication relief valve plug
22	Double dashpot spring	48	Pump strap
23	Dashpot piston assembly	49	Pump pin
24	Dashpot plug	50	Cam
25	'O' ring	51	Woodruff key
26	Sump filter		

OVERDRIVE — J TYPE



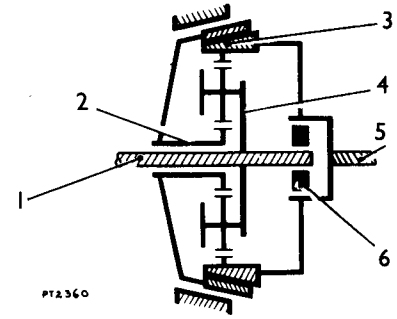
INTRODUCTION

The overdrive is an additional gear unit between the gearbox and propeller shaft. When in operation it provides a higher overall gear ratio than that given by the final drive, crown wheel and pinion.

The primary object of an overdrive is to provide open road cruising at an engine speed lower than it would be in normal top gear. This reduced engine speed gives a considerable reduction in petrol consumption and increase in engine life. Overdrive may also be used on the indirect gears to enhance performance or to provide easy and clutchless gear changing, for example in town traffic.

The overdrive is operated by an electric solenoid controlled by a switch, fitted in the gear-lever knob. An inhibitor switch is fitted in the electrical circuit to prevent engagement of overdrive in reverse, and some or all of the indirect gears.

Overdrive can be engaged or disengaged at will at any speed, but usually above 30 m.p.h. in top gear. It should be operated without using the clutch pedal and at any throttle opening because the unit is designed to be engaged and disengaged when transmitting full power. The only precaution necessary is to avoid disengaging overdrive at too high a road speed, particularly when using it in an indirect gear, since this would cause excessive engine revolutions.



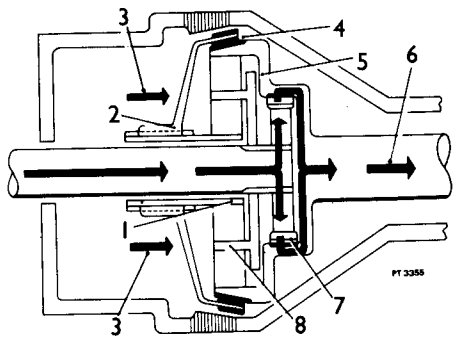
KEY

1 Input shaft connected to planet carrier
2 Sun gear
3 Annulus
4 Planet carrier
5 Output shaft connected to annulus
6 Roller clutch

WORKING PRINCIPLES

The overdrive gears are epicyclic and consist of a central sun-wheel meshing with three planet gears which in turn mesh with an internally toothed annulus. All gears are in constant mesh. The planet carrier is attached to the input shaft and the annulus is integral with the output shaft.
The unit is shown diagrammatically in PT 3355.
An extension of the gearbox mainshaft forms the overdrive input shaft. Forward direct drive power is transmitted from this shaft to the inner member of uni-directional clutch and then to the outer member of this clutch through rollers which are driven up inclined faces and wedge between the inner and outer members. The outer member forms part of the combined annulus and output shaft.
The gear train is inoperative. A cone clutch is mounted on the externally splined extension of the sun-wheel and is loaded in contact with the annulus by a number of springs which have their reaction against the casing of the overdrive unit. The spring load is transmitted to the clutch member through a thrust ring and ball bearing. This arrangement causes the inner friction lining of the cone clutch to contact the outer cone of the annulus and rotate with the annulus, whilst the springs and thrust ring remain stationary. Since the sun-wheel is splined to the clutch member the whole gear train is locked, permitting over-run and reverse torque to be transmitted by the cone clutch, without which the uni-directional clutch would give a free-wheel condition. Additional load is imparted to the clutch member, during over-run and reverse, by the sun-wheel which, due to the helix angle of its gear teeth, thrusts rearward and has for its reaction member the cone clutch.

IN DIRECT DRIVE

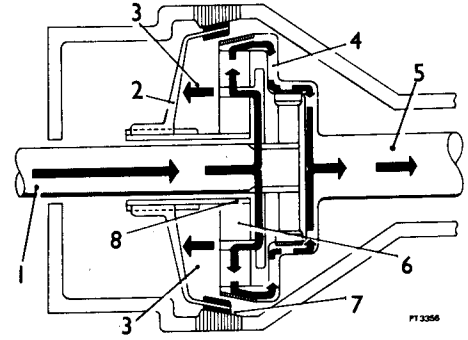


KEY

1 Sun wheel
2 Sliding cone clutch
3 Spring pressure
4 Anulus and sun wheel locked
5 Annulus
6 To propshaft
7 Uni-directional roller clutch
8 Planet wheels

The illustration PT 3356 shows the position of the cone clutch when overdrive is engaged. It will be seen that it is no longer in contact with the annulus but has moved forward so that its outer friction lining is in contact with a brake ring forming part of the overdrive casing. The sun wheel to which the clutch is attached is therefore held stationary. The output shaft and annulus continue to rotate at the same speed, so the planet wheels rotate on their axes around the stationary sun wheel reducing the planet carrier and input shaft speed. The uni-directional clutch permits the outer member to over-run the inner member. This condition gives a lower engine speed for a given road speed.
Movement of the cone clutch in a forward direction is effected by means of hydraulic pressure which acts upon two pistons when a valve is opened, by operating the driver-controlled selector switch. This hydraulic pressure overcomes the springs which load the clutch member on to the annulus and causes the clutch to engage the brake ring with sufficient load to hold the sun wheel at rest. Additional load is imparted to the clutch in a forward direction due to the helix angle of the gear teeth.

IN OVERDRIVE



KEY

1 From gearbox
2 Sliding cone clutch
3 Hydraulic pressure
4 Annulus drive by planet gears
5 To propshaft
6 Planet wheels
7 Locked cone clutch holds sun wheel
8 Sun wheel

SOLENOID AND OPERATING VALVE

Energizing

The solenoid and operating valve are a self-contained, factory sealed unit, situated on the main case of the overdrive.

The solenoid has a single coil, encapsulated and completely waterproof, with a continuous current consumption of approximately 2 amperes. There are no electrical contacts in the solenoid.

In direct drive a residual pressure of approximately 40 lbf/in² maintains the system in primed condition and provides lubrication. This is achieved by the relief valve piston reacting on the residual pressure spring. When overdrive is engaged, pressure increases to a pre-determined operating pressure of 500/550 lbf/in². When the solenoid is energized, its valve opens and oil which is at residual pressure is directed via passage 'Z' to the bottom of the dashpot piston. This causes the dashpot piston to rise and compress the dashpot spring, causing a progressive increase in hydraulic pressure until the piston reaches its stop, by which time the relief valve spring has been compressed to its working length, thus giving full operating pressure. This pressure causes the operating pistons to move forward, overcoming the clutch springs and engages the cone clutch in the brake ring.

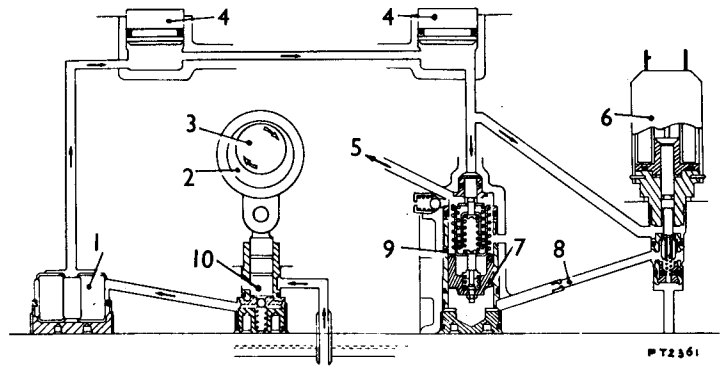
De-energising

When the solenoid is de-energized, its valve is closed by a spring, cutting off the oil supply from the pump to the dashpot. Oil is now exhausted via the control orifice in passage 'Z' which allows the relief valve spring to relax to its direct drive position. The dashpot spring moves the dashpot piston to its stop allowing the system pressure to drop progressively, which enables the clutch springs to move the cone clutch gently into contact with the annulus.

The residual pressure of approximately 40 lbf/in² is now maintained in direct drive.

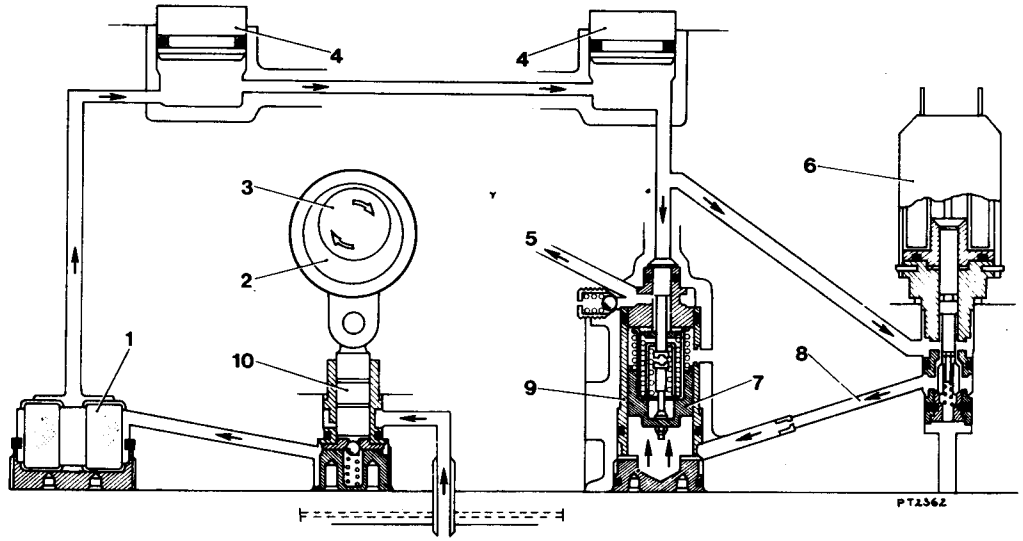
HYDRAULIC SYSTEM

Hydraulic pressure is developed by a plunger-type pump, cam-operated from the input shaft. The pump draws oil from an air-cooled sump through a suction filter and delivers it via non-return valve, through a pressure filter to the operating pistons, solenoid valve and relief valve. Incorporated in the relief valve is a spring dashpot which ensures smooth overdrive engagement and disengagement under varying conditions.



KEY

1	Pressure filter	6	Solenoid valve
2	Cam	7	Dashpot
3	Input shaft	8	Passage Z
4	Operating pistons	9	Relief valve
5	To central lubrication	10	Pump



KEY

1	Pressure filter	6	Solenoid valve
2	Cam	7	Dashpot
3	Input shaft	8	Passage Z
4	Operating pistons	9	Relief valve
5	To central lubrication	10	Pump

LUBRICATION SYSTEM

Oil is discharged through the relief valve to an annular channel in the centre of the main casing and then through drillings in the mainshaft to the annulus spigot bearing. Immediately in front of the spigot bearing a radial drilling passes oil through the unidirectional clutch: from here it is directed by an oil thrower into a catcher disc on the planet carrier and to the planet bearings via the hollow planet bearing pins.

The pressure in the lubrication passage is controlled by the lubrication relief valve.

MAINTENANCE

The level of oil should be checked at the gearbox. To drain, the sump of the overdrive must be removed as well as the gearbox drain plug. This will provide acces to the suction and pressure filters, which should also be removed and cleaned before replenishing with new oil.

Following complete draining and refilling, run the transmission for a short period then re-check the oil level.

It is essential that only the approved lubricant is used for topping-up and refilling. ON NO ACCOUNT SHOULD ANY ANTI-FRICTION ADDITIVES BE USED.

CLEANLINESS

Scrupulous cleanliness must be maintained throughout all servicing operations. Even minute particles of dust, dirt or lint from cleaning cloths may cause malfunction. When the overdrive and gearbox have a common oil supply, it is naturally as important that the same high standards of cleanliness must be maintained when servicing the gearbox.

Great care must be taken to avoid the entry of dirt when topping-up or re-filling.

For cleaning use petrol or paraffin ONLY, and on no account should water be used.

FAULT DIAGNOSIS AND RECTIFICATION

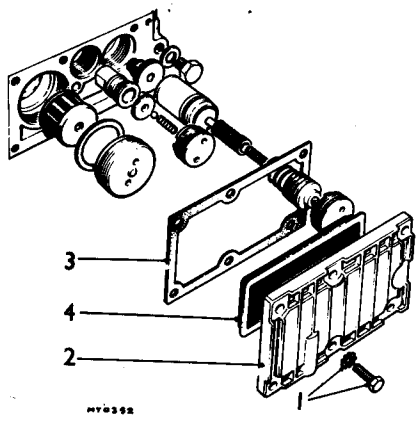
Fault	Possible Cause	Remedy
OVERDRIVE DOES NOT ENGAGE	a Insufficient oil in unit	Top up gearbox/overdrive.
	b Solenoid not energizing	Check electrical circuit.
	c Solenoid energizing but not operating	Remove solenoid and check operation of solenoid valve.
	d Insufficient hydraulic pressure	Fit pressure gauge and check operating pressure.
		Clean filters.
		Re-seat pump non-return valve if necessary.
		Check relief valve operation.
		Clean control orifice. DO NOT PROBE WITH WIRE.
	e Pump damaged	Remove and check.
	f Internal damage	Remove and examine overdrive.
*OVERDRIVE DOES NOT RELEASE	*THIS CALLS FOR IMMEDIATE ATTENTION. DO NOT REVERSE THE CAR, OR EXTENSIVE DAMAGE MAY BE CAUSED	
	a Fault in electrical control circuit	Check electrical system for closed circuit.
	b Sticking solenoid valve	Remove solenoid and check valve.
	c Residual pressure too high	Fit pressure gauge and check residual pressure. If pressure is too high, check for sticking relief valve.
	d Control orifice blocked	Check and blow through with compressed air. DO NOT PROBE WITH WIRE.
	e Cone clutch sticking	Tap the brake ring several times with a hide mallet.
	f Internal damage	Remove and examine overdrive.
CLUTCH SLIP IN OVERDRIVE	a Insufficient oil in unit	Top up gearbox/overdrive.
	b Operating pressure too low	Fit the pressure gauge and check the pressure. Check the filters, pump non-return ball valve and relief valve.
		Check that the control orifice is clear.
	c Sticking solenoid valve	Remove solenoid and check
		Remove solenoid and check operation of solenoid valve.
	d Worn or glazed clutch linings	Remove overdrive and examine the linings for mechanical obstruction to movement of cone clutch.
SLOW DISENGAGEMENT OF OVERDRIVE, FREEWHEELING ON OVER-RUN, SLIP IN REVERSE GEAR	(THESE SYMPTOMS MAY OCCUR TOGETHER OR SEPARATELY)	
	a Sticking relief valve	Check for sticking relief valve.
	b Sticking or partially blocked control valve	Remove solenoid and check.
	c Control orifice blocked	Check to ensure that the orifice is clear.
	d Internal damage	Remove and examine overdrive.

DIMENSIONS AND CLEARANCES FOR PARTS WHEN NEW

	Dimensions New	Clearances New
Cam		
Outside diameter of cam	1·4590 in/1·4600 in	0·0010 in/0·0030 in
Inside diameter of pump strap	1·4610 in/1·4620 in	
Gearbox mainshaft		
Diameter of oil transfer	0·9640 in/0·9650 in	0·0010 in/0·0030 in
Inside diameter of maincase at oil transfer	0·9660 in/0·9670 in	
Diameter at sun wheel	0·9410 in/0·9430 in	0·0040 in/0·0080 in
Inside diameter of sun wheel bush (where fitted)	0·9470 in/0·9490 in	
Diameter at mainshaft spigot	0·5620 in/0·5625 in	0·0003 in./0·0018 in.
Inside diameter at spigot bearing	0·5628 in/0·5638 in	
Operating pistons		
Operating piston diameter	1·2492 in/1·2497 in	0·0003 in/0·0020 in
Operating piston bore diameter	1·2500 in/1·2512 in	
Relief valve, pump		
Pump plunger diameter	0·4996 in/0·5000 in	0·0003 in/0·0013 in
Pump body bore	0·5003 in/0·5009 in	
Relief valve		
Outside diameter of relief valve piston	0·2496 in/0·2498 in	0·0002 in/0·0009 in
Inside diameter of relief valve body	0·2500 in/0·2505 in	
Outside diameter of dashpot piston	0·9360 in/0·9370 in	0·0005 in/0·0025 in
Inside diameter of dashpot sleeve	0·9375 in/0·9385 in	0·0005 in/0·0025 in
Speedo pinion		
Outside diameter of speedo pinion	0·3105 in/0·3110 in	0·0010 in/0·0030 in
Inside diameter of speedo bearing	0·3120 in/0·3135 in	
Miscellaneous		
Sliding member travel from direct drive to overdrive (measured at bridge pieces)	0·090 in/0·115 in	

SUMP FILTER

Remove and refit **40.10.01**



Removing

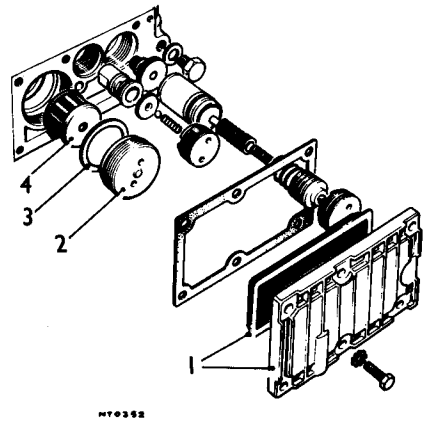
1 Remove the six bolts and star washers holding the sump on.
2 Remove the sump.
3 Remove the sump gasket.
4 Pull the filter out.
5 Clean the filter in either paraffin or petrol.

Refitting

6 Push the filter back into position.
7 Refit the sump and gasket.
8 Refit the bolts and star washers and tighten to a torque of 6 lbf ft (0·8 kgf m).

PRESSURE FILTER

Remove and refit **40.10.08**

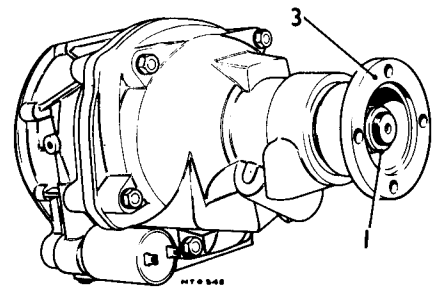


Removing

1 Remove the sump and suction filter.
2 Remove the pressure filter base plug (largest plug), using tool L 354; the filter element will come away with the plug.
3 Remove the aluminium washer which locates on the shoulder in the filter bore.
4 Remove foreign matter and wash the element in petrol or paraffin.
5 Renew the aluminium washer if there are any signs of damage or scoring.
6 Refit the filter and pressure filter base plug, using tool L 354.
7 Tighten up until the plug is flush with the base, a torque loading of 16 lbf ft (2·2 kgf m).

OIL SEAL — REAR

Remove and refit **40.15.01**



Removing

1 Remove the nut.
2 Remove the washer.
3 Remove the drive flange.
4 Remove the rear oil seal, using special tool L 177A with 7657.

Refitting

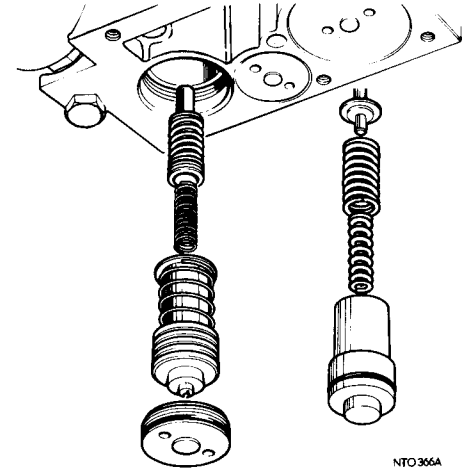
5 Fit the oil seal, using special tool L 177A with 550.
6 Refit the drive flange.
7 Refit the washer.
8 Fit a new self-locking nut and tighten to a torque of 80 to 130 lbf ft (11·1 to 18·0 kgf m).

RELIEF VALVE AND DASHPOT ASSEMBLY

Remove and refit **40.16.04**

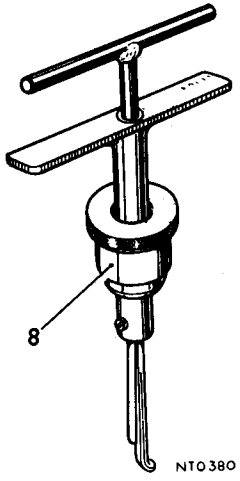
NOTE: If the vehicle has been in recent use, care should be taken to avoid hot oil burning the skin.

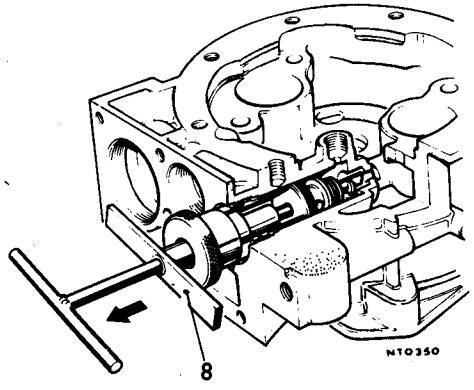
1 Remove six bolts and star washers securing the sump to the main case.
2 Remove the gasket.
3 Remove the gauze filter.
4 Using Churchill tool L 354A, remove the relief valve plug.
5 Withdraw the dashpot piston complete with its component springs and cup.
6 Remove the residual pressure spring.
NOTE: This is the only loose spring in the general assembly.



NOTE: Earlier and later types of relief valve are illustrated.

7 The relief valve piston assembly can now be withdrawn by carefully pulling down with a pair of pliers.





8 Insert tool L 401A into the new exposed relief valve bore (taking care not to damage this) and withdraw the relief valve together with the dashpot sleeve.
NOTE: Do not dismantle the dashpot and relief valve piston assemblies otherwise the predetermined spring pressures will be disturbed.

Refitting

9 Ensure that before assembly all the components are clean and lightly oiled.
10 Insert the relief body in the bore and, using the relief valve outer sleeve, push fully home.
NOTE: The end with the 'O' ring is nearest to the outside of the casing.
11 Position the relief valve spring and piston assembly into the dashpot cup, ensuring that both ends of the residual pressure spring are correctly located.
12 Carefully position these components in the relief valve outer sleeve, at the same time engaging the relief valve piston in its housing.
13 Fit the base plug and tighten it flush with the casing to a torque loading of 16 lbf ft (2·2 kgf m).

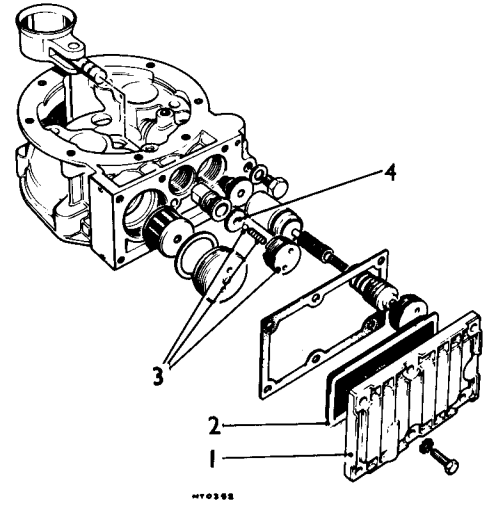
RELIEF VALVE AND DASHPOT ASSEMBLY

Overhaul **40.16.07**

1 Remove the relief valve and dashpot assembly, see 40.16.04.
2 Inspect the pistons and ensure that they move freely in their respective housings.
3 Inspect the 'O' rings and ensure that they are in good condition.
4 If they are damaged at all, the 'O' ring should be renewed.
5 Refit the relief valve and dashpot assembly, see 40.16.04.

PUMP NON-RETURN VALVE

Remove and refit **40.16.10**



Removing

1 Remove the overdrive sump.
2 Remove the suction filler.
3 With Churchill tool L 354A, remove the pump plug (centre plug) taking care not to lose the non-return valve spring and ball.
4 Remove the non-return valve seat.

Refitting

5 Place the spring in the non-return valve plug.
6 Position the ball on the spring.
7 Locate the non-return seat on the ball.
8 Screw the complete assembly into the maincase, using tool L 354A.
9 Screw up flush with the case to a torque loading of 16 lbf ft (2·2 kgf m).

PUMP NON-RETURN VALVE

Overhaul **40.16.14**

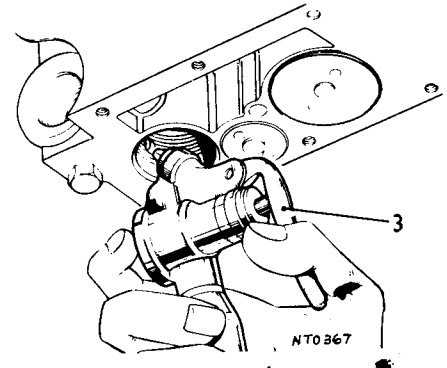
1 Remove the pump non-return valve, see 40.16.10.
2 Carefully inspect the non-return valve ball and valve seat. If necessary, reseat the ball on the seat by tapping gently with a copper drift.
3 Ensure that the 'O' ring is undamaged.
4 If the 'O' ring is damaged, renew it.
5 Refit the 'O' ring after smearing with petroleum jelly.
6 Refit the pump non-return valve, see 40.16.10.

CONTROL ORIFICE

Clean **40.16.19**

The control orifice is situated in the angled drilling between the relief valve and the solenoid control valve.

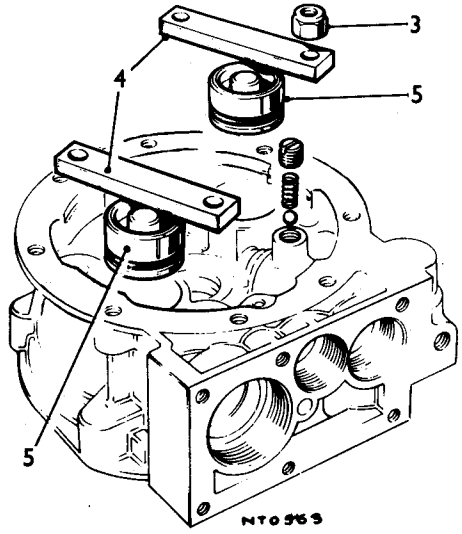
1 To gain access, remove the solenoid control valve, see 40.22.04.
2 Remove the relief valve and outer sleeve, see 40.16.04.



3 Clean the orifice with a high pressure air-line.
NOTE: Do not attempt to clean the orifice with wire or its calibration may be impaired.
4 Refit the relief valve and outer sleeve, see 40.16.04.
5 Refit the solenoid control valve, see 40.22.04.

OPERATING PISTONS

Remove and refit **40.16.24**



Removing

1 Remove the gearbox and overdrive from the car, see 37.20.01.
2 Remove the overdrive from the gearbox, see 40.20.07.
3 Remove four nuts.
4 Remove two bridge pieces.
5 With a pair of pliers, remove the operating pistons, identifying them with their respective cylinders.

Refitting

6 Lightly oil the operating pistons.
7 Push the pistons into the housings.
8 Fit the two bridge pieces.
9 Fit and tighten the four new nuts to a torque of 6 to 8 lbf ft (0·8 to 1·1 kgf m).
10 Refit the overdrive to the gearbox, see 40.20.07.
11 Refit the gearbox and overdrive to the car, see 37.20.01.

OPERATING PISTONS

Overhaul **40.16.29**

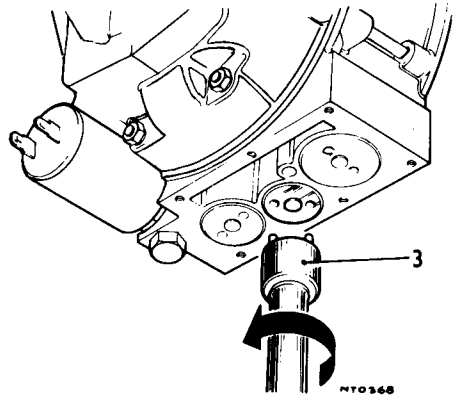
1 Remove the operating pistons, see 40.16.24.
2 Inspect each of the 'O' rings for any damage or wear.
3 If any damage is found the ring must be renewed and smeared with petroleum jelly.
4 Refit the operating pistons, see 40.16.24.

OIL PUMP

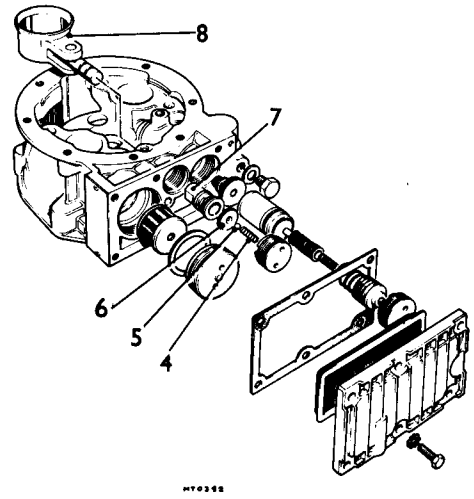
Remove and refit **40.18.01**

Removing

1 Remove the overdrive from the car, see 40.20.07.
2 Remove the sump and filter, see 40.10.01.



3 Remove the pump plug, using tool L 354A.



4 Remove the non-return valve spring.
5 Remove the steel ball.
6 Remove the non-return valve seat.
7 Work the pump body out of the main casing.
8 Remove the pump plunger assembly.

Refitting

9 Position the pump plunger assembly in the main case.
10 Fit the pump body in the main casing, ensuring that the flat on the body faces towards the pressure filter housing.
11 Fit the non-return valve seat.
12 Fit the steel ball.
13 Fit the non-return valve spring into the pump plug.
14 Fit the plug and tighten to a torque of 16 lbf ft (2·2 kgf m).
15 Clean the sump filter and replace.
16 Fit the sump with a new joint.
17 Tighten the sump bolts to a torque of 6 lbf ft (0·8 kgf m).
18 Refit the overdrive to the car, see 40.20.07.

OIL PUMP

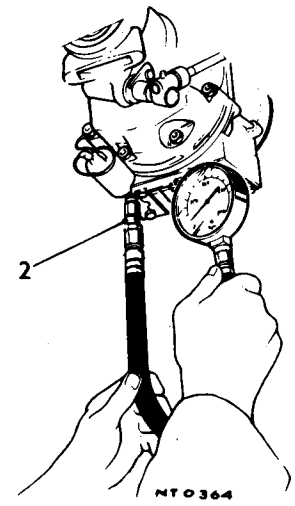
Overhaul **40.18.04**

1 Remove the pump plunger assembly, see 40.18.01.
2 Check that the strap is a good fit on the mainshaft cam.
3 Check that there is no excess play between the strap and the plunger.
4 If the pump plunger assembly is worn or damaged, this must be replaced as a complete assembly.
5 Check that the 'O' rings on the pump body and the plug are perfect; if not, these must be replaced.
6 Refit the pump plunger assembly, see 40.18.01.

OVERDRIVE ASSEMBLY

Hydraulic pressure test **40.20.01**

1 Check that the oil level in the gearbox is correct.
2 Remove the plug adjacent to the solenoid and fit an hydraulic pressure gauge (special tool L 188 A) together with adaptor (L 188 — 2).



3 Jack the car up and run the transmission at approximately 25 m.p.h. (40 km/h).
4 In direct drive the residual pressure should register on the gauge to approximately 20 lbf/in² (1·4 kgf/cm²).
5 Engage the overdrive; a pressure of 500 to 550 lbf/in² (35·1 to 38·7 kgf/cm²) should be recorded.
6 Disengage the overdrive and the gauge should return to show the residual pressure.

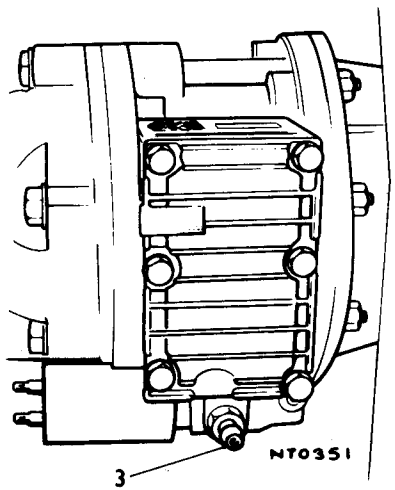
OVERDRIVE ASSEMBLY

Remove and refit **40.20.07**

Removing

NOTE: Before commencing overdrive removal it is advisable to raise the rear wheels and run the transmission. Engage overdrive, then disengage with the clutch depressed leaving the overdrive ready for removal. This will release the spline loading between the planet carrier and the uni-directional roller clutch which could make removal difficult.

1 Remove the gearbox and overdrive from the car as operation 37.20.01.
2 Remove the eight ½ in U.N.F. nuts securing the unit to the adaptor plate.



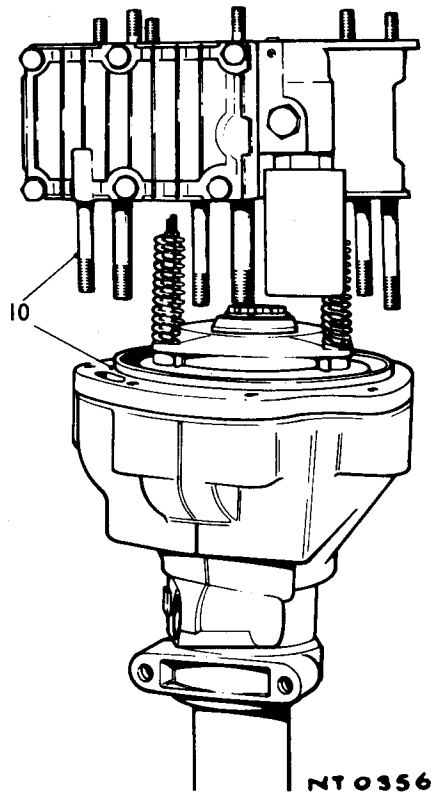
3 Remove the overdrive over the mainshaft, leaving the adaptor plate in position on the gearbox.
If difficulty is experienced in separating the overdrive from the gearbox, use the following procedure:
Remove the hexagon plug adjacent to the solenoid, and screw in and tighten tool L 402. Energize the solenoid, then pressurize the unit by pumping clean oil through the nipple on the tool with a lubrication gun. This will release the spline loading on the mainshaft and permit easy removal. De-energize the solenoid when the overdrive has separated by about ¾ in (19 mm).
4 Use a screwdriver of suitable length to rotate the inner member of the uni-directional roller clutch (this is the innermost set of splines), in an anti-clockwise direction until the splines of this member are in line with the splines in the planet carrier.
5 Ensure that the pump cam and sun gear spring ring are correctly located on the mainshaft.
6 Rotate the gearbox mainshaft so that the peak of the pump cam is at the bottom to assist engagement with the pump strap.
7 Engage the bottom gear in the gearbox.
8 Fit a new joint to the front face of the overdrive.
9 Offer up the overdrive to the gearbox.
10 Rotate the output shaft of the unit in a clockwise direction.
11 At the same time apply slight pressure until the splines are engaged.
12 Ensure that the pump strap assembly rides smoothly onto the cam and that the overdrive pushes home to the adaptor plate face without excessive force.
13 Fit and tighten the eight nuts which secure the unit.
14 If the overdrive fails to meet the adaptor plate face by approximately ⅝ in (16 mm) it means that the planet carrier and the uni-directional roller splines have become mis-aligned. In this case remove the unit and realign the splines.

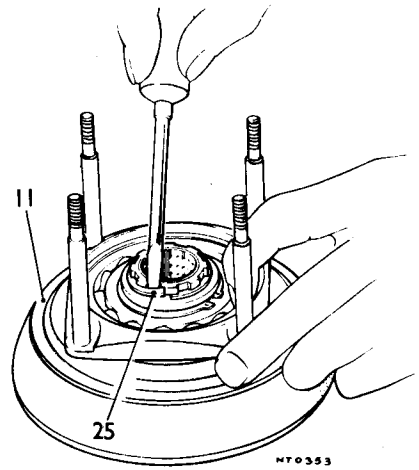
OVERDRIVE ASSEMBLY

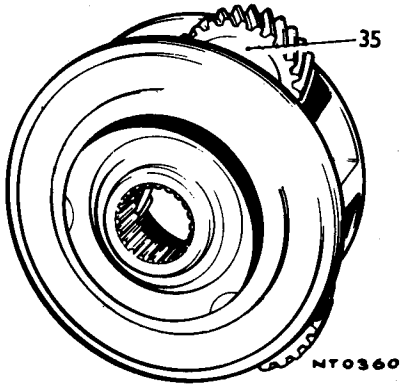
Overhaul or dismantle **40.20.10**

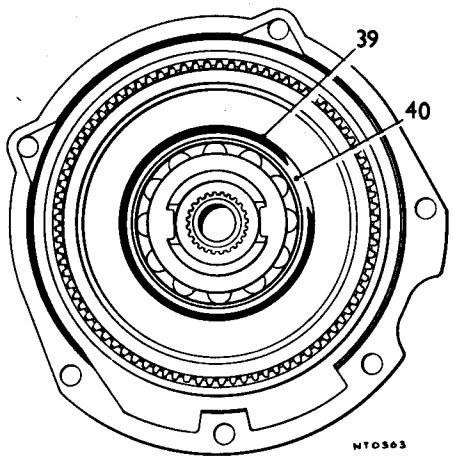
1 Remove the gearbox and overdrive from the car, see 37.20.01.
2 Remove the overdrive from the gearbox, see 40.20.07.
3 Before starting to dismantle the overdrive assembly, the exterior of the casings must be thoroughly cleaned.
4 Mount the unit vertically in a vice with the use of 'soft' jaws.
5 Remove four nuts securing the bridge pieces.
6 Remove the bridge pieces.
7 Progressively release the six nuts around the main casing to release the clutch return spring pressure.
8 Note the position of the two copper washers which fit on the two studs at the top of the casing.
9 Remove all the washers from the casing.
10 Separate the main casing complete with the brake ring from the rear case.
11 Lift out the sliding member assembly complete with the sun wheel.
12 Lift out the planet carrier assembly, taking care not to damage the oil catcher which is attached to the underside of the carrier.
13 Tap the brake ring from its spigot in the main casing with a suitable drift.
14 Using a pair of pliers, withdraw the operating pistons.
15 Remove the sump and suction filter, see 40.10.01.
16 Remove the relief valve assembly, see 40.16.04.
17 Remove the pump non-return valve assembly, see 40.16.10.
18 Remove the oil pump assembly, see 40.18.01.
19 Remove the pressure filter, see 40.10.08.
20 Remove the solenoid control valve, see 40.22.09.
21 Inspect the main casing for cracks.
22 Examine the operating cylinder bores for scores or wear.
23 Check the operating pistons for wear.
24 Replace the sealing rings if there is any sign of damage.
25 Remove the circlip from the sun wheel extension.

continued

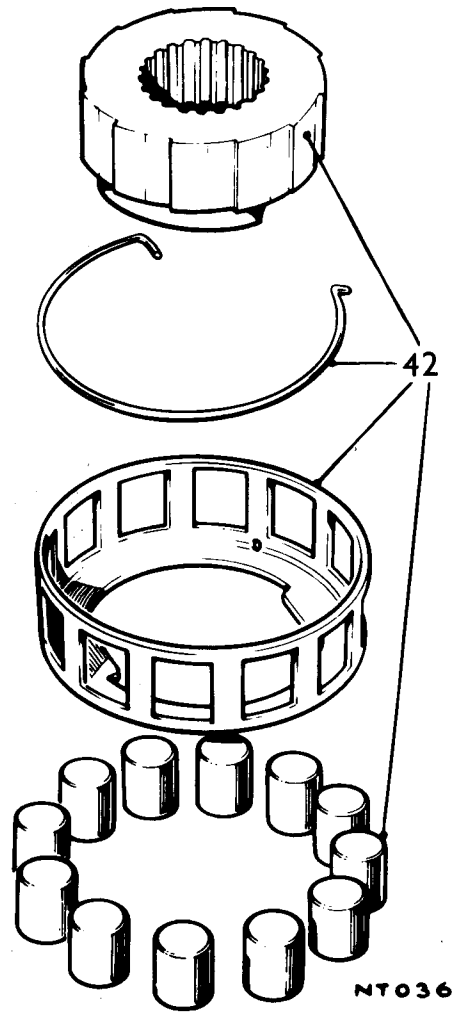


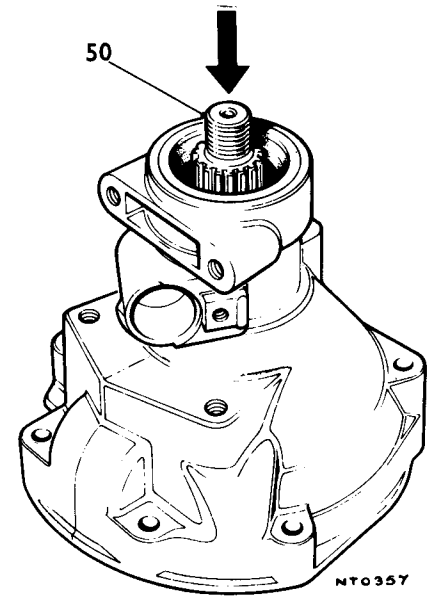


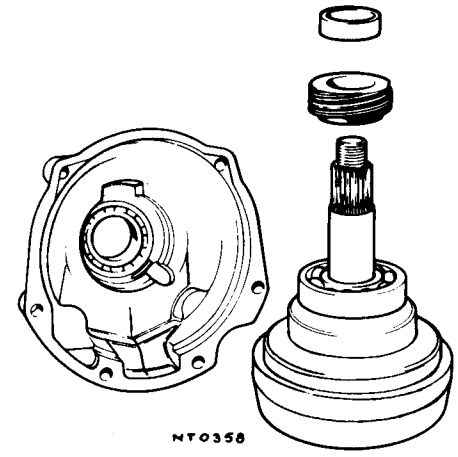




26 Take out the sun wheel.
27 Remove the circlip from its groove on the cone clutch hub.
28 Tap out the clutch from the thrust ring bearing, using a hide mallet.
29 Extract the large circlip.
30 Press the bearing from its housing.
31 Examine the clutch linings on the sliding member for any signs of excessive wear or charring.
32 If there is any sign of this condition, the complete sliding member must be renewed.
NOTE: It is not possible to fit new linings as these are precision machined after they are bonded.
33 Check the ball race and ensure that it rotates smoothly as this can be a source of noise when running in direct drive.
34 Examine the clutch return springs for any signs of distortion or collapse.
35 Inspect the sun wheel teeth for wear or damage.
36 Inspect the planet gears for damage or wear.
37 Check the planet gear bearings for any excessive clearance.
38 Examine the oil thrower for damage.
39 Using a screwdrive blade, remove the circlip.
40 Lift out the oil thrower.
41 Place tool L 178A over the exposed unidirectional roller clutch.
42 Lift the inner member complete with rollers into the special tool.
43 Remove the bronze thrust washer.
44 Remove the speedometer drive bolt.
45 Remove the speedometer driven gear clamp.
46 Pull the speedometer driven gear out with a pair of pliers; this will also remove the speedometer bush.
47 Separate the bush from the driven gear.
48 Remove the coupling flange nut and washer.
49 Withdraw the flange, using a suitable extractor.

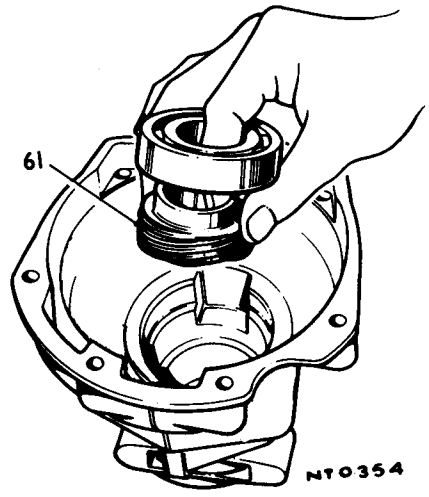


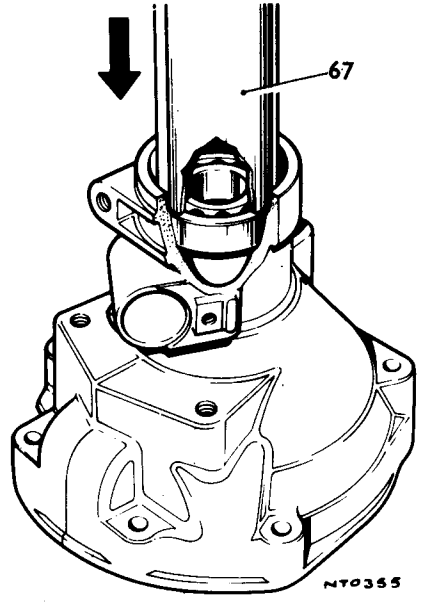




50 Drift out the annulus, using a hide mallet applied to the end of the tail shaft.
51 The front bearing, speedometer drive gear and spacer will be withdrawn together with the annulus.

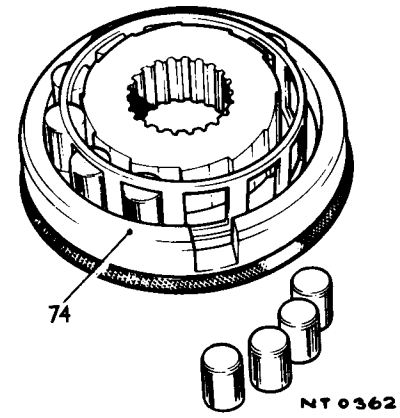
52 Remove the oil seal.
53 Drive out the rear bearing.
54 Check, and renew if necessary, all the 'O' rings.
55 Inspect the teeth and the cone surface of the annulus for wear.
56 Check that the uni-directional clutch rollers are not chipped.
57 Check that the inner and outer members are not damaged.
58 Examine the spring and cage for distortion.
59 The oil seal must be replaced.
60 Examine the speedometer drive and driven gears for wear and chafing; in either case they must be replaced.
61 Position the speedometer drive gear in the rear casing with its plain boss facing the front bearing.
NOTE: The speedometer drive gear cannot be fitted from the rear of the casing.
62 Press the front bearing into the rear casing.
63 Ensure that its outer track abuts against the shoulder in the casing.
64 Position the annulus with the inner face resting on a suitable packing piece.
65 Using tool L 186, press the front bearing together with the rear casing and speedometer driving gear onto the annulus until the bearing abuts on the locating shoulder.
66 Fit the spacer onto the annulus.
67 Using tool L 186, press the rear bearing onto the annulus and into the rear casing simultaneously.

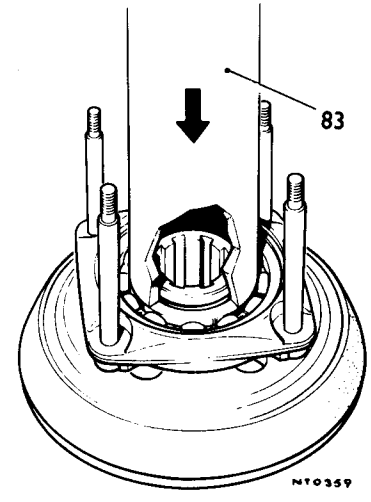


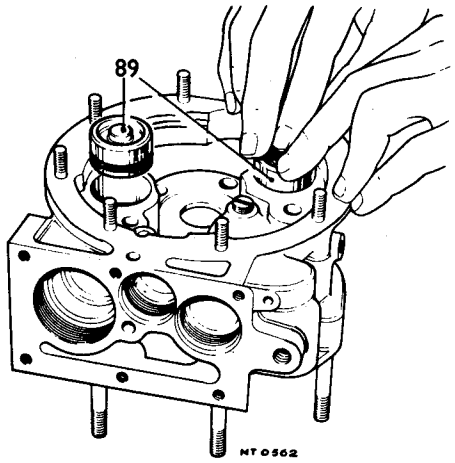


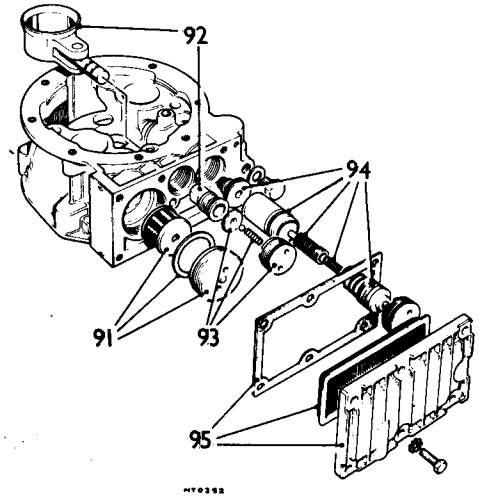
68 Fit the oil seal, using tool L 177 with 550.
69 Press on the coupling flange.
70 Fit the washer.
71 Tighten up the self-locking nut to a torque loading of 80 to 130 lbf ft (11·1 to 18·0 kgf m).
72 Position the spring and inner member of the uni-directional roller clutch into the cage.
73 Locate the spring so that the cage is spring loaded in an anti-clockwise direction when viewed from the front.
74 Place this assembly into tool L 178, with the open side of the cage uppermost.
75 Move the clutch in a clockwise direction until all the rollers are in place.
76 Refit the bronze thrust washer in the recess in the annulus.
77 Transfer the uni-directional clutch assembly from the special assembly tool into its outer member in the annulus.
78 Position the oil thrower.
79 Secure with the circlip.
80 Check that the clutch rotates in an anti-clockwise direction only.
81 Fit the ball race into its housing.
82 Secure the ball race with the large circlip.
83 Position this assembly onto the hub of the cone clutch.
84 Secure with a circlip.
85 Ensure that the circlip locates properly in the groove.
86 Insert the sun wheel into the hub.
87 Fit the circlip on the sun wheel extension.
88 Lightly smear the operating pistons with oil.

continued

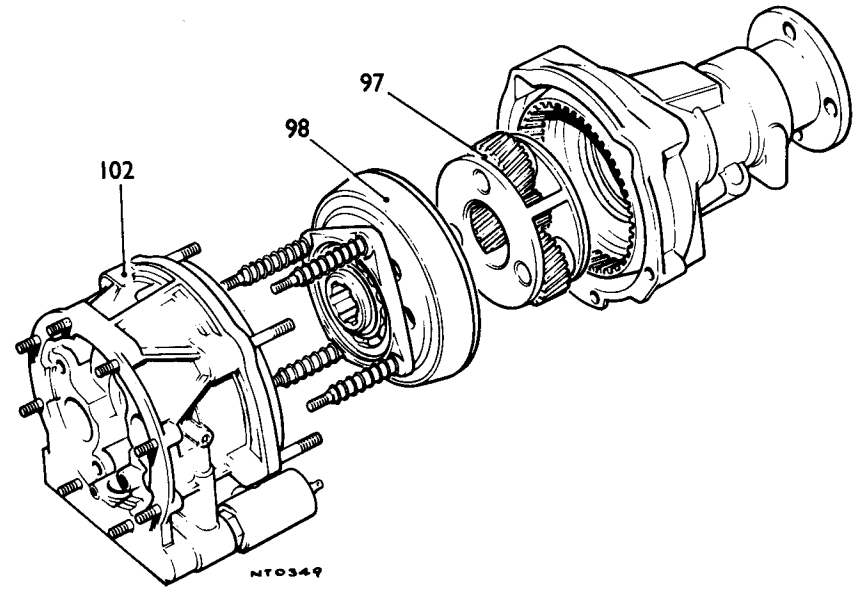








89 Fit the pistons into their respective housings.
90 Refit the solenoid control valve, see 40.22.09.
91 Refit the pressure filter, see 40.10.08.
92 Refit the oil pump assembly, see 40.18.01.
93 Refit the pump non-return valve assembly, see 40.16.10.
94 Refit the relief valve assembly, see 40.16.04.
95 Refit the sump and suction filter, see 40.10.01.
96 Mount the rear casing assembly vertically in a vice.
97 Insert the planet carrier assembly.
NOTE: The gears can be meshed in any position.
98 Place the sliding member assembly complete with the clutch return springs onto the cone of the annulus.
99 Engage the sun wheel with the planet gears.
100 Apply Wellseal to new gaskets either side of the brake ring.
NOTE: These gaskets are different.
101 Fit the brake ring onto its spigot in the tail casing aligning the stud holes.
102 Position the main casing assembly over the thrust housing pins, at the same time entering the studs in the brake ring.
103 Fit and progressively tighten the six nuts securing the rear and main case assemblies to a torque setting of 13 to 15 lbf ft (1·8 to 2·1 kgf m).



104 Apply Wellseal to the two copper washers and threads of the two top studs.
105 Secure the earth lead to the stud above the solenoid aperture.
106 The clutch return spring pressure will be felt as the two casings go together.
107 Fit the two bridge pieces.
108 Secure with four new self-locking nuts to a torque setting of 6 to 8 lbf ft (0·8 to 1·1 kgf m).

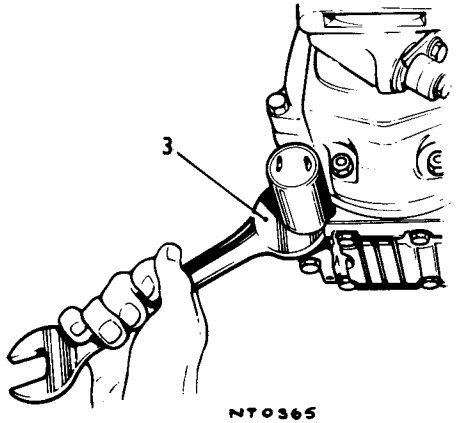
SOLENOID

Test **40.22.01**

1 Connect the solenoid in series with a 12-volt battery and ammeter.
2 The solenoid should draw approximately 2 amps.
3 Check that the plunger in the valve moves forward when the solenoid is energized.
4 Check that the plunger in the valve returns to its direct drive position by spring pressure when the solenoid is de-energized.
NOTE: The solenoid does not operate with a loud click as the other types of overdrive.
5 If the solenoid is still faulty, the complete unit must be renewed.

SOLENOID OPERATING VALVE

Remove and refit **40.22.04**



Removing
1 Disconnect the negative battery lead.
2 Disconnect the two Lucar connectors from the solenoid.
3 Using a 1 in (25 mm) A.F. open-ended spanner on the hexagon, loosen and unscrew the solenoid.
NOTE: Do not attempt to remove the solenoid by gripping the cylindrical body as this is very easily damaged.

Refitting
4 Screw the solenoid into the casing.
5 Tighten with a spanner.
6 Connect Lucar connectors to the terminals; these can be connected either way round.
7 Connect the negative lead of the battery.

SOLENOID OPERATING VALVE

Overhaul **40.22.13**

1 Remove the solenoid and operating valve, see 40.22.04.
2 Should it be necessary to clean the operating valve, immerse this part of the solenoid valve in paraffin until the valve is clean.
3 Examine the 'O' rings on the solenoid valve for damage, and renew together with a sealing washer if necessary.
4 Fit the solenoid and operating valve, see 40.22.04.

SPEEDO DRIVE GEAR

Remove and refit **40.25.01**

Removing
1 Working from under the car, remove the locking plate screw.
2 Remove the drive pinion and holder.

Refitting
3 Refit the drive gear, ensuring that the drive gear meshes with the driven gear.
4 Refit the locking plate and screw.
5 Top up any oil lost.

IMPORTANT

Under agreements existing between Borg-Warner Limited and the car manufacturers, the former does NOT undertake the servicing of automatic transmission units, nor do they supply spare parts or special tools. All matters appertaining to service or spares must therefore be dealt with by Triumph Distributors or Dealers within the organization.

UNIT IDENTIFICATION

A serial number prefix **017** appears on the left hand side of the transmission case.

TRANSMISSION DATA

	Top (3rd)	Intermediate (2nd)	Low (1st)	Reverse
Gearbox ratios	1 : 1	1·45 : 1	2·39 : 1	2·09 : 1
Converter reduction	Infinitely variable between 1–1·91 : 1 operating on all gears			

AUTOMATIC TRANSMISSION—SHIFT SPEEDS

Throttle Position	Zero Throttle	Light Throttle		Part Throttle	Kick-down						
Selector	1	D	D	D	D	D	D	1	D	2	2
Shift	2–1	1–2	2–3	3–2	1–2	2–3	3–2	2–1	3–1	1–2	2–1
Road Speed M.P.H.	23–24	8–11	11–15	21–26	36–43	62–68	55–64	26–38	26–38	36–43	23–34
Km/H	37–45	13–18	18–24	34–42	58–69	99–109	88–102	42–61	42–61	58–69	37–55

EXAMINATION OF COMPONENTS

Transmission case and servo covers	Check for cracks and obstructions in passages.
Front and rear pump	Check for scoring and excessive wear.
Shafts	Check bearing and thrust faces for scoring.
Clutch plates	Check for warping, scoring, overheating and excessive wear.
Bands	Check for scoring, overheating and excessive wear.
Drums	Check for overheating and scoring.
Gears	Check teeth for chipping, scoring, wear and condition of thrust faces.
Uni-directional clutch and races	Check for scoring, overheating and wear.
Valve block and governor	Check for burrs, crossed or stripped threads, and scored sealing faces.
Impeller hub and front pump drive gear	Check for pitting and wear. Ensure good contact.
Thrust washers	Check for burrs, scoring and wear.
White metal bushes	Check for scoring and loss of white metal.
Lip seals	Check for cuts, hardening of rubber, leakage past outer diameter.
Rubber 'O' rings and seals	Check for hardening, cracking, cuts or damage.
Cast iron sealing rings	Check fit in groove and wear (evident by lip overhanging the groove).
Teflon sealing rings	Check for cracking, cuts or damage.

SERVICING REQUIREMENTS

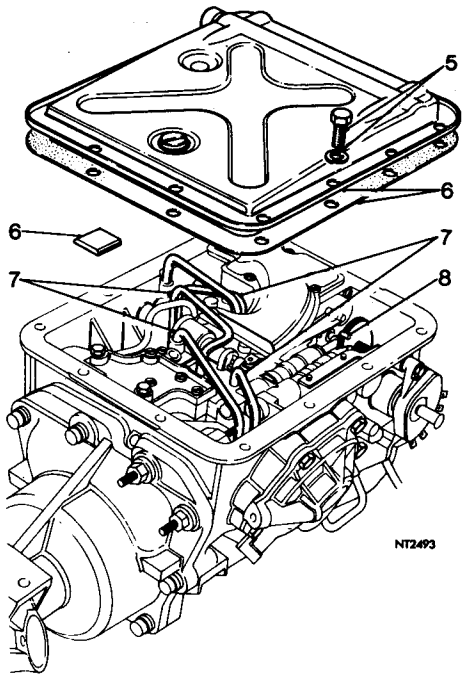
1 For all operations high standards of cleanliness are essential.
2 Rags and cloths must be clean and free from lint; nylon cloths are preferable.
3 Prior to assembly all components must be cleaned thoroughly with petrol, paraffin or an industrial solvent.
4 All defective items must be renewed.
5 Components should be lubricated with transmission fluid before assembly.
6 New washers should be fitted where applicable.
7 Where jointing compound is required, the use of Hylomar SQ32M, Hermetite or Wellseal is approved.
8 All screws, bolts and nuts must be tightened to the recommended torque figure.
9 Thrust washers and bearings should be coated with petroleum jelly to facilitate retaining them in position during assembly operations. Grease should not be used as it may be insoluble in the transmission fluid and could subsequently cause blockage of fluid passages and contamination of brake band and clutch facings.

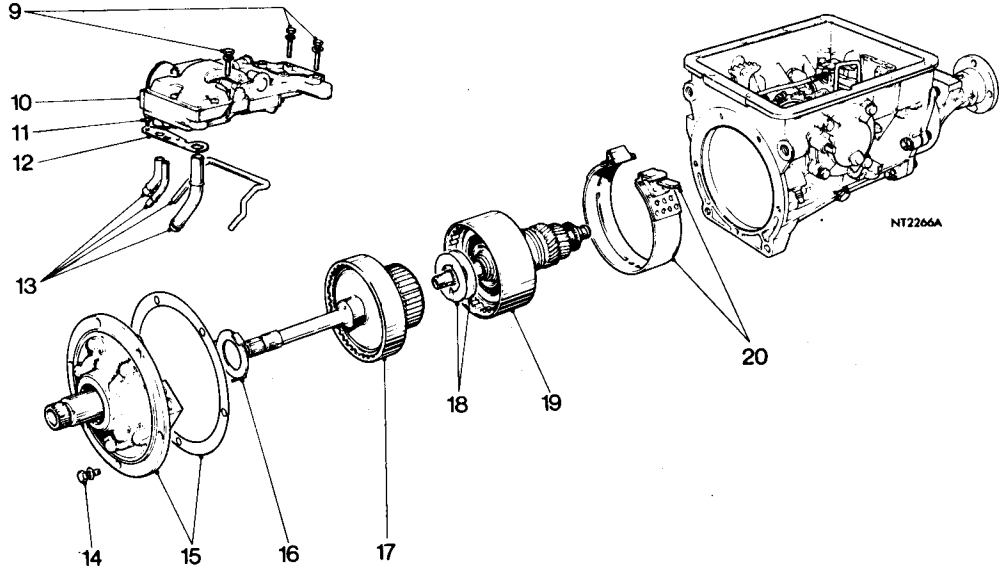
IMPORTANT: Metric threads are used throughout most of the transmission unit and it is therefore essential that fastenings, and especially lock washers, are segregated into sets and not intermixed with those from other parts of the vehicle.

FRONT BRAKE BAND

Remove and refit **44.10.01**

Service tools: CBW 60, CBW 547B-75





Removing

1 Remove the transmission unit, see 44.20.01.
2 Wash the exterior of the unit in clean petrol or paraffin, invert it and place on a bench cradle CBW 60. Remove the switch, see 44.15.15.
3 Unscrew the bolts securing the torque converter housing.
4 Remove the torque converter housing.
5 Unscrew twelve bolts.
6 Remove the oil pan, joint washer and magnet.
7 Pull out the five oil tubes.
8 Release the down-shift inner cable from the down-shift cam.
9 Take out three bolts and washers.
10 Lift off the valve block.
11 Unscrew two bolts.
12 Remove the oil tube locating plate.
13 Pull out the oil tubes. (Note the 'O' ring on the pump section tube.)
14 Take out five bolts.
15 Remove the pump and joint washer.
16 Remove the thrust washer.
17 Withdraw the front clutch.
18 Remove the thrust washers.
19 Withdraw the rear clutch and forward sun gear.
20 Squeeze together the ends of the front brake band and remove it together with the strut.

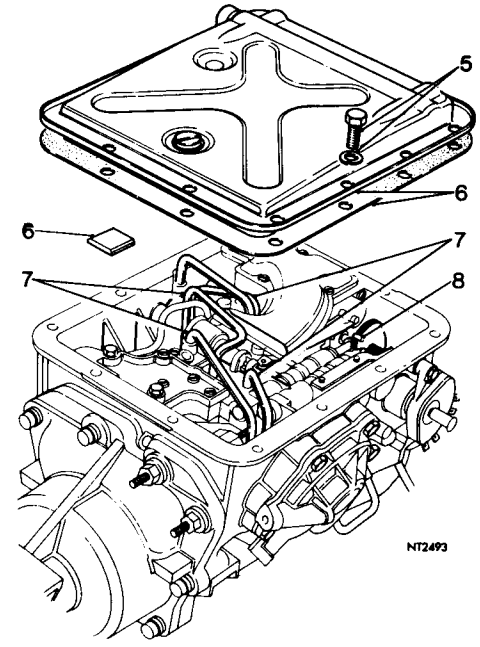
Refitting

21 Squeeze together the ends of the front brake band and fit it in position together with the strut.
22 Refit the rear clutch and forward sun gear assembly.
23 Using petroleum jelly, stick the thrust washers to the rear clutch assembly (phosphor-bronze towards the front clutch).
24 Refit the front clutch assembly.
25 Using petroleum jelly, stick the thrust washer to the pump assembly.
26 Refit the pump assembly and joint washer.
27 Fit and tighten the bolts.
28 Refit the oil tubes. (Note the 'O' ring on the pump suction tube.)
29 Refit the oil tube locating plate.
30 Fit and tighten the two bolts.
31 Carefully refit the valve block, ensuring that the oil tubes are not distorted.
32 Fit and tighten the three bolts and washers.
33 Connect the down-shift inner cable to the down-shift cam.
34 Refit the five oil tubes.
35 Replace the magnet and refit the oil pan and joint washer.
36 Fit and tighten twelve bolts.
37 Locate the torque converter housing in place.
38 Fit and tighten four bolts securing the torque converter housing.
39 Refit the switch, see 44.15.15.
40 Refit the transmission unit.

REAR BRAKE BAND

Remove and refit **44.10.09**

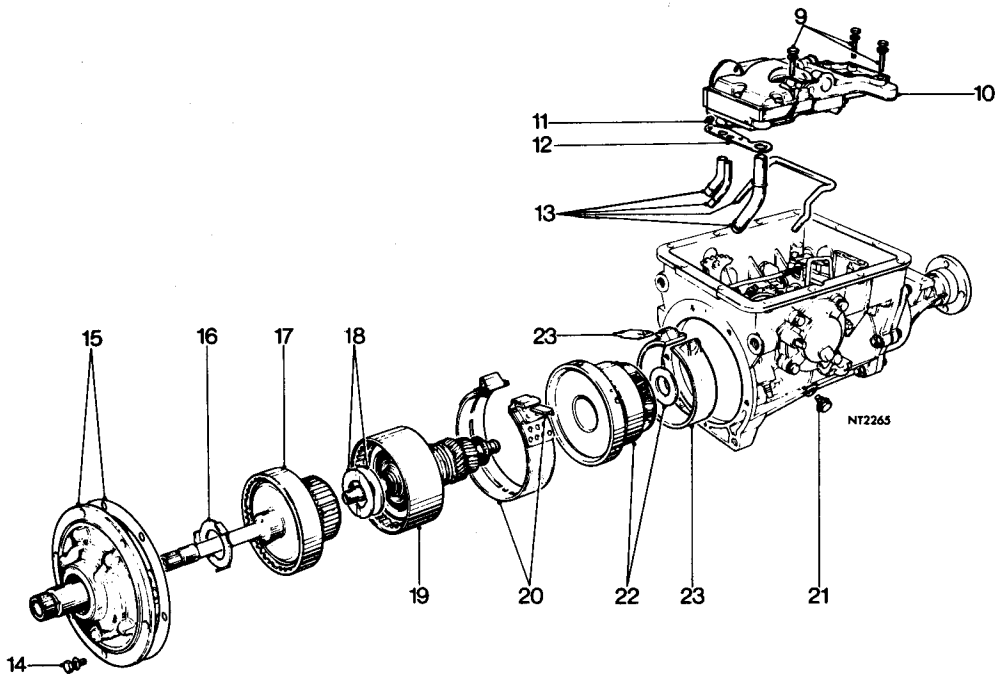
Service tools: CBW 60, CBW 547B-75



Removing

1 Remove the transmission unit, see 44.20.01.
2 Wash the exterior of the unit in clean petrol or paraffin, invert it and place on a bench cradle CBW 60. Remove the switch, see 44.15.15.
3 Unscrew the bolts securing the torque converter housing.
4 Remove the torque converter housing.
5 Unscrew twelve bolts.
6 Remove the oil pan, joint washer and magnet.
7 Pull out the oil tubes.
8 Release the down-shift inner cable from the down-shift cam.

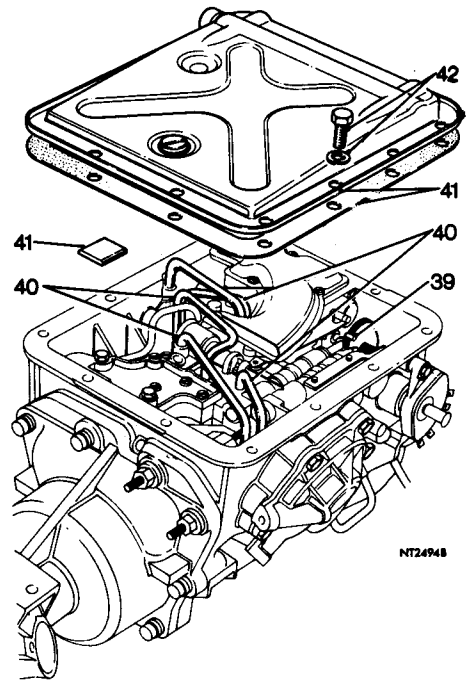
continued



9 Take out three bolts and washers.
10 Lift off the valve block.
11 Unscrew two bolts.
12 Remove the oil tube locating plate.
13 Pull out the oil tubes. (Note the 'O' ring on the pump suction tube.)
14 Take out five bolts.
15 Remove the pump and joint washer.
16 Remove the thrust washer.
17 Withdraw the front clutch.
18 Remove the thrust washers.
19 Withdraw the rear clutch and forward sun gear.
20 Squeeze together the ends of the front brake band and remove it together with the strut.
21 Unscrew the bolts.
22 Withdraw the centre support/planet gear assembly and thrust race.
23 Squeeze together the ends of the rear brake band, tilt and withdraw it from the casing together with the strut.

Refitting

24 Refit the rear brake band and strut.
25 Refit the centre support and planet gear assembly, ensuring that the oil holes in the centre support are aligned with those in the casing.
26 Fit and tighten the bolts.
27 Squeeze together the ends of the front brake band and fit it in position together with the strut.
28 Refit the rear clutch and forward sun gear assembly.
29 Using petroleum jelly, stick the thrust washers to the rear clutch assembly (phosphor-bronze towards the front clutch).
30 Refit the front clutch assembly.
31 Using petroleum jelly, stick the thrust washer to the pump assembly.
32 Refit the pump assembly and joint washer.

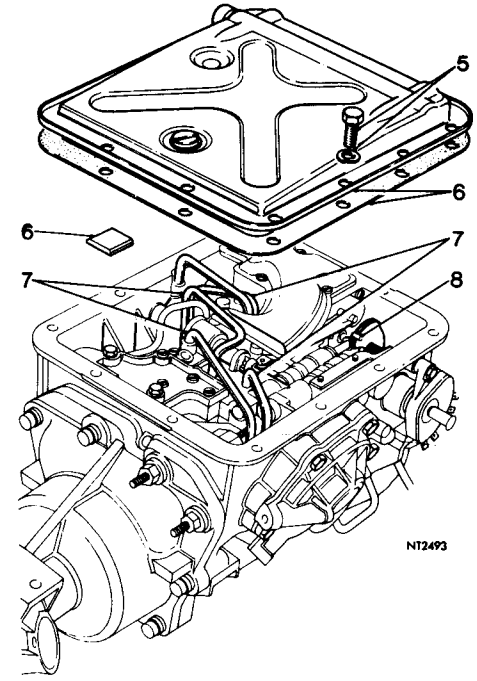


33 Fit and tighten the bolts.
34 Refit the oil tubes. (Note the 'O' ring on the pump suction tube.)
35 Refit the oil tube locating plate.
36 Fit and tighten the two bolts.
37 Carefully refit the valve block, ensuring that the oil tubes are not distorted.
38 Fit and tighten the three bolts and washers.
39 Connect the down-shift inner cable to the down-shift cam.
40 Refit the oil tubes.
41 Replace the magnet and refit the oil pan and joint washer.
42 Fit and tighten twelve bolts.
43 Locate the torque converter housing in place.
44 Fit and tighten four bolts securing the torque converter housing.
45 Refit the switch, see 44.15.15.
46 Refit the transmission unit, see 44.20.01.

FRONT CLUTCH

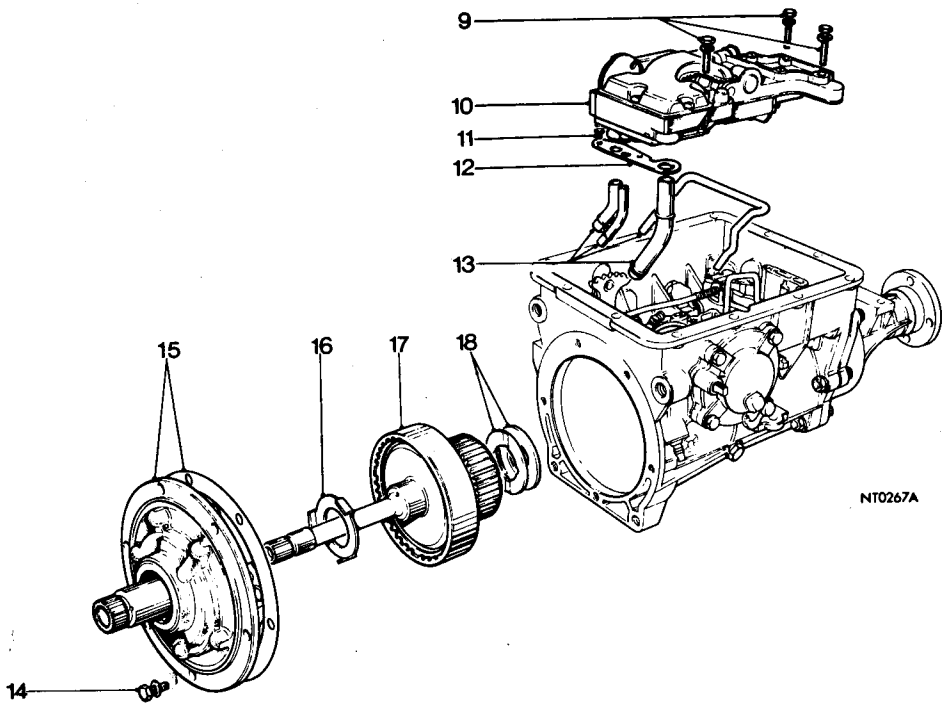
Remove and refit **44.12.04**

Service tools: CBW 60, CBW 547B-75



Removing

1 Remove the transmission unit, see 44.20.01.
2 Wash the exterior of the unit in clean petrol or paraffin, invert it and place on a bench cradle CBW 60. Remove the switch, see 44.15.15.
3 Unscrew the bolts securing the torque converter housing.
4 Remove the torque converter housing.
5 Unscrew twelve bolts.
6 Remove the oil pan, joint washer and magnet.
7 Pull out the oil tubes.
8 Release the down-shift inner cable from the down-shift cam.



9 Take out three bolts and washers.
10 Lift off the valve block.
11 Unscrew two bolts.
12 Remove the oil tube locating plate.
13 Pull out the oil tubes. (Note the 'O' ring on the pump suction tube.)
14 Take out five bolts.
15 Remove the pump joint washer.
16 Remove the thrust washer.
17 Withdraw the front clutch.
18 Remove the thrust washers.

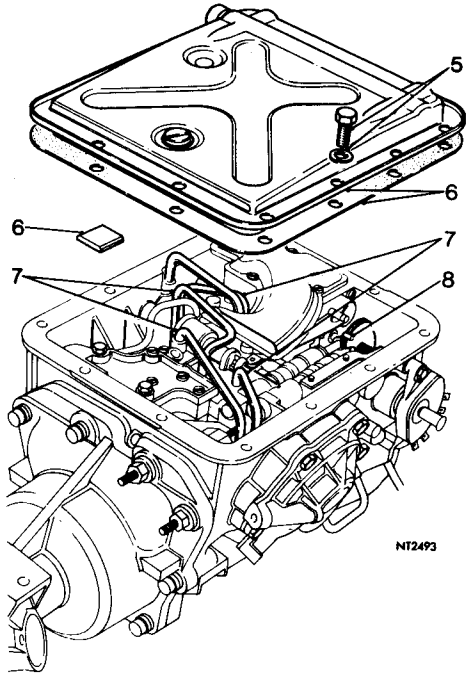
Refitting

19 Using petroleum jelly, stick the thrust washers to the rear clutch assembly (phosphor-bronze towards the front clutch).
20 Refit the front clutch assembly.
21 Using petroleum jelly, stick the thrust washer to the pump assembly.
22 Refit the front assembly and joint washer.
23 Fit and tighten the bolts.
24 Refit the oil tubes. (Note the 'O' ring on the pump suction tube.)
25 Refit the oil tube locating plate.
26 Fit and tighten the two bolts.
27 Carefully refit the valve block, ensuring that the oil tubes are not distorted.
28 Fit and tighten the three bolts and washers.
29 Connect the down-shift inner cable to the downshift cam.
30 Refit the oil tubes.
31 Replace the magnet and refit the oil pan and joint washer.
32 Fit and tighten the twelve bolts.
33 Locate the torque converter housing in place.
34 Fit and tighten four bolts securing the torque converter housing.
35 Refit the switch, see 44.15.15.
36 Refit the transmission unit, see 44.20.01.

REAR CLUTCH

Remove and refit **44.12.07**

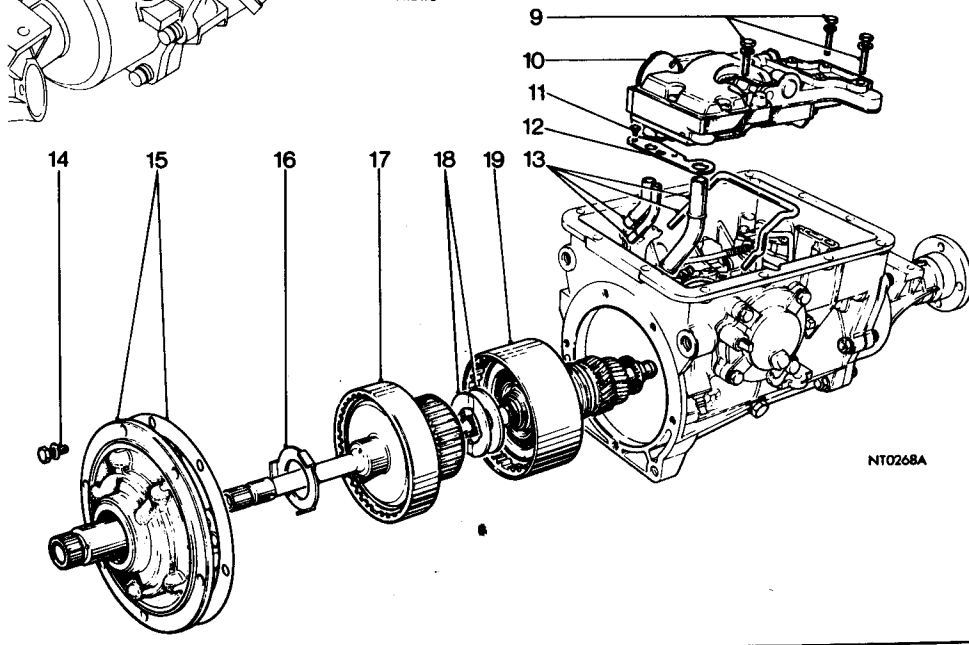
Service tools: CBW 60, CBW 547B-75

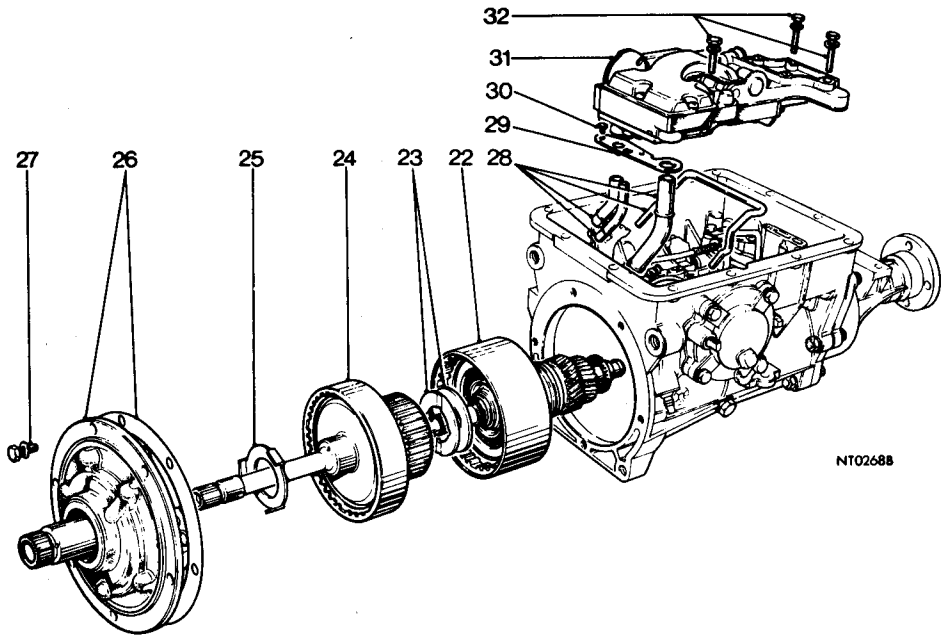


Removing

1 Remove the transmission unit, see 44.20.01.
2 Wash the exterior of the unit in clean petrol or paraffin, invert it and place on a bench cradle CBW 60. Remove the switch, see 44.15.15.
3 Unscrew the bolts securing the torque converter housing.
4 Remove the torque converter housing.
5 Unscrew twelve bolts.
6 Remove the oil pan, joint washer and magnet.
7 Pull out the oil tubes.
8 Release the down-shift inner cable from the down-shift cam.
9 Take out three bolts and washers.
10 Lift off the valve block.
11 Unscrew two bolts.
12 Remove the oil tube locating plate.
13 Pull out the oil tubes. (Note the 'O' ring on the pump suction tube.)
14 Take out five bolts.
15 Remove the pump and joint washer.
16 Remove the thrust washer.
17 Withdraw the front clutch.
18 Remove the thrust washers.

continued





19 Withdraw the rear clutch and forward sun gear.
20 Separate the forward sun gear assembly from the rear clutch.

Refitting

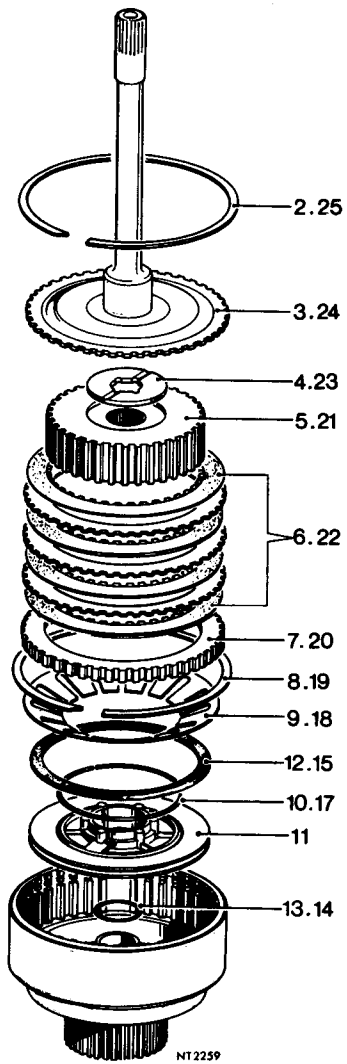
21 Assemble the forward sun gear to the rear clutch.
22 Refit the rear clutch and forward sun gear assembly.
23 Using petroleum jelly, stick the thrust washers to the rear clutch assembly (phosphor-bronze towards the front clutch).
24 Refit the front clutch assembly.
25 Using petroleum jelly, stick the thrust washer to the pump assembly.
26 Refit the pump assembly and joint washer.
27 Fit and tighten the bolts.
28 Refit the oil tubes. (Note the 'O' ring on the pump suction tube.)
29 Refit the oil tube locating plate.
30 Fit and tighten the two bolts.
31 Carefully refit the valve block, ensuring that the oil tubes are not distorted.
32 Fit and tighten the three bolts and washers.
33 Connect the down-shift inner cable to the down-shift cam.
34 Refit the oil tubes.
35 Replace the magnet and refit the oil pan and joint washer.
36 Fit and tighten twelve bolts.
37 Locate the torque converter housing in place.
38 Fit and tighten four bolts securing the torque converter housing.
39 Refit the switch, see 44.15.15.
40 Refit the transmission unit, see 44.20.01.

FRONT CLUTCH

Overhaul **44.12.10**

Service tool: CBW 42A

1 Remove the front clutch, see 44.12.04.

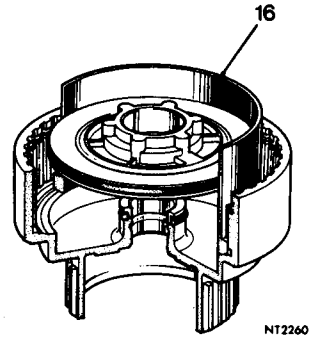


Dismantling

2 Remove the circlip.
3 Withdraw the input shaft.
4 Remove the thrust washer.
5 Remove the hub.
6 Take out the inner and outer friction plates.
7 Remove the pressure plate.
8 Remove the circlip.
9 Take out the spring.
10 Remove the spring bearing.
11 Withdraw the piston. (If necessary, blank off the bores of the clutch drum and apply a compressed air line to the piston valve hole).
12 Remove the seal from the piston.
13 Remove the 'O' ring from the drum.

Reassembling

14 Refit the 'O' ring to the drum.
15 Refit the seal to the piston.



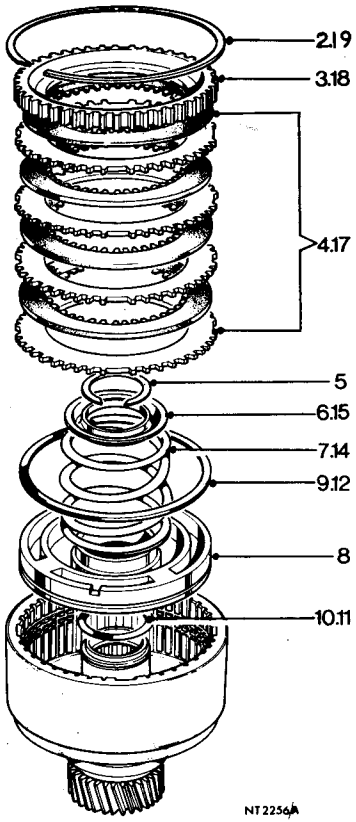
16 Fit the piston into tool no. CBW 42A and place the tool in the drum. Push the piston into the drum and remove the tool.
17 Locate the spring bearing in position.
18 Refit the spring.
19 Fit the circlip.
20 Refit the pressure plate.
21 Refit the hub.
22 Fit the inner and outer friction plates in alternate sequence.
23 Using petroleum jelly, stick the thrust washer to the hub.
24 Locate the input shaft in position.
25 Refit the circlip.
26 Refit the front clutch, see 44.12.04.

REAR CLUTCH

Overhaul **44.12.13**

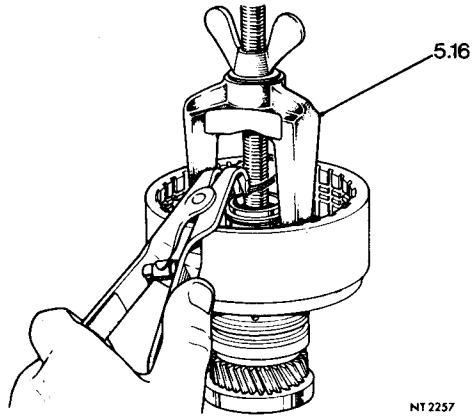
Service tools: CBW 37A, CBW 41.

1 Remove the rear clutch, see 44.12.07.



Dismantling

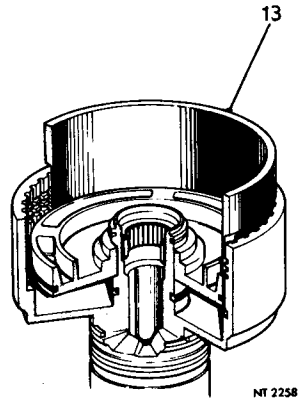
2 Remove the circlip.
3 Take out the pressure plate.
4 Remove the inner and outer friction plates.



5 Using tool CBW 37A as shown, compress the spring and remove the spring seat circlip. Remove the tool.
6 Take out the spring seat.
7 Remove the spring.
8 Withdraw the piston.
9 Remove the rubber sealing ring from the piston.
10 Remove the rubber 'O' ring from the drum.

Reassembling

11 Fit the 'O' ring to the drum.
12 Fit the sealing ring to the piston drum.

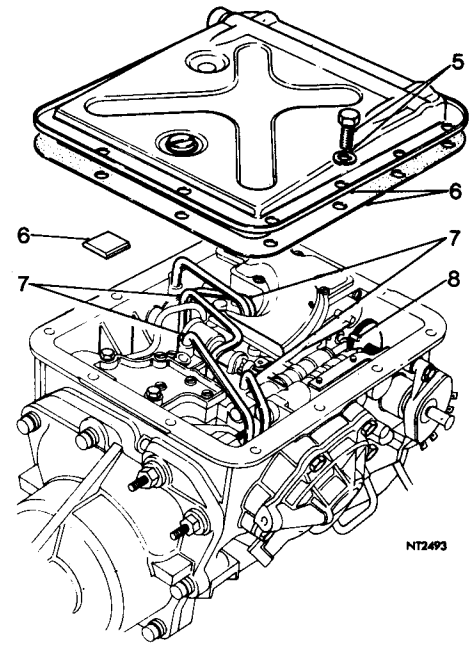


13 Fit the piston assembly into tool CBW 41 and locate the tool in the drum. Push the piston into the drum. Remove the tool.
14 Refit the spring.
15 Refit the spring seat.
16 Using tool CBW 37A, compress the spring and fit the circlip. Remove the tool.
17 Refit the inner and outer clutch plates in alternate sequence.
18 Fit the pressure plate.
19 Refit the circlip.
20 Refit the rear clutch, see 44.12.07.

UNI-DIRECTIONAL CLUTCH

Remove and refit **44.12.16**

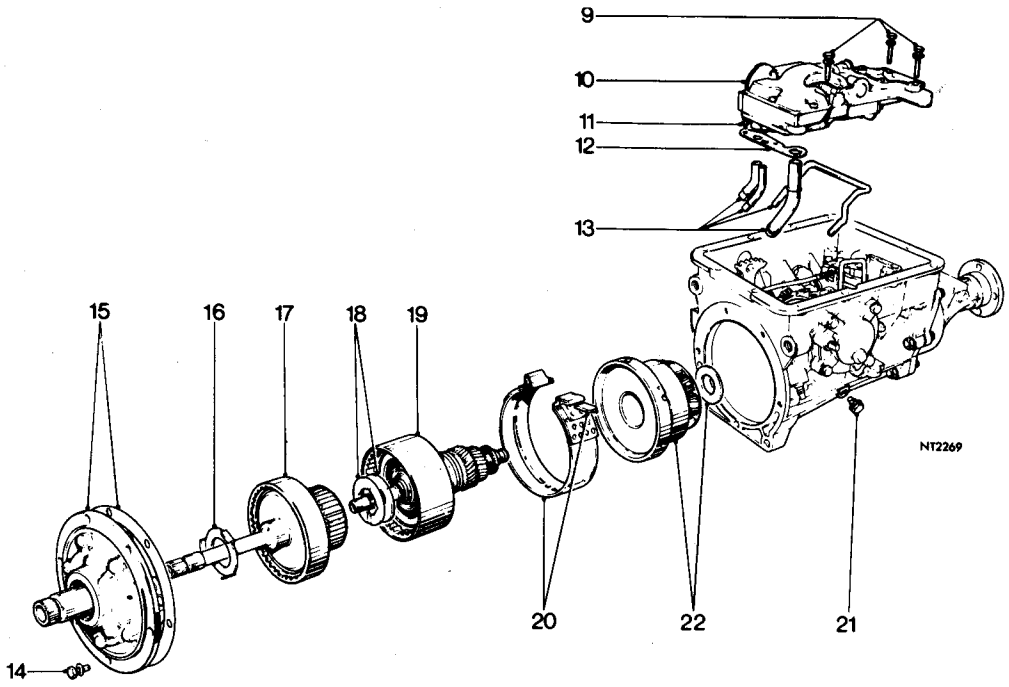
Service tools: CBW 60, CBW 547B-75

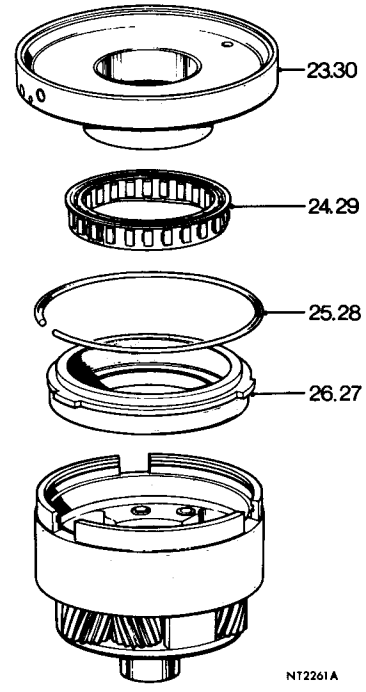


Removing

1 Remove the transmission unit, see 44.20.01.
2 Wash the exterior of the unit in clean petrol or paraffin, invert it and place on a bench cradle CBW 60. Remove the switch, see 44.15.15.
3 Unscrew the bolts securing the torque converter housing.
4 Remove the torque converter housing.
5 Unscrew twelve bolts.
6 Remove the oil pan, joint washer and magnet.
7 Pull out the oil tubes.
8 Release the down-shift inner cable from the down-shift cam.

continued





9 Take out three bolts and washers.
10 Lift off the valve block.
11 Unscrew two bolts.
12 Remove the oil tube locating plate.
13 Pull out the oil tubes. (Note the 'O' ring on the pump suction tube.)
14 Take out five bolts.
15 Remove the pump and joint washer.
16 Remove the thrust washer.
17 Withdraw the front clutch.
18 Remove the thrust washer.
19 Withdraw the rear clutch and forward sun gear.
20 Squeeze together the ends of the front brake band and remove it together with the strut.
21 Unscrew the bolts.
22 Withdraw the centre support/planet gear assembly.
23 Separate the centre support from the planet gear assembly.
24 Withdraw the uni-directional clutch.
25 Remove the circlip.
26 Remove the uni-directional clutch outer race.

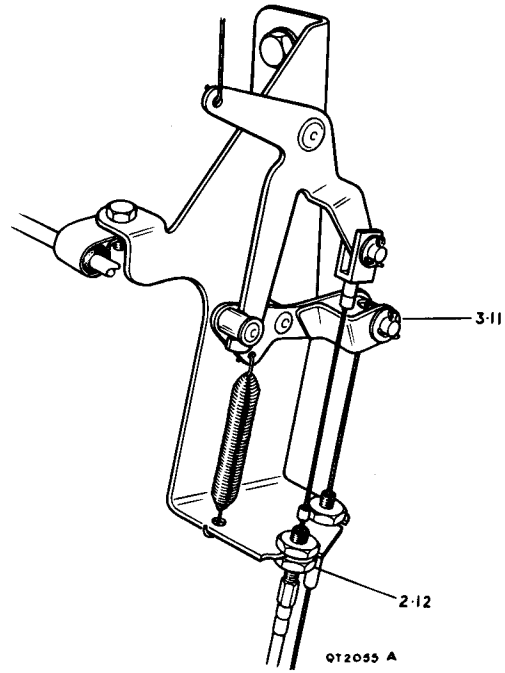
Refitting

27 Refit the uni-directional clutch outer race to the rear drum.
28 Refit the circlip.
29 Refit the uni-directional clutch.
30 Assemble the centre support and planet gear assembly.
31 Refit the assembly, ensuring that the oil and locating holes in the centre support align with those in the casing.
32 Fit and tighten three bolts.
33 Squeeze together the ends of the front brake band and fit it in position together with the strut.
34 Refit the rear clutch and forward sun gear assembly.
35 Using petroleum jelly, stick the thrust washer to the rear clutch assembly (phosphor-bronze towards the front clutch).
36 Refit the front clutch assembly.
37 Using petroleum jelly, stick the thrust washer to the pump assembly.
38 Refit the pump assembly and joint washer.
39 Fit and tighten the bolts.
40 Refit the oil tubes. (Note the 'O' ring on the pump suction tube.)
41 Refit the oil tube locating plate.
42 Fit and tighten the two bolts.
43 Carefully refit the valve block, ensuring that the oil tubes are not distorted.
44 Fit and tighten three bolts and washers.
45 Connect the down-shift inner cable to the down-shift cam.
46 Refit the oil tubes.
47 Replace the magnet and refit the oil pan and joint washer.
48 Fit and tighten twelve bolts.
49 Locate the torque converter housing in place.
50 Fit and tighten four bolts securing the torque converter housing.
51 Refit the switch, see 44.15.15.
52 Refit the transmission unit, see 44.20.01.

DOWN-SHIFT CABLE

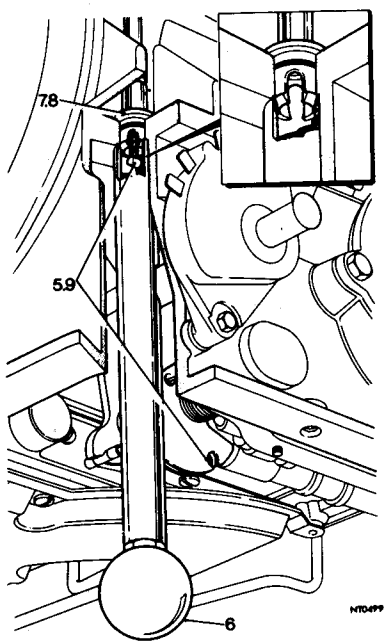
Remove and refit **44.15.01**

Service tool: CBW 62



Removing

1 Drive the vehicle onto a ramp, select 'N', chock the wheels and open the bonnet.
2 Unscrew the locknut.
3 Remove the split pin, washer and clevis pin.
4 Raise the ramp and remove the transmission sump pan, see 44.24.04.
5 Disconnect the downshift inner cable from the cam.
6 Using tool no. CBW 62, remove the down-shift outer cable from the gearbox casing.
7 Remove the down-shift cable assembly.

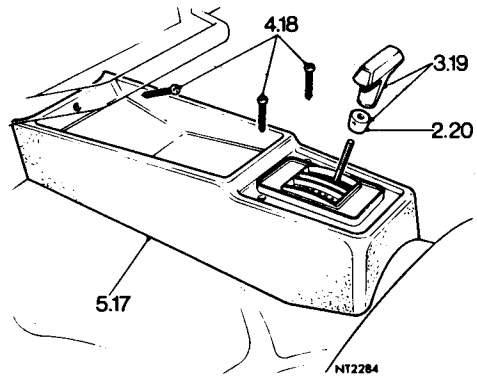


Refitting

8 Clip the down-shift outer cable into the gearbox casing.
9 Connect the inner cable to the down-shift cam.
10 Refit the sump pan and filler pipe and lower the ramp.
11 Refit the clevis pin, washer and split pin.
12 Refit the locknut and adjust the cable, see 44.30.01.
13 Refill the unit with transmission fluid.

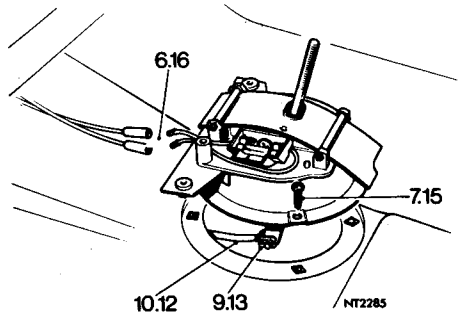
HAND LEVER TURRET

Remove and refit **44.15.04**



Removing

1 Select position '1' and apply the hand brake.
2 Slacken the locking collar.
3 Unscrew the 'T' handle and collar.
4 Take out the screws.
5 Lift the console panel over the hand lever.
6 Disconnect the leads to the selector panel illumination bulb.
7 Take out the screws.
8 Lift the turret assembly clear of the transmission tunnel.
9 Push the clip forward.
10 Disconnect the selector rod from the hand lever.



Refitting

11 Move the hand lever to position '1'.
12 Locate the selector rod in the hand lever.
13 Pull back the clip to secure the rod to the lever.
14 Locate the turret assembly onto the transmission tunnel.
15 Secure the turret with four screws.
16 Connect the selector panel illumination leads.
17 Fit the console panel over the hand lever.
18 Secure the panel with three screws.
19 Screw the 'T' handle and locking collar onto the hand lever.
20 Tighten the locking collar.

HAND LEVER TURRET

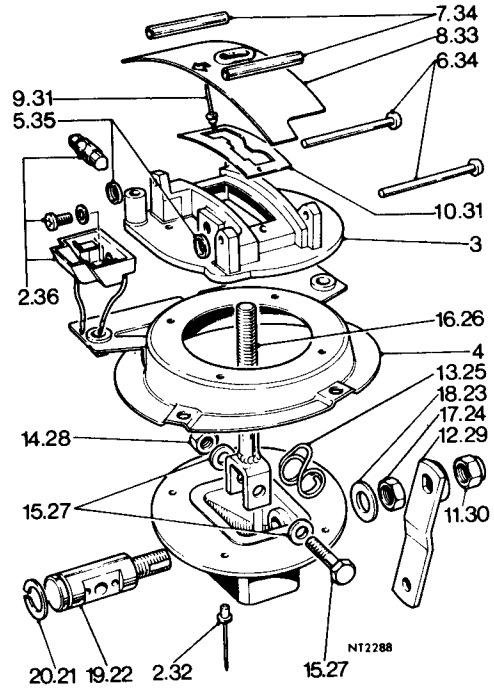
Overhaul **44.15.05**

Dismantling

1 Remove the bulb. Take out the screw and withdraw the bulb holder.
2 Drill out the 'Pop' rivets.
3 Take off the top plate assembly.
4 Take off the base plate.
5 Remove the retaining clips.
6 Take out the pins.
7 Remove the spacer tubes.
8 Lift off the finisher plate.
9 Drill out the 'Pop' rivets.
10 Remove the gate plate.
11 Unscrew the nut.
12 Remove the lower lever.
13 Remove the bias spring.
14 Unscrew the nut.
15 Take out the bolt and washers.
16 Remove the lever.
17 Unscrew the nut.
18 Remove the washer.
19 Withdraw the pivot pin.
20 If necessary, remove the circlip.

Reassembling

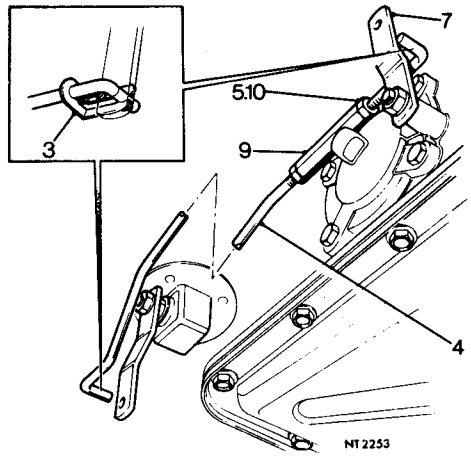
21 Fit the circlip to the pivot pin.



22 Lightly grea these pivot pin and insert it in the selector box.
23 Fit the washer.
24 Fit the nut and tighten just sufficiently to eliminate end-float of the pin.
25 Fit the bias spring to the pivot pin.
26 Fit the lever over the pivot pin.
27 Lightly grease the bolt and washers and fit through the lever and pivot pin.
28 Fit and tighten the nut.
29 Assemble the lower lever to the pivot pin.
30 Refit the nut.
31 Using 'Pop' rivets, secure the gate plate to the top plate.
32 Assemble the selector box, base plate and top plate and secure with 'Pop' rivets.
33 Fit the finisher plate over the lever.
34 Refit the pins and spacer tubes.
35 Secure the pins, using new clips.
36 Refit the bulb holder, secure with the screw and refit the bulb.

SELECTOR ROD

Remove and refit **44.15.08**



Removing

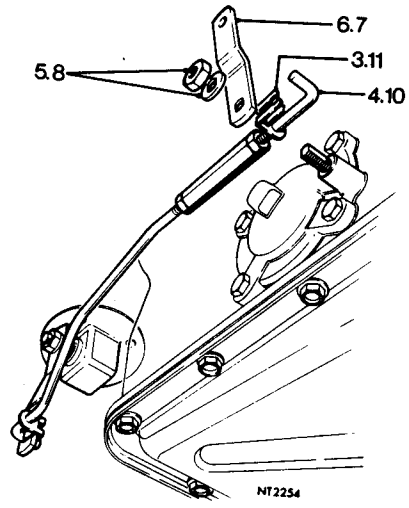
1 Drive the vehicle onto a ramp, lock the selector lever in 'N' and apply the hand brake.
2 Raise the ramp.
3 Push the clips clear of the levers.
4 Remove the selector rod from the gearbox selector and hand lever.

Refitting

5 Slacken the selector rod locknut.
6 Ensure that the gearbox selector lever and the hand lever are both in position 'N'.
7 Fit the selector rod to the gearbox selector lever.
8 Fit the clip onto the selector lever.
9 Alter the length of the rod by adjusting the turn-buckle until the end of the rod can be located in the hand lever.
10 Tighten the locknut.
11 Push the clip onto the lever and secure the rod.

GEARBOX SELECTOR LEVER

Remove and refit **44.15.09**



Removing

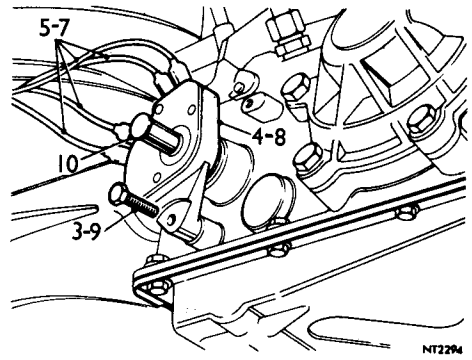
1 Drive the vehicle onto a ramp, select 'N' and apply the hand brake.
2 Raise the ramp.
3 Push the clip rearward.
4 Disconnect the selector rod from the lever.
5 Unscrew the nut and washer.
6 Remove the lever.

Refitting

7 Fit the lever to the shaft.
8 Fit and tighten the nut and washer.
9 Move the selector into the neutral position.
10 Connect the selector rod to the lever.
11 Push the clip onto the lever and secure the rod.

STARTER INHIBITOR/REVERSE LAMP SWITCH

Remove and refit **44.15.15**



Removing

1 Disconnect the battery and raise the ramp.
2 Remove the heat shield.
3 Remove the switch retaining bolt.
4 Remove the switch.
5 Disconnect the wires.

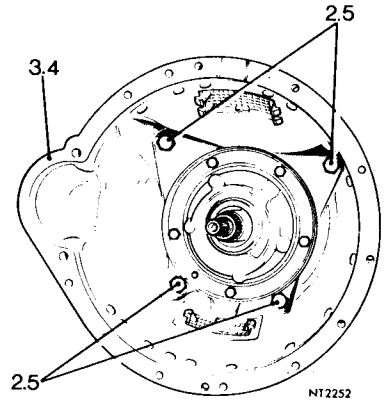
Refitting

6 Remove the thread protector.
7 Reconnect the wires.
8 Refit the switch to the gearbox.
9 Refit the retaining bolt.
10 Refit the thread protector.
11 Refit the shield, connect up the battery.
12 Lower the ramp.

TORQUE CONVERTER HOUSING

Remove and refit **44.17.01**

Service tool: CBW 547B-75



Removing

1 Remove the gearbox, see 44.20.01.
2 Unscrew the four bolts securing the torque converter housing to the transmission.
3 Remove the housing.

Refitting

4 Place the torque converter housing in position.
5 Fit and tighten the four bolts.
6 Refit the gearbox, see 44.20.01.

TORQUE CONVERTER

Remove and refit **44.17.07**

Removing

1 Remove gearbox, see 44.20.01.
2 Pull the torque converter out of the housing.

Refitting

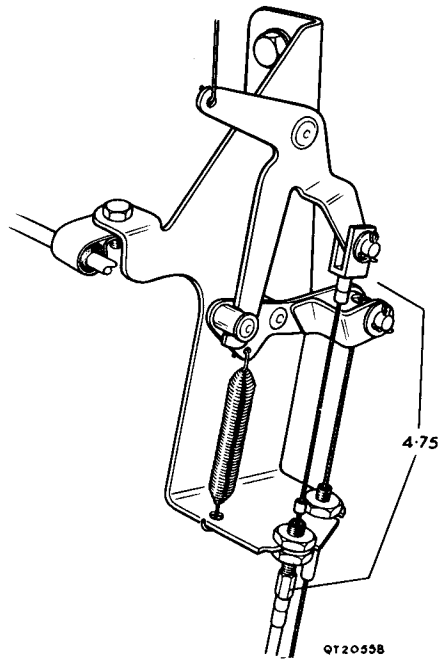
3 Carefully position the torque converter pump drive through the front oil seal and ensure that the dogs engage in the front pump.
4 Refit the gearbox, see 44.20.01.

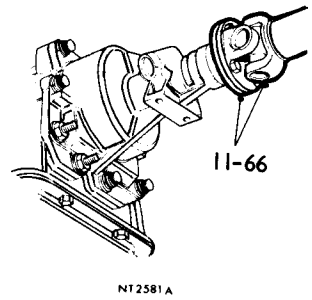
GEARBOX

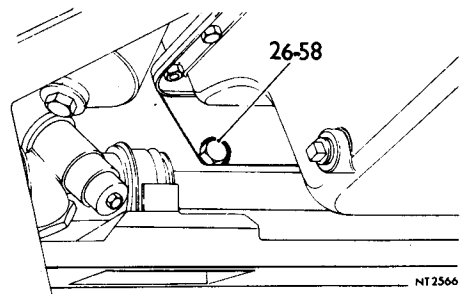
Remove and refit **44.20.01**

Removing

1 Open the bonnet.
2 Disconnect the battery.
3 Drain the coolant.
4 Disconnect the kick-down cable.
5 Disconnect the thermostat housing (2 bolts).
6 With the weight of the body supported by jacks disconnect the damper bottom pivot bolt, both sides.
7 Remove the spark plugs.
8 Remove the two top exhaust flange bolts.
9 Ensure that the steering-wheel is in the straight-ahead position.
10 Raise the ramp.
11 Disconnect the prop at the gearbox and tie it up.
12 Disconnect the exhaust system from the front pipe.
13 Disconnect all the rubber hangers.
14 Push the system to the rear of the car.
15 Drain the gearbox oil.
16 Remove the lower steering-column coupling pinch bolt.
17 Slacken the steering-column top pinch bolt.
18 Fit the locking bolt to the rack.
19 Position the jack under the centre of the frame.
20 Release the rear frame mountings.
21 Slacken the front mountings.
22 Disconnect the tie box.
23 Position the body jacks.
24 Raise the jacks.
25 Lower the sub-frame.
26 Disconnect the torque converter bolts.
27 Disconnect the bottom exhaust flange bolt.
28 Manouvre the exhaust pipe out.
29 Remove the heat shield.
30 Remove the wires from the inhibitor switch.





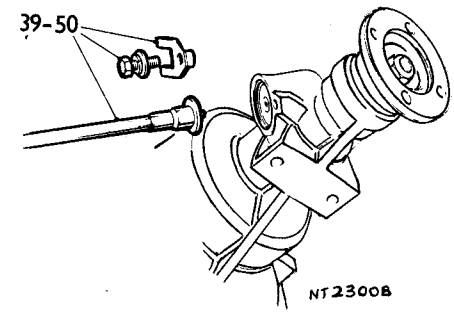


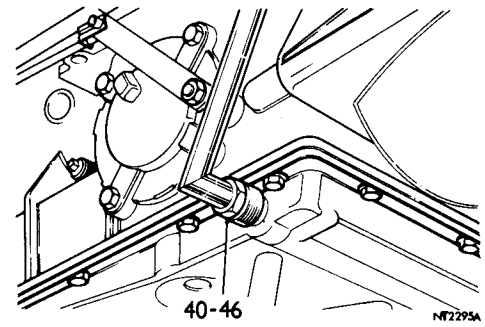
31 Release the selector rod at the gear-lever.
32 Remove the breather pipe.
33 Jack up the engine.
34 Disconnect the engine rear mountings.
35 Remove the bell-housing bottom bolts.
36 Remove the starter motor bolts.
37 Lower the engine and gearbox.
38 Disconnect the speedo cable.
39 Disconnect the oil cooler pipes.
40 Remove the dipstick from the gearbox sump.
41 Release the remaining bell housing bolts. **CAUTION:** When removing the gear-box use mechanical assistance as the gearbox is excessively heavy.
42 Remove the gearbox from the car.

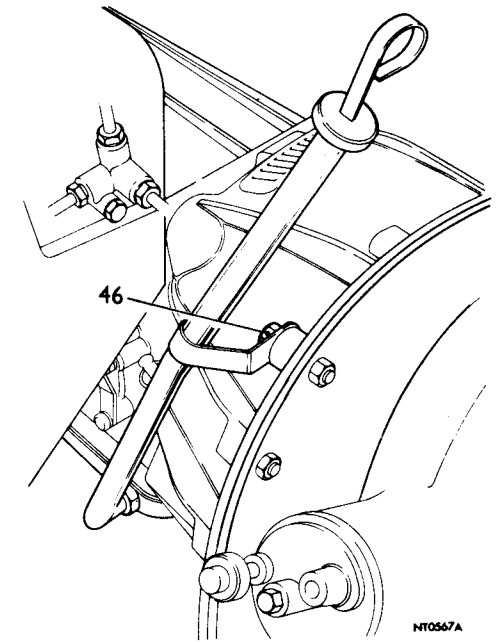
Refitting

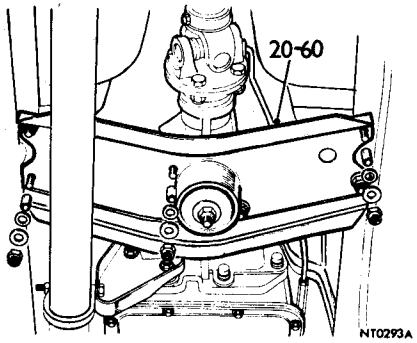
43 Ensure that the dogs on the converter are engaged in the front pump. To check this, measure from the bell-housing mounting face to the converter mounting face; if it is engaged this distance will be 2 cm.
44 Lift the gearbox back in position.
45 Fit all the bell-housing bolts.
46 Fit the dipstick both ends.
47 Fit the starter motor.
48 Connect the isolator wires.
49 Connect the oil cooler pipes.
50 Refit the speedo cable.
51 Connect the breather pipe.
52 Refit the gaskets, down-pipe and bottom bolt.
53 Refit the heat shield.
54 Connect the selector rod.
55 Jack up the engine.
56 Align the gearbox, rear mounting and fit the four nuts.
57 Remove the jack.
58 Bolt the torque converter to the drive plate.
59 Jack up the sub-frame, ensuring that the steering coupling aligns with the neck.

continued







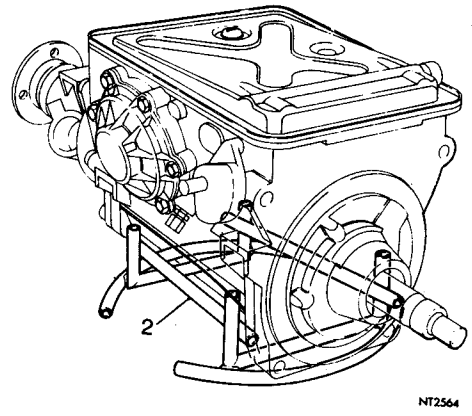


60 Refit the sub-frame mountings and tighten both front and rear.
61 Remove the jacks.
62 Remove the body jacks.
63 Refit the two top exhaust bolts.
64 Refit the exhaust system to the down-pipe.
65 Refit the seven exhaust rubbers.
66 Refit the prop shaft.
67 Disconnect the steering-column clamp bolt.
68 Refit the pinch bolt.
69 Clamp the remaining bolt.
70 Reconnect the tie-bar.
71 Connect the bottom hose.
72 Lower the ramp.
73 Connect the shock absorbers and bottom pivot bolts.
74 Connect the thermostat housing.
75 Connect the kick-down cable.
76 Connect the air box breather pipes.
77 Refit the spark plugs and leads.
78 Fill the radiator.
79 Fill the gearbox.

GEARBOX

Overhaul **44.20.06**

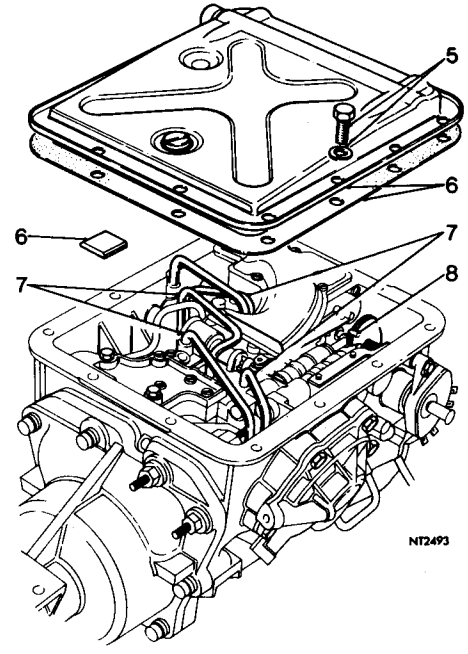
Service tools: CBW 60, CBW 33, CBW 62, CBW 547B-75, CBW 547A-50-2A, RG 421 or S 337, CBW 33



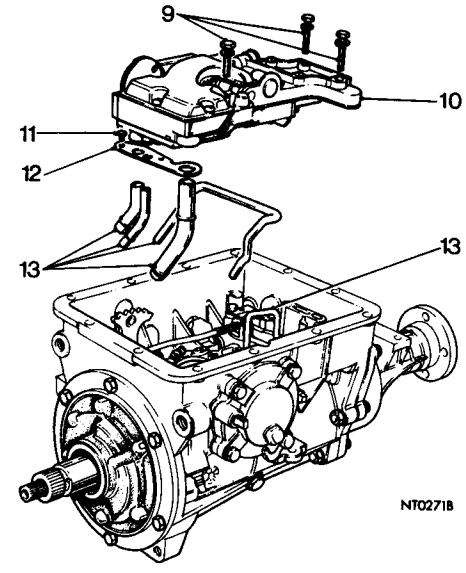
1 Remove the transmission unit, see 44.20.01.
2 Wash the exterior of the unit in clean petrol or paraffin, invert it and place on a bench cradle CBW 60.

Dismantling

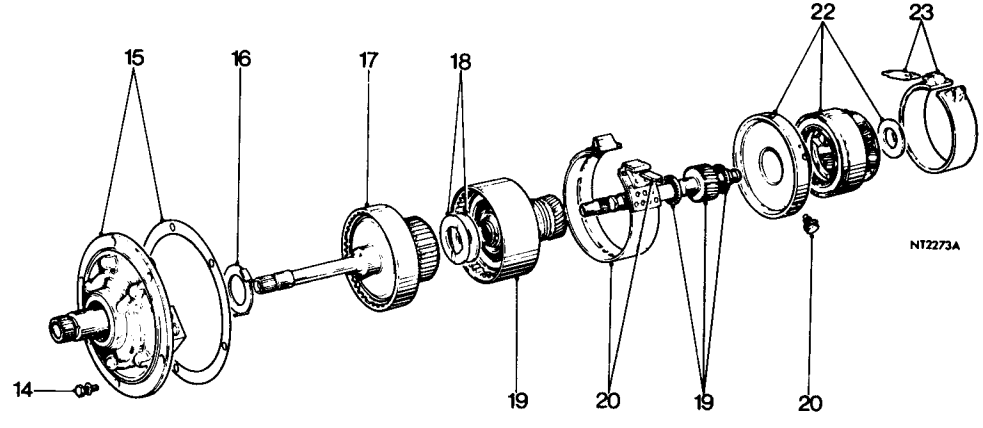
3 Unscrew the bolts securing the torque converter housing.
4 Remove the torque converter housing.
5 Unscrew twelve bolts.
6 Remove the oil pan, joint washer and magnet.
7 Pull out the oil tubes.
8 Release the down-shift inner cable from the down-shift cam.
9 Take out three bolts and washers.
10 Lift off the valve block.
11 Unscrew two bolts.
12 Remove the oil tube locating plate.
13 Pull out the oil tubes. (Note the 'O' ring on the pump suction tube.)
14 Take out five bolts.

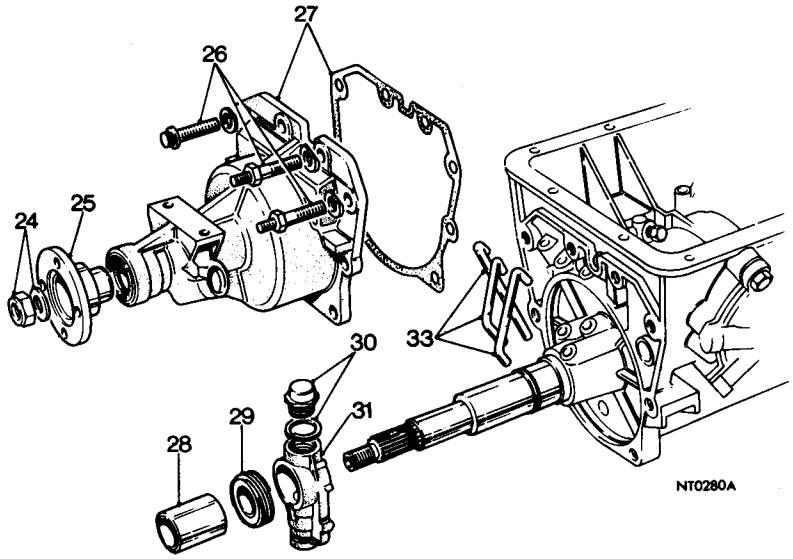


15 Remove the pump and joint washer.
16 Remove the thrust washer.
17 Withdraw the front clutch.
18 Remove the thrust washers.
19 Withdraw the rear clutch and forward sun gear.

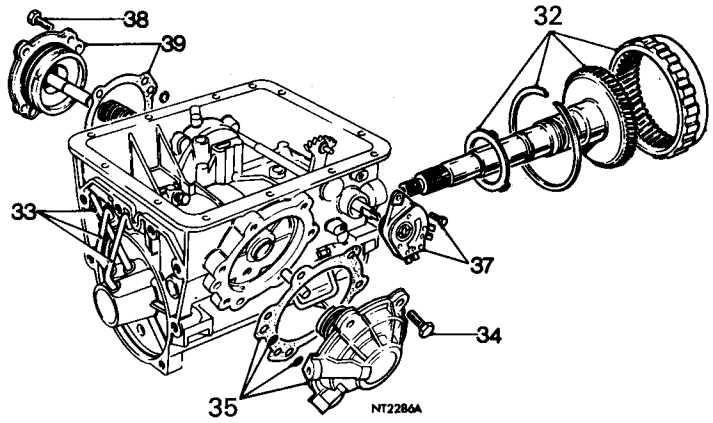


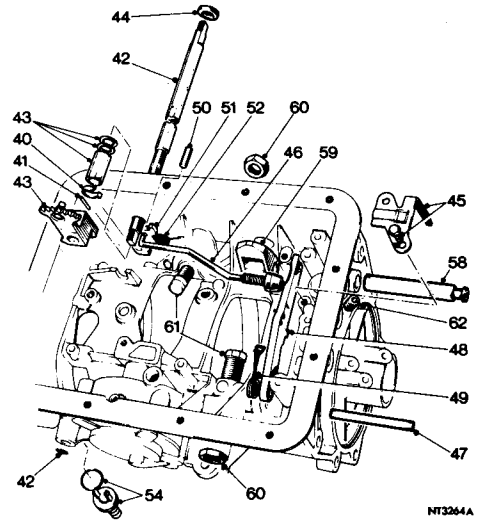
20 Squeeze together the ends of the front brake band and remove it together with the strut.
21 Unscrew the three bolts.
22 Withdraw the centre support/planet gear assembly.
23 Squeeze together the ends of the rear brake band, tilt and withdraw it together with the strut.





24 Using tool no. RG 421 or S 337 to hold the flange, unscrew the nut.
25 Withdraw the flange.
26 Unscrew the bolts.
27 Remove the rear extension and joint washer.
28 Remove the clamp tube.
29 Withdraw the speedometer drive gear.
30 Unscrew the counterweight.
31 Withdraw the governor assembly.
32 Withdraw the output shaft assembly and thrust washer.
33 Remove the oil tubes.
34 Unscrew the bolts.
35 Remove the rear servo assembly, joint washer and 'O' rings.
36 Unscrew the nut and remove the selector lever.
37 Unscrew the bolt and remove the switch.





38 Unscrew the bolts.
39 Remove the front servo and joint washer.
40 Remove the spring clip.
41 Withdraw the pin.
42 Withdraw the cross-shaft and remove the 'O' ring.
43 Remove the detent lever, collar, washers and 'O' ring.
44 Remove the oil seal.
45 Unscrew two screws and remove the cam plate.
46 Remove the parking brake rod assembly.
47 Withdraw the parking brake pawl pivot pin.
48 Remove the parking brake pawl.
49 Remove the spring.
50 Remove the relay lever pivot pin.
51 Remove the relay lever.
52 Remove the torsion spring.
53 Using tool no. CBW 62, remove the down-shift cable assembly.
54 Using tool no. CBW 62, remove the breather adaptor.
55 Unscrew the unions and remove the bridge pipe.
56 Unscrew the adaptor.
57 Unscrew the return valve.
58 Withdraw the rear servo lever pivot pin.
59 Remove the servo lever.
60 Unscrew the locknuts.
61 Unscrew the adjusting screws.
62 Unscrew the pressure take-off plug.

Reassembling

63 Fit the pressure take-off plug.
64 Refit the adjusting screws.
65 Loosely refit the locknuts.
66 Replace the rear servo lever.
67 Refit the rear servo lever pivot pin.
68 Fit the oil return valve.
69 Fit the adaptor.
70 Refit the bridge pipe and tighten the unions.
71 Refit the breather adaptor.
72 Refit the down-shift cable.
73 Replace the relay lever and torsion spring.
74 Refit the relay lever pivot pin.
75 Replace the parking brake pawl and spring.
76 Refit the parking brake pawl pivot pin.
77 Refit the parking brake rod.
78 Refit the cam plate, ensuring that the tag end locates in the groove in the rear servo lever pivot pin.
79 Fit and tighten the bolts.
80 Fit a new cross-shaft oil seal.
81 Locate the cross-shaft through the oil seal and fit the washers.
82 Fit the collar and detent lever and push the cross-shaft fully home.
83 Refit the pin.
84 Refit the clip.
85 Refit the 'O' ring.
86 Refit the front servo and joint washer.
87 Fit and tighten the bolts.
88 Refit the switch and secure with the bolt.
89 Refit the selector lever and secure with the nut.
90 Refit the rear servo assembly, joint washer and 'O' rings, retaining them in position using petroleum jelly.
91 Fit and tighten the bolts.
92 Refit the oil tubes, ensuring that they are correctly located.
93 Locate the thrust washer on the end wall of the casing, using petroleum jelly.
94 Carefully refit the output shaft assembly.
95 Refit the governor assembly.
96 Fit and tighten the counterweight.
97 Refit the speedometer drive gear.
98 Refit the clamp tube.

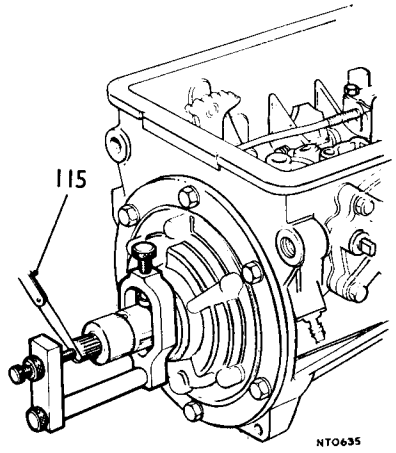
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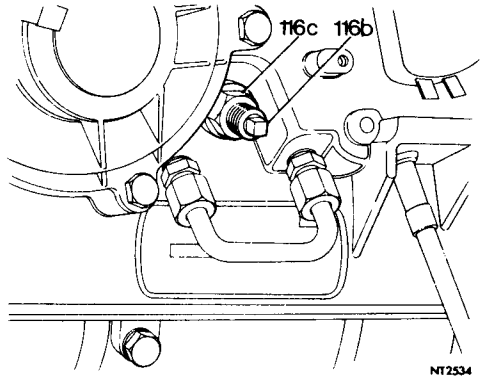
99 Refit the rear extension housing and joint washer.
100 Fit and tighten the bolts.
101 Tap the drive flange into position.
102 Fit the washer and nut and using tool no. RG 421 or S 337 to hold the flange, tighten the nut to the correct torque.
103 Squeeze together the ends of the rear brake band, tilt and locate it in position.
104 Refit the rear brake band strut.
105 Using petroleum jelly, locate the thrust race on the rear drum spigot.
106 Refit the centre support/planet gear assembly, ensuring the oil and locating holes align with those in the casing.
107 Fit and tighten the three bolts.
108 Squeeze together the ends of the front brake band and fit it in position together with the strut.
109 Refit the rear clutch and forward sun gear assembly.
110 Using petroleum jelly, stick the thrust washers to the rear clutch assembly (phosphor bronze towards the front clutch).
111 Refit the front clutch assembly.
112 Using petroleum jelly, stick the thrust washer to the pump assembly.
113 Refit the pump assembly and joint washer.
114 Fit and tighten the bolts.

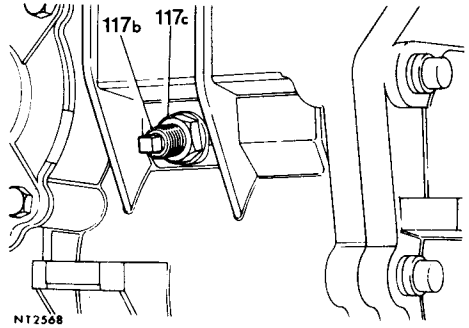
115 Using tool no. CBW 87, check the gear train end-float, and if necessary, adjust the selective use of the thrust washer fitted between the pump and the front clutch.
Recommended end-float 0·25 mm to 0·75 mm (0·010 to 0·030 in).

116 Adjust the front band as follows:
a Slacken the adjusting screw and locknut.
b Tighten the adjusting screw to 0·7 kgf m (5 lbf ft) and back off three-quarters of a turn.
c Tighten the locknut.

117 Adjust the rear band as follows:
a Slacken the adjusting screw and locknut.
b Tighten the adjusting screw to 0·7 kgf m (5 lbf ft) and back off three-quarters of a turn.
c Tighten the locknut.





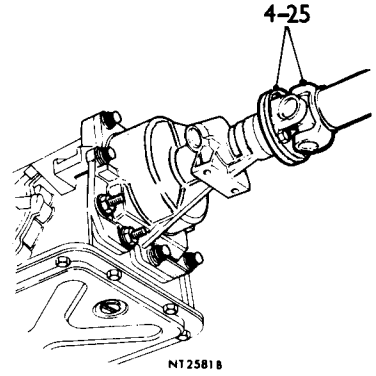


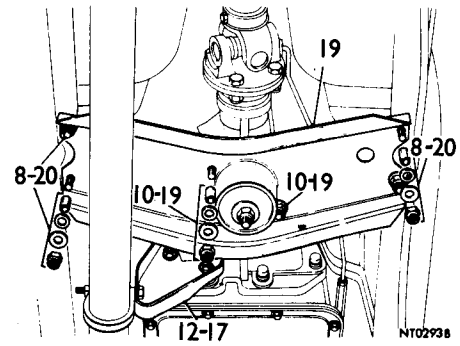
118 Refit the oil tubes. (Note the 'O' ring on the pump suction tube).
119 Refit the oil tube locating plate.
120 Fit and tighten the two bolts.
121 Carefully refit the valve block, ensuring that the oil tubes are not distorted.
122 Fit and tighten the three bolts and washers.
123 Connect the down-shift inner cable to the down-shift cam.
124 Refit the oil tubes.
125 Replace the magnet and refit the oil pan and joint washer.
126 Fit and tighten 12 bolts.
127 Locate the torque converter housing in place.
128 Fit and tighten four bolts securing the torque converter housing.
129 Refit the transmission unit.

REAR EXTENSION

Remove and refit **44.20.15**

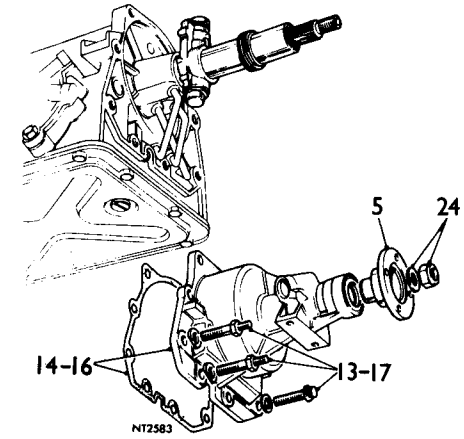
Removing
1 Raise the ramp.
2 Drain the oil.
3 Disconnect the exhaust and push it to the rear of the car.
4 Release the four propshaft bolts.
5 Using tool RG 421, remove the drive flange.

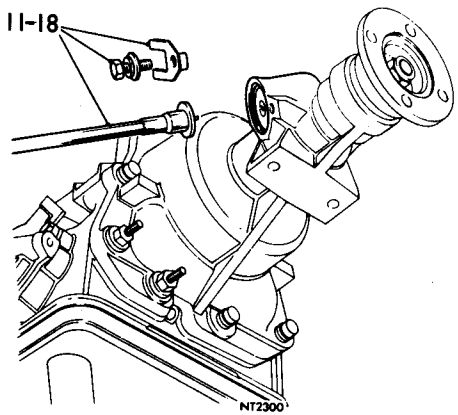




6 Unclip the selector rod.
7 Support the gearbox.
8 Remove the four gearbox mounting nuts.
9 Lower the rear of the gearbox.
10 Remove the rear mounting—two nuts.
11 Release the speedo cable.
12 Remove the exhaust steady bracket—two bolts.
13 Remove all the remaining bolts (six) and studs (two).
14 Remove the rear extension.

Refitting
15 Clean the mating faces of the extension and gearbox main case. Fit a new gasket.
16 Fit the extension in position.
17 Secure it with six bolts and two studs.



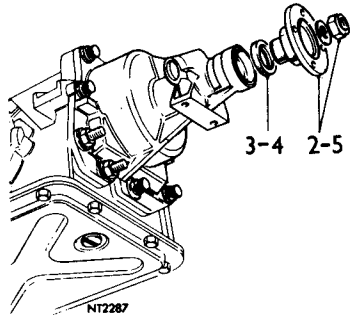


18 Refit the speedo cable and clamp.
19 Refit the rear mounting to the gearbox.
20 Fit the mounting to the floor.
21 Remove the gearbox support.
22 Tighten the gearbox rubber mounting bolts (two).
23 Connect up the selector rod.
24 Refit the drive flange nut and washer.
25 Connect up the propshaft (four bolts and nuts).
26 Connect up the exhaust system seven rubbers and one clip.
27 Check and top up the gearbox.
28 Lower the ramp.

REAR OIL SEAL

Remove and renew **44.20.18**

Service tool: RG 421



Removing
1 Drive the vehicle onto a ramp, select 'P' and chock the wheels. Raise the ramp.
2 Disconnect the propshaft from the drive flange. Unscrew and remove the nut and withdraw the flange using tool RG 421.
3 Prise out the oil seal.

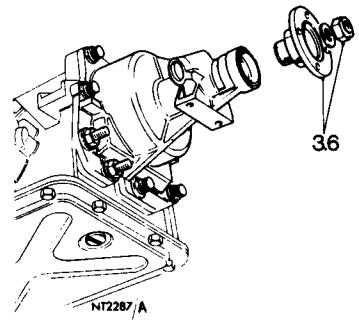
Fitting
4 Using a suitable drift, drive a new oil seal into the rear extension.
5 Refit the flange and secure with the nut and washer.
6 Refit the propeller shaft.

DRIVE FLANGE

Remove and refit **44.20.23**

Service tool: RG 421

Removing
1 Raise the ramp.
2 Release the prop shaft.

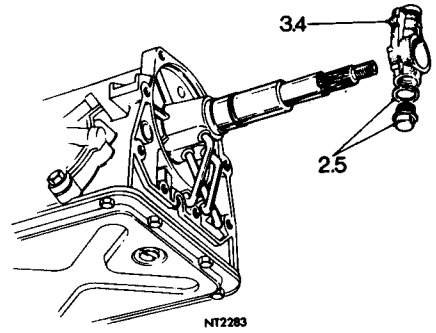


3 Using tool RG 421, hold the flange and remove the nut.
4 Remove the flange.

Refitting
5 Refit the flange.
6 Using tool RG 421, hold the flange and tighten the nut.
7 Refit the propshaft.
8 Lower the ramp.

GOVERNOR

Remove and refit **44.22.01**

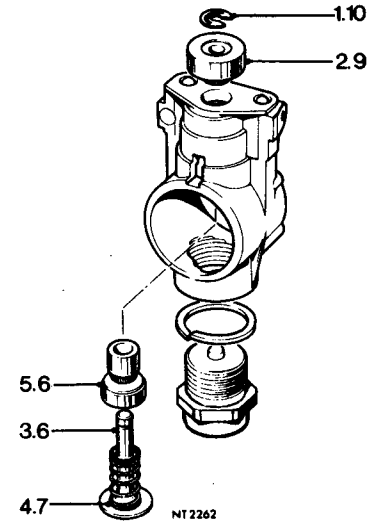


Removing
1 Remove the rear flange, rear extension and speedometer drive gear, see 44.38.07
2 Unscrew the counterweight.
3 Withdraw the governor assembly.

Refitting
4 Slide the governor assembly into position.
5 Locate and secure the counterweight.
6 Refit the speedometer drive gear, rear extension and drive flange, see 44.38.07.

GOVERNOR

Overhaul **44.22.04**

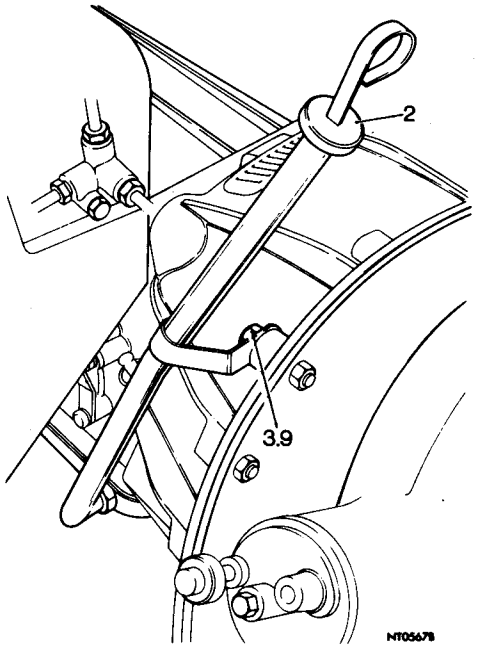


Dismantling
1 Pull off the retainer.
2 Withdraw the weight.
3 Withdraw the stem.
4 Remove the spring.
5 Withdraw the valve.

Reassembling
6 Insert the valve.
7 Refit the spring onto the stem.
8 Refit the stem and spring.
9 Refit the weight.
10 Refit the retainer.

DIPSTICK/FILLER TUBE

Remove and refit **44.24.01**



Removing

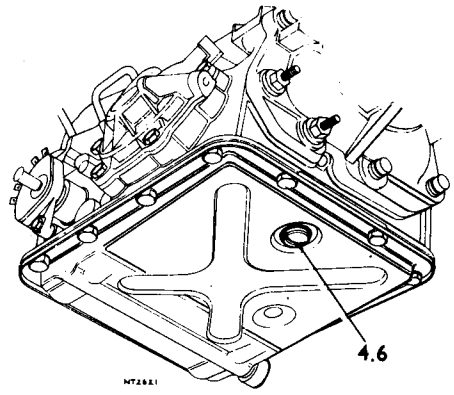
1 Drive the vehicle onto a ramp, select 'PARK', apply the hand brake and open the bonnet.
2 Withdraw the dipstick.
3 Release the filler tube from the engine/transmission flange.
4 Raise the ramp.
5 Unscrew the union nut from the sump pan, and release the filler pipe from the sump.
Drain the fluid from the transmission unit.
6 Withdraw the filler tube from below the vehicle.

Refitting

7 Manoeuvre the filler tube into position and secure it to the sump pan with the union nut.
8 Lower the ramp.
9 Secure the filler tube to the engine/transmission flange.
10 Refill the unit with fluid, see 44.24.02.

TRANSMISSION FLUID

Drain and refill **44.24.02**



Draining

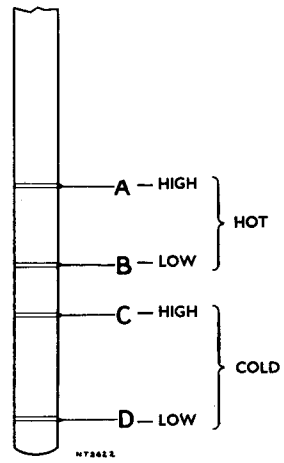
1 Drive the vehicle onto a ramp, select 'PARK' and apply the hand brake.
2 Raise the ramp.
3 Place a tray under the drain plug.
4 Unscrew the plug.
5 Drain the fluid into the tray.

NOTE: It is not possible to drain the torque converter.

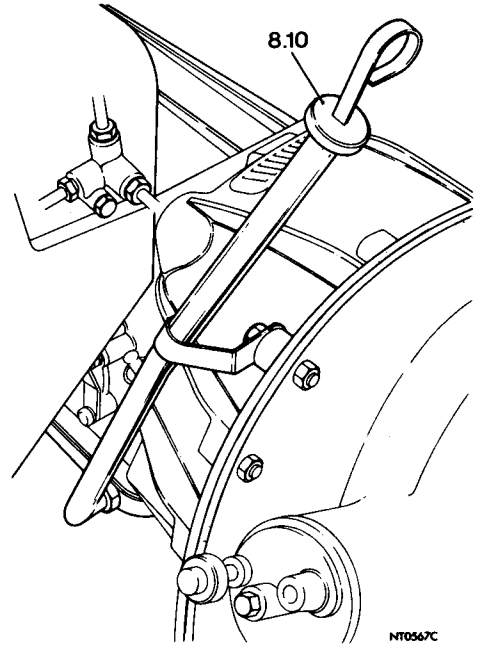
Filling

If the sump has been drained it will be necessary to replenish the transmission unit until the fluid level is no higher than the 'cold high' mark 'C' (third mark down from top).
Check the level (hot) as follows:

7 Drive the vehicle for approximately 30 km (20 miles) until the transmission unit has reached its normal operating temperature. Park the vehicle on level ground, apply the hand brake and select 'PARK'.



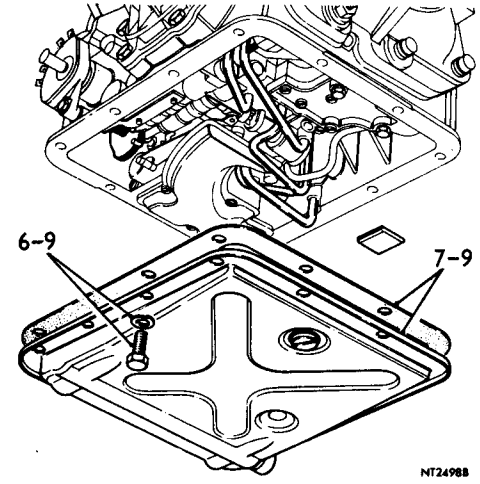
8 Raise the bonnet and wipe clean around the dipstick/filler orifice.



9 Switch off the engine, withdraw the dipstick and wipe it clean, using clean paper or a non-fluffy cloth.
10 Push the dipstick home and again withdraw it for reading. The fluid level should be at the top mark 'A' ('hot high').
DO NOT OVERFILL THE TRANSMISSION.
11 When the oil level is correct, lower the bonnet and stop the engine.

TRANSMISSION SUMP

Remove and refit **44.24.04**

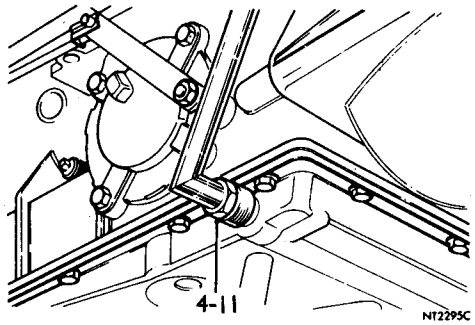


Removing

1 Open the bonnet and disconnect the battery.
2 Raise the ramp.
3 Drain the oil.
4 Release the dipstick tube.
5 Release the two bolts holding the heat shield.
6 Remove the remaining ten bolts.
7 Remove the sump.

Refitting

8 Clean both mating faces.
9 Refit the sump pan with the ten bolts.



10 Refit the heat shield with the two bolts.
11 Refit the dipstick tube.
12 Refill the gearbox, see 44.24.02.
13 Lower the ramp.
14 Connect the battery.

OIL COOLER

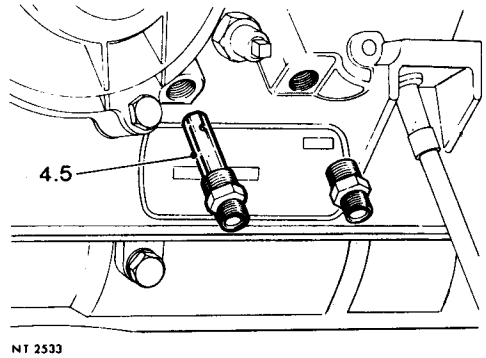
Remove and refit **44.24.10**

Removing
1 Open the bonnet and disconnect the battery.
2 Drain the coolant.
3 Remove the bonnet.
4 Remove the two air ducts.
5 Remove the two top hoses.
6 Disconnect the horn wires.
7 Remove the four bolts securing the radiator.
8 Disconnect the oil cooler pipes.
9 Lift out the radiator and the oil cooler.
10 Separate the oil cooler from the radiator one union and three bolts.

Refitting
11 Refit the oil cooler to the radiator (three bolts and one union).
12 Place the radiator back in position.
13 Bolt the radiator back in position (four bolts).
14 Connect the oil cooler pipes.
15 Connect the horn wires.
16 Connect all the radiator hoses.
17 Connect the air ducts.
18 Refit the bonnet.
19 Fill the radiator with coolant.
20 Connect the battery.
21 Check the oil level in the gearbox and top up if necessary.
22 Close the bonnet.

RESTRICTOR VALVE AND BY-PASS PIPE

Remove and refit **44.24.22**



Removing
1 Drive the vehicle onto a ramp, select 'PARK' and apply the hand brake.
2 Remove the oil cooler pipes, see 44.24.19.
3 Remove the by-pass pipe.
4 Unscrew the restrictor valve.

Refitting
5 Screw the restrictor valve into the casing.
6 Connect the by-pass pipe.
7 Tighten the union nuts.

OIL COOLER PIPE, COOLER TO HOSES

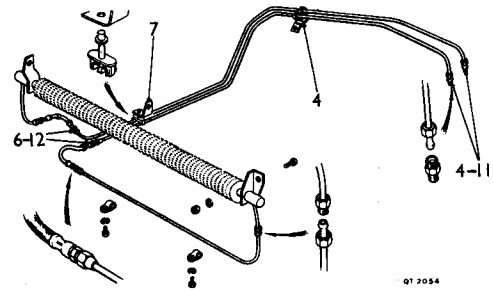
Remove and refit **44.26.16**

Removing
1 Disconnect the radiator from the flexible hose and cooler.
2 Slacken the bolts that hold the bracket and pipes to the radiator.
3 Remove the pipe.

Refitting
4 Connect the hose and pipe to the radiator.

OIL COOLER FLUID PIPES, GEARBOX TO HOSES

Remove and refit **44.24.19**

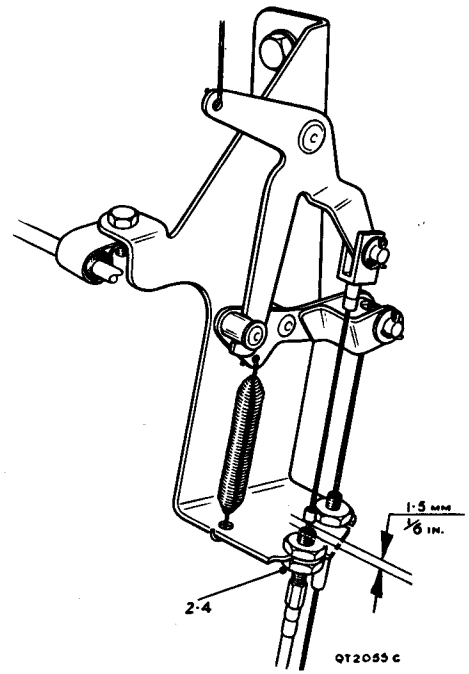


Removing
1 Lift the transmission cover carpet.
2 Remove the access plate on the near-side tunnel cover.
3 Slacken the pipes, unions and pull away.
4 Pull the pipes away from the top clip.
5 Raise the ramp.
6 Disconnect the pipes from the hoses.
7 Pull pipes away from the lower clip.
8 Remove the air cleaner box.
9 Manoeuvre the pipes from the car.

Refitting
10 Lay the pipes back in position.
11 Refit the pipes to the gearbox and clip them into position.
12 Connect them to the flexihose.
13 Refit the air cleaner.
14 Refit the access plate on the gearbox cover.

DOWN-SHIFT CABLE

Initial setting **44.30.01**

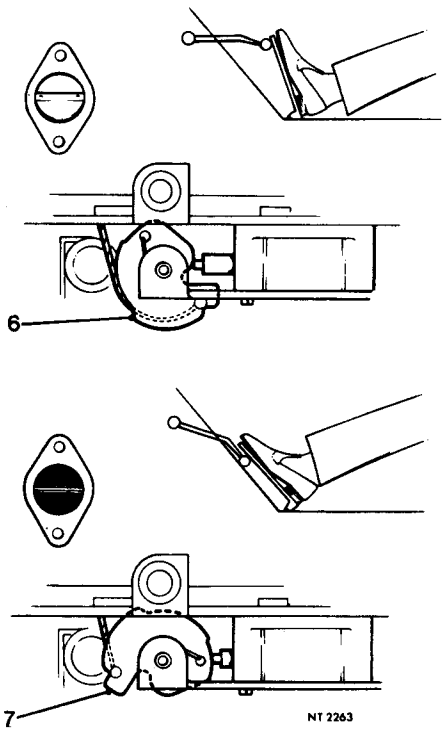


1 Check that the carburetter slow-running and fast idle settings are satisfactory.
2 Slacken the locknut.
3 Adjust the outer cable in the bracket until the crimped stop is 1·5 mm ($\frac{1}{16}$ in) from the end of the outer cable ferrule.
4 Tighten the locknut.
5 Road test the vehicle and check the gear-shift speeds.

DOWN-SHIFT CABLE

Adjust **44.30.02**

1 Drive the vehicle onto a ramp, apply the hand brake and chock the wheels.
2 Start the engine, select 'D' and adjust the idling speed to 750 rev/min. Stop the engine.
3 Slacken the locknut.
4 Adjust the outer cable to 1·5 mm ($\frac{1}{16}$ in) from the stop, see 44.30.01, para. 3.
5 Remove the sump pan, see 44.24.04.



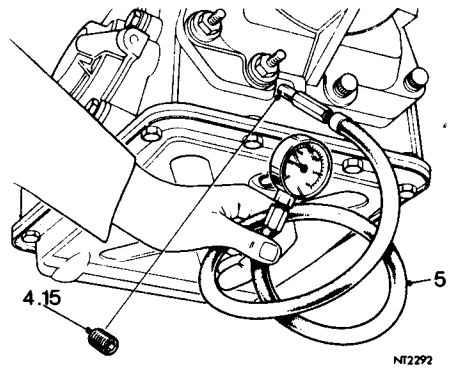
6 Check that the down-shift cam is in the idling position.
7 With the aid of an assistant in the driving seat, open fully the throttle and check that the down-shift cam is in the kick-down position.
8 If necessary, adjust the outer cable until the idling and kick-down positions can be correctly obtained on the down-shift cam. Tighten the locknut.
9 Refit the sump, see 44.24.04.

DOWN-SHIFT CABLE

Pressure check **44.30.03**

Service tools: CBW 1C and CBW 1C-2

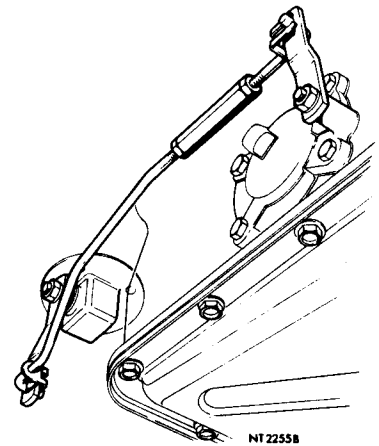
1 Start and run the engine until the transmission reaches its normal operating temperature.
2 Drive the vehicle onto a ramp and check that the engine idling speed is approximately 750 rev/min. Stop the engine.
3 Raise the ramp.



4 Remove the plug.
5 Connect the pressure gauge to the transmission unit.
6 Lower the ramp, chock the wheels and apply the hand brake and foot brake.
7 Start the engine and select 'D'.
8 With the engine idling at 750 rev/min, note the pressure gauge reading which should be 4·2 to 5·3 kgf/cm² (60 to 75 lbf/in²).
9 Increase the engine speed to 1,000 rev/min and note the pressure increase which should be 1·0 to 1·4 kgf/cm² (15 to 20 lbf/in²).
10 Stop the engine.
11 If the pressure increase is less than 1·0 kgf/cm² (15 lbf/in²), increase the effective length of the outer cable. If the pressure increase is more than 1·4 kgf/cm² (20 lbf/in²), decrease the effective length of the outer cable.
12 Repeat operations 7 to 11 until the pressure increase is correct.
13 Raise the ramp.
14 Disconnect the pressure gauge.
15 Refit the plug.
16 Lower the ramp.

SELECTOR ROD

Adjust **44.30.04**

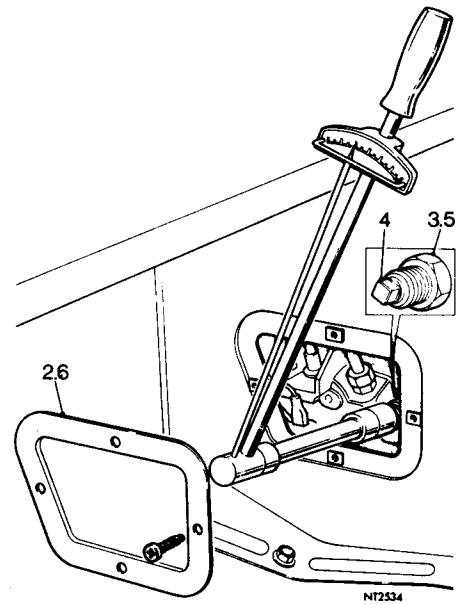


1 Drive the vehicle onto a ramp, lock the selector lever in 'N' and apply the hand brake.
2 Raise the ramp.
3 Slacken the locknut.
4 Push the clip off the hand lever.
5 Disconnect the selector rod and check that the gearbox selector lever is in the neutral position.
6 Alter the length of the selector rod by adjusting the turnbuckle until the end of the rod can be located in the hand lever.
7 Tighten the locknut.
8 Push the clip onto the lever and secure the rod.

FRONT BRAKE BAND

Adjust **44.30.07**

Service tools: CBW 547B-75, CBW 547A-50-2A

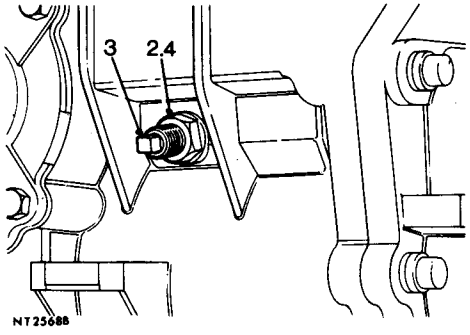


1 Lift the transmission cover carpet.
2 Remove the access plate.
3 Slacken the locknut.
4 Tighten the adjusting screw to 0·7 kgf m (5 lbf ft) and back off three-quarters of a turn.
5 Tighten the locknut.
6 Refit the access plate.

REAR BRAKE BAND

Adjust 44.30.10

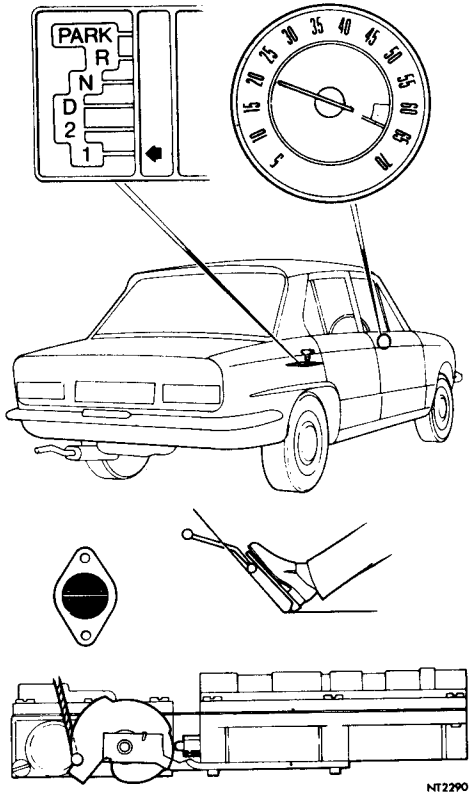
Service tools: CBW 547B-75, CBW 547A-50-2A



1 Drive the vehicle onto a ramp, select 'PARK', apply the hand brake and raise the ramp.
2 Slacken the locknut.
3 Tighten the adjusting screw to 0·7 kgf m (5 lbf ft) and back off three-quarters of a turn.
4 Tighten the locknut.

STALL TEST 44.30.13

The function of a stall test is to determine that the torque converter and gearbox are operating satisfactorily.

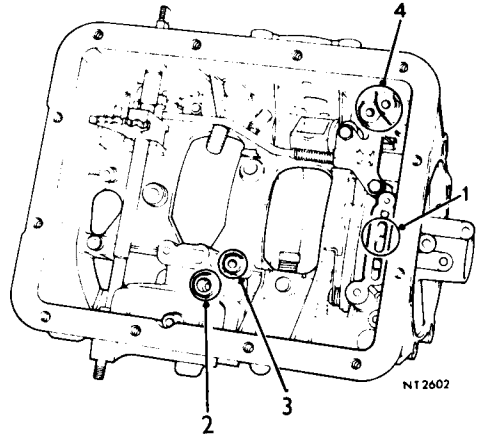


1 Check the condition of the engine. An engine which is not developing full power will affect the stall test readings.
2 Allow the engine and transmission to reach correct working temperatures.
3 Chock the wheels and apply the hand brake and foot brake.
4 Select '1' or 'R' and depress the throttle to the 'kick-down' position. Note the reading on the tachometer which should be 2,100 rev/min. If the reading is below 1,300 rev/min, suspect the converter for stator slip. If the reading is down to 1,500 rev/min, the engine is not developing full power. If the reading is in excess of 2,300 rev/min, suspect the gearbox for brake band or clutch slip.

NOTE: Do not carry out a stall test for a longer period than 10 seconds, otherwise the transmission will become overheated.

AIR PRESSURE CHECKS 44.30.16

Air pressure checks can be made on the gearbox assembly to determine whether the clutches and brake bands are operating. These checks can be made with the transmission in the car or on the bench, using a high pressure air-line. Remove the oil pan, the valve body and oil tubes.



1 **Front clutch and Governor Feed**
Apply air pressure to the passage (1). Listen for a thump, indicating that the clutch is functioning. With the unit on a bench, verify by rotating the input shaft with air pressure applied. Keep air pressure applied for several seconds to check for leaks in the circuit.
If the extension housing has been removed, rotate the output shaft so that the governor weight will be at the bottom of the assembly. Verify that the weight moves inwards with air pressure applied.

2 **Rear Clutch**
Apply air pressure to the passage (2). With the unit on the bench, verify that the clutch is functioning by turning the input shaft. Keep air pressure applied for several seconds to check for leaks; then listen for a thump indicating that the clutch is releasing.

3 **Front Servo**
Apply air pressure to the tube location (3). Observe the movement of the piston pin.

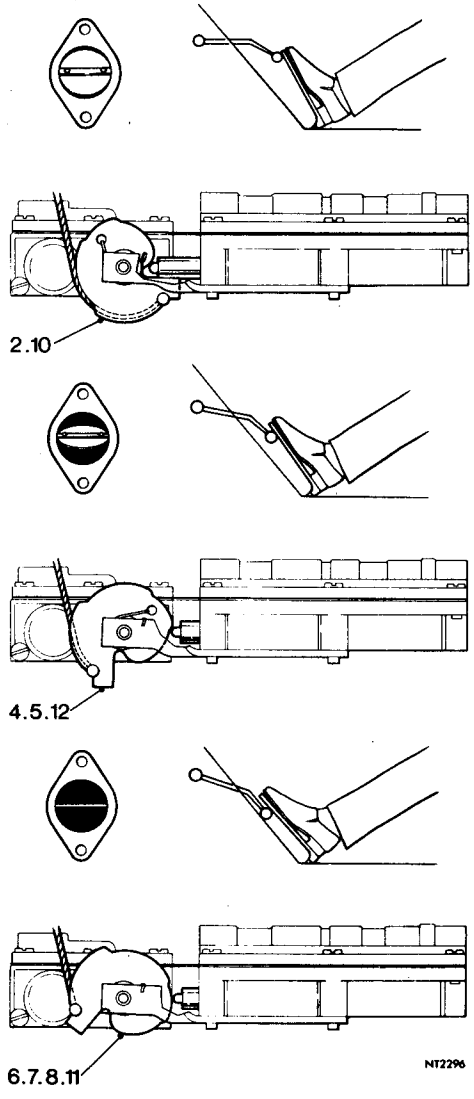
4 **Rear Servo**
Apply air pressure to the tube location (4). Observe the movement of the servo lever.

ROAD TEST 44.30.17

Throughout the road test procedure the term 'full throttle' is equivalent to approximately seven-eighths of the available pedal movement and 'kick-down' is equivalent to the full movement.

Procedure

1 Check that the starter motor will operate only with the selector lever in 'PARK' or 'N' and that the reverse lights operate only in 'R'.
2 Apply the hand brake and with the engine idling select 'N–D', 'N–2', 'N–R'. Engagement should be positive. A cushioned 'thump' under fast idling conditions is normal.
3 With the transmission at normal running temperatures, select 'D', release the brakes and accelerate with minimum throttle. Check the 1–2 and 2–3 shift speeds and the quality of change.
4 Stop the vehicle, select 'D' and re-start using 'full throttle'. Check 1–2 and 2–3 shift speeds and the quality of change.
5 At 65 km/h (40 m.p.h.) apply 'full throttle'. The vehicle should accelerate in third gear and should not down-shift to second.



6 At a maximum speed of 93 km/h (58 m.p.h.) 'kick-down' fully. The transmission should down-shift to second gear.
7 At a maximum speed of 51 km/h (32 m.p.h.) 'kick-down' fully. The transmission should down-shift to first gear.
8 Stop the vehicle, select 'D' and re-start using 'kick-down'. Check the 1–2 and 2–3 shift speeds.
9 At 34 km/h (21 m.p.h.) select 2 and release the throttle. Check the 3–2 down-shift.
10 At 37 km/h (23 m.p.h.) select 1 and release the throttle. Check the 2–1 down-shift.
11 With 1 still engaged, stop the vehicle and using 'kick-down' accelerate to over 65 km/h (40 m.p.h.). Check for 'slip', 'squawk', and the absence of up-shifts.
12 Stop the vehicle and select 'R'. Reverse using 'full throttle' if possible. Check for 'slip' and 'squawk'.
13 Stop the vehicle on a gradient. Apply the hand brake and select 'PARK'. Release the hand brake and check the parking pawl hold. Check that the selector lever is held firmly in the gate in 'P'.

CONVERTER DIAGNOSIS

Inability to start on steep gradients, combined with poor acceleration from the rest and low stall speed (1,400 rev/min) indicates that the converter stator uni-directional clutch is slipping. This condition permits the stator to rotate in an opposite direction to the impeller and turbine, and torque multiplication cannot occur.

Poor acceleration in third gear above 50 km/h (30 m.p.h.) and reduced maximum speed, indicates that the stator uni-directional clutch has seized. The stator will not rotate with the turbine and impeller and the 'fluid flywheel' phase cannot occur. This condition will also be indicated by excessive overheating of the transmission although the stall speed will be correct.

ROAD TEST — FAULT DIAGNOSIS CHART

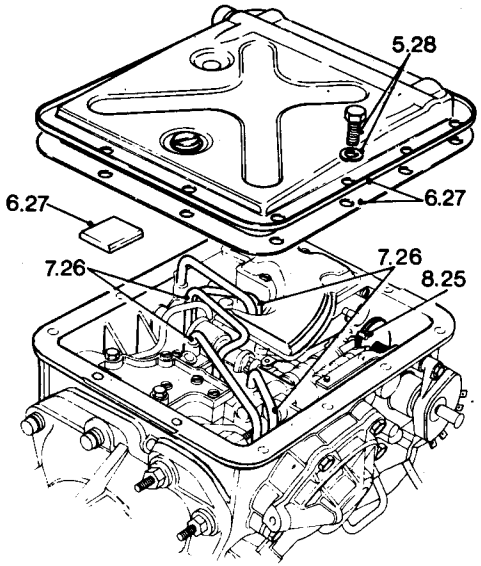
NOTE: The numbers indicate the recommended sequence of investigation

SYMPTOM	Diagnosis	Engagement of 1, 2, D or R: Bumpy	Engagement of 1, 2, D or R: Delayed	Engagement of 1, 2, D or R: None	Take-off: None forward	Take-off: None reverse	Take-off: Seizure reverse	Take-off: No neutral	Take-off: Squawk	Take-off: Slip	Up-shifts: No 1–2	Up-shifts: No 2–3	Up-shifts: Above normal speed	Up-shifts: Below normal speed	Up-shift Quality: Slip 1–2	Up-shift Quality: Slip 2–3	Up-shift Quality: Rough 1–2	Up-shift Quality: Rough 2–3	Up-shift Quality: Seizure 1–2	Up-shift Quality: Seizure 2–3	Down-shifts: No 2–1	Down-shifts: No 3–2	Down-shifts: Involuntary 3–2	Down-shifts: Above normal speed	Down-shifts: Below normal speed	Downshift Quality: Slip 2–1	Downshift Quality: Slip 3–2	Downshift Quality: Rough 2–1	Downshift Quality: Rough 3–2
ADJUSTMENT FAULTS	Fluid level insufficient		1	1						1					1	1							1						
	Down-shift cable incorrectly assembled or adjusted	2								2				1	2	2					1	1		1	1				
	Manual linkage incorrectly assembled or adjusted		2	2	1	1		1		3	1	1			3	3											1		1
	Incorrect engine idling speed	1	3																										
	Incorrect front band adjustment						1				2				4	4	2	2		1									
	Incorrect rear band adjustment					2													1										
HYDRAULIC CONTROL FAULTS	Oil tubes incorrectly installed, missing or leaking		4	3		7				7	8	8			8	9				2			2			6		
	Sealing ring missing or broken		7	4	3	6				5	9	9	8	5	9	10			5	3				5	5	7	3		
	Valve block screws missing or loose	5	6	5	2	5		3			10	10	9	6	10	11	10	6	6	4				6	6	8			5
	Primary regulator valve sticking	3	5	6									10		6	7	3	3								4			3
	Secondary regulator valve sticking																												
	Throttle valve sticking	4									6	6	2	2	7	8	4	4						4	4	5		4	
	Modulator valve sticking										7	7	7				5												
	Governor valve sticking, leaking or incorrectly assembled										3	2	3	3			6				3	3		2	2		3	2	
	Orifice control valve sticking																												
	1–2 shift valve sticking					3					4		4								2	2		7					
	2–3 shift valve sticking					4						3	5											8					
	2–3 shift valve plunger sticking											4	6	4										3	3				
	Converter 'out' check valve sticking or missing		13																										
	Check valve sticking or missing		8																										
MECHANICAL FAULTS	Front clutch slipping		9		4				4								9										2		
	Front clutch seized or plates distorted	6					2	2															3						
	Rear clutch slipping		10			9			6			5				5											9		6
	Rear clutch seized or plates distorted	7																	5	2			4						7
	Front band slipping due to faulty servo or worn band										5				5	6					4	5					2		8
	Rear band slipping due to faulty servo or worn band		11			8																							
	Uni-directional clutch slipping or incorrectly installed				5												7		3							1		1	
	Uni-directional clutch seized																8		4										
	Input shaft broken			7																									
	Front pump drive tangs on converter hub broken			8																									
	Front pump worn		12	9																									
	Converter blading and/or uni-directional clutch failed			10																									

PUMP

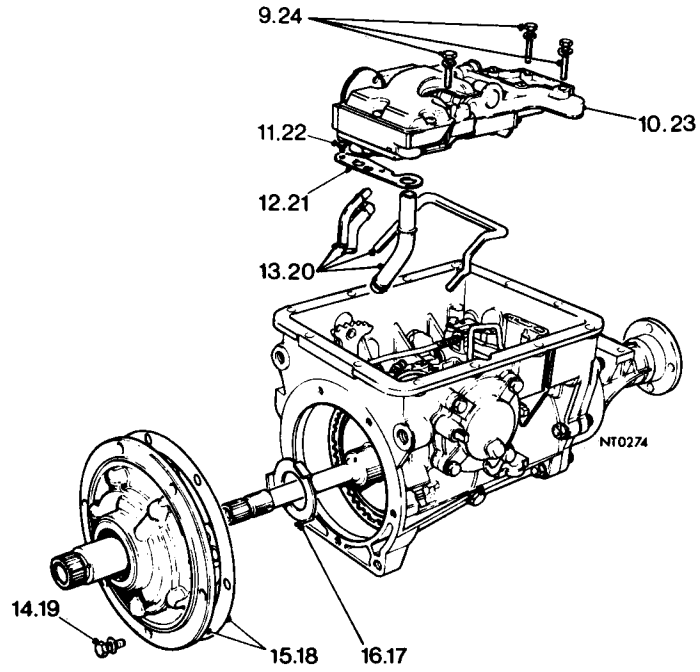
Remove and refit **44.32.01**

Service tools: CBW 60, CBW 547B-75



Removing

1 Remove the transmission unit, see 44.20.01.
2 Wash the exterior of the unit in clean petrol or paraffin, invert it and place on a bench cradle CBW 60. Remove the switch, see 44.15.15.
3 Unscrew the bolts.
4 Remove the torque converter housing.
5 Unscrew twelve bolts.
6 Remove the oil pan, joint washer and magnet.
7 Pull out the oil tubes.
8 Release the inner down-shift cable from down-shift cam.
9 Take out three bolts and washers.



10 Lift off the valve block.
11 Unscrew two bolts.
12 Remove the oil tube locating plate.
13 Pull out the oil tubes. (Note the 'O' ring on the pump suction tube.)
14 Take out five bolts.
15 Remove the pump and joint washer.
16 Remove the thrust washer.

Refitting

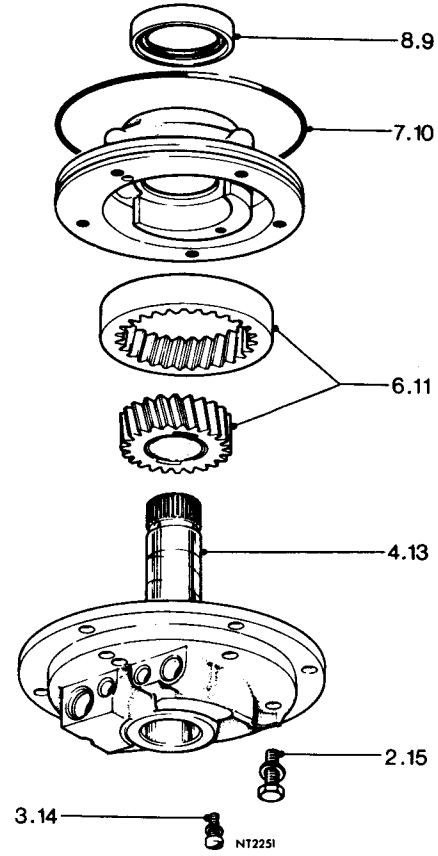
17 Using petroleum jelly, stick the thrust washer to the pump assembly.
18 Refit the pump assembly and joint washer.
19 Fit and tighten the bolts.
20 Refit the oil tubes. (Note the 'O' ring on the pump suction tube.)
21 Refit the oil tube locating plate.
22 Fit and tighten the two bolts.
23 Carefully refit the valve block, ensuring that the oil tubes are not distorted.
24 Fit and tighten the three bolts and washers.
25 Connect the down-shift inner cable to the down-shift cam.
26 Refit the oil tubes.
27 Replace the magnet and refit the oil pan and joint washer.
28 Fit and tighten twelve bolts.
29 Locate the torque converter housing in place.
30 Fit and tighten four bolts.
31 Refit the switch, see 44.15.15.
32 Refit the transmission unit.

PUMP

Overhaul **44.32.04**

Service tool: CBW 547B-75.

1 Remove the pump, see 44.32.01.



Dismantling

2 Unscrew the bolts.
3 Take out the locating screw.
4 Separate the stator support from the pump body assembly.
5 Mark the outside faces of the gears to facilitate correct assembly.
6 Remove the gears.

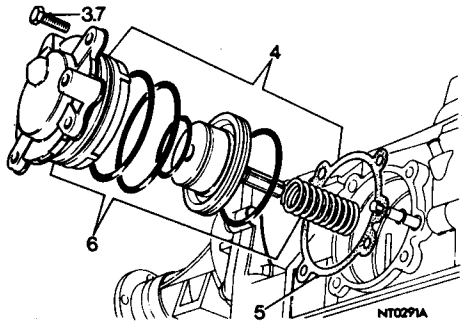
7 Remove the 'O' ring.
8 Extract the seal.

Reassembling
9 Renew the seal.
10 Refit the 'O' ring.
11 Rit the gears into the pump body.
12 Lightly lubricate the gears and the 'O' ring.
13 Refit the stator support.
14 Fit and tighten the locating screw and lock washer.
15 Fit and tighten the bolts and lock washers.
16 Refit the front pump, see 44.32.01.

FRONT SERVO

Remove and refit **44.34.07**

Service tool: CBW 547B-75



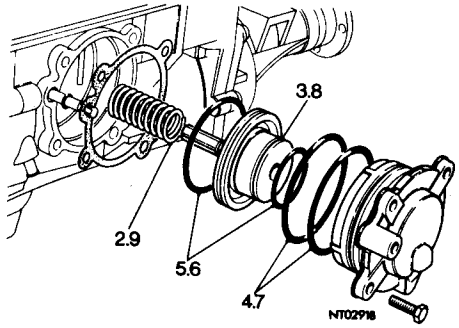
Removing
1 Drive the vehicle onto a ramp, select 'N' and apply the hand brake.
2 Remove the gearbox selector lever.
3 Take out the four bolts.
4 Withdraw the front servo assembly, spring and joint washer.

Refitting
5 Locate the joint washer onto the servo body flange.
6 Refit the servo and spring.
7 Fit and tighten the bolts.

FRONT SERVO

Overhaul **44.34.10**

1 Remove the front servo, see 44.34.07.



Dismantling
2 Remove the spring.
3 Withdraw the piston.
4 Remove the 'O' rings from the body.
5 Remove the 'O' rings from the piston.

Reassembling
6 Fit the 'O' rings to the piston.
7 Fit the 'O' rings to the body.
8 Refit the piston.
9 Fit the spring.
10 Refit the servo assembly, see 44.34.07.

REAR SERVO

Remove and refit **44.34.13**

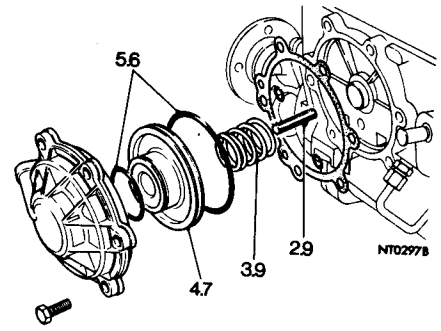
Removing
1 Open the bonnet and disconnect the battery.
2 Drain the water.
3 Disconnect the thermostat housing.
4 Disconnect the shock absorbers from the upper wishbones.
5 Raise the ramp.
6 Disconnect the tie-bar.
7 Disconnect the exhaust clamp and the seven rubbers and push the system to the rear of the car.
8 Disconnect the prop shaft.
9 Disconnect the selector rod.
10 Disconnect the breather pipe.
11 Disconnect the steering clamp.
12 Slacken the top pinch bolt.
13 Set the steering-wheel in the straight-ahead position.
14 Position the body jacks and support the frame.
15 Remove the rear mountings.
16 Lower the sub-frame.
17 Support the engine.
18 Remove the four rear mounting nuts.
19 Lower the engine and gearbox ensuring that the mounting does not foul the brake pipes, fuel pipes and servo.
20 Slacken the six bolts on the rear servo housing.
21 Remove the rear servo.

Refitting
22 Clean the two mating faces.
23 Grease the gasket.
24 Refit the servo, ensure that the two 'O' rings are fitted.
25 Tighten the six servo bolts.
26 Raise the engine and box.
27 Align the rear mounting.
28 Refit the rear four mounting nuts.
29 Refit the breather pipe.
30 Refit the gear-lever selector rod.
31 Release the engine jack.
32 Jack up the sub-frame.
33 Connect and tighten all the sub-frame mountings and the front dampers.
34 Remove the jack from beneath the sub-frame.
35 Release the body jacks.
36 Refit and tighten the bottom steering pinch bolt.
37 Tighten the top pinch bolt.
38 Refit the propshaft.
39 Refit the exhaust clip and seven rubbers.
40 Refit the bottom hose.
41 Refit the engine tie-bar.
42 Lower the ramp.
43 Refit the thermostat housing.
44 Fill up with water.
45 Fill up with oil.
46 Reconnect the battery.
47 Close the bonnet.

REAR SERVO

Overhaul **44.34.16**

1 Remove the rear servo.



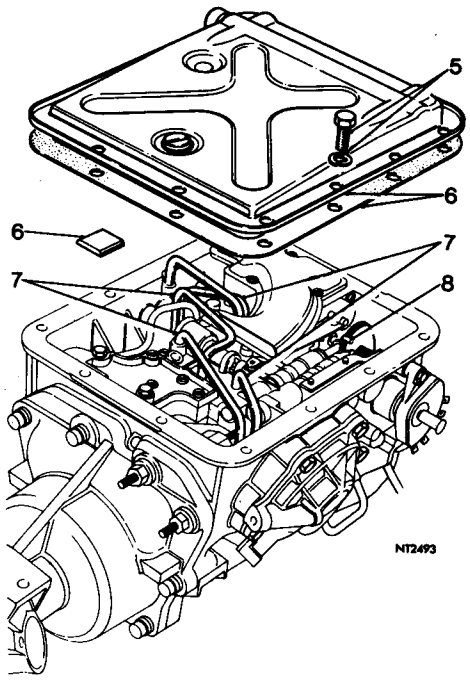
Dismantling
2 Remove the push-rod.
3 Remove the spring.
4 Withdraw the piston.
5 Remove the 'O' rings.

Reassembling
6 Fit the 'O' rings to the piston.
7 Refit the piston.
8 Refit the spring.
9 Refit the push-rod.
10 Refit the rear servo.

OUTPUT SHAFT

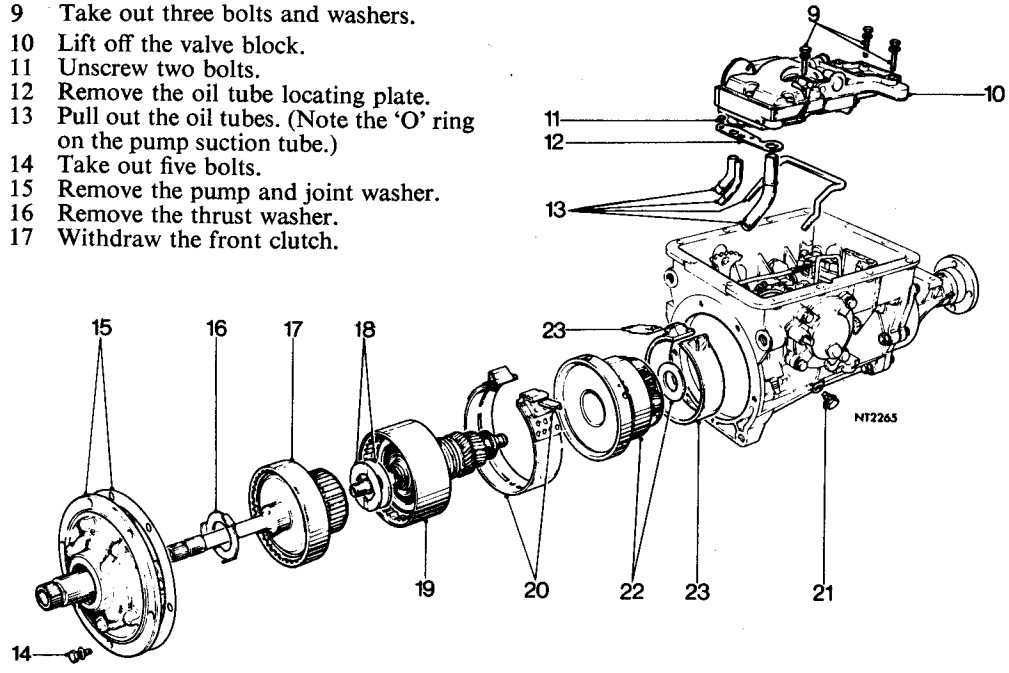
Remove and refit **44.36.01**

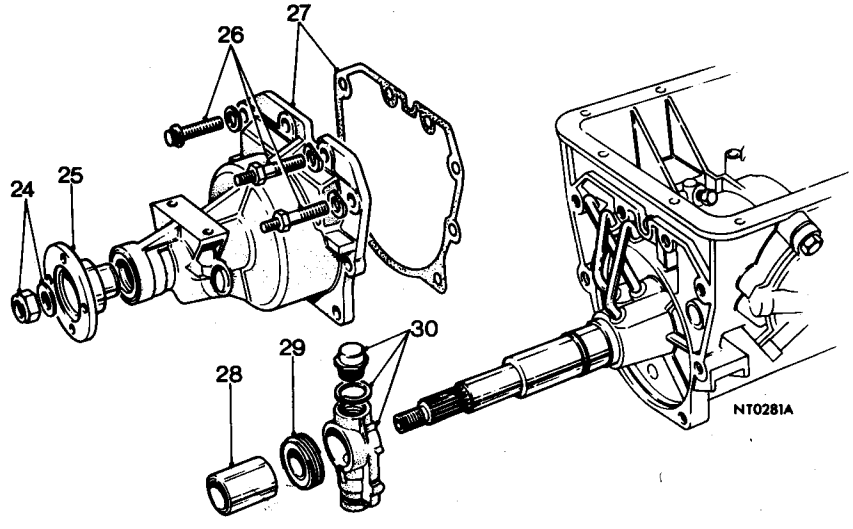
Service tools: CBW 60, RG 421 or S 337, CBW 547B-75



Removing

1 Remove the transmission unit, see 44.20.01.
2 Wash the exterior of the unit in clean petrol or paraffin, invert it and place on a bench cradle CBW 60. Remove the switch, 44.15.15.
3 Unscrew the bolts securing the torque converter housing.
4 Remove the torque converter housing.
5 Unscrew twelve bolts.
6 Remove the oil pan, joint washer and magnet.
7 Pull out the oil tubes.
8 Release the down-shift inner cable from the down-shift cam.
9 Take out three bolts and washers.
10 Lift off the valve block.
11 Unscrew two bolts.
12 Remove the oil tube locating plate.
13 Pull out the oil tubes. (Note the 'O' ring on the pump suction tube.)
14 Take out five bolts.
15 Remove the pump and joint washer.
16 Remove the thrust washer.
17 Withdraw the front clutch.

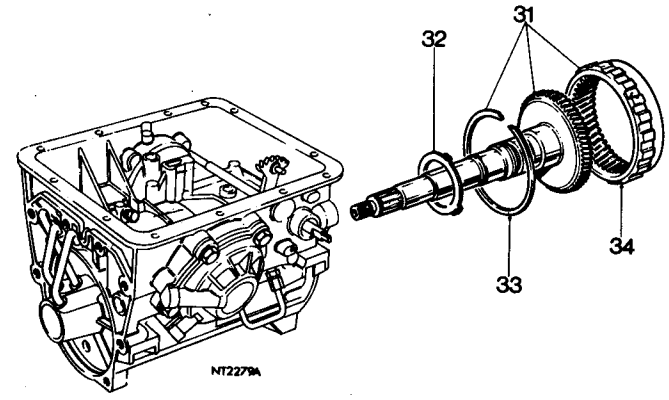




18 Remove the thrust washers.
19 Withdraw the rear clutch and forward sun gear.
20 Squeeze together the ends of the front brake band and remove it together with the strut.
21 Unscrew the three bolts.
22 Withdraw the centre support/planet gear assembly and needle thrust assembly.
23 Squeeze together the ends of the rear brake band, tilt and withdraw together with the strut.
24 Using tool no. RG 421 or S 337 to retain the flange, unscrew the nut.
25 Withdraw the flange.
26 Unscrew the bolts.
27 Withdraw the rear extension and joint washer.
28 Remove the clamp tube.
29 Withdraw the speedometer drive gear.
30 Unscrew the counterweight and remove the governor.
31 Withdraw the output shaft assembly.
32 Remove the thrust washer.
33 Remove the circlip.
34 Detach the outer annulus from the output shaft.

Refitting

35 Assemble the outer annulus and the output shaft.
36 Fit the circlip.
37 Using petroleum jelly, stick the thrust washer to the casing.
38 Refit the output shaft assembly.

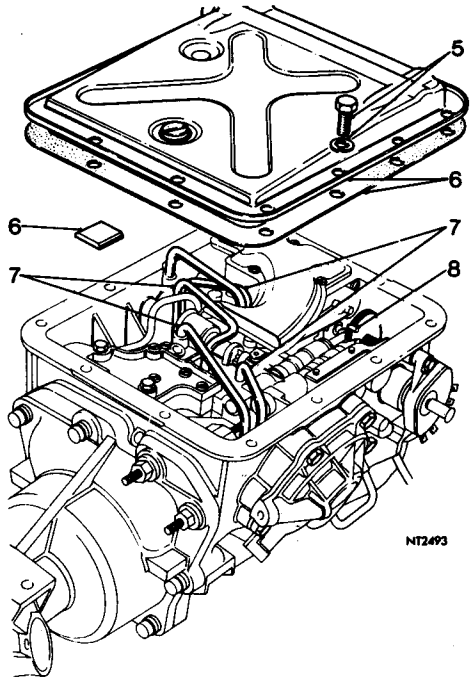


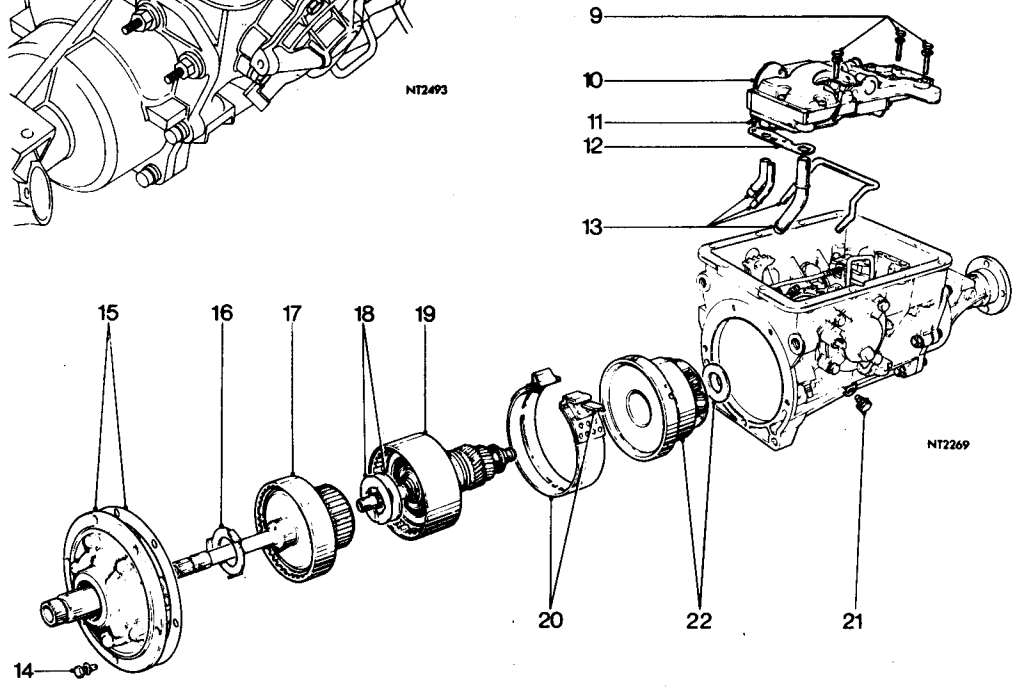
39 Refit the governor and secure it with the counterweight.
40 Refit the speedometer drive gear.
41 Refit the clamp tube.
42 Refit the rear extension, using a new joint washer if necessary.
43 Fit and tighten the bolts.
44 Refit the flange.
45 Holding the flange with tool no. RG 421 or S 337, fit and tighten the nut.
46 Using petroleum jelly, stick the needle thrust bearing onto the planet gear case (rear drum).
47 Refit the rear brake band and strut.
48 Refit the centre support/planet gear assembly, ensuring that the oil and locating holes align with those in the casing.
49 Fit and tighten the bolts.
50 Squeeze together the ends of the front brake band and fit it in position together with the strut.
51 Refit the rear clutch and forward sun gear assembly.
52 Using petroleum jelly, stick the thrust washers to the rear clutch assembly (phosphor-bronze towards the front clutch).
53 Refit the front clutch assembly.
54 Using petroleum jelly, stick the thrust washer to the pump assembly.
55 Refit the pump assembly and joint washer.
56 Fit and tighten the bolts.
57 Refit the oil tubes. (Note the 'O' ring on the pump suction tube.)
58 Refit the oil tube locating plate.
59 Fit and tighten the two bolts.
60 Carefully refit the valve block, ensuring that the oil tubes are not distorted.
61 Fit and tighten the three bolts and washers.
62 Connect the down-shift inner cable to the down-shift cam.
63 Refit the oil tubes.
64 Replace the magnet and refit the oil pan and joint washer.
65 Fit and tighten twelve bolts.
66 Locate the torque converter housing in place.
67 Fit and tighten four bolts securing the torque converter housing.
68 Refit the switch, see 44.15.15.
69 Refit the transmission unit, see 44.20.01.

PLANET GEARS AND REAR DRUM ASSEMBLY

Remove and refit **44.36.04**

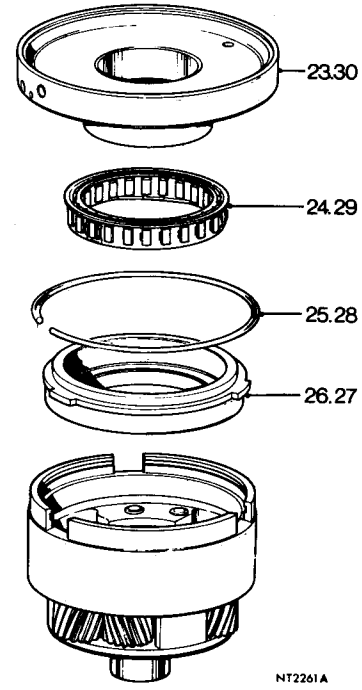
Service tools: CBW 60, CBW 547B-75





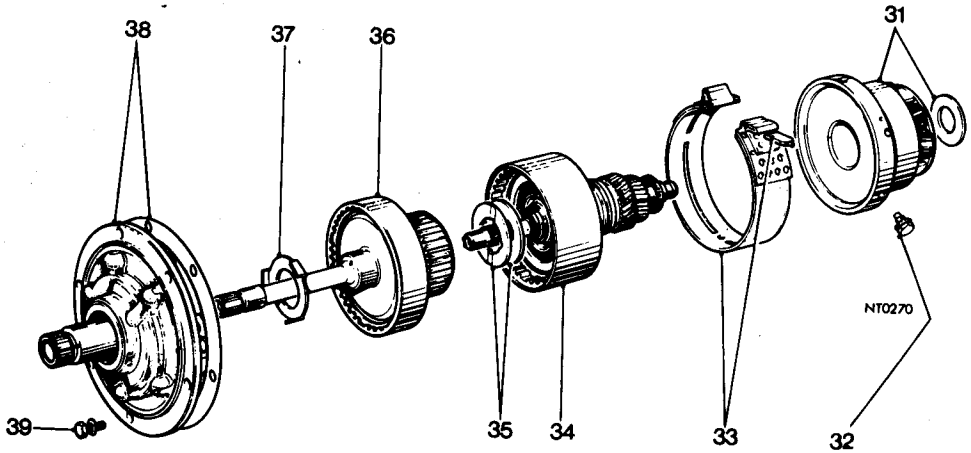
Removing

1 Remove the transmission unit, see 44.20.01.
2 Wash the exterior of the unit in clean petrol or paraffin, invert it and place on a bench cradle CBW 60. Remove the switch, see 44.15.15.
3 Unscrew the bolts securing the torque converter housing.
4 Remove the torque converter housing.
5 Unscrew twelve bolts.
6 Remove the oil pan, joint washer and magnet.
7 Pull out the oil tubes.
8 Release the down-shift inner cable from the down-shift cam.
9 Take out three bolts and washers.
10 Lift off the valve block.
11 Unscrew two bolts.
12 Remove the oil tube locating plate.



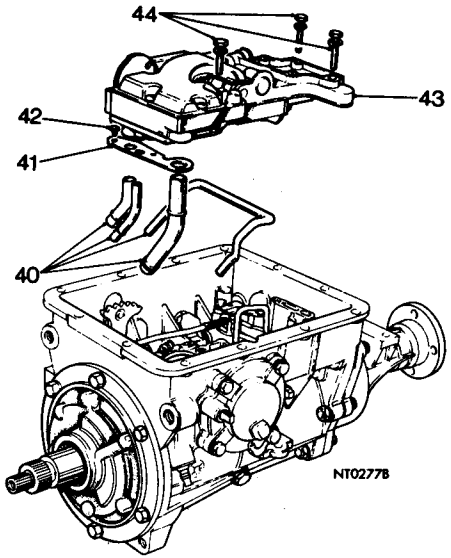
13 Pull out the oil tubes. (Note the 'O' ring on the pump suction tube.)
14 Take out five bolts.
15 Remove the pump and joint washer.
16 Remove the thrust washer.
17 Withdraw the front clutch.
18 Remove the thrust washers.
19 Withdraw the rear clutch and forward sun gear.
20 Squeeze together the ends of the front brake band and remove it together with the strut.
21 Take out three bolts.
22 Withdraw the centre support/planet gear assembly.
23 Separate the centre support from the planet gear assembly.
24 Withdraw the uni-directional clutch.
25 Remove the circlip.
26 Detach the uni-directional clutch outer race.

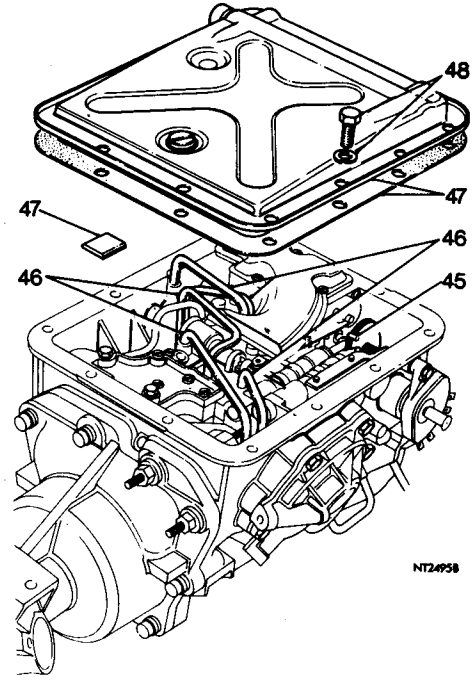
continued



Refitting

27 Fit the uni-directional clutch outer race to the rear drum assembly.
28 Fit the circlip.
29 Refit the uni-directional clutch.
30 Assemble the centre support and planet gear assembly.
31 Refit the centre support/planet gear assembly, ensuring that the oil and locating holes align with those in the casing.
32 Fit and tighten the bolts.
33 Squeeze together the ends of the front brake band and fit it in position together with the strut.
34 Refit the rear clutch and forward sun gear assembly.
35 Using petroleum jelly, stick the thrust washers to the rear clutch assembly (phosphor-bronze towards the front clutch).
36 Refit the front clutch assembly.
37 Using petroleum jelly, stick the thrust washer to the pump assembly.
38 Refit the pump assembly and joint washer.
39 Fit and tighten the bolts.
40 Refit the oil tubes. (Note the 'O' ring on the pump suction tube.)

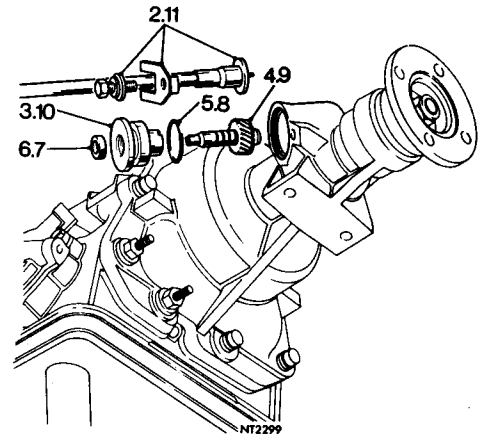




41 Refit the oil tube locating plate.
42 Fit and tighten the two bolts.
43 Carefully refit the valve block, ensuring that the oil tubes are not distorted.
44 Fit and tighten the three bolts and washers.
45 Connect the down-shift inner cable to the down-shift cam.
46 Refit the oil tubes.
47 Replace the magnet and refit the oil pan and joint washer.
48 Fit and tighten twelve bolts.
49 Locate the torque converter housing in place.
50 Fit and tighten four bolts securing the torque converter housing.
51 Refit the switch, see 44.15.15.
52 Refit the transmission unit.

SPEEDOMETER DRIVE PINION

Remove and refit **44.38.04**



Removing

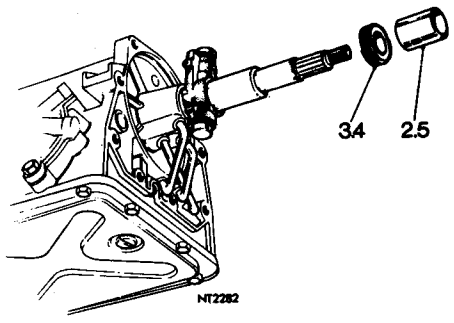
1 Drive the vehicle onto a ramp and apply the hand brake.
2 Disconnect the speedometer cable from the gearbox.
3 Carefully prise the speedometer pinion housing out of the extension.
4 Withdraw the pinion from the housing.
5 Remove the 'O' ring.
6 Extract the seal.

Refitting

7 Press a new seal into the housing.
8 Fit a new 'O' ring to the housing.
9 Fit the drive pinion into the housing.
10 Press the housing into the rear extension.
11 Refit the speedometer cable.

SPEEDOMETER DRIVE GEAR

Remove and refit **44.38.07**



Removing

1 Remove the rear extension, see 44.20.15.
2 Remove the clamp tube.
3 Withdraw the speedometer drive gear.

Refitting

4 Fit the speedometer drive gear.
5 Refit the clamp tube.
6 Refit the reat extension, see 44.20.15.

VALVE BLOCK

Remove and refit **44.40.01**

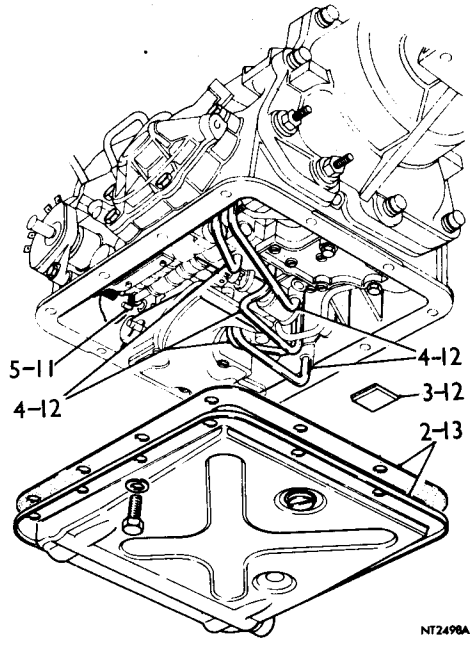
Removing

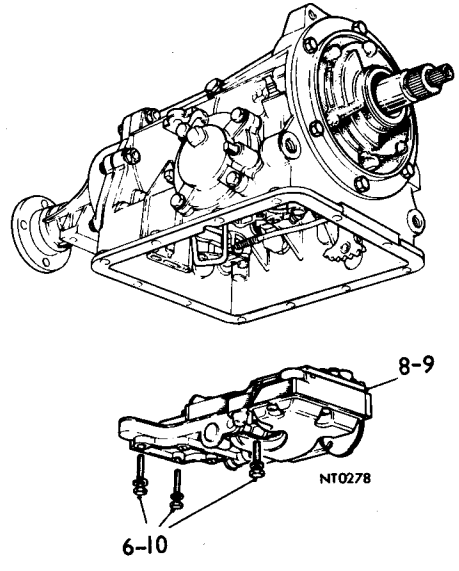
Select neutral and apply the handbrake.

1 Raise the ramp.
2 Remove the sump pan, see 44.24.04.
3 Remove the magnet.
4 Pull out the five oil connector pipes.
5 Disconnect the down-shift cable from the cam.
6 Take out the three bolts.
7 Observe and take note of the position of the selector arm.
8 Release the valve block.

Refitting

NOTE: Before refitting the valve block ensure that the selector is in its original position.





9 Refit the valve block.
10 Fit and tighten the three bolts.
11 Connect the kick-down cable.
12 Refit the five oil connector pipes and the magnet.
13 Refit the sump pan and gasket and tighten the dipstick tube.
14 Refit the heat shield. Top-up the gearbox.
15 Lower the ramp.

NOTE: If for any reason the selector shaft has to be rotated with the valve block removed it is necessary to remove the inhibitor switch to prevent damage.

VALVE BLOCK

Overhaul **44.40.04**

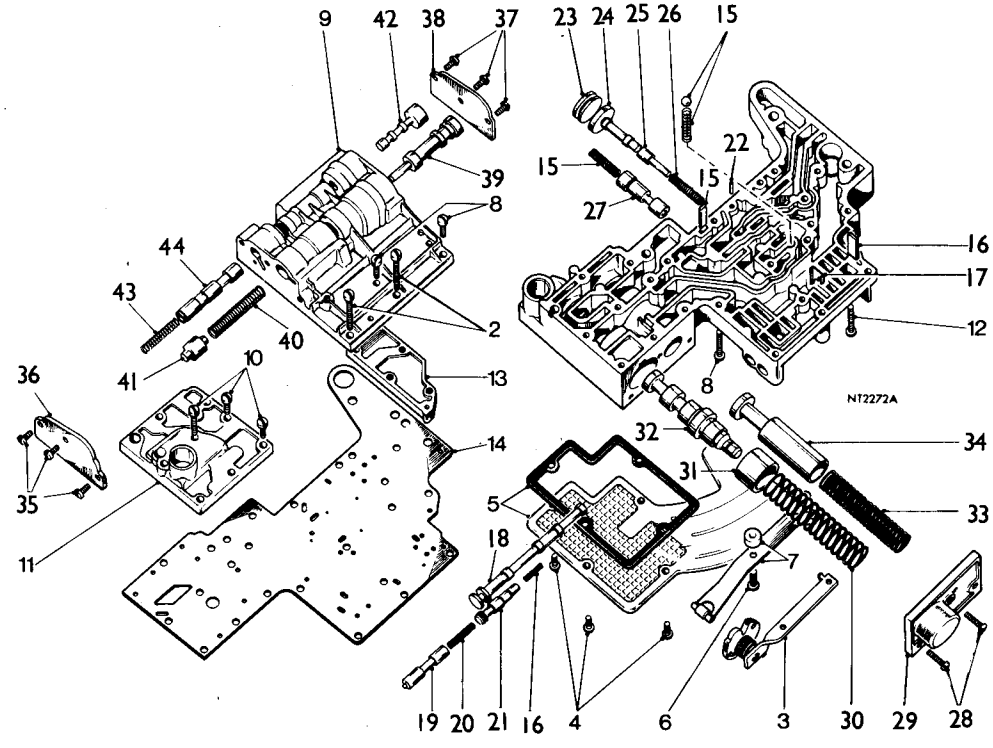
Service tool: CBW 548

1 Remove the valve block, see 44.40.01.

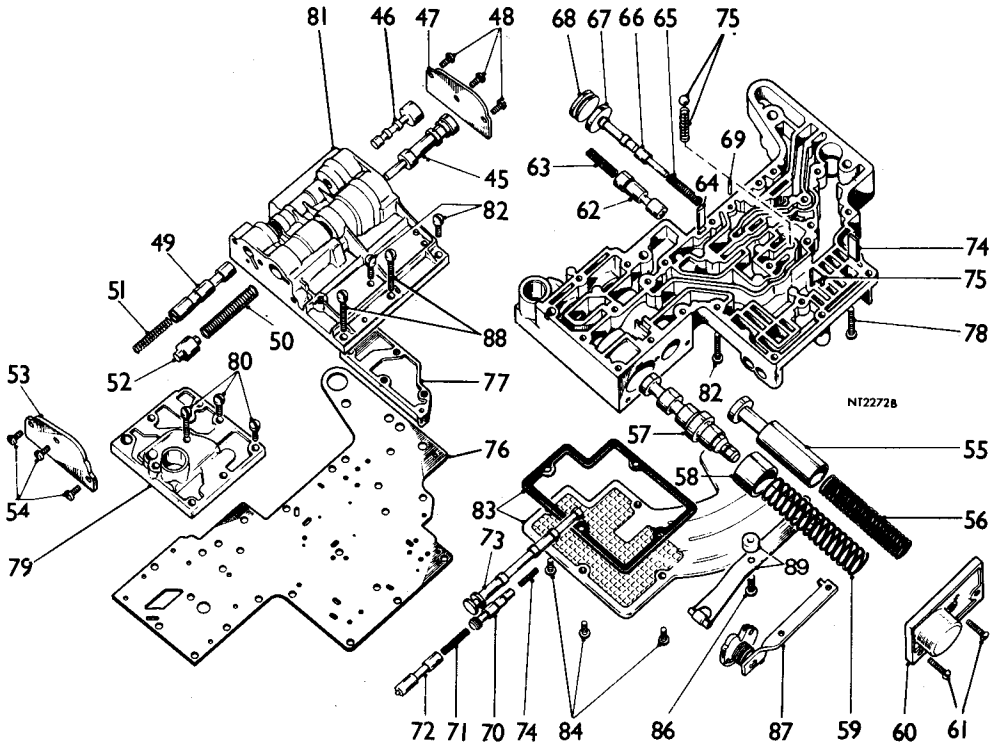
Dismantling

2 Take out two screws.
3 Remove the down-shift cam assembly.
4 Take out four screws.
5 Remove the oil strainer and gasket.
6 Take out screw.
7 Remove detent spring and spacer.
8 Take out eight screws.
9 Remove upper valve body.
10 Take out eight screws.
11 Remove the oil tube collector.
12 Take out four screws.
13 Remove the governor line plate.
14 Remove the separating plate.
15 Remove the check valve ball and spring.
16 Remove the throttle valve stop, return spring and servo orifice control valve spring and stop.

continued



17 Remove the throttle valve plate.
18 Withdraw the manual control valve.
19 Withdraw the down-shift valve.
20 Remove the throttle valve spring.
21 Withdraw the throttle valve.
22 Tap out the dowel pin, applying light pressure to the plug.
23 Withdraw the modulator plug.
24 Withdraw the modulator valve.
25 Withdraw the modulator valve spacer.
26 Withdraw the modulator valve spring.
27 Withdraw the servo orifice control valve.
28 Slacken progressively the three screws.
29 Carefully remove the end plate.
30 Remove the spring.
31 Withdraw the sleeve.
32 Take out the primary regulator valve.
33 Remove the spring.
34 Withdraw the secondary regulator valve.
35 Remove the screws from the upper valve body.
36 Remove the front end plate.
37 Take out three screws.
38 Remove the rear end plate.
39 Withdraw the 2–3 shift valve from the rear.
40 Remove the spring.
41 Withdraw the plunger.
42 Withdraw the 1–2 shift valve from the rear.
43 Remove the spring.
44 Withdraw the plunger.



Reassembling

45 Insert the 1–2 shift valve.
46 Insert the 2–3 shift valve.
47 Replace the rear end plate.
48 Fit and tighten the three screws.
49 Insert the 1–2 shift valve plunger.
50 Insert the 2–3 shift valve spring.
51 Insert the 1–2 shift valve spring.
52 Insert the 2–3 shift valve plunger.
53 Locate the front end plate in position.
54 Fit and tighten three screws.
55 Insert the secondary regulator valve into the lower valve body.
56 Refit the spring.
57 Insert the primary regulator valve.
58 Insert the sleeve.
59 Insert the spring.
60 Hold the end plate in position.
61 Fit and tighten the three screws.
62 Insert the servo orifice control valve.
63 Insert the spring.
64 Depress the spring and fit the stop.
65 Insert the modulator control valve spring.
66 Insert the spacer.
67 Insert the modulator control valve.
68 Insert the plug.
69 Fit the dowel pin.
70 Insert the throttle valve.
71 Insert the spring.
72 Insert the down-shift valve.
73 Insert the manual control valve.
74 Insert the throttle valve return spring and stop.
75 Refit the throttle valve plate and refit the check valve ball and spring.
76 Place the separating plate in position.
77 Hold the governor line plate in position.
78 Fit and loosely tighten the four screws.
79 Replace the oil tube collector.
80 Fit and loosely tighten eight screws.
81 Replace the upper valve body.
82 Fit and tighten the eight screws.
83 Refit the oil strainer and gasket.
84 Fit and tighten four screws.
85 Refit the detent spring and spacer.
86 Fit and tighten the screw.
87 Tension the down-shift cam and refit the assembly.
88 Fit and tighten the two screws.
89 Refit the valve block, see 44.40.01.

PROPELLER SHAFT ASSEMBLY

Remove and refit **47.15.01**

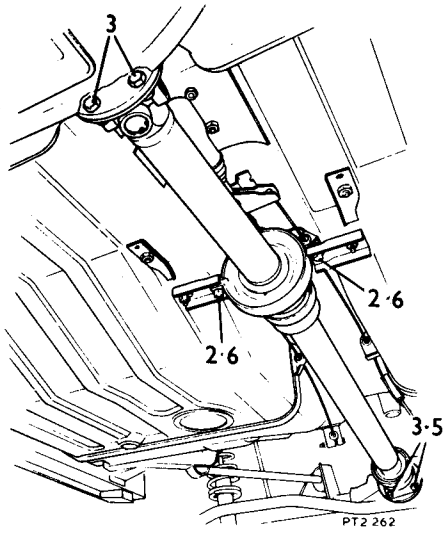
Removing

1 Drive the vehicle onto a ramp. Select neutral, chock the wheels but do not apply the hand brake. Raise the ramp.
2 Remove the nuts, bolts and washers securing the centre bearing housing to the support brackets.
3 Support the propeller shaft and disconnect it from the gearbox and rear axle flanges.
4 Remove the propeller shaft from the vehicle.

Refitting

5 Attach the propeller shaft to the gearbox and axle flanges, ensuring that the spigot locations are engaged.
6 Loosely secure the centre bearing housing to the support brackets.
7 Move the centre bearing to align the shafts, and tighten the nuts and bolts.

NOTE: Some vehicles may be fitted with an alternative propeller shaft to that illustrated.



UNIVERSAL JOINT

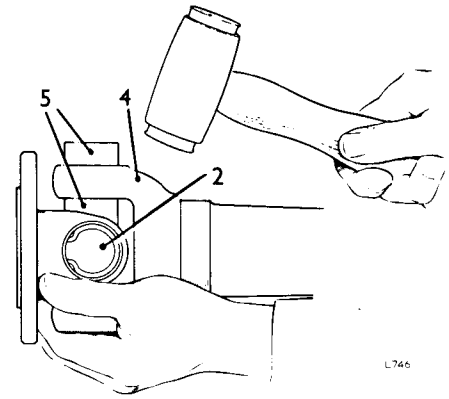
Overhaul **47.15.18**

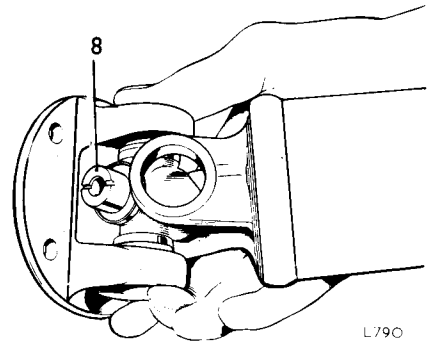
Dismantling

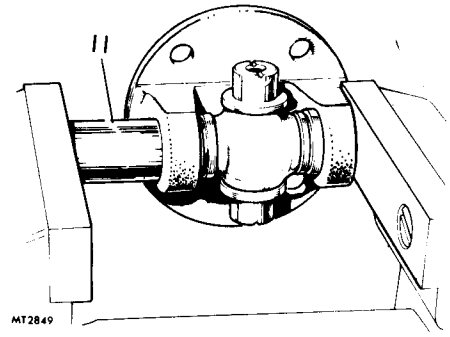
1 Remove the propeller shaft, see 47.15.01.
2 Remove the paint, rust etc. from the vicinity of the bearing cups and circlips.
3 Remove the circlips.
4 Tap the yokes to eject the bearing cups.
5 Withdraw the bearing cups and spider.

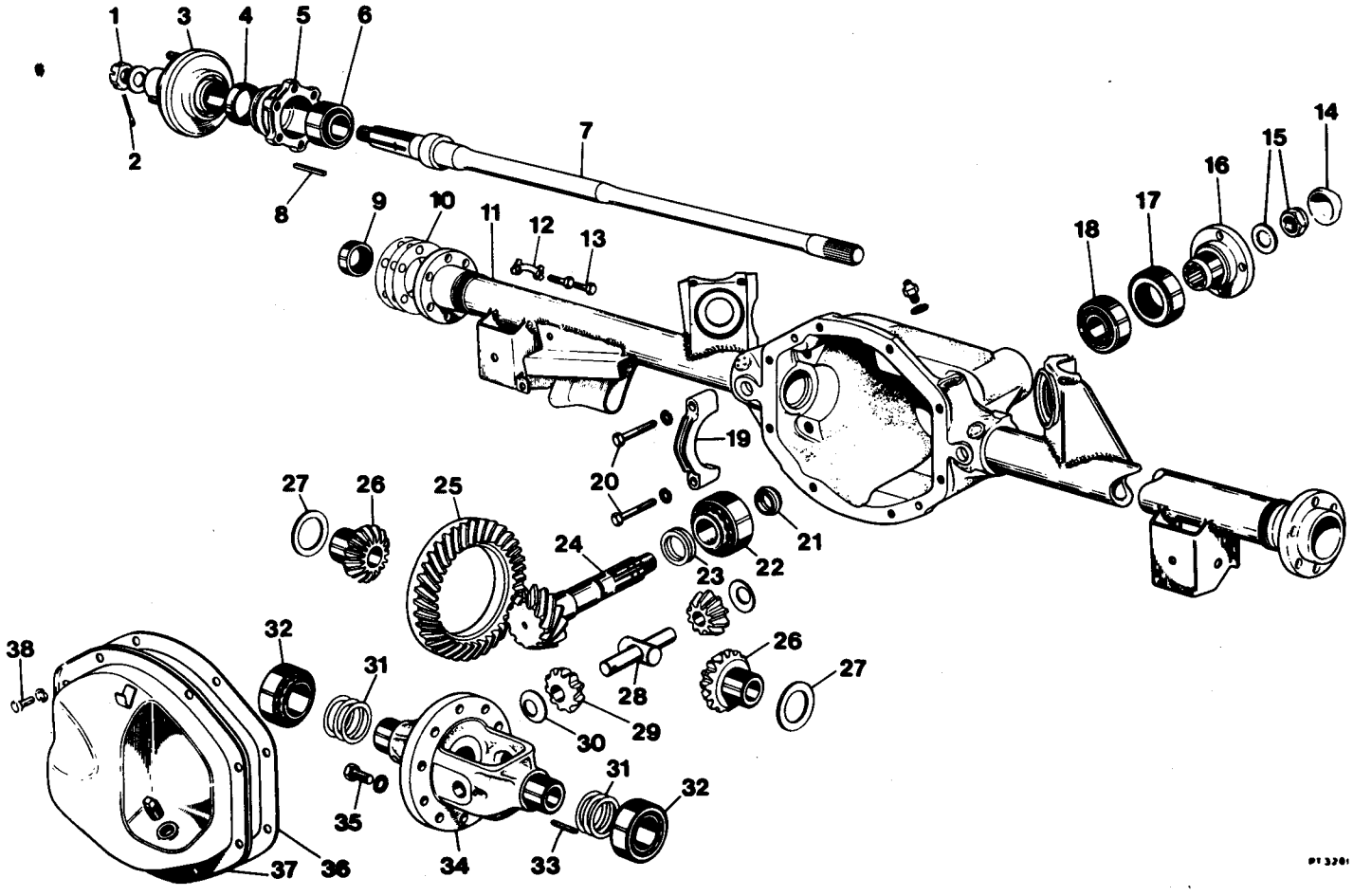
Reassembling

6 Remove the bearing cups from the new spider.
7 Ensure that the cups contain approved lubricant (one-third full) and that the needle bearings are complete and in position.
8 Fit the spider to the propeller shaft yoke.
9 Engage the spider trunnion in the bearing cup and insert the cup into the yoke.
10 Fit the opposite bearing cup to the yoke and carefully press both cups into position, ensuring that the spider trunnion engages the cups and that the needle bearings are displaced.
11 Using two flat faced adaptors of slightly smaller diameter than the bearing cups press the cups into the yokes until they reach the lower land of the circlip grooves. Do not press the bearing cups below this point or damage may be caused to the cups and seals.
12 Fit the circlips.
13 Refit the propeller shaft, see 47.15.01.









KEY

1 Castellated nut
2 Split pin
3 Hub flange
4 Oil seal—hub bearing
5 Hub bearing housing
6 Hub bearing
7 Axle shaft
8 Key
9 Oil seal—axle tube
10 Shim pack—axle shaft end-float
11 Axle casing
12 Lock tab
13 Bolt—retaining hub
14 Cap
15 Nut/plain washer—pinion
16 Pinion drive flange
17 Oil seal—pinion
18 Taper bearing—pinion tail
19 Differential bearing cap
20 Bolts—retaining bearing cap
21 Collapsable spacer—pinion pre-load
22 Taper bearing—pinion head
23 Shim pack—pinion height
24 Pinion } matched pair
25 Crown wheel }
26 Sun gears
27 Thrust washers—sun gears
28 Cross-shaft /thrust block
29 Planet gears
30 Thrust washers—planet gears
31 Shim packs—differential pre-load and crown wheel mesh
32 Taper bearings—differential carrier
33 Retaining pin—cross-shaft
34 Differential carrier
35 Bolt—retaining crown wheel
36 Gasket—rear cover
37 Rear cover
38 Bolt—retaining rear cover

CAUTION: The axles of these vehicles are fitted with a collapsible pinion spacer in place of pinion shims, as a means of setting the pinion bearing pre-load. On production, a protective cap was fitted over the pinion flange nyloc nut.
Particular care should be taken when completing operations involving the removal and refitting of the pinion flange and its retaining nut. Excess torque applied to the flange nut will overstress the spacer necessitating a complete strip and rebuild of the differential assembly to replace it.

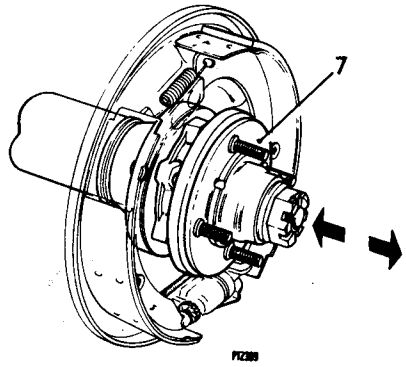
WARNING: An overstressed collapsible spacer should not be used or left in place in a differential unit.

HALF SHAFT ASSEMBLY

Remove and refit **51.10.12**

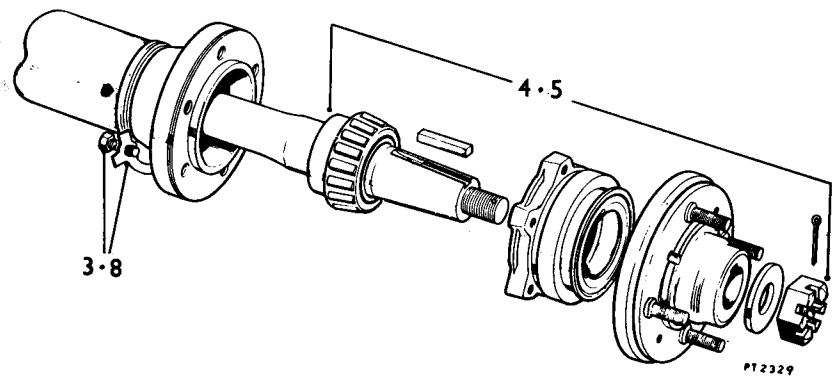
Removing

1 Raise the rear of the vehicle, support on axle stands and remove the road wheel.
2 Remove the brake drum.
3 Bend back the lock tabs and unscrew the bolts.
4 Withdraw the axle shaft assembly.



Refitting

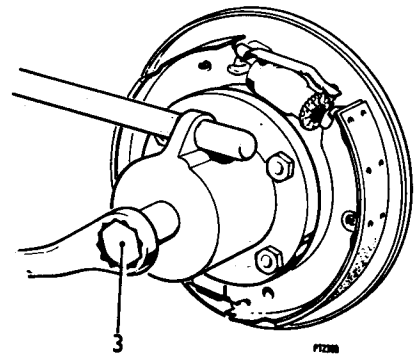
5 Refit the axle shaft assembly, exercising care to avoid damaging the oil seal.
6 Fit and tighten the bolts.
7 Using a dial indicator, check the total lateral float of the axle shafts. Adjust the thickness of the shim pack interposed between the backplate and axle tube to achieve the maximum specified float of 0·004 to 0·006 in (0·1 to 0·15 mm).
If adjustment of the shim pack is required, it should be carried out equally on both ends of the axle tube.
8 Remove the bolts, fit new lockplates and tighten the bolts. Bend over the lock tabs.
9 Refit the brake drum and road wheel.
10 Lower the vehicle to the ground.

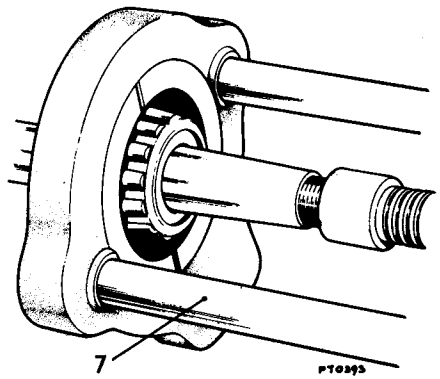


HALF SHAFT ASSEMBLY

Overhaul **51.10.16**

Service tools: S 109D, S 4221A-21





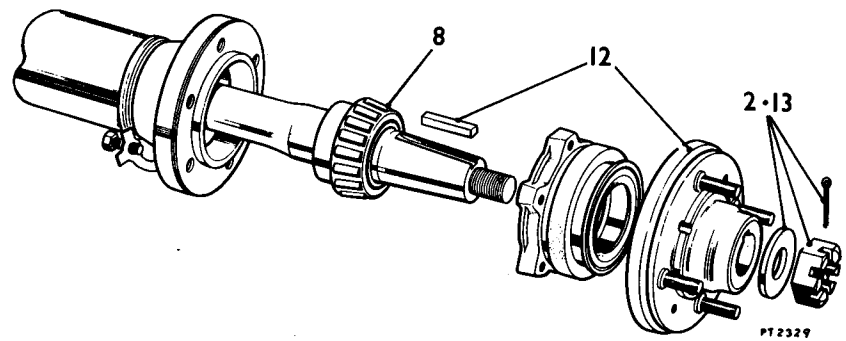
1 Remove the halfshaft and hub assembly, see 51.10.12.

Dismantling

2 Remove the split pin and unscrew the nut and washer.
3 Using tool No. S 109D, remove the hub flange and key.
4 Withdraw the hub assembly.
5 Extract the oil seal.
6 Drift the bearing outer race out of the hub.
7 Using tool No. S 4221A-21, withdraw the taper bearing from the shaft.

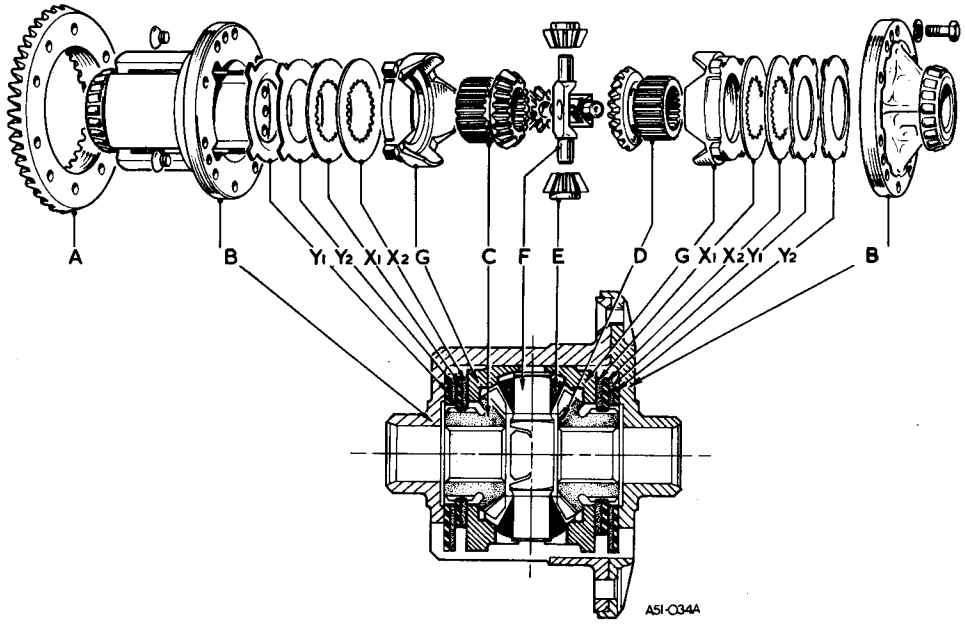
Reassembling

8 Press out the bearing onto the shaft.
9 Press the bearing outer race into the hub.
10 Press the oil seal into the hub.
11 Fit the hub assembly onto the shaft.
12 Refit the hub flange and key.
13 Fit the washer and nut and tighten the nut to a torque of 90 to 120 lbf ft (12·4 to 16·5 kgf m). Fit a new split pin.
14 Refit the half-shaft assembly, see 51.10.12.



POWR-LOCK LIMITED SLIP DIFFERENTIAL

Data and description **51.15.00**



These units, manufactured by Salisbury Transmissions Limited, became available from commission number VA 15937 as a factory fitted optional extra to special order. The unit replaces the standard differential assembly and does not affect the standard propeller or drive shafts. The axle ratio of 3·45 : 1 is unchanged.

Cars fitted with this unit have the letter 'S' added as a suffix to the commission number and rear axle number.

When working on cars fitted with a limited slip differential:

1 DO NOT ATTEMPT TO SPIN A JACKED - UP WHEEL ON THE REAR AXLE WITH THE OTHER WHEEL STILL IN CONTACT WITH THE GROUND. The action of the differential unit would be to apply torque to the ground wheel and thus cause the car to move.

2 WHEN A LIMITED SLIP DIFFERENTIAL UNIT IS FITTED, OVERHAULED OR THE OIL LEVEL TOPPED-UP, one of the following lubricants MUST be used:
BP Limslip 90/1
Regent 3450
Castrol Hypoy L S
Texaco 3450
Shell S 8096 B
Shell Spirax Super 90
Shell S 7143
Failure to observe these lubricant recommendations may lead to premature failure of the differential unit.

General operating principles

Power is transmitted through the rear axle pinion to the crown wheel 'A' bolted to a two-piece differential case 'B'.

Road wheel drive shafts are splined into two side gears 'C' and 'D' which in turn are splined into two clutch friction discs 'X_1' and 'X_2'. Thus the drive shafts, side gears and clutch friction discs revolve as one unit.

Four differential pinion gears 'E' are mounted on cross pins 'F' which are located in cam grooves formed in the gear rings 'G'. Gear rings 'G' and two clutch friction plates 'Y_1' and 'Y_2' are keyed to the differential case 'B'. Thus the differential case, the gear rings and the clutch friction plates revolve as one unit.

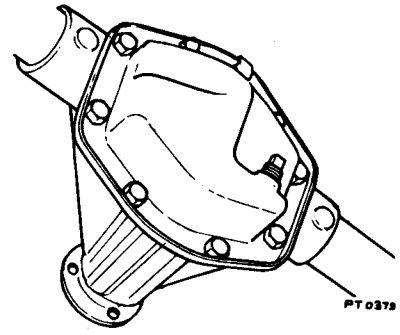
The outer friction plate is in the form of a dished Belleville washer pre-loading the clutch plate and disc pack.

In conditions of wheel spin, where one road wheel and drive shaft move at a different speed to the other road wheel, an interaction occurs between the clutch friction discs 'Z_1' and 'X_2' and the clutch friction plates 'Y_1' and 'Y_2' so that the road wheel offering the greatest resistance to movement receives the greater proportion of the available driving torque.

DIFFERENTIAL

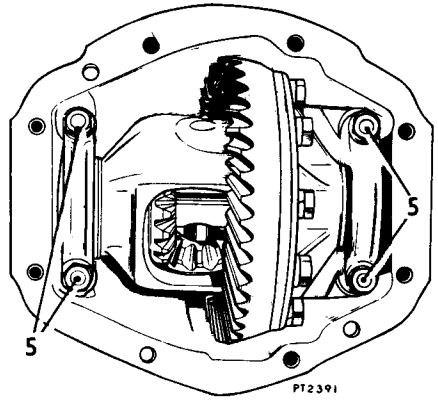
Remove and refit **51.15.01**

Service tool: S 101

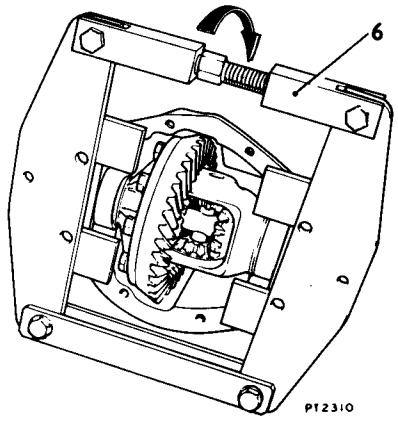


Removing

1 Remove the rear axle unit from the car, see 51.25.01.
2 Slacken the eight bolts and spring washers securing the rear cover to the hypoid casing and allow the oil to drain.
3 Remove the rear cover.
4 Remove the half shafts, see 51.10.12.
5 Note the location identity markings on the carrier bearing caps. Remove four bolts and spring washers securing the bearing caps and withdraw the bearing caps. Do not intermix the bearing caps.



6 Fit the spreader tool (S 101) and adaptor plates (S 101-1) to the hypoid casing. Mount the spreader tool on the adaptor and turn the jacking screw by hand to expand the spreader. A further half-turn with a spanner will spread the casing sufficiently to release the differential unit.
DO NOT over-expand or damage will be caused to the hypoid casing.

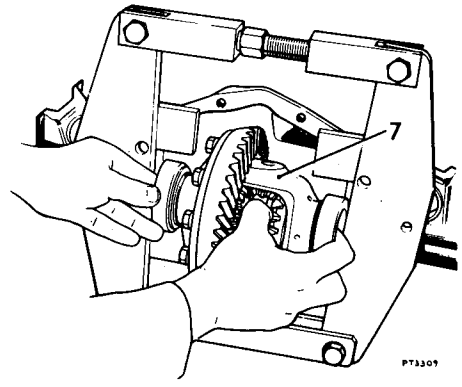


7 Lift out the crown wheel and differential unit.

Refitting

8 Reverse instructions 1 to 7.

NOTE: Where the carrier bearing(s) and/or the crown wheel are renewed it is necessary to check the carrier bearing tolerances and the crown wheel/pinion backlash as is detailed under operation number 51.15.13.



DIFFERENTIAL

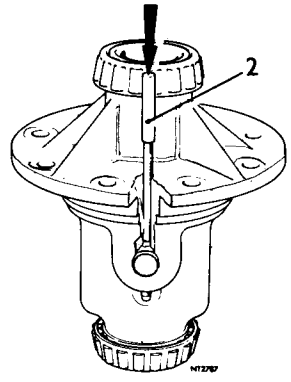
Overhaul **51.15.07**

For limited slip differential units refer to the next operation bearing this number.

1 Remove the differential unit, 51.15.01

Dismantling

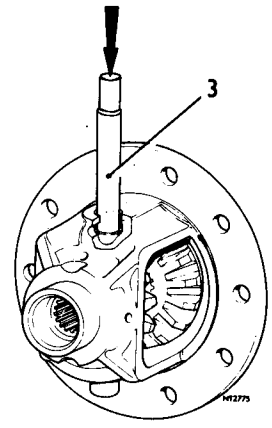
2 Drift out the cross-shaft locking pin.



3 Remove the cross-shaft and thrust block.

4 Rotate the sun gears through 90° and extract the planet gears and thrust washers.

5 Withdraw the sun gears and thrust washers.



Reassembling

6 Assemble the thrust washers and sun gears and insert them into the differential carrier.

7 Using grease to retain the thrust washers to the planet gears, insert them through the apertures in the carrier to mesh with the sun gears. Rotate the sun gears to align the bores of the planet with those of the carrier.

8 Insert the cross-shaft.

9 Check the planet gear backlash by measuring the sun gear end-float with feeler gauges. By selective use of planet gear thrust washers, adjust the sun gear end-float to 0·002 to 0·004 in (0·05 to 0·10 mm).

10 Remove the cross-shaft.

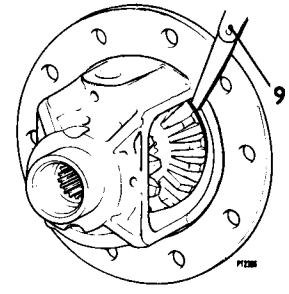
11 Insert the thrust block.

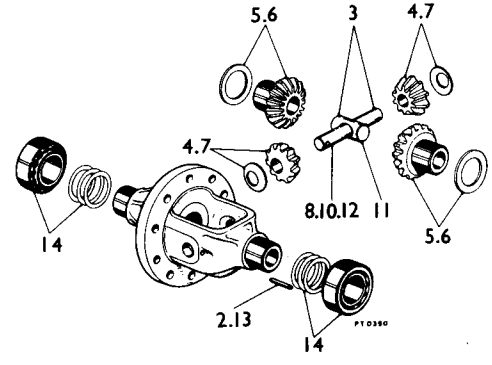
12 Refit the cross-shaft.

13 Align the locating hole in the cross-shaft with the drilling through the carrier and fit the retaining pin. Peen the edge of the drilling over the pin to prevent dislodgement.

14 Using a hand press refit the differential carrier bearings and shims.

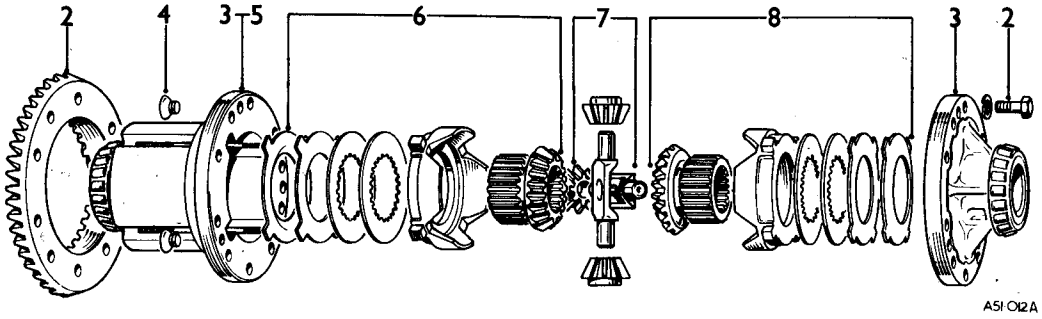
15 Refit the differential unit, see 51.15.01.





DIFFERENTIAL — LIMITED SLIP DIFFERENTIAL UNIT

Overhaul **51.15.07**



1 Remove the differential unit, see 51.15.01.

Dismantling

NOTE: Mark all mating components to ensure that original settings are maintained during re-assembly.

2 Remove ten bolts holding the crown wheel to the case and lift off the crown wheel.
3 Clamp the two halves of the case together.
4 Remove three screws holding the case halves together, without allowing the case halves to separate.
5 Stand the case on one end and lift off one half of the case without disturbing the inner components.
6 Withdraw one side gear complete with its gear ring, clutch friction discs and clutch friction plates.
7 Lift off the pinion gears and cross-pin assembly.
8 Lift off the other side gear complete with its gear ring, clutch friction discs and clutch friction plates.
9 Dismantle the side gear and cross-pin assemblies.

Reassembling

10 Clean all parts thoroughly and apply a recommended oil liberally to the faces between the gear rings and each clutch plate.
11 Reassemble the side gear assemblies and the cross-pin assembly.

NOTE: Pay particular attention to the clutch plate/disc sequence as this will affect the limited slip differential performance.
The Belleville washer at the end of the side gear assemblies dishes towards the gears, i.e. its inner diameter is in contact with the differential case.

12 Fit one side gear assembly into the case.
13 Fit the cross-pin assembly.
14 Fit the other side gear assembly.
15 Check that all gears locate and mesh correctly.
16 Fit the case half over the inner components and clamp the two case halves together.
17 Fit the three screws and tighten them evenly to a torque of 13·2 lbf ft (1·83 kgf m).
18 Clean the crown wheel and differential case mating faces and fit the crown wheel to the case.
19 Apply Loctite to the ten crown wheel bolts, fit them and tighten them evenly to a torque of 46 lbf ft (6·4 kgf m).
20 Refit the differential unit, see 51.15.01.

PINION OIL SEAL

Remove and refit **51.20.01**

DRIVE FLANGE

Remove and refit — Operations 1 to 5 and 8 to 12 **51.15.36**

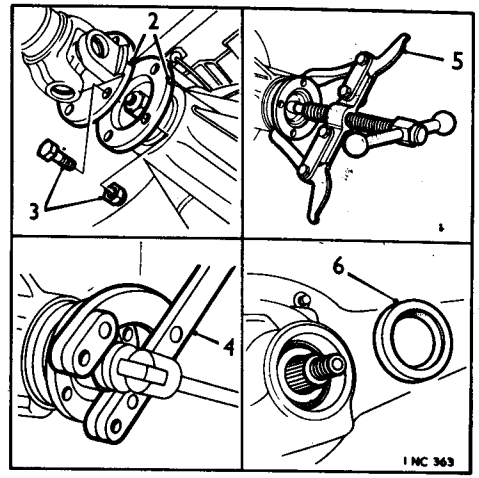
Service tools: S337, 18G 1205

Removing

1 Raise and support the rear of the car.
2 Mark the propeller shaft and pinion flanges for correct re-alignment.
3 Remove the four nuts and bolts from the pinion flange and using a centre punch, carefully mark the flange, pinion shaft and nut to identify original position.
4 Using tool S 337 to hold the differential pinion flange, unscrew and remove the nut and washer. Count the number of turns required for nut removal.
5 Withdraw the differential pinion flange.
6 Extract the pinion oil seal.
CAUTION: Place a container directly beneath the driving flange to collect oil spillage when the driving flange and oil seal are removed.

Refitting

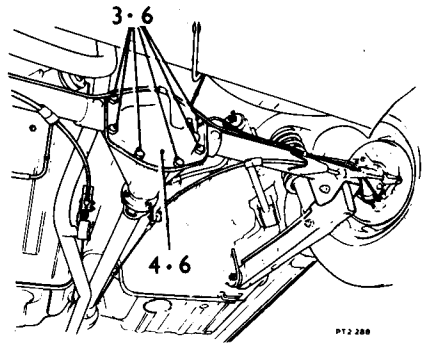
7 Fit a new pinion oil seal (lip of seal towards axle).
NOTE: This seal should be soaked in engine oil for one hour before installation.



8 Fit the differential pinion flange, aligning the flange marking (instruction 3) to the mark in the pinion shaft.
9 Fit the washer and nut. Count the number of turns and using tool S 337 to hold the pinion flange, tighten the nut until the pop marks are aligned.
10 Fit the propeller shaft noting the flange alignment marks.
11 Fit and tighten the four shaft securing bolts and nuts.
12 Lower the car.

HYPOID CASING REAR COVER GASKET

Remove and refit **51.20.08**



Removing

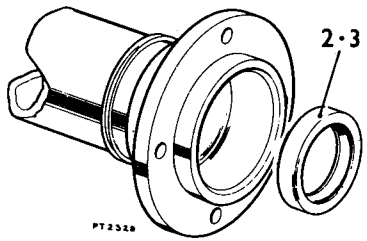
1 Drive the car onto the ramp and raise.
2 Place a drip tray under the hypoid unit.
3 Slacken the eight bolts securing the rear cover to the hypoid casing. Ease the cover from the casing and allow the oil to drain.
4 Remove the cover.
5 Remove the gasket and clean the mating faces.

Refitting

6 Fit a new gasket and assemble the cover to the hypoid casing (eight bolts).
7 Refill the hypoid casing with new oil.
8 Lower the ramp and drive the car off.

OIL SEAL (INNER)

Remove and refit **51.20.14**



Removing

1 Remove the half-shaft and hub assembly, see 51.10.03.
2 Extract the oil seal.

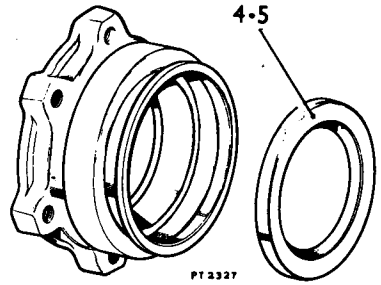
Refitting

3 Refit the oil seal.
4 Refit the half-shaft and hub assembly, see 51.10.03.

HUB BEARING OIL SEAL

Remove and refit **51.20.17**

Service tool: S 109D

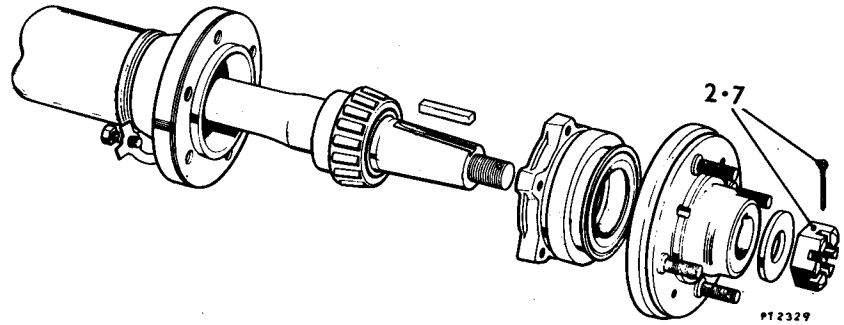


Removing

1 Jack up the rear of the vehicle, support on axle stands and remove the road-wheel and brake drum.
2 Remove the split pin and unscrew the nut and washer.
3 Using tool No. S 109D, remove the hub flange.
4 Extract the oil seal.

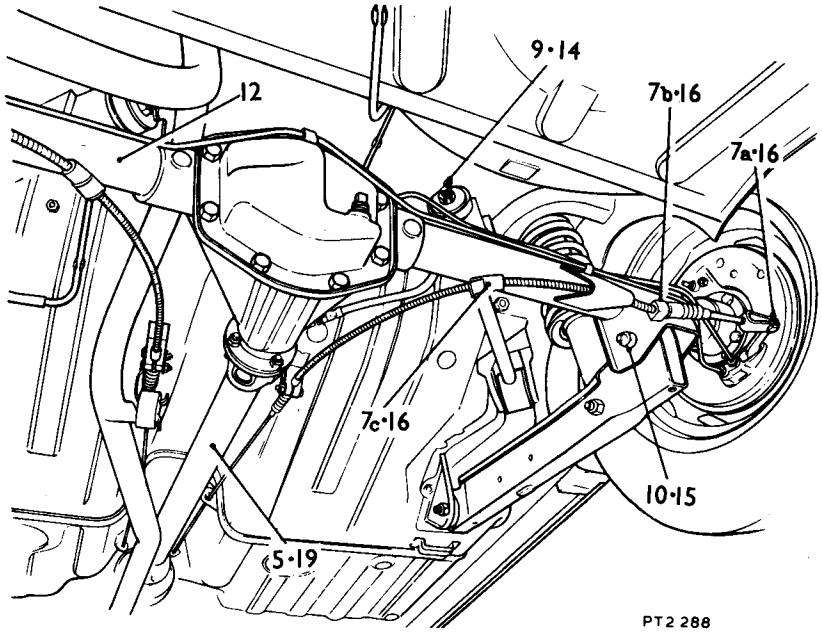
Refitting

5 Press a new oil seal into the hub.
6 Refit the hub flange.
7 Fit the nut and washer and tighten the nut to a torque of 90 to 120 lbf ft (12·4 to 16·5 kgf m). Fit a new split pin.
8 Refit the brake drum and road wheel and lower the vehicle to the ground.



REAR AXLE

Remove and refit **51.25.01**



Removing

1 Jack up the rear of the car and support the body on stands.
2 Locate a jack under the differential.
3 Remove the road wheels.
4 Release the hand brake.
5 Disconnect the rear propeller shaft from the differential flange.
6 Disconnect the operating lever of the brake apportioning valve from the bracket on the axle case.
7 Disconnect both hand brake cables at:
  a Brake backplate lever.
  b Rear suspension bracket.
  c Rear axle tube clip.
  NOTE: Later vehicles may differ in detail to that illustrated.
8 Disconnect the brake pipe union at the flexible hose and disconnect the hose from the axle bracket. Seal the pipe and hose to prevent the entry of grit.
9 Remove the nuts, washers and bushes securing the radius rods to the axle casing.
10 Remove the bolts and nuts securing the rear suspension arms to the axle.
11 Raise the axle and remove rearwards to clear the suspension arms.
12 Withdraw the axle from the car.

Refitting

13 Position the axle below the car and support on a jack.
14 Raise the jack, engage the rear ends of the radius rods through the axle brackets and fit the bushes, washers, nuts and pins.
15 Engage the rear ends of the suspension arms in the axle casing brackets and fit the retaining bolts and nuts.
16 Connect the hand brake cables to the axle clips, suspension brackets, and backplate levers.
17 Connect the brake apportioning valve to the axle.
18 Adjust the linkage, see 70.25.30.
19 Connect the rear propeller shaft to pinion flange.

REAR AXLE

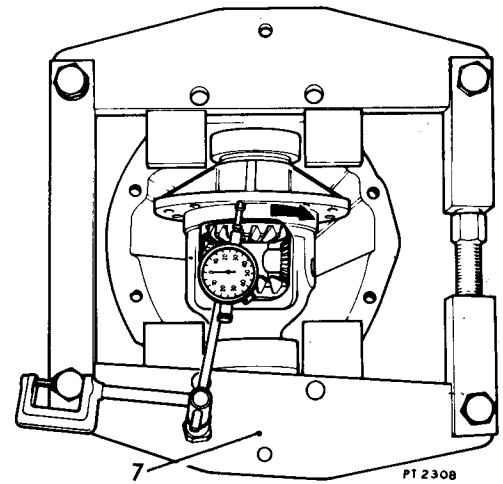
Overhaul **51.25.07**

Service tools: S 4221A-10-11, S 98A, RG 421, M 84B-1, S 101-1

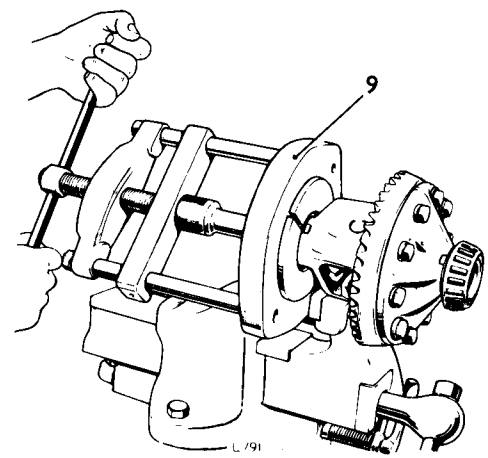
1 Remove the rear axle assembly, see 51.25.19.

Dismantling

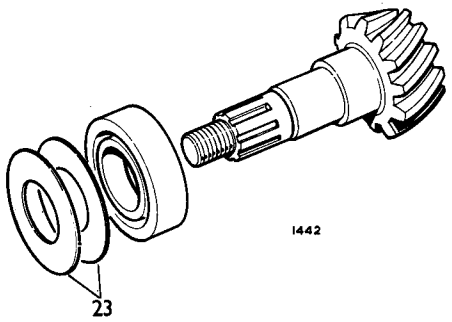
2 Remove the brake pipes.
3 Remove the crown wheel and differential assembly from the hypoid casing, see 51.15.01.
4 Remove the brake back plate and shim packs.
5 Remove the bolts and spring washers securing the crown wheel to the differential carrier. Withdraw the crown wheel.
6 Install the differential assembly in the casing and release all tension from the spreading tool.
7 Using a dial gauge check the crown wheel flange run-out. Maximum run-out must not exceed 0·003 in (0·08 mm). Excessive run-out is indicative of a distorted flange or differential cage or defective bearings.
8 Remove the differential unit from the hypoid casing. Remove the spreader.

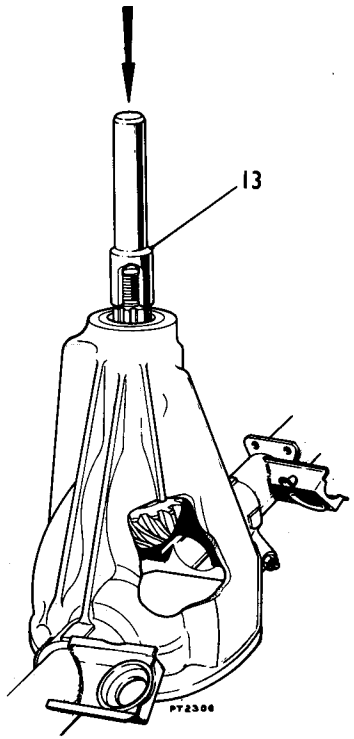


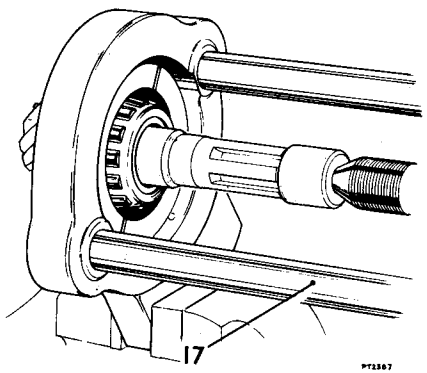
9 Using tool No. S 4221A-10, remove the differential carrier bearings and shims.
10 Overhaul the differential unit, see 51.15.07.
11 Remove the flange nut cap.
12 Using tool No. S 337 to retain the flange, unscrew and remove the nut and washer.

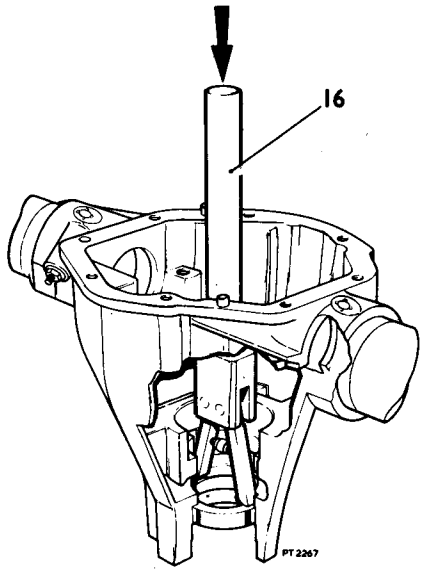


13 Carefully drive out the pinion assembly.
14 Remove the tail bearing and collapsible spacer.
15 Extract the oil seal from the hypoid casing.
16 Remove the pinion bearing outer races and shims from the hypoid casing.
17 Using tool No. S 4221A-11, withdraw the pinion head bearing.





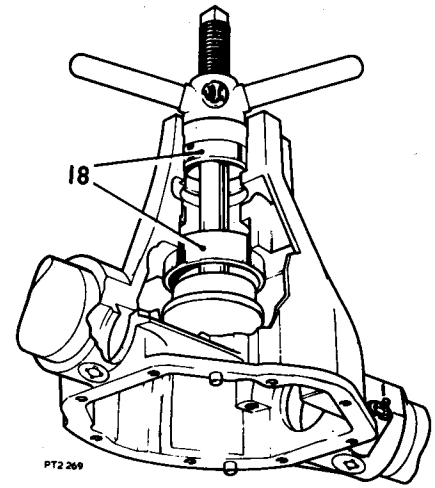


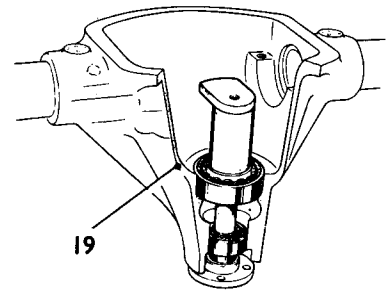


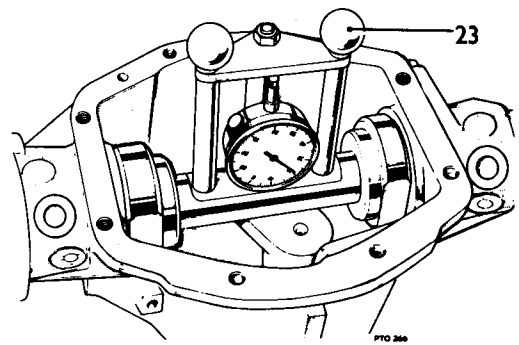
Reassembling

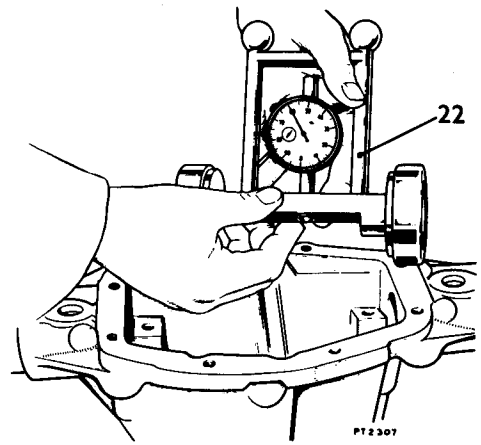
Setting pinion height

18 Press the pinion bearing outer races into the hypoid casing.
19 Fit the pinion head bearing onto the dummy pinion and install the assembly into the hypoid casing.
20 Fit the tail bearing, washer and nut.
21 Tighten the nut until a torque of 19 to 22 lbf in (0·22 to 0·26 kgf m) will just turn the pinion.
22 Using the setting button, set the pinion height gauge, tool No. M 84B-1, to zero.
23 Install the gauge and dummy bearings into the casing. Maintaining slight pressure on the gauge body, rock the stylus across the dummy pinion. Observe the gauge readings. The minimum value is recorded when the stylus is parallel to the pinion axis. This reading gives the shim pack thickness to be fitted under the pinion head bearing outer race.
24 Remove the gauge and the dummy pinion from the hypoid casing.

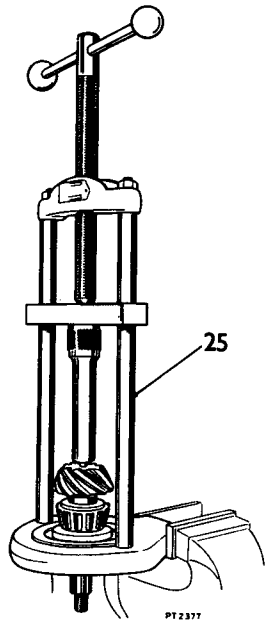




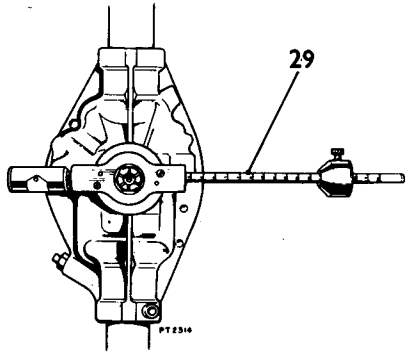


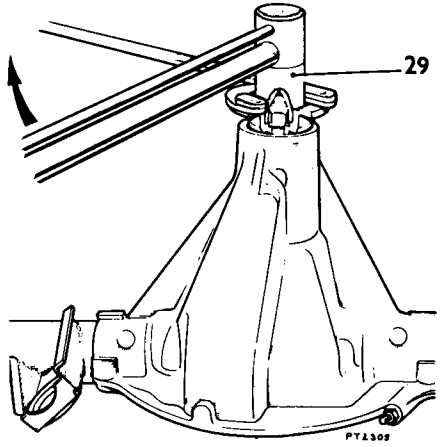


25 Fit the required thickness of shims to the hypoid casing outer race and using tool No. S 4221A-11 fit the pinion head bearing.
26 Press a new oil seal into the hypoid casing.
27 Install the pinion into the hypoid casing.
28 Fit a new collapsible spacer, the pinion tail bearing and the drive flange.

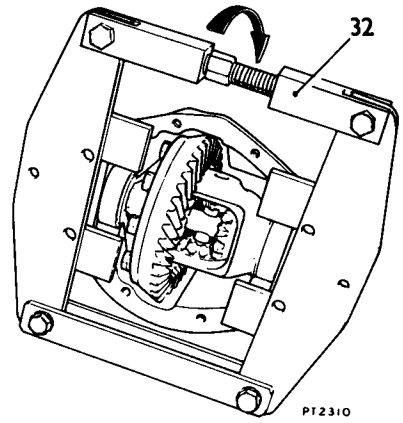


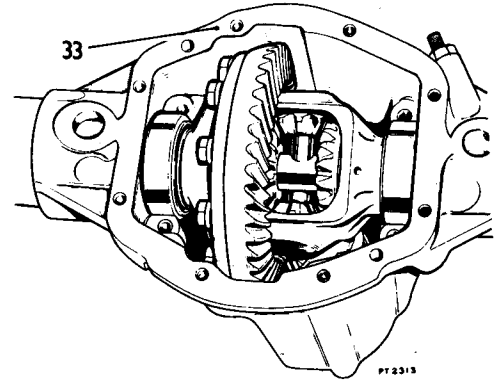
29 Fit the plain washer and a new nyloc nut. Using tool No. RG 421 to retain the flange, tighten the nut to approximately 90 lbf ft (12·4 kgf m) and check the pre-load using gauge No. S 98A and adaptor 18G 207E. Gradually tighten the nut to collapse the spacer up to a *maximum* torque of 120 lbf ft (16·6 kgf m), whilst checking the pre-load which should be 26 to 29 lbf in (0·29 to 0·32 kgf m).
30 Fit a new cap over the flange nut.
31 Press the differential bearing cones onto the carrier. Fit the bearing outer races.

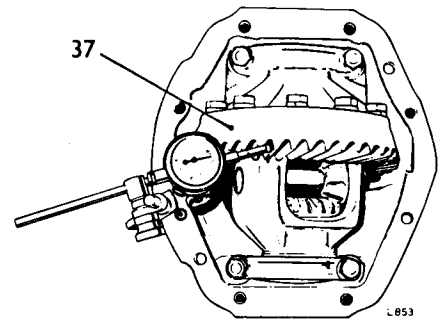


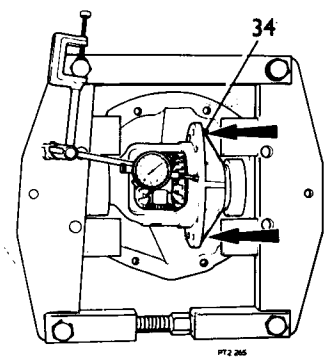


32 Assemble the spreader tool S 101 and adaptors S 101-1 to the hypoid casing and tighten the turnbuckle until finger-tight. Tighten three flats to spread the casing. DO NOT OVERSPREAD.
33 Install the differential unit into the hypoid casing. Do not fit the caps.
34 Using a dial gauge, check the total axial float of the differential assembly. To the measurement obtained must be added 0·003 in (0·076 mm) carrier bearing pre-load.
35 Remove the differential unit and fit the crown wheel. Apply Locquic grade 'T' primer and Locquic 75 compound to the threads and tighten the bolts to the recommended torque.
36 Install the differential unit into the hypoid casing.
37 Using the dial gauge, measure the axial movement of the carrier. This reading represents the total in/out of mesh. Subtract an operational backlash requirement of 0·005 in (0·13 mm) from the gauge reading.









38 Determine the shim pack thicknesses to be fitted behind the carrier bearings as follows:

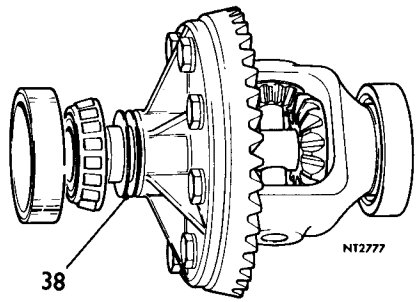
From instruction 34:	
Total side-float	=A
Pre-load	=0·003in (0·076mm)
Total shim thickness required (both sides)	=A+0·003in (0·076mm)
From instruction 37:	
Total in/out of mesh	=B
Backlash	=0·005in (0·13mm)
Total shim thickness required on crown wheel side	=B−0·005in (0·13mm)
Total shim thickness opposite crown wheel side	=A−B+0·008in (0·203 mm)

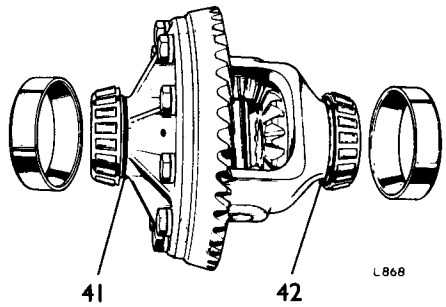
39 Remove the carrier bearings. Fit the appropriate shim packs and refit the bearings.

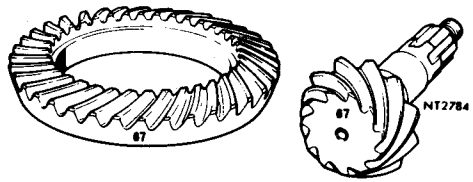
40 Install the differential assembly into the hypoid casing, fit the caps and tighten the bolts. Remove the spreader tool.

Crown wheel/pinion backlash

41 Mount a dial gauge on the casing and, with the pinion held firmly, rock the crown wheel to the fullest extent and note the indicator movement. Measure the backlash at several positions around the crown wheel and check that it is within the specified limits, 0·004 to 0·006 in (0·10 to 0·15 mm). If the backlash is insufficient, transfer shims of the equivalent value to which the backlash is to be reduced from the crown wheel side to the opposite side. If the backlash is excessive, reverse the transfer of shims.







NOTE: If slight damage to the crown wheel or the pinion necessitates replacement, discard both items and fit a new matched pair. These gears are lapped together during manufacture and etched with similar marking to identify them as a pair; therefore, before fitting, ensure that each gear is similarly marked as shown.

Tooth markings

42 Apply a thin coat of engineer's blue to 10 to 12 of the crown wheel teeth. Turn the pinion until all the blued teeth have been in mesh with the pinion teeth. Observe the markings and diagnose as follows:

a Correct marking
The contact area evenly covers the working depth of the tooth flank. The marking is roughly lozenge-shaped and nearer to the toe than the heel.

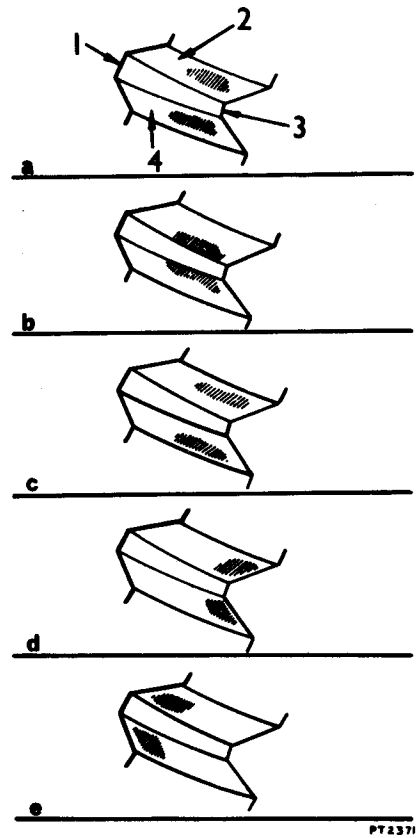
b High contact
Markings high up on the tooth flank indicate that the pinion is too far out of mesh. To rectify this condition, add shims under the pinion head.

c Low contact
Markings low down towards the tooth roots indicate that the pinion is too tight in mesh. Rectify this condition by removing shims from under the pinion head.
NOTE: This correction tends to move the tooth contact area towards the heel on 'drive' and the toe on 'coast'. It may therefore be necessary to re-adjust the crown wheel, as described in (d) and (e).

d Toe contact
The contact area is concentrated at the toe end of the tooth. To rectify this condition, transfer the shims from the crown wheel side to the opposite side, thereby moving the crown wheel out of mesh and increasing backlash.

e Heel contact
The contact area is concentrated at the heel end of the tooth. To rectify this condition, transfer shims to the crown wheel side from the opposite side, thereby moving the crown wheel deeper into mesh with the pinion and reducing the backlash.

ADDENDUM — pitch line to tooth tip
DEDENDUM — pitch line to tooth root



1 Heel (thick end)
2 Coast side (concave)
3 Toe (thin end)
4 Drive side (convex)

43 Refit the axle shafts, shim packs and brake backplate.

44 Refit the brake pipes.

45 Refit the rear cover and gasket and refill the unit with oil.

STEERING RACK AND PINION

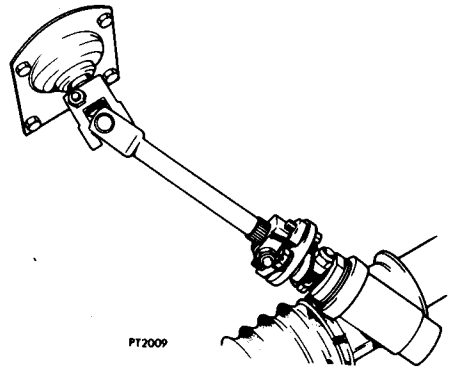
Remove and refit **57.25.01**

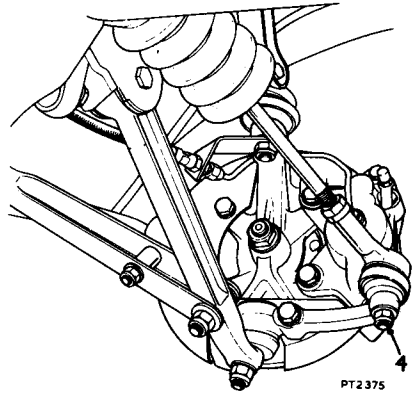
Removing

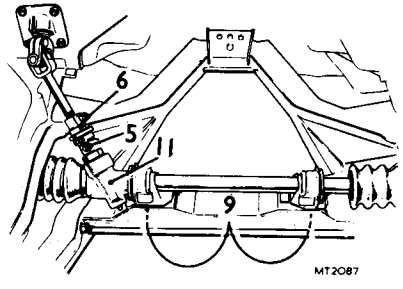
1 Set the front road wheels to the straight-ahead position.
2 Scribe the pinion shaft and the flexible coupling of the intermediate shaft to ensure original spline location on refitting.
NOTE: This instruction is valid only if the pinion and rack are not to be dismantled.
3 Remove the right-hand front wheel (right-hand steering models)
or
the left-hand front wheel (left-hand steering models).
4 Disconnect the rack tie-rod outer ball joints from the steering arms.
5 Remove the pinchbolt securing the flexible coupling to the pinion shaft.
6 Slacken the pinchbolt securing the upper end of the flexible coupling to the intermediate shaft.
7 Supporting the right-hand side of the engine on a jack, remove the two bolts and nuts securing the right-hand engine mounting to the sub-frame.
8 Raise the engine slightly to provide clearance for the withdrawal of the rack 'U' clamp.
9 Remove the four nuts and washers securing the rack 'U' bolts to the sub-frame.
10 Remove the 'U' clamps from the rack and sub-frame.
11 Release the rack pinion from the flexible coupling.
12 Remove the rack through the sub-frame.

Refitting

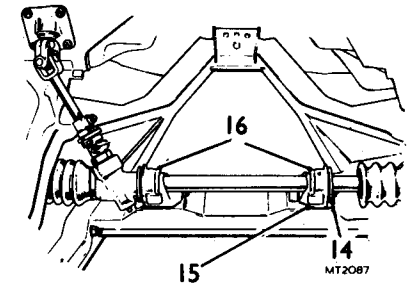
13 Carefully guide the rack through the sub-frame and with the steering-wheel in the straight-ahead position, align the previously scribed markings and engage the pinion shaft in the flexible coupling
or

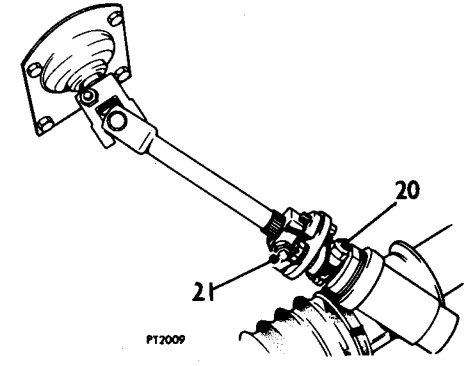


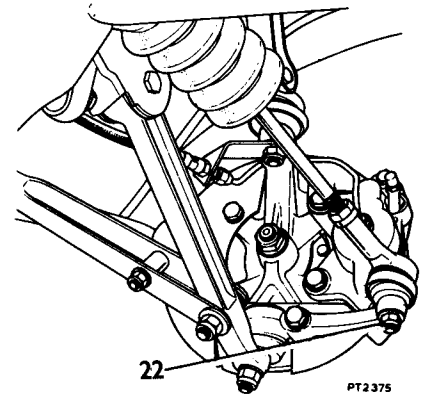




If no scribe lines were made, or the rack and pinion were dismantled, it is advised that the rack shaft is centralized before beginning installation on the car. Set the steering-wheel to the straight-ahead position and engage the pinion shaft in the flexible coupling.
14 Check that the rack mounting rubbers are correctly positioned. They must butt against the rack tube flanges with their lower lip snugly under the flat of the flanges.
15 Fit the locating plate (chamfered edge inboard) under the left-hand mounting. Ensure that the plate butts against the stop on the sub-frame.
16 Fit the mounting clamps and 'U' bolts.
17 Fit the plain washers and nyloc nuts to the 'U' bolts.
18 Tighten the right-hand 'U' bolt nuts.
19 With the left-hand mounting clamp pushed outboard against the mounting rubber and the locating plate held inboard against the stop on the sub-frame, tighten the left-hand 'U' bolt nuts.
20 Fit and tighten the pinchbolt securing the flexible coupling to the pinion shaft and remove the short bolt (if used) temporarily locking the pinion shaft.
21 Tighten the pinchbolt securing the upper end of the flexible coupling to the intermediate shaft.
22 Connect the tie-rod ball ends to the steering arms.
23 Fit the road wheel and lower the car.
24 Check and adjust front wheel track as necessary.

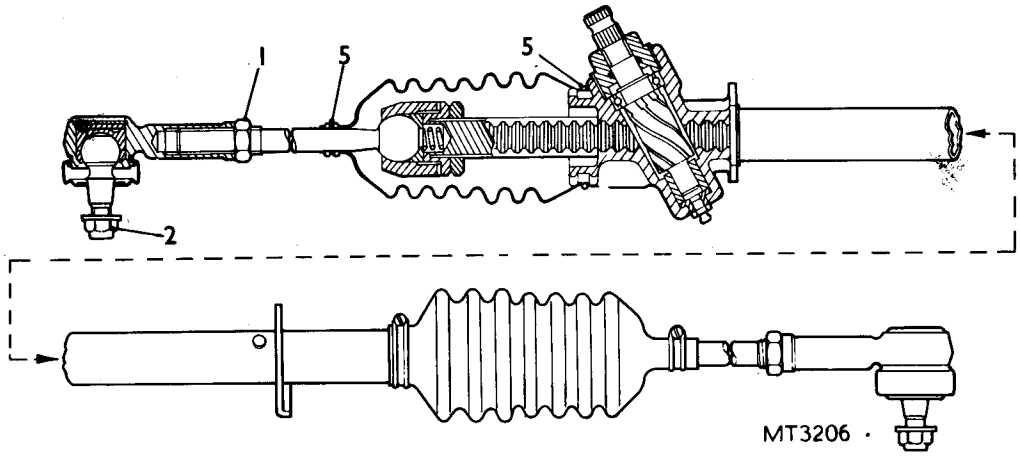






STEERING RACK GAITERS

Remove and refit **57.25.02**



Removing

1 Slacken the locknut securing both tie-rod outer ball joints.
2 Remove the nut and washer securing the tie-rod outer ball joint to the steering arm.
3 Release the ball joint from the steering arm.
4 Unscrew the ball joint from the tie-rod and remove the retaining locknut.
5 Remove the inner and outer clips retaining the gaiter to the rack and tie-rod respectively.
6 Withdraw the gaiter.
7 Repeat instructions 2 to 6 on the opposite tie-rod.

Refitting

8 Lubricate the tie-rod inner ball joint with fresh grease.
9 Slide the new gaiter along the tie-rod into position on the rack.
10 With the rack centralized, fit the inner clip to the gaiter and rack housing.
11 Position the outer end of the gaiter on the tie-rod so that it is capable of accommodating movement of the tie-rod from lock to lock.
12 Secure the outer end of the gaiter to the tie-rod end with the clip.
13 Fit the locknut to the tie-rod, locating it as near as possible to its original location.
14 Fit the outer ball joint to the tie-rod.
15 Connect the tie-rod outer ball joint to the steering arm and secure it with the plain washer and nut.
16 Repeat instructions 8 to 15 on the opposite tie-rod.
17 Check, and re-set the front wheel alignment as necessary.
18 Tighten the locknut securing the tie-rod outer ball joint.

STEERING RACK AND PINION

Overhaul **57.25.07**

Dismantling

Rack damper

1 Remove the plug securing the damper assembly to the rack housing.
2 Withdraw the spring, shim(s), and damper.

Pinion

3 Unscrew and withdraw the plug securing the pinion assembly to the rack housing.
4 Remove the internal 'O' ring from the plug.
5 Invert the plug and fit it to the pinion shaft.
6 Engage the two short bolts in the tapped holes in the plug and tighten to grip the pinion shaft.
7 Using two screwdrivers, evenly prise the pinion shaft clear of the rack housing.
8 Slacken the bolts and remove the inverted plug from the pinion. Remove the bolts from the plug.
9 Remove the circlip securing the ball-race to the pinion shaft and withdraw the ball-race.

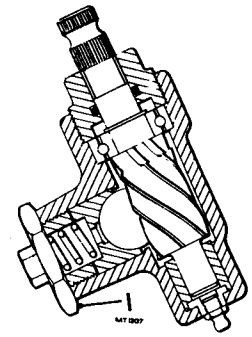
Tie-rods and rack shaft

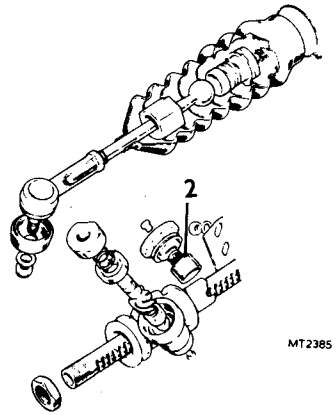
10 Release the clips securing the gaiters to the rack housing and tie-rods, and slide the gaiters clear of the rack.
11 Slide the pinion end of the rack housing towards its adjacent tie-rod inner ball joint.
12 Grip the exposed rack shaft in protected vice jaws.
13 Slacken the locknuts at both ends of the rack shaft and unscrew the tie-rod inner ball joint assemblies.
14 Remove the locknuts and withdraw the rack shaft.

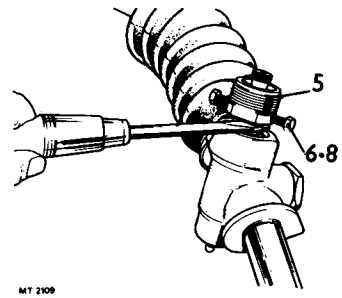
Rack housing bush

15 Remove the bush from the rack housing.

continued







Pinion housing lower bush

16 Remove the grease nipple from the pinion housing.
17 Carefully drive or press out the end cover and pinion shaft lower bush.

Reassembling

Rack housing bush

18 Fit a new bush to the rack housing.

Pinion

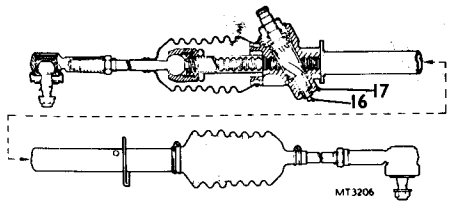
19 Fit a new end cover to the lower end of the pinion housing.
20 Fit a new lower bush to the pinion housing, ensuring that the recessed end of the bush is fitted adjacent to the end-cover.

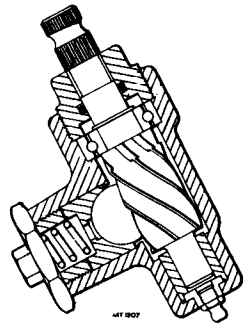
Rack shaft and tie-rods

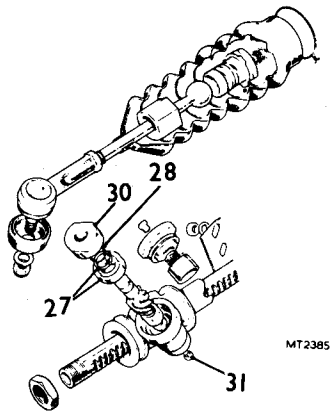
21 Hold the plain (toothless) portion of the rack shaft in protected vice jaws.
22 Fit the locknut to the plain end of the rack shaft.
23 Fit the tie-rod assembly and spring to the plain end of the rack shaft.
24 Secure the tie-rod assembly with the locknut. Torque 80 lbf ft (11·06 kgf m).
25 Fit the rack shaft to the rack housing ensuring that the toothed end of the shaft is located at the pinion housing.
26 Fit the locknut and tie-rod assembly to the pinion end of the rack shaft and tighten the locknut to 80 lbf ft (11·06 kgf m).

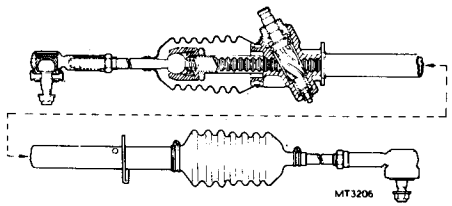
Pinion

27 Fit the ball-race to the pinion and secure it with the circlip.
28 Fit a new internal 'O' ring to the pinion end plug.
29 Position the rack shaft teeth to permit pinion entry and install the pinion in the rack.
30 Lubricate the pinion shaft and fit and tighten the end-plug.
31 Fit the grease nipple to the base of the pinion housing and lubricate the pinion and lower bush.
32 Pack the ends of the rack shafts and tie-rod inner ball joints with clean grease and fit and secure the gaiters.
33 Fit the rack damper, see 57.35.10.





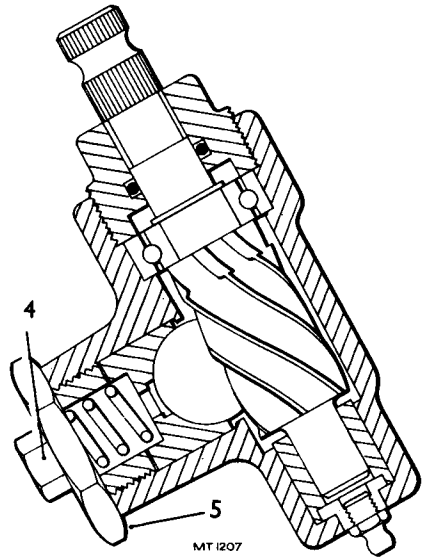




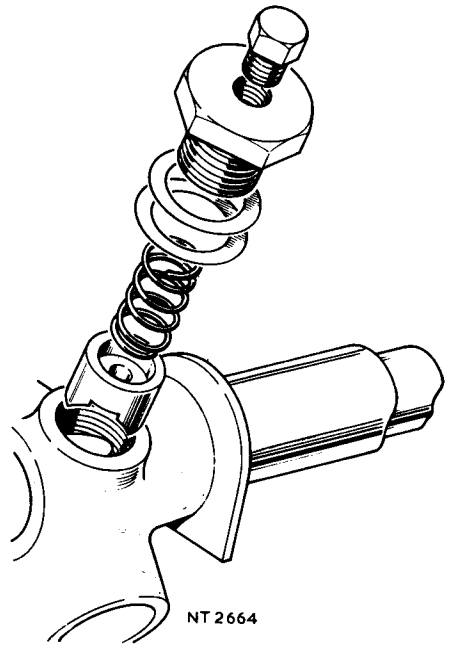
STEERING RACK DAMPER

Adjust **57.35.09**

1 Remove the rack, see 57.25.01.
2 Locate the rack shaft in mid-position.
3 Release the gaiter clips at the pinion end of the rack and slide the gaiter along the tie-rod to expose the rack shaft.



4 Remove the centre plug from the damper plug and insert a stylus or dial gauge and check the rack shaft for side movement (90 degrees to shaft axis). Side movement should be within 0·004 to 0·008 in (0·1016 to 0·2032 mm).
5 Adjust as required by removing the damping plug and adding or removing shim(s) as required.
or
5a In the absence of a dial gauge, remove the damper plug and shims.
5b Remove the shims and replace the damper plug.
5c Gently tighten the damper plug until the plunger grips the rack, eliminating all side-play.
5d With feeler gauges inserted between the rack pinion housing and the underside of the damper plug flange, check the clearance existing.
5e To the thickness of the feeler gauge pack, add the rack side movement required, 0·006 in (0·154 mm). This gives the thickness of shims to be fitted under the damper plug flange.



5f Remove the damper plug and fit the required shim pack. Tighten the damper plug.
6 Ensure that the rack shaft is adequately lubricated and fit the gaiter.
7 Refit the rack, see 57.25.01.

STEERING RACK DAMPER

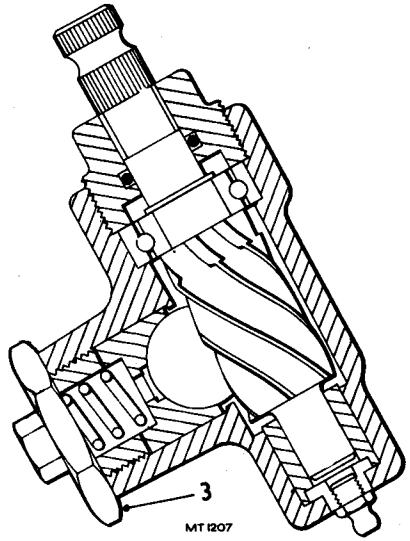
Remove and refit **57.35.10**

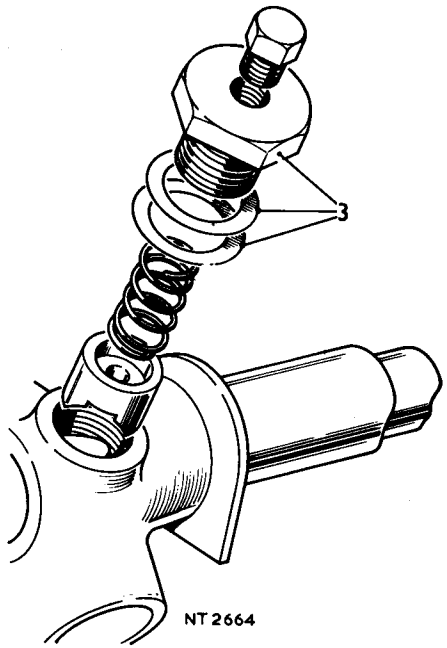
Removing

1 Remove the rack, see 57.25.01.
2 Remove the clips securing the gaiter at the pinion end of the rack and slide the gaiter along the tie-rod to expose the rack shaft.
3 Unscrew and remove the damper plug and shims.
4 Withdraw the spring and plunger.

Refitting

5 Locate the rack shaft in mid-position.
6 Fit the plunger and spring.
7 Check and adjust the rack shaft side movement as required, see 57.35.09, instructions 4 to 6.
8 Refit the rack, see 57.25.01.



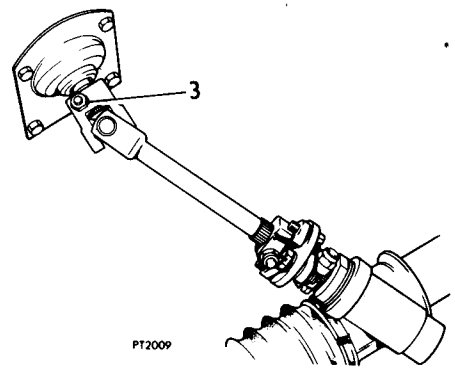


STEERING-COLUMN ASSEMBLY

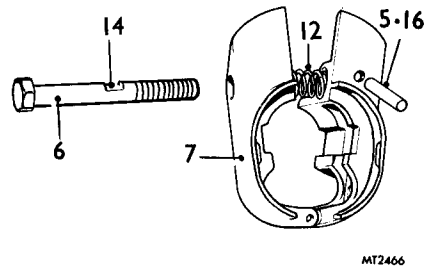
Remove and refit **57.40.01**

Removing

1 Disconnect the battery.
2 Disconnect the plug-in connectors (2) for the ignition/starter and horn/trafficator/lights.



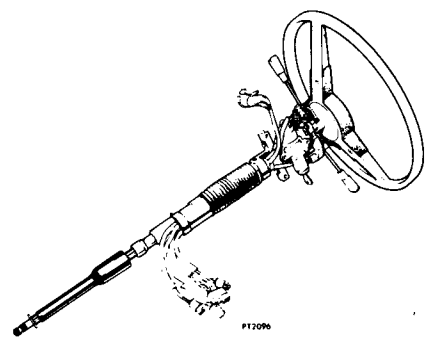
3 Remove the pinch-bolt securing the intermediate shaft to the lower end of the steering-column.
4 Slacken the steering clamp wing nut.



5 Using a pin punch, extract the clamp bolt retaining pin from the clamp bracket.
6 Remove the clamp bracket wing nut and bolt.
7 Remove the clamp bracket complete with spring.
8 Withdraw the steering-column. Note the steel and plastic washers fitted front and rear respectively to the steering-column lower bush.

Refitting

9 Enter the steering-column in the lower bush, ensuring that the plastic washer is fitted inboard and the steel washer is fitted outboard.
10 With the road wheels in the straight-ahead position and the steering-wheel centralized, engage the steering-column splines in the intermediate shaft.
11 Fit the pinch-bolt to the intermediate shaft.
12 Fit the clamp bracket to the steering-column, ensuring that the spring is located in both halves of the bracket.
13 Engage the clamp bracket in the steering-column support bracket,
14 Insert the clamp bracket bolt (milled flat on shank uppermost), ensuring that the flats on the bolt head engage the slot in the steering-column support bracket.
15 Fit the wing nut to the clamp and align the milled slot on the bolt shank with the retaining pin hole in the clamp bracket.
16 Fit a new retaining pin, ensuring that the head of the pin is flush with the surface of the clamp bracket.



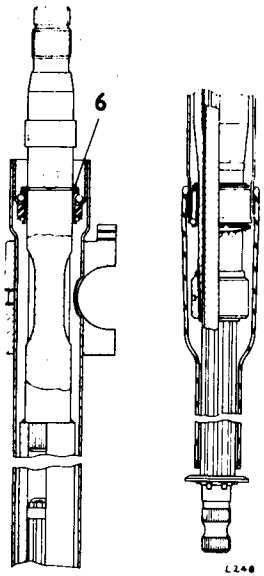
17 Adjust the steering-column to the required rake and tighten the wing nut.
18 Reconnect the plug-in connectors.
19 Connect the battery.

STEERING MAST

Remove and refit 57.40.06

Removing

1 Remove the steering-column assembly from the car, see 57.40.01.
2 Remove the steering-wheel pad.
3 Remove the nacelle.
4 Remove the brackets securing the horn/trafficator/light and windscreen wiper/washer control stalks.
5 Remove the trafficator trip cam.



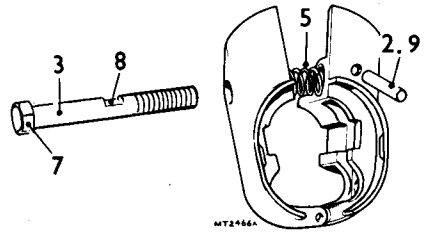
6 Remove the circlip and washer retaining the steering mast upper bearing.
7 Withdraw the steering mast downward from the column housing.

Refitting

8 Reverse instructions 1 to 8.

STEERING-COLUMN ADJUSTMENT CLAMP

Remove and refit 57.40.07



Removing

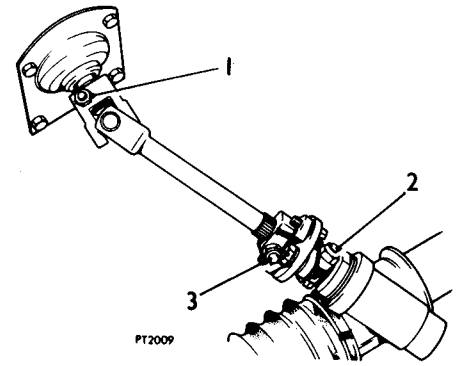
1 Slacken the steering clamp wing nut.
2 Using a pin punch, extract the clamp bolt retaining pin from the clamp bracket.
3 Remove the clamp bracket wing nut and bolt.
4 Lower the steering-column fully and remove the clamp bracket and spring.

Refitting

5 Fit the clamp bracket to the steering-column, ensuring that the spring is located in both halves of the bracket.
6 Engage the clamp bracket in the steering-column support bracket.
7 Insert the clamp bracket bolt (milled flat on shank uppermost), ensuring that the flats on the bolt head engage the slot in the steering-column support bracket.
8 Fit the wing nut and align the milled slot on the bolt shank with the retaining pin hole in the clamp bracket.
9 Fit a new retaining pin, ensuring that the head of the pin is flush with the surface of the clamp bracket.
10 Adjust the steering-column to the required rake and tighten the wing nut.

INTERMEDIATE SHAFT

Remove and refit 57.40.22



Removing

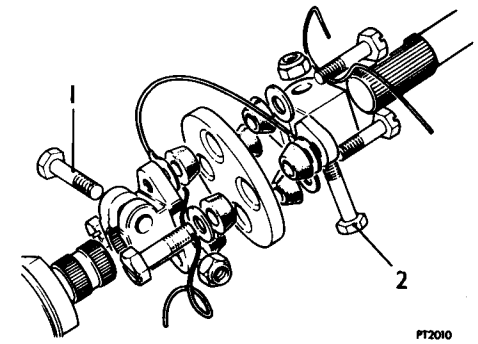
1 Slacken the pinch-bolt securing the intermediate shaft universal joint to the steering mast.
2 Slacken the pinch-bolt securing the intermediate shaft flexible coupling to the rack pinion.
3 Slacken the pinch-bolt securing the flexible coupling to the intermediate shaft.
4 Set the road wheels and steering-wheel in the 'straight-ahead' position.
5 Insert a short bolt into the threaded hole in the pinion shaft retaining nut and tighten to lock the pinion shaft. This retains the rack in the 'straight-ahead' position and facilitates correct spline engagement on reassembly.
6 Remove the upper and lower pinch-bolts (instructions 1 and 2).
7 Slide the flexible coupling upwards until it disengages from the pinion shaft.
8 Withdraw the universal joint downward and remove the intermediate shaft.

Refitting

9 Engage the universal joint in the splines of the steering mast.
10 Ensure that the steering-wheel is in the 'straight-ahead' position and engage the flexible coupling in the splines of the pinion shaft.
11 Install the three pinch-bolts.
12 Remove the bolt temporarily fitted to lock the rack.
13 Tighten the three pinch-bolts.

INTERMEDIATE SHAFT FLEXIBLE COUPLING

Remove and refit 57.40.25



Removing

1 Slacken the pinch-bolt securing the flexible coupling to the rack pinion.
2 Slacken the pinch-bolt securing the flexible coupling to the intermediate shaft.
3 Set the road wheels and steering-wheel in the 'straight-ahead' position.
4 Insert a short bolt into the threaded hole in the pinion shaft retaining nut and tighten to lock the pinion shaft. This retains the rack in the 'straight-ahead' position and facilitates correct spline engagement on reassembly.
5 Remove the two pinch-bolts from the flexible coupling (instructions 1 and 2).
6 Slide the flexible coupling upwards until it disengages from the pinion shaft and withdraw it from the intermediate shaft.

Refitting

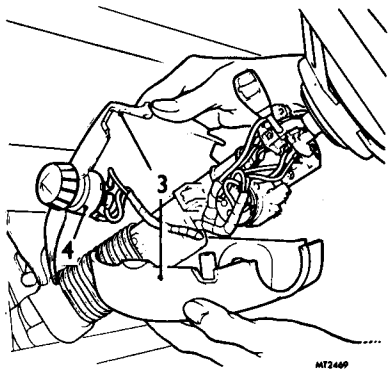
7 Reverse instructions 1 to 6. Note that the flexible coupling upper pinch-bolt must be aligned with the machined flat of the intermediate shaft.
8 Remove the bolt temporarily fitted to lock the rack.

STEERING-COLUMN NACELLE

Remove and refit 57.40.29

Removing

1 Withdraw the key from the steering lock/ignition switch.
2 Remove the three screws clamping the nacelle halves.



3 Remove the nacelle halves.
4 Remove the master light switch, 86.65.09.

Refitting

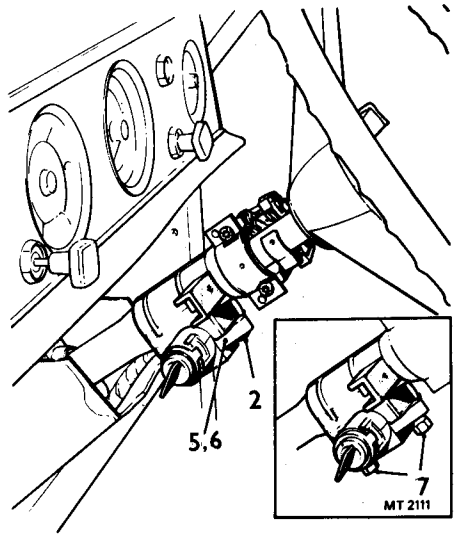
5 Reverse instructions 1 to 4.

STEERING LOCK/IGNITION SWITCH

Remove and refit 57.40.31

Removing

1 Remove the nacelle, see 57.40.29.



2 Using a centre-punch, mark the centre of the two shear-head bolts securing the steering lock to the column.
3 Using a small chisel, unscrew the shear-head bolts.
or
3a If instruction 3 proves to be unsuccessful, drill into the shear-head bolts where previously marked by centre-punch and, using an Easiout extractor, unscrew the shear-head bolts.
4 Disconnect the plug-in connector to the ignition switch.
5 Remove the steering lock.

Refitting

6 Locate the steering lock on the column and align the mounting holes.
7 Fit two new shear-head bolts and tighten evenly until both heads shear.
8 Connect the plug-in connector for the ignition switch.
9 Fit the nacelle, see 57.40.29.

TIE-ROD BALL JOINT — OUTER

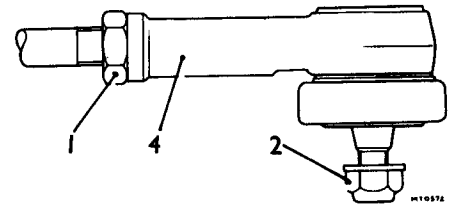
Remove and refit 57.55.02

Removing

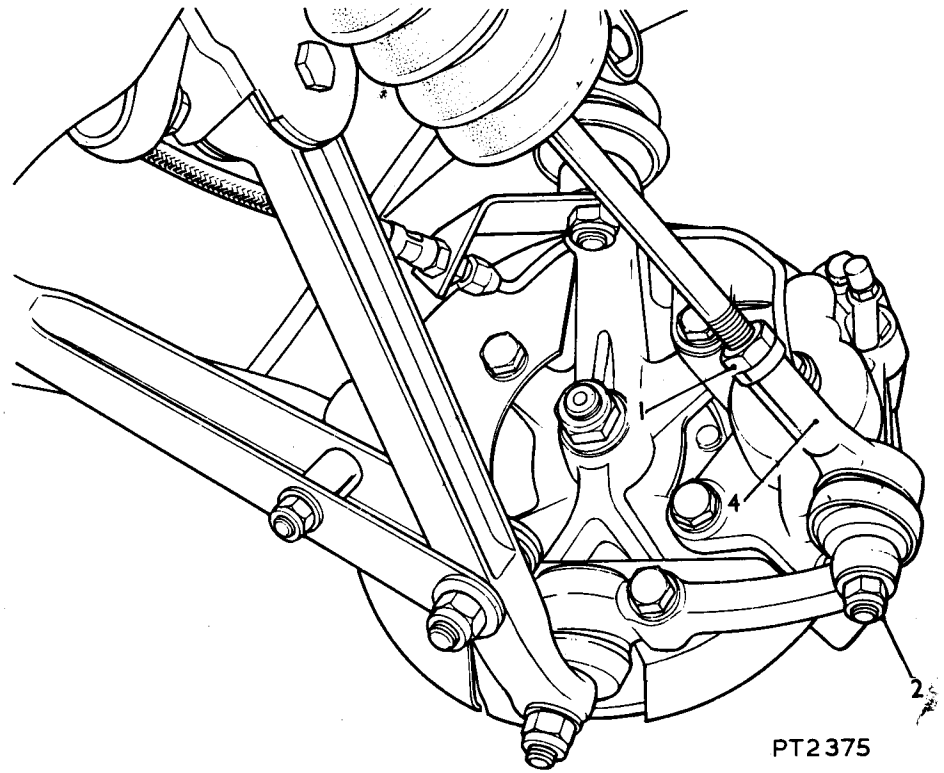
1 Slacken the locknut securing the tie-rod to the outer ball joint.
2 Remove the nut and washer securing the ball joint to the steering arm.
3 Release the ball joint from the steering arm.
4 Unscrew the ball joint from the tie-rod.

Refitting

5 Screw the ball joint onto the tie-rod. The distance between tie-rod ball joint centres (inner to outer) is $9\frac{3}{16}$ in (233·4 mm).

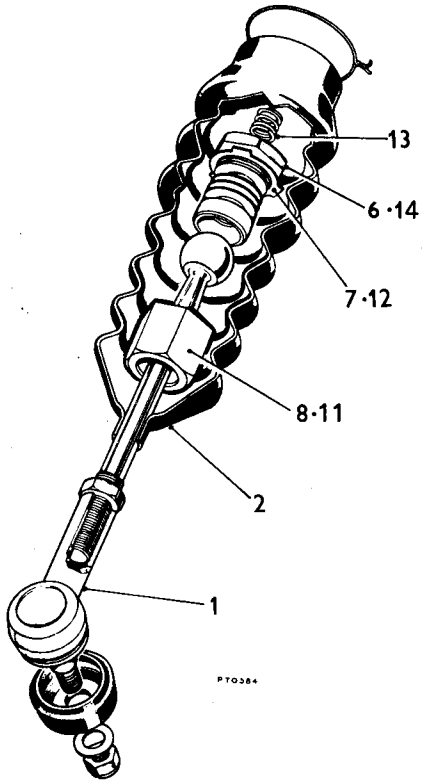


6 Connect the ball joint to the steering arm and secure with the washer and nut.
7 Check and adjust the front wheel alignment as necessary.
8 Tighten the tie-rod locknut.



TIE-ROD BALL JOINT — INNER

Remove and refit 57.55.03



Removing

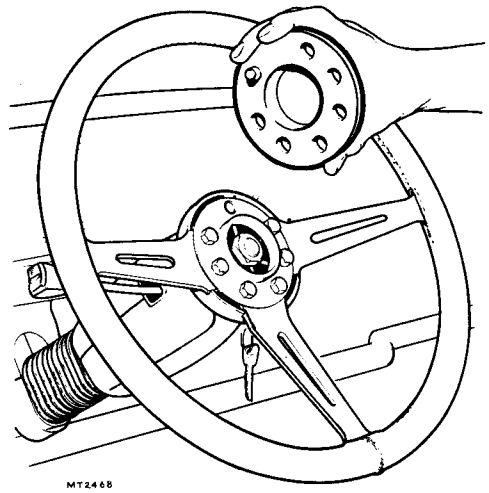
1 Remove the tie-rod outer ball joint, see 57.55.02.
2 Release the gaiter clips and remove the gaiter from the inner ball joint to be serviced.
3 Release the gaiter clips and slide the gaiter along the tie-rod at the opposite end of the rack.
4 Wipe the inner ball joints clear of grease.
5 Slacken the locknut on the ball joint to be removed. To prevent stress being applied to the rack pinion, the opposite inner ball housing should be held with a spanner.
6 Unscrew the ball adaptor from the rack shaft, observing the precaution mentioned in instruction 5.
7 Straighten the lock tabs on the washer securing the ball adaptor and housing.
8 Unscrew the adaptor from the housing and withdraw the shim(s), spring, ball seat and tie-rod.

Refitting

9 Lubricate the ball housing and insert the rod.
10 Fit the ball seat, shim(s), new tab washer and adaptor.
11 Tighten the adaptor (torque 80 lbf ft, 11·06 kgf m) and check the ball end for end-float and articulation. End-float should be within 0·0005 to 0·003 in (0·0127 to 0·0762 mm). There must be no tight spots in articulation. Adjust by adding or removing shims as necessary. Shims available are: 0·002, 0·004 and 0·010 in (0·0508, 0·1016 and 0·254 mm).
12 If end-float and articulation are satisfactory, bend over the lock washer tabs to secure the adaptor and ball housing.
13 Slide the spring into the adaptor.
14 Fit the locknut to the rack shaft and fit the adaptor and ball housing to the rack shaft.
15 To avoid stress being applied to the rack pinion, it is necessary to prevent rack shaft movement when the adaptor and locknut are tightened. When tightening the adaptor and locknut, employ a spanner at the opposite end of the rack shaft to prevent rotation of the rack shaft.
16 Tighten the locknut to 80 lbf ft (11·06 kgf m).
17 Pack the inner ball ends with fresh grease and fit the gaiters and clips.
18 Fit the tie-rod outer end, see 57.55.02.
19 Check, and adjust the front wheel track as necessary.

STEERING-WHEEL

Remove and refit 57.60.01



Removing

1 Prise off the steering-wheel pad from the hub centre.
2 Remove the six bolts securing the steering-wheel to the hub and lift off the wheel.

Refitting

3 Reverse instructions 1 and 2.

STEERING-WHEEL HUB

Remove and refit 57.60.02

Removing

1 Locate the front road wheels in the straight-ahead position and remove the steering-wheel pad.
2 Slacken and remove the exposed centre nut and plain washer.
3 To ensure that the steering-wheel hub will be replaced in its original spline location, scribe both hub centre and top of the steering mast.
4 Using a suitable extractor, withdraw the steering-wheel. Do not attempt to drive or tap the steering-wheel from the mast.

Refitting

5 Reverse instructions 1, 2 and 4. If the steering-wheel was withdrawn without spline location being marked, set the road wheels to the straight-ahead position and centralize the steering-wheel.

FRONT WHEEL ALIGNMENT

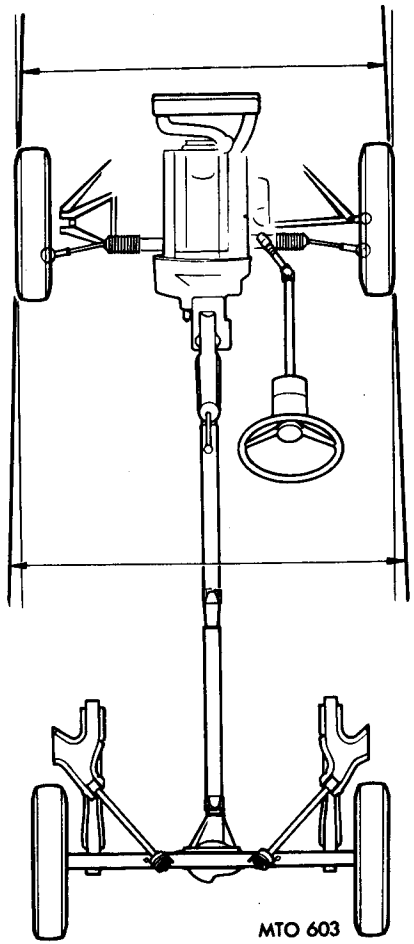
Check and adjust **57.65.01**

Checking

1 Locate the car on level ground and position the front wheels in the straight-ahead position.
2 Using wheel alignment equipment, check the front wheels for toe-in. Four requirements should be met:
  a Steering-wheel centralized.
  b Steering rack centralized.
  c Front wheels parallel to $\frac{1}{16}$ in (1·59 mm) toe-in.
  d Ball centres of both tie-rods equal.

Adjusting

3 Slacken the outer clips on the rack gaiter.
4 Slacken the locknuts at the tie-rod outer ball joints.
5 Shorten or extend both tie-rods an equal amount to obtain the required setting—0 to $\frac{1}{16}$ in (0 to 1·59 mm) toe-in.
6 Tighten the locknuts at the tie-rod outer ball joints.
7 Tighten the gaiter clips.


MTO 603

STEERING GEOMETRY

Check **57.65.02**

Only two adjustments are possible: camber, see 57.65.05, and toe-in, see 57.65.01.

DATA

	Kerb condition	Laden condition (4 up)
Camber angle	$\frac{3}{4}°$ positive $\pm 1°$	$\frac{3}{4}°$ negative $\pm \frac{3}{4}°$
Castor angle	$2\frac{1}{4}° \pm 1°$	$2\frac{3}{4}° \pm \frac{1}{2}°$
King pin inclination	$6\frac{1}{4}° \pm 1°$	$7\frac{3}{4}° \pm \frac{3}{4}°$
Wheel alignment	0 to $\frac{1}{16}$″ (0 to 1·59 mm) toe-in	0 to $\frac{1}{16}$″ (0 to 1·59 mm) toe-in

CAMBER ANGLE

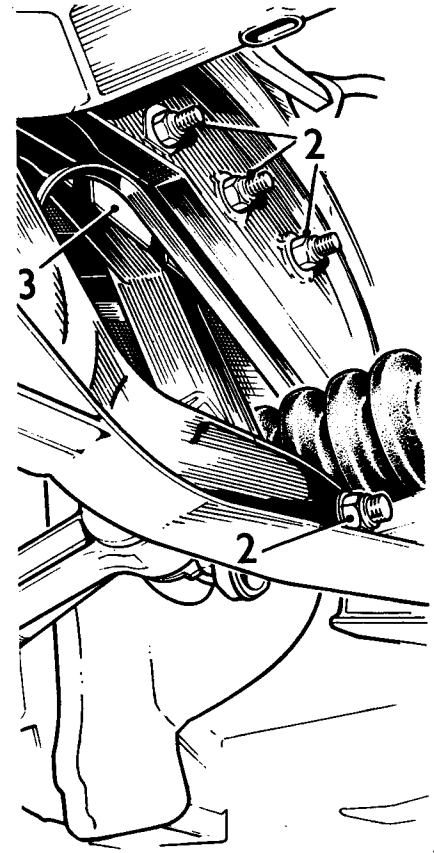
Check and adjust **57.65.05**

Checking

Front wheel camber should be as listed under DATA, 57.65.02.

Adjusting

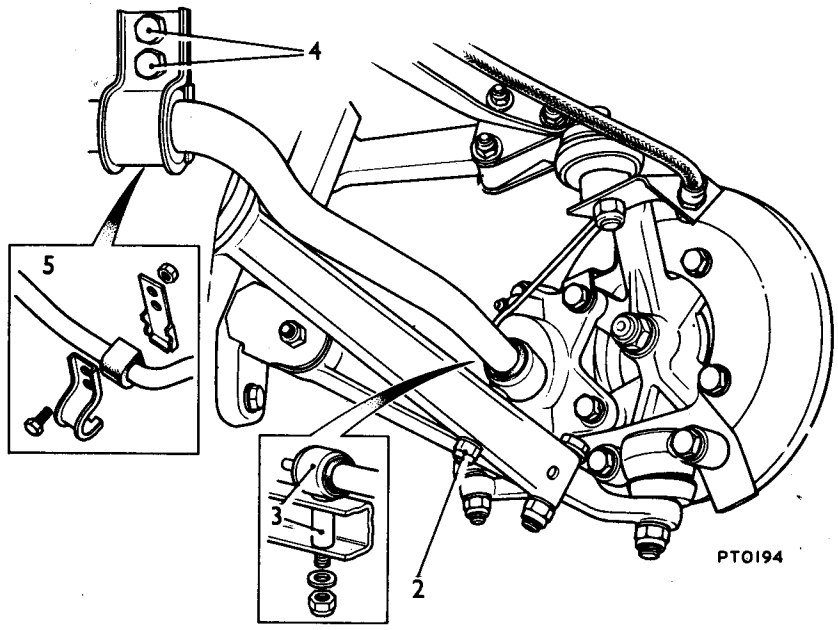
1 Jack up the car and support the body on stands.
2 Slacken the four bolts and nuts (3 top, 1 bottom) securing the front suspension bracket to the sub-frame.
3 Remove shim(s) between the top of the bracket and the sub-frame for negative adjustment: add shim(s) for positive adjustment.
  One shim equals approximately 1 degree camber angle.
4 Tighten the suspension bracket bolts and nuts and remove the body stands.



MT2470

ANTI-ROLL BAR

Remove and refit **60.10.01**



Removing

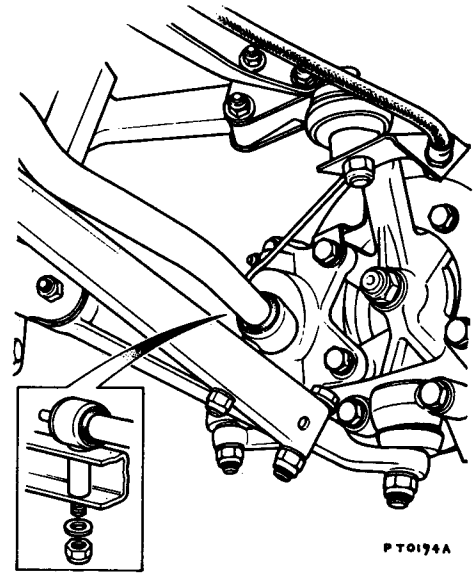
1 Raise the car and support it safely.
2 Remove the Nyloc nuts (one each side) securing the anti-roll bar links to the radius rods.
3 Release the anti-roll bar links and spacers from the radius rods.
4 Remove the bolts (two each side) securing the anti-roll bar mounting brackets to the sub-frame and lift off the anti-roll bar.
5 Remove the mounting brackets from the anti-roll bar.

Refitting

6 Fit the mounting brackets to the anti-roll bar.
7 Offer up the anti-roll bar to the sub-frame, align the mounting holes and fit the securing bolts, but do not tighten at this stage.
8 Fit the spacers to the radius rods and connect the anti-roll bar links.
9 Fit and tighten the Nyloc nuts to the anti-roll bar links.
10 Tighten the mounting bracket bolts.
11 Lower the car.

ANTI-ROLL BAR LINKS

Remove and refit **60.10.02**



Removing

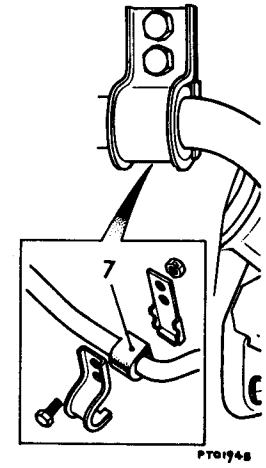
1 Raise the car and support it safely.
2 Remove the anti-roll bar, see 60.10.01.
3 Grip the plain shank of the anti-roll bar link in a vice and withdraw the anti-roll bar end clear of the link bush.
4 Extract the anti-roll bar from the remaining anti-roll bar link in similar manner.

Refitting

5 Ensure that the ends of the anti-roll bar are clean and undamaged.
6 Smear the ends of the anti-roll bar with approved rubber grease.
7 Slide the anti-roll bar links into position on the ends of the anti-roll bar.
8 Fit the anti-roll bar.
9 Lower the car.

ANTI-ROLL BAR RUBBERS

Remove and refit **60.10.04**



Removing

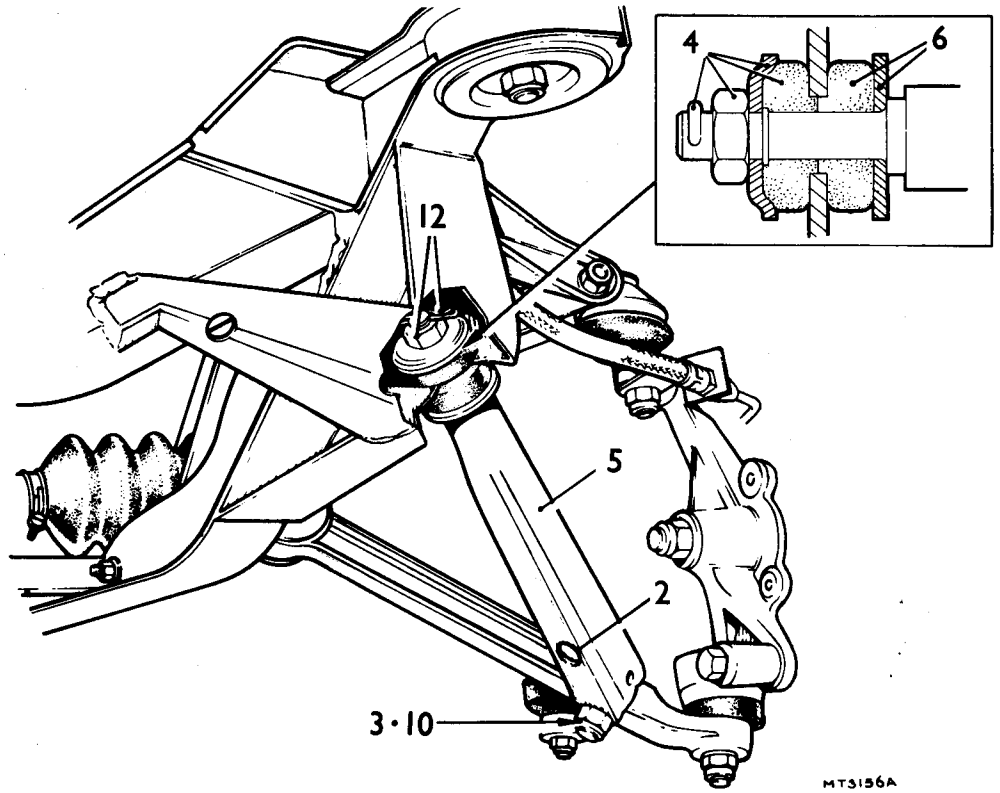
1 Raise the car and support it safely.
2 Remove the anti-roll bar, see 60.10.01.
3 Remove one anti-roll bar link.
4 Cut the old mounting bushes and remove them from the anti-roll bar.

Refitting

5 Ensure that the anti-roll bar is clean throughout its length.
6 Smear the anti-roll bar with approved rubber grease.
7 Slide the new mounting bushes into position along the anti-roll bar.
8 Fit the anti-roll link.
9 Fit the anti-roll bar to the car.
10 Lower the car.

RADIUS ROD

Remove and refit 60.10.16



Removing

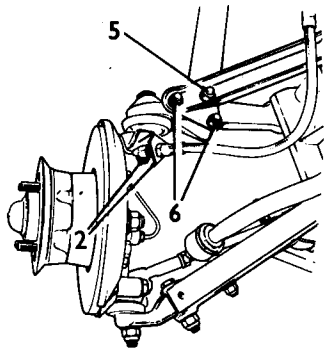
1 Raise the front of the car, support the body on stands and remove the front wheel.
2 Remove the nut securing the anti-roll bar link to the radius rod.
3 Remove the nut and bolt securing the radius rod to the lower wishbone.
4 Remove the spring pin, nut, dished washer and outer rubber bush from the front (sub-frame) end of the radius rod.
5 Release the anti-roll bar link and spacer from the radius rod, detach the radius rod end from the lower wishbone and withdraw the radius rod from the sub-frame.
6 Remove the inner rubber bush and washer from the radius rod.

Refitting

7 Fit the inner washer and bush to the radius rod.
8 Enter the radius rod in the sub-frame.
9 Fit the spacer to the radius rod and enter the anti-roll bar link.
10 Fit the end of the radius rod to the lower wishbone and secure with bolt and nut.
11 Fit the outer rubber bush and dished washer (dish towards bush) to the sub-frame end. Tighten the nut and secure with the spring pin.
12 Fit and tighten the nut securing the anti-roll bar link to the radius rod.
13 Fit the front wheel, remove the stands and lower the car.

BALL JOINT — UPPER

Remove and refit 60.15.02



Removing

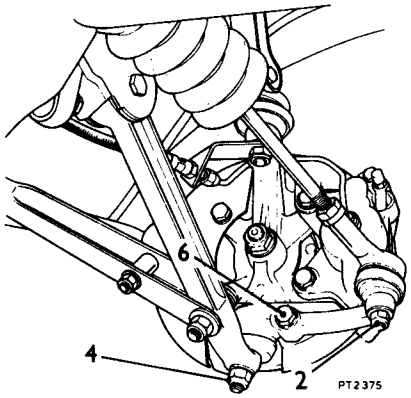
1 Jack up the car, support the body on stand(s) and remove the front wheel.
2 Remove the nut, washer and brake hose bracket from the upper wishbone ball joint shank.
3 Release the ball joint shank from the vertical link.
4 Support the vertical link/hub assembly with a cord or wire to avoid stressing the flexible brake hose.
5 Slacken the nut and bolt securing the lower end of the damper to the wishbone.
6 Remove the two bolts and nuts securing the stem of the ball joint to the wishbone arms.
7 Withdraw the ball joint.

Refitting

8 Reverse instructions 1 to 7.

BALL JOINT — LOWER

Remove and refit 60.15.03



Removing

1 Jack up the car and support the body on stand(s).
2 Remove the Nyloc nut and washer from the tie-rod outer ball joint.
3 Release the tie-rod outer ball joint from the steering arm.
4 Remove the Nyloc nut and washer securing the lower ball joint to the lower wishbone.
5 Release the lower ball joint from the wishbone.
6 Remove the two bolts and spring washers securing the lower ball joint/steering arm assembly to the vertical link.
7 Withdraw the lower ball joint and steering arm assembly.

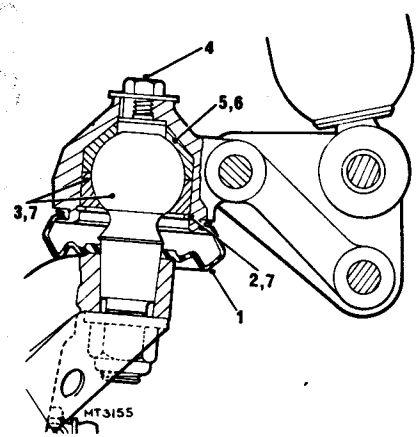
Refitting

8 Reverse instructions 1 to 7.

BALL JOINT — UPPER

Overhaul **60.15.12**

This operation applies only to earlier cars fitted with adjustable ball joints. On later cars the complete ball joint assembly must be changed when the lift movement in the joint exceeds 0·020 in (0·50 mm).



Dismantling

1 Remove the rubber boot.
2 Remove the circlip retaining the ball seat to the housing.
3 Withdraw the ball pin, shims and lower seat.
4 Remove the plug and washer from the ball housing.
5 Using a suitable chisel, remove the plastic upper seat, taking care to avoid damaging the housing.

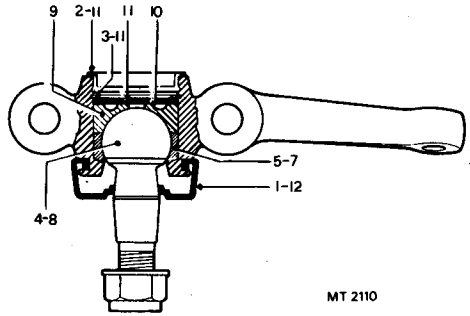
Reassembling

6 Using the ball pin and vice, carefully press the new upper seat into position.
7 Fit the ball pin, lower seat and circlip and check the ball pin for freedom of movement and end-float.
The ball bearing should articulate freely and have a maximum end-float of 0·004 in (0·1016 mm). Three alternative sizes of lower ball seat are available, also shims of 0·005 and 0·010 in (0·127 and 0·254 mm). Select a lower ball seat and shim(s) to satisfy the requirements of free articulation and end-float.
8 Remove the ball pin and lower seat, lubricate with clean grease and reassemble. The circlip retaining the lower seat must be fitted with its open end at right angles to the ball housing shank.
9 Partially pack the rubber boot with clean grease, and fit it to the ball housing.
10 Fit the grease nipple to the plug hole and charge the assembly with grease.
11 Remove the nipple and fit the washer and plug.

BALL JOINT — LOWER

Overhaul **60.15.13**

This operation applies only to earlier cars fitted with adjustable ball joints. On later cars the complete ball joint assembly must be changed when the lift movement in the joint exceeds 0·020 in (0·50 mm).



Dismantling

1 Remove the rubber boot.
2 Prise off the top sealing cap.
3 Remove the circlip.
4 Remove the ball pin complete with upper socket, disc, spring and top cover.
5 Remove the lower seat.
6 Clean all components, and renew as necessary.

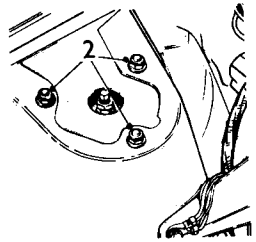
Reassembling

7 Fit the lower ball seat.
8 Lubricate the ball with clean grease and insert it in the housing.
9 Fit the upper ball seat.
10 Fit the disc spring (concave adjacent to ball seat).
11 Fit the top cover, circlip and sealing cap.
12 Partially fill the rubber boot with clean grease and fit it to the housing.

FRONT ROAD SPRING

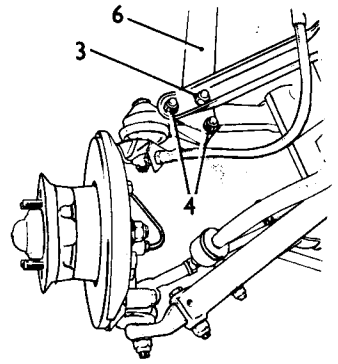
Remove and refit **60.20.01**

Service tools: S4221A, S4221A-5-18 or P5045.

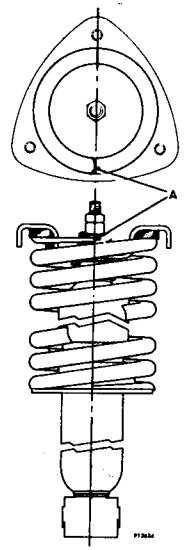


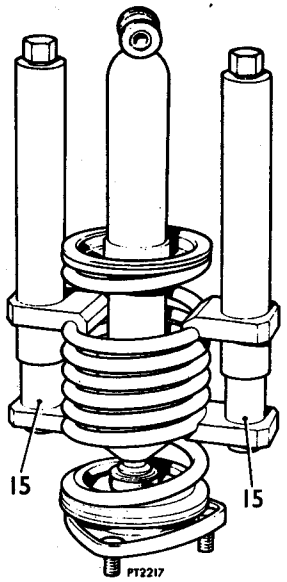
Removing

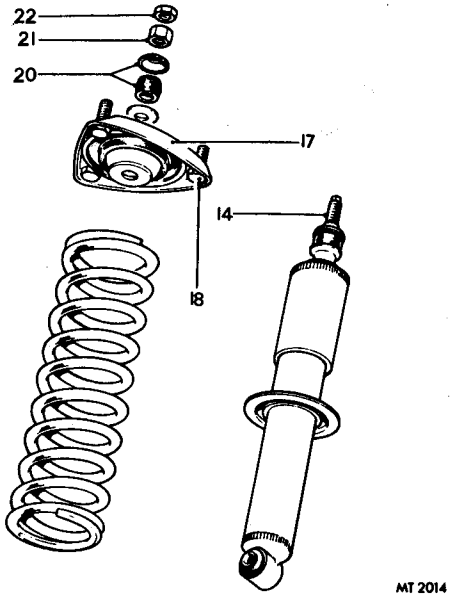
1 Jack up the car and remove the front wheel.
2 Raise the bonnet and remove the three Nyloc nuts and plain washers from the top of the suspension turret.
3 Remove the nut and bolt securing the lower end of the damper to the upper wishbone.
4 Slacken the two nuts and bolts securing the upper wishbone to the ball joint stem.
5 Release the lower end of the damper from the wishbone.
6 Withdraw the damper and spring assembly from the turret.



7 Remove the spacing washers from the mounting flange studs.
8 Using tool S 4221A and adaptors S 4221A-5 and S 4221A-18 or tool P 5045, compress the road spring until the upper mounting flange can be rotated freely.
9 Remove the locknut and nut securing the upper mounting flange to the damper rod.
10 Withdraw the mounting flange complete with upper rubber bush, washers, and spring insulating ring.
11 Withdraw the lower rubber bush and washers.
12 Release spring tension and remove the tool.







13 Remove the spring.

Refitting

If spring renewal is intended it is essential to check that a correct replacement is employed. In some models identical springs are not fitted to left- and right-hand sides and Parts Lists must be consulted to ascertain the correct part number and spring colour code.

14 Fully extend the damper rod and locate the spring on the damper flange.
NOTE: Attention must be paid to the radial position of the spring upper finishing tip 'A' relative to the damper eye bush and the spring upper locating plate. When assembled to the car the spring upper finishing tip should be outboard of the spring upper locating plate and at 90° to the axis of the damper eye bush as shown.
15 Using tool P 5045 or S 4221A and adaptor 5A, compress the spring until the free end of the spring is below the damper rod end.
16 Fit the washers and the lower rubber bush to the damper rod, ensuring that the collar of the upper washer is positioned to engage the mounting flange.
17 Fit the insulating ring to the spring, engaging the lip inside the coils.
18 Fit the mounting flange to the damper rod, ensuring that the centre of the flange engages the collar of the lower bush washer.
19 Fit the lower washer of the upper rubber bush, engaging the collar in the mounting flange.
20 Fit the rubber bush and upper washer.
21 Fit and tighten the damper rod nut.
22 Fit and tighten the locknut.
23 Remove the spring and damper from the tool.
24 Fit the spacing washers to the mounting flange studs.
25 Enter the mounting flange studs in the turret and fit the plain washers and Nyloc nuts. Tighten the nuts.
26 Fit the lower end of the damper to the wishbone and secure it with the bolt and nut.
27 Tighten the two nuts securing the upper wishbone to the ball joint stem.
28 Fit the road wheel, remove the body stands and lower the jack.
29 Close the bonnet.

FRONT HUB

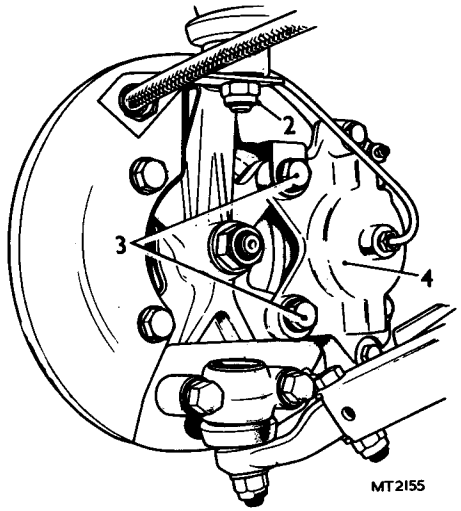
Remove and refit **60.25.01**

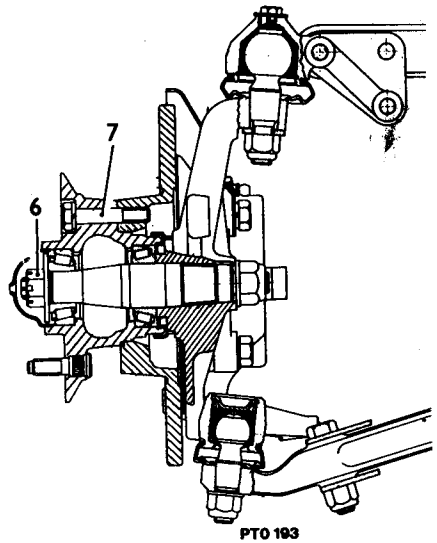
Removing

1 Jack up the car, support the body on stands and remove the front wheel.
2 Remove the nut and bracket securing the brake hose to the vertical link.
3 Remove the two bolts and spring washers securing the caliper to the vertical link.
4 Withdraw the caliper clear of the brake disc, ensuring that strain is not imposed on the brake hose.
5 Prise off the hub cap and wipe grease from the end of the stub axle.
6 Remove the cotter pin, slotted nut and washer from the stub axle.
7 Withdraw the hub complete with disc, bearings and oil seal.

Refitting

8 Partially pack the hub with fresh grease.
9 Locate the oil seal in the hub and enter the hub and bearings on the stub axle.
10 Fit the washer and slotted nut to the stub axle.
11 Adjust the slotted nut to provide hub end-float of 0·002 to 0·005 in (0·508 to 0·1270 mm).
12 Fit a new cotter pin to the slotted nut.
13 Partially fill the hub cap with fresh grease and fit the cap to the hub.
14 Fit the caliper to the vertical link.
15 Fit the hose support bracket to the upper ball joint.
16 Fit the road wheel, remove the body stands and lower the jack.

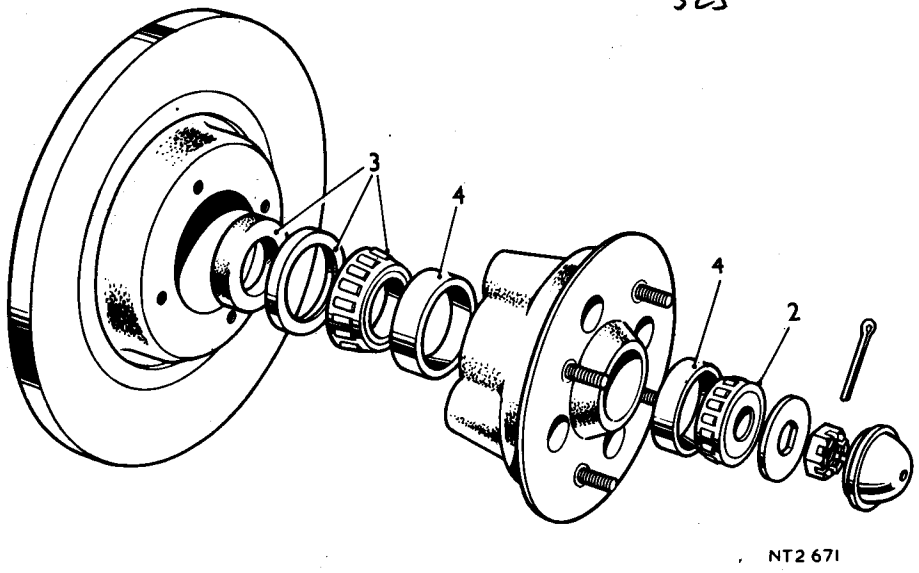




FRONT HUB

Overhaul **60.25.07**

MIN DISC THICKNESS — .325"



NT2 671

Dismantling

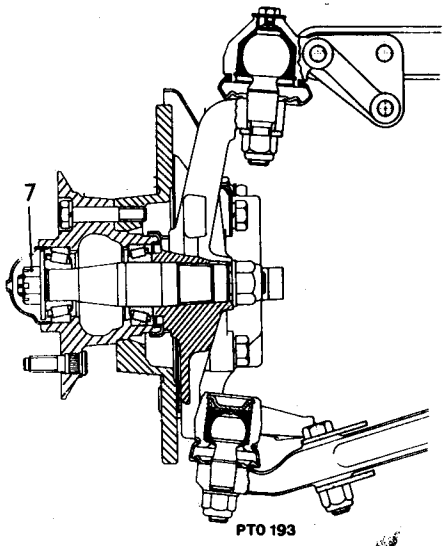
1 Remove the front hub, see 60.25.01.
2 Withdraw the outer bearing.
3 Withdraw the inner oil seal, inner bearing shield and inner bearing.
4 Extract the inner and outer bearing tracks.
5 Thoroughly clean all components.

Reassembling

6 Examine all components, and renew as necessary.
7 Fit the bearing inner and outer tracks to the hub.
8 Fit the inner bearing.
9 Fit the inner bearing shield.
10 Partially fill the hub with fresh grease.
11 Lubricate the new felt seal and enter the seal in the hub.
12 Fit the outer bearing.
13 Install the hub on the stub shaft, see 60.25.01.

FRONT HUB BEARING END-FLOAT

Check and adjust **60.25.13**



PTO 193

Checking

1 Jack up the car, support the body on stands and remove the front wheel.
2 Remove the brake pads, see 70.40.02.
3 Check the bearing end-float. A correctly adjusted hub will have end-float within 0·002 to 0·005 in (0·0508 to 0·1270 mm).

Adjusting

4 Prise off the hub cap.
5 Wipe grease from the end of the stub axle.
6 Remove the cotter pin.
7 Tighten or slacken the slotted nut as necessary to obtain 0·002 to 0·005 in (0·0508 to 0·1270 mm) end-float.
8 Fit a new cotter pin.
9 Clean the hub cap and partially fill it with fresh grease.
10 Fit the hub cap.
11 Fit the brake pads, see 70.40.02.
12 Fit the front road wheel, remove the body stands and lower the jack.

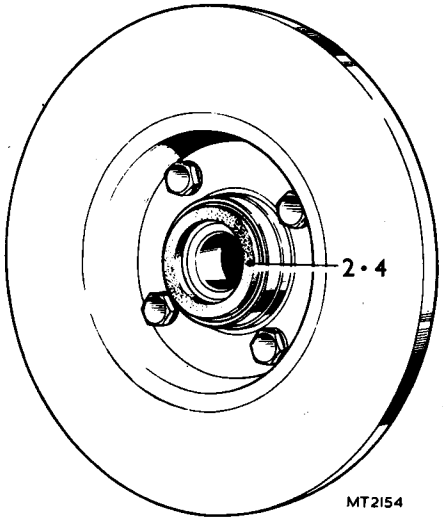
FRONT HUB BEARINGS

Remove and refit **60.25.14**

As operation 60.25.07.

FRONT HUB OIL SEAL

Remove and refit **60.25.15**



MT2154

Removing

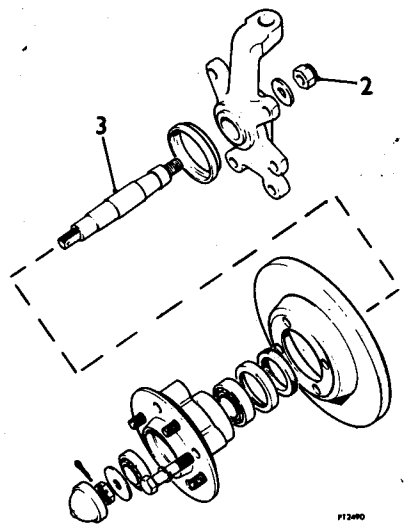
1 Remove the front hub, see 60.25.01.
2 Withdraw the oil seal.

Refitting

3 Partially pack the hub with fresh grease.
4 Lubricate the new hub seal and enter the seal in the hub.
5 Fit the hub to the stub axle, see 60.25.01.

FRONT HUB STUB AXLE

Remove and refit **60.25.22**



Removing

1 Remove the vertical link, see 60.25.23.
2 Remove the Nyloc nut and plain washer securing the stub axle to the vertical link.
3 Press out the stub axle from the vertical link.

Refitting

4 Reverse instructions 1 to 3.
5 Fit the vertical link and hub assembly, see 60.25.23.

VERTICAL LINK

Remove and refit **60.25.23**

Removing

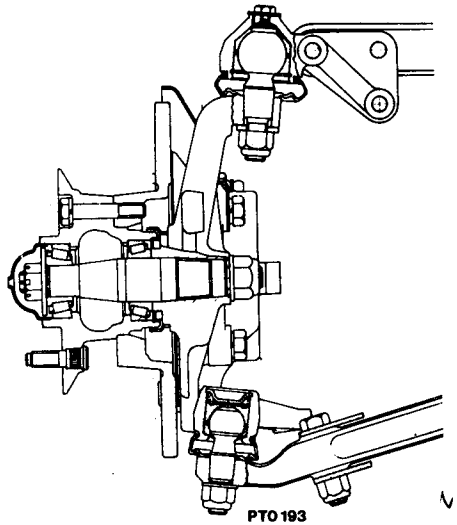
1 Jack up the front of the car and support the body/sub-frame on stand(s).
2 Remove the road wheel.
3 Remove the front hub, see 60.25.01.
4 Remove the disc upper shield.
5 Detach the upper ball joint from the vertical link.
6 Remove the two bolts and spring washers securing the steering arm to the vertical link, also the lower disc shield.
7 Withdraw the vertical link.

Refitting

8 Reverse instructions 1 to 7.

FRONT HUB WHEEL STUD

Remove and refit **60.25.29**



Removing

1 Jack up the car, support the body on stands and remove the front

2 Thoroughly clean the hub and brake disc in the area between the hub flange and the disc.
3 Slacken and partially unscrew the four bolts securing the disc to the hub until the heads of the bolts project beyond the hub flange.
4 Tap the wheel stud towards the disc.
5 Withdraw the stud.

Refitting

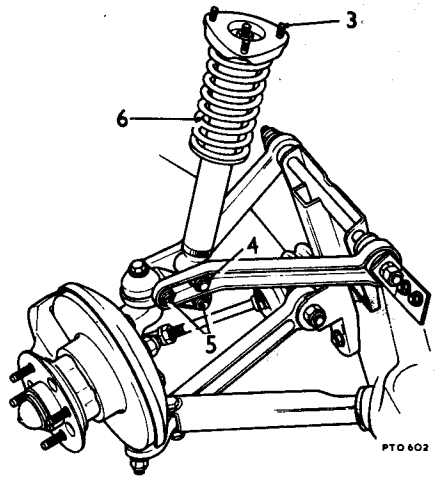
6 Ensure that the mating, countersunk faces of the stud and hub flange are clean.
7 Enter the stud from the rear of the hub flange.
8 Using suitable packing, e.g. a short length of steel tubing and a steel wheel nut (not a wheel nut fitted to the vehicle), draw the stud into position.
9 Remove the steel nut and packing.
10 Evenly tighten the four bolts securing the brake disc to the hub.
11 Fit the road wheel, remove the body stands and lower the jack.

FRONT DAMPER

Remove and refit **60.30.02**

Removing

1 Jack up the car, support the body on stands and remove the front wheel.
2 Raise the bonnet.
3 Remove the three nuts and washers securing the front damper/road spring assembly to the front suspension turret.



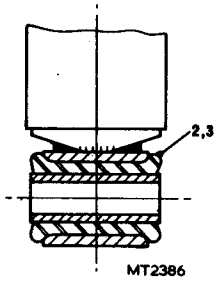
4 Remove the nut and bolt securing the lower end of the damper to the wishbone.
5 Slacken the two bolts securing the damper mounting plates to the wishbone and ball joint.
6 Release the lower end of the damper from the wishbone and withdraw the damper and spring assembly from the turret.
NOTE: Refer to 60.20.01 if it is required to operate the damper from the front spring.

Refitting

7 Ensure that the three spacing washers are fitted to the damper mounting flange and engage the mounting flange studs in the turret.
8 Fit the three plain washers and Nyloc nuts to the damper studs. Tighten the nuts.
9 Engage and align the lower end of the damper in the mounting plates on the upper wishbone. Fit the nut and bolt and tighten.
10 Tighten the two nuts and bolts securing the wishbones to the upper ball joint.
11 Fit the road wheel, remove the body stands and lower the car to the ground.
12 Close the bonnet.

DAMPER BUSH

Remove and refit 60.30.07



Removing

1 Remove the damper and front spring assembly from the car, see 60.30.02.
2 Press out the damper lower bush.

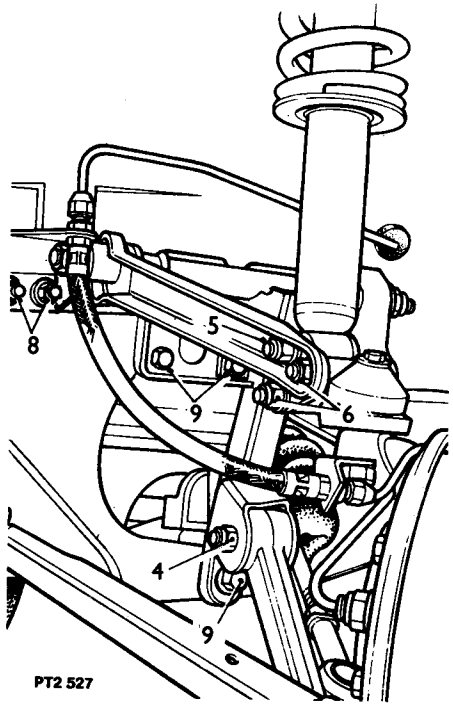
Refitting

3 Press in the new bush and centralize it in the damper eye.
4 Fit the damper and road spring to the car, see 60.30.02.

SUSPENSION WISHBONE — UPPER

Remove and refit 60.35.01

NOTE: The nuts securing the fulcrum shaft vary between early and later models. On early models a Nyloc nut at the front and a nut with locknut at the rear were used. On later models this was reversed.

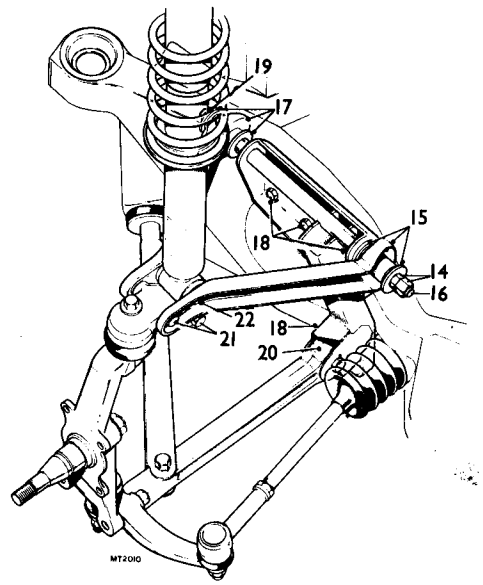


Removing

1 Raise the front of the car and support the body on stands.
2 Disconnect the battery.
3 Remove the front wheel.
4 Remove the bolt and nut securing the inner end of the lower wishbone to the suspension bracket and detach the wishbone from the bracket.
5 Remove the bolt and nut securing the damper to the upper wishbone.
6 Remove the bolts and nuts securing the upper ball joint to the upper wishbone.
7 Using string or wire support the hub assembly to the road spring to prevent strain being applied to the brake hose.
8 Remove the two bolts, nuts and spring washers securing the stiffening bracket to the sub-frame.
9 Remove the four bolts and nuts (three upper, one lower) securing the suspension bracket to the sub-frame.
10 Withdraw the suspension bracket and shim(s) (if fitted) complete with upper wishbones, noting shim position for reassembly.
11 Remove the Nyloc nut, stiffening bracket and washer from the upper wishbone fulcrum shaft and withdraw the front wishbone arms and inner washer.
12 Withdraw the fulcrum shaft, rear wishbone arm and plain washers.
13 Renew the wishbone bushes as necessary.

Refitting

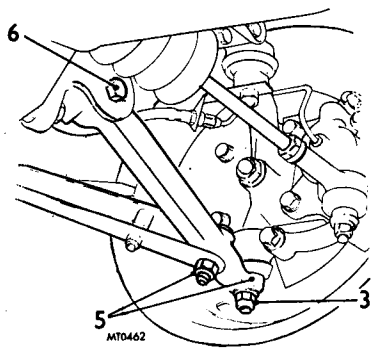
14 Check the position and tightness of the Nyloc nut on the end of the fulcrum shaft. It should be located on the shaft with one full thread projecting beyond the nut. The Nyloc nut should be tightened to 30 to 32 lbf ft (4·1 to 5·2 kgf m).
15 Fit the outer plain washer, upper rear wishbone (cranked end forward) and inner plain washer to the fulcrum shaft.
16 Insert the fulcrum shaft into the rear of the suspension bracket.
17 Fit the inner plain washer, wishbone (cranked end rearward), plain washer, stiffening bracket and nut. Do not tighten the nut at this stage.
18 Fit the suspension bracket complete with upper wishbones and shim(s) (if fitted) to the sub-frame and secure with four bolts and nuts.
19 Fit the two bolts, spring washers and nuts securing the stiffening bracket to the sub-frame.



20 Fit the lower wishbone to the suspension bracket and secure with bolt and nut. Ensure that the bush sealing rubber and side plates are not omitted.
21 Remove the string or wire supporting the weight of the hub assembly and fit the securing bolts and nuts but do not tighten at this stage.
22 Fit the lower end of the damper to the wishbone and secure with bolt and nut.
23 Tighten the ball joint bolts and nuts.
24 Fit the front wheel and connect the battery.
25 Remove the stands and lower the car.
26 Tighten the nut and bolt securing the lower wishbone to the suspension bracket.
27 Tighten the inner nut on the upper fulcrum shaft to 30 to 38 lbf ft (4·1 to 5·2 kgf m). Fit the locknut and tighten to 26 to 34 lbf ft (3·6 to 4·7 kgf m).

SUSPENSION WISHBONE — LOWER

Remove and refit **60.35.02**



Removing

1 Raise the front of the car and support the body on stands.
2 Remove the front wheel.
3 Remove the Nyloc nut and washer from the lower wishbone ball joint.
4 Release the ball joint from the lower wishbone.
5 Detach the lower wishbone from the radius rod and the lower ball joint.
6 Remove the Nyloc nut and the bolt securing the wishbone to the suspension bracket and withdraw the wishbone.

Refitting

7 Enter the wishbone in the suspension bracket ensuring that the bush sealing rubbers and side plates are not omitted.
8 Engage the radius rod in the lower wishbone and secure with bolt and Nyloc nut.
9 Engage the lower ball joint in the wishbone and secure with plain washer and Nyloc nut.
10 Fit and tighten the bolt and Nyloc nut to the lower ball joint shank.
11 Fit the front wheel.
12 Remove the stands and lower the car.

SUSPENSION WISHBONE — LOWER

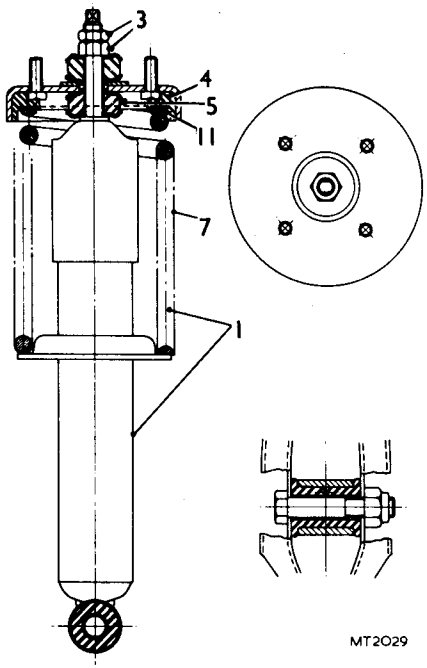
Overhaul **60.35.09**

1 Remove the lower wishbone from the car, see 60.35.02.
2 Press out the wishbone rubber bush.
3 Press in the new rubber bush, ensuring that it is centred in the wishbone.
4 Fit the wishbone to the car, see 60.35.02.

REAR ROAD SPRING

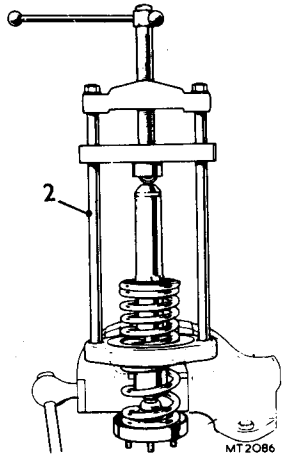
Remove and refit **64.20.01**

Service tools: S 4221A, S 4221A-5, P 5045



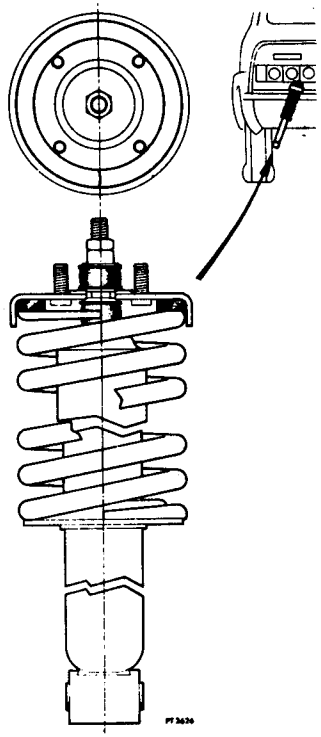
Removing

1 Remove the rear damper and spring assembly from the car, see 64.30.01.
2 Using hand press S 4221A and adaptor 5, or P 5045, compress the road spring.
3 Remove the locknut and nut securing the damper rod to the mounting flange.
4 Withdraw the mounting flange complete with upper rubber bush, washers, and spring insulating ring.
5 Withdraw the lower rubber bush and washers.
6 Remove the damper and spring from the press.
7 Lift off the road spring.



Refitting

8 Place the road spring on the damper flange.
NOTE: Attention must be paid to the radial position of the spring upper finishing tip relative to the damper eye bush and the spring upper locating plate. When assembled to the car the spring upper finishing tip should face rearward and be at 90° to the axis of the damper eye bush as shown.
9 Using the hand press and adaptors, compress the road spring.
10 Fit the washers and lower rubber bush to the damper rod, ensuring that the collar of the upper washer is positioned to engage the mounting flange.
11 Fit the insulating ring to the spring.
12 Fit the mounting flange to the damper rod, ensuring that the centre of the flange engages the collar of the lower bush washer.
13 Fit the lower washer of the upper rubber bush, engaging the collar in the mounting flange.
14 Fit the rubber bush and upper washer.
15 Fit and tighten the damper rod nut.
16 Fit and tighten the locknut.



17 Remove the damper assembly from the press.
18 Fit the damper and spring assembly to the car, see 64.30.01.

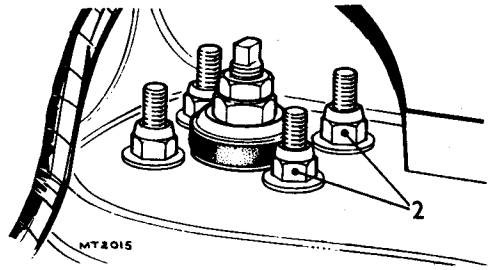
REAR ROAD SPRING INSULATING RING

Remove and refit **64.20.17**

As operation 64.20.01.

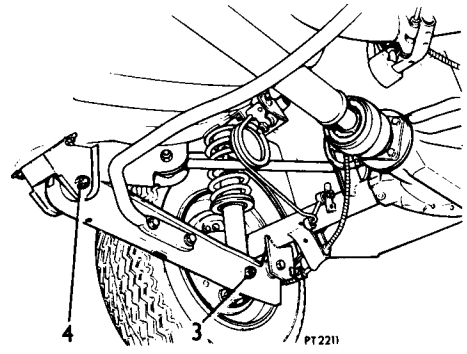
REAR DAMPER

Remove and refit **64.30.01**



Removing

1 Jack up the car and support the body on stands. Locate the jack under the rear axle.
2 Remove the four nuts and plain washers securing the damper upper mounting studs to the top of the rear spring turret (inside boot).



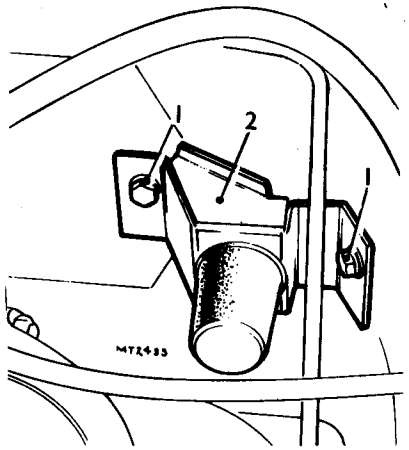
3 Remove the bolt and nut securing the lower end of the damper to the rear suspension arm.
4 Remove the bolt and nut securing the rear suspension arm to the body.
5 Detach the suspension arm from the body and lift out the damper.

Refitting

6 Reverse instructions 1 to 6. Do not fully tighten the bolt and nut securing the rear suspension arm to the body until the weight of the car is supported on the road wheels.

BUMP STOP

Remove and refit **64.30.15**



Removing

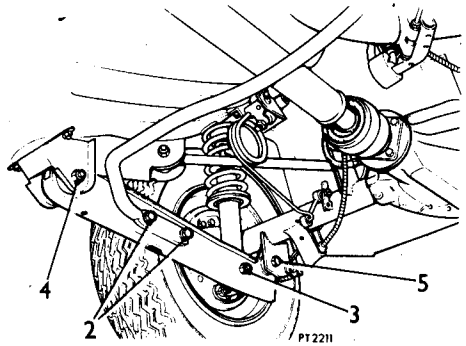
1 Remove the two bolts and spring washers securing the bump stop bracket to the car body.
2 Withdraw the bump stop and bracket.

Refitting

3 Reverse instructions 1 and 2.

SUSPENSION ARM

Remove and refit **64.35.02**



Removing

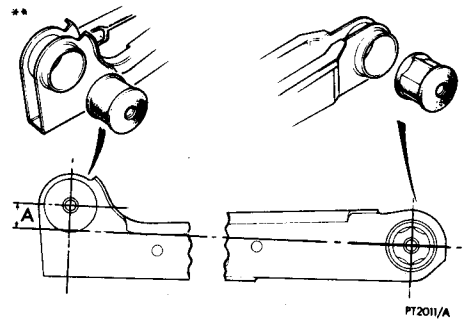
1 Jack up the car and support the body on stands. Locate the jack under the rear axle.
2 Disconnect the anti-roll bar from the suspension arm.
3 Remove the bolt and nut securing the lower end of the damper to the suspension arm.
4 Remove the bolt and nut securing the forward end of the suspension arm to the body bracket.
5 Remove the bolt and nut securing the rear end of the suspension arm to the rear axle tube bracket.
6 Detach the suspension arm from the damper, axle bracket and body bracket.

Refitting

7 Engage the rear end of the suspension arm in the axle bracket. Fit the retaining bolt and nut.
8 Engage the lower end of the damper in the suspension arm. Fit the retaining bolt and nut.
9 Engage the front end of the suspension arm in the body bracket and fit the retaining bolt and nut.
10 Connect the anti-roll bar link to the suspension arm.
11 Remove the body stands and jack.
12 Tighten the attachment bolts at the damper, axle bracket, and body bracket.

SUSPENSION ARM BUSHES

Remove and refit **64.35.05**



Removing

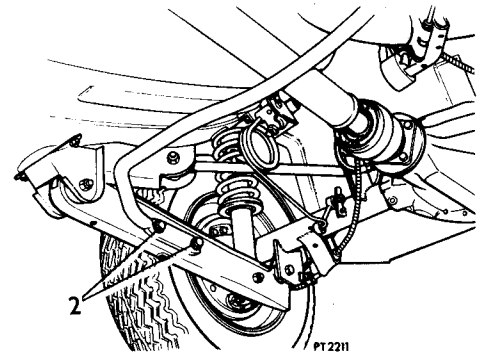
1 Remove the suspension arm, see 64.35.02.
2 Press out the old bushes.

Refitting

3 Press in the new bushes, ensuring they are centralized in the suspension arm. Note that the front bush must be installed in the position illustrated. Dimension 'A' equals 1 in (25·4 mm).
4 Fit the suspension arm, see 64.35.02.

ANTI-ROLL BAR

Remove and refit **64.35.08**



Removing

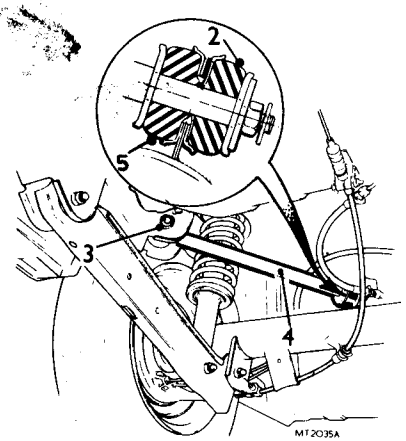
1 Raise the car and support it safely.
2 Remove the four bolts and nuts (two either side) securing the anti-roll bar to the rear suspension arms.
3 Withdraw the anti-roll bar and shim(s) if fitted.

Refitting

4 Locate the anti-roll bar (and shim(s), if removed) in position on the rear suspension arms.
5 Align the mounting holes and fit and tighten the four securing bolts and nuts.
6 Lower the car.

RADIUS ROD

Remove and refit 64.35.28



Removing

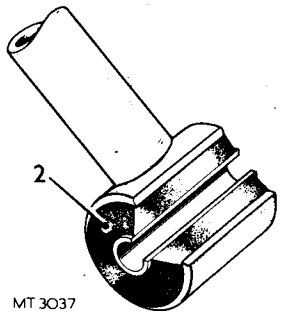
1 Raise the car on the jack and support the body on stands.
2 Remove the spring pin, nut, plain washer, dished washer, outer rubber bush and nylon washer from the axle end of the radius rod.
3 Remove the nut and bolt securing the radius rod to the body bracket.
4 Withdraw the radius rod complete with inner rubber bush and dished washer.
5 Remove the inner rubber bush and dished washer from the radius rod.

Refitting

6 Fit the dished washer to the radius rod, ensuring that the curved peripheral rim of the washer is inclined towards the bushed eye of the radius rod.
7 Fit the inner rubber bush (plain face of bush towards axle bracket).
8 Enter the screwed end of the radius rod in the axle bracket and engage the bushed end in the body bracket.
9 Fit the bolt and nut to the body bracket.
10 Fit the nylon washer and outer rubber bush to the screwed end of the radius rod, ensuring that the plain face of the bush is towards the nylon washer.
11 Fit the washers, nut and spring pin.
12 Tighten the body bracket bolt.

RADIUS ROD BUSHES

Remove and refit 64.35.29



Removing

1 Remove the radius rod from the car, see 64.35.28.
2 Press out the bush from the radius rod.

Refitting

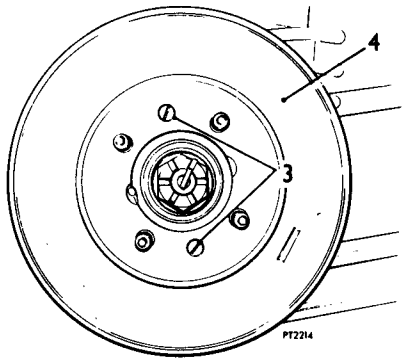
3 Fit a new bush to the radius rod.
4 Install the radius rod in the car, see 64.35.28.

REAR BRAKE-DRUM

Remove and refit 70.10.03

Removing

1 Jack up the car and remove the rear wheel.
2 Release the hand brake.



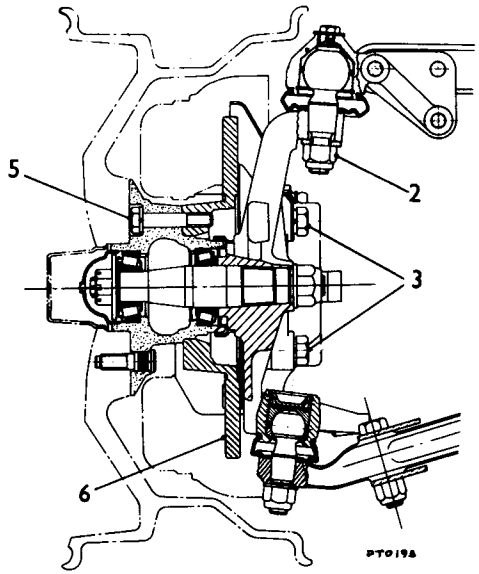
3 Remove the two countersunk screws securing the brake-drum to the hub.
4 Withdraw the brake-drum.

Refitting

5 Align the countersunk holes in the drum with the tapped holes in the hub.
6 Engage the wheel studs in the drum.
7 Slide the drum into position. If the brake-shoes were disturbed, they may require to be centralized on the back-plate to allow drum entry.
8 Fit and tighten the two countersunk screws.
9 Fit the road wheel and remove the jack.
10 Operate and release the hand brake several times to adjust the brake.

BRAKE DISC

Remove and refit 70.10.10



Removing

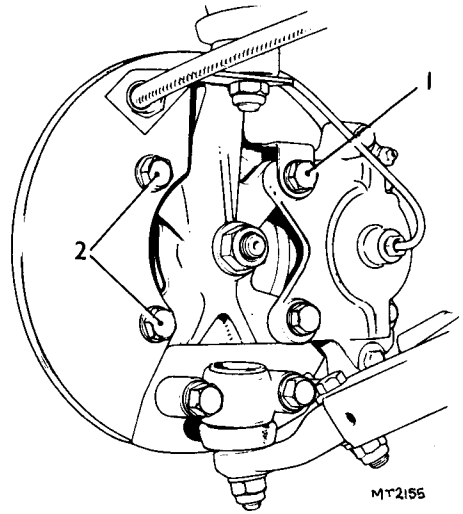
1 Jack up the car and remove the front wheel.
2 Release the front brake hose from the upper ball joint.
3 Remove the two bolts securing the caliper lugs to the vertical link and withdraw the caliper. Do not allow the weight of the caliper to hang suspended by the brake hose.
4 Remove the hub, see 60.25.01.
5 Remove the four bolts and spring washers securing the disc to the hub.
6 Withdraw the disc.

Refitting

7 Offer up the disc to the hub.
8 Fit and tighten the four bolts and spring washers.
9 Locate the felt oil seal in the hub.
10 Fit the hub and disc to the stub axle.
11 Adjust the bearing end-float and fit the hub cap, see 60.25.01.
12 Fit the brake hose bracket to the upper ball joint.
13 Fit the caliper assembly.
14 Fit the road wheel and remove the jack.

FRONT DISC SHIELD — UPPER

Remove and refit 70.10.18



Removing

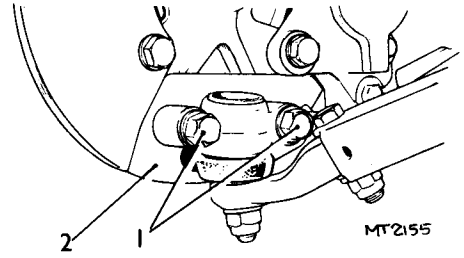
1 Remove the upper bolt and spring washer securing the caliper to the vertical link.
2 Remove the two bolts and spring washers securing the disc shield to the vertical link.
3 Withdraw the upper disc shield.

Refitting

4 Reverse instructions 1 to 3.

FRONT DISC SHIELD — LOWER

Remove and refit 70.10.20



Removing

1 Remove the two bolts and spring washers securing the lower ball joint and steering arm to the vertical link.
2 Remove the lower disc shield.

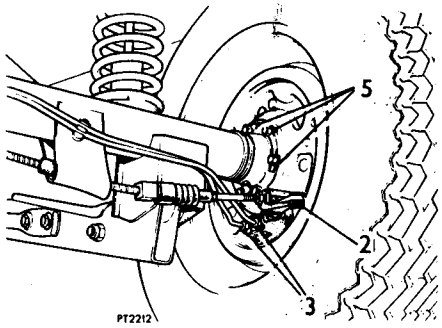
Refitting

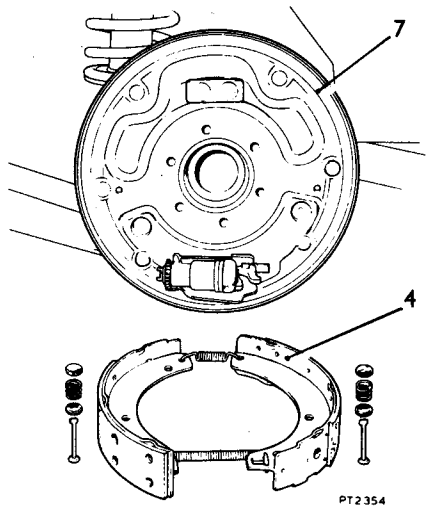
3 Reverse instructions 1 and 2.

REAR BRAKE BACK PLATE

Remove and refit **70.10.26**

Service tool: S 109D





Removing

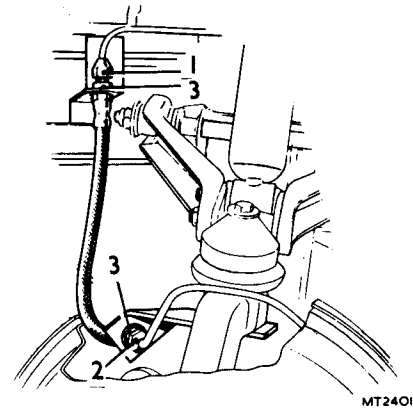
1 Jack up the car, remove the rear wheel and release the hand brake.
2 Remove the clevis pin securing the hand brake cable fork to the backplate lever.
3 Disconnect the brake feed pipe union at the wheel cylinder (left-hand side only)
or
Disconnect the brake feed pipe and transfer pipe unions at the wheel cylinder (right-hand side only).
4 Remove the brake-shoes and springs from the backplate.
5 Straighten the locking tabs and remove the six bolts securing the half-shaft bearing housing to the axle flange.
6 Withdraw the half-shaft.
7 Withdraw the brake backplate.
NOTE: Shims are fitted between the backplate and axle flange.
8 Remove the wheel cylinder from the backplate.

Refitting

9 Reverse instructions 1 to 8.
10 Bleed the brakes.

BRAKE HOSE — FRONT

Remove and refit—Left-hand **70.15.02**
Right-hand **70.15.03**



Removing

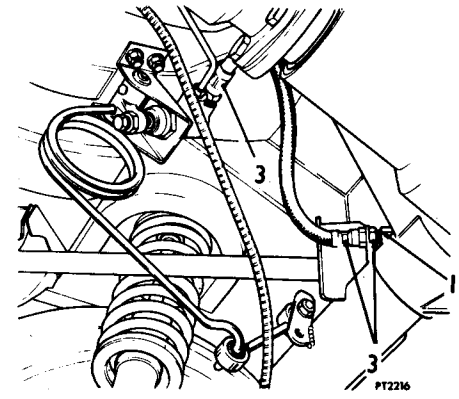
1 Disconnect the brake pipe and union from the inboard end of the flexible hose.
2 Disconnect the brake pipe and union from the outboard end of the flexible hose.
3 Using two spanners, remove the locknut and washer securing the hose to the support bracket at the upper ball joint, and remove the hose.

Refitting

4 Reverse instructions 1 to 3. Ensure that the hose is neither kinked nor twisted when installed.
5 Bleed the brakes.

BRAKE HOSE — REAR

Remove and refit **70.15.17**



Removing

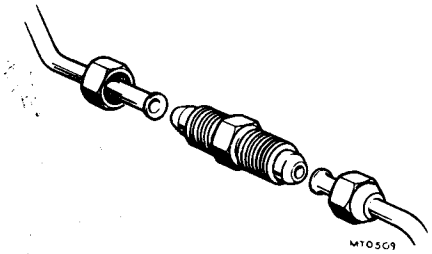
1 Disconnect the brake pipe union at the rear end of the brake hose.
2 Using two spanners remove the nut and lock washer securing the rear end of the brake pipe to the axle bracket.
3 Release the brake hose from the axle bracket and unscrew the forward end of the hose from the brake load conscious valve.

Refitting

4 Reverse instructions 1 to 3. Ensure that the hose is neither kinked nor twisted when installed.
5 Bleed the brakes.

CONNECTOR—2-WAY

Remove and refit **70.15.32**

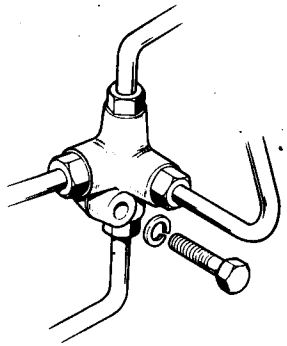


Removing
1 Clean the connector and unions.
2 Disconnect the brake pipe unions from the connector.

Refitting
3 Fit and tighten the brake pipe unions to the connector.
4 Bleed the brakes.

CONNECTOR—4-WAY

Remove and refit **70.15.35**



Removing
1 Clean the connector and unions.
2 Disconnect the brake pipe unions from the connector.
3 Remove the bolt securing the connector to the scuttle.

Refitting
4 Reverse instructions 2 and 3.
5 Bleed the brakes.

P.D.W.A. UNIT

— Remove and refit **70.15.36**

Removing
1 Release the snap connector from P.D.W.A. unit.
2 Disconnect the four brake pipe unions at P.D.W.A. unit.
3 Support the service interval indicator(s) and remove the bolt securing P.D.W.A. unit to the car.
4 Withdraw the P.D.W.A. unit.

Refitting
5 Reverse instructions 1 to 4.
6 Bleed the brakes.
7 Check operation of brake circuit warning light and ensure that the P.D.W.A. shuttle is centralised.

HYDRAULIC PIPES

To aid identification of individual pipes, operation numbers are included in the illustration showing the general arrangement of the brake system for right-hand steering cars.

Pipe—master cylinder to 4-way connector—remove and refit **70.20.01**

Pipe—4-way connector to L.H. front hose—remove and refit **70.20.02**

Pipe—4-way connector to R.H. front hose—remove and refit **70.20.03**

Pipe—L.H. front hose to caliper—remove and refit **70.20.04**

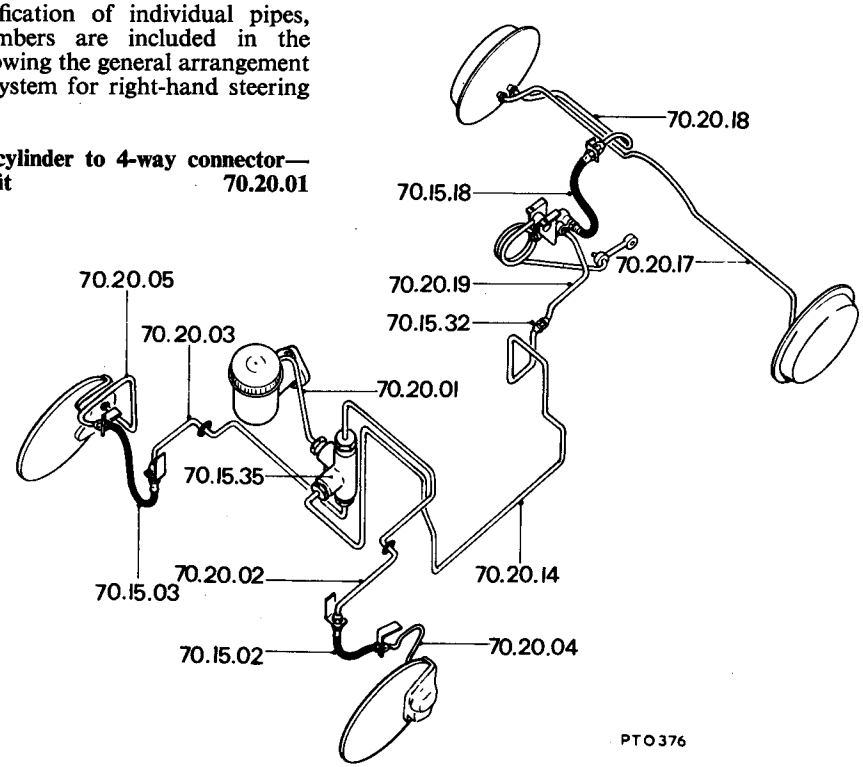
Pipe—R.H. front hose to caliper—remove and refit **70.20.05**

Pipe—4-way connector to 2-way connector—remove and refit **70.20.14**

Pipe—R.H. rear cylinder to L.H. cylinder—remove and refit **70.20.17**

Pipe—rear hose to R.H. rear wheel cylinder—remove and refit **70.20.18**

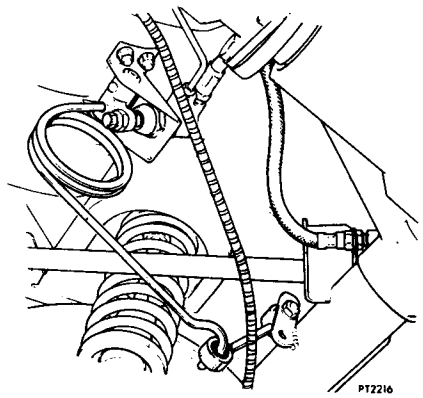
Pipe—feed from 2-way connector—remove and refit **70.20.19**



LOAD SENSING VALVE

Description **70.25.00**

A load sensing valve is installed in the brake circuit between the master cylinder and the rear wheel cylinders. Its function is to vary and to optimize rear wheel hydraulic braking effort to suit conditions of load, road surface undulations and the affect of weight transference, ensuring that rear wheel retardation is directly apportioned to the load carried by the rear wheels at any given instant.

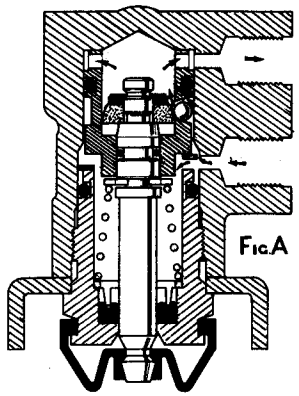


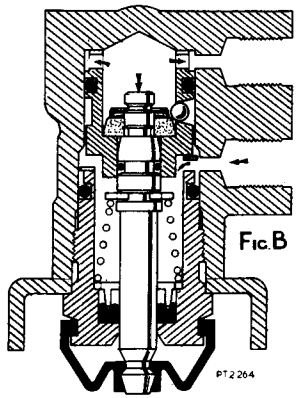
A coil spring linking the load sensing valve to the rear axle mechanically relates vehicle load to the sensing valve piston, which, through the influence of mechanical loading and brake-line pressure reacts to meter and/or reduce braking effort to the rear wheels to suit the load conditions of the rear axle.

Operation
The position of the piston in the valve body is determined by: (a) the combined load transmitted by the axle linkage, the effort of the spring in the lower chamber, and (b) hydraulic force in the upper and lower chambers.

When the brakes are applied fluid is forced through the inlet port to the lower chamber and also through the ball valve and sleeve port to the upper chamber and thence through the outlet port to the rear wheel cylinders (Fig. A).

Since piston upper area exceeds piston lower area (due to the presence of the piston rod), a pressure differential exists. In the upper chamber is a pure hydraulic force, while in the lower chamber there is hydraulic force plus spring pressure and mechanical loading through the axle linkage. It follows, therefore, that so long as combined hydraulic and mechanical forces in the lower chamber is greater than the hydraulic effort in the upper chamber the piston will remain raised. In this position the ball valve is held from its seat and brake-line pressure will expand the wheel cylinders. This condition prevails on initial brake application and also under heavy axle loads. Axle loading, however, is a variable factor influenced by road undulations and the shift of weight transference due to gradient changes and the action of braking forces. These changes and therefore varying piston loads are sensed by the pressure differential in the two chambers. When the force acting on the upper side of the piston exceeds the force and mechanical effort on the lower side of the piston the piston is forced downwards causing the ball valve to restrict or shut off fluid flow to the rear brakes (Fig. B). When this occurs, rear wheel cylinder pressure is held static until changes in pedal pressure or vehicle response to road gradients or undulations cause the piston to move and alter rear braking effort. Thus rear braking effort is constantly apportioned to the load carried by the rear wheels at any given moment.

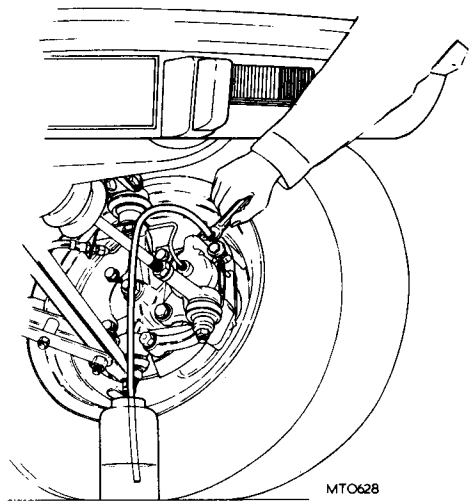




BRAKES

Bleed **70.25.02**

Do not allow the fluid level in the reservoir to fall below half capacity. When topping-up during the bleeding process, do no use aerated fluid exhausted from the system. Do not bleed the system with the servo in operation (engine running).



1 Release the hand brake.
2 Attach the bleed tube to the bleed nipple of the front caliper farthest from the master cylinder, allowing the free end of the bleed tube to hang submerged in brake fluid in a transparent container.
3 Open the bleed nipple (90 to 180 degrees).
4 Depress the brake pedal fully and follow with three rapid, successive strokes. Allow the pedal to return. Repeat until fluid free from air bubbles issues from the wheel cylinder.
5 Depress the brake pedal, close the nipple and release the pedal. Remove the tube.
6 Attach the bleed tube to the opposite front caliper and repeat instructions 4 and 5.
7 Attach the bleed tube to the single nipple on the rear backplate (right-hand steering—left-hand backplate, left-hand steering—right-hand backplate) and repeat instructions 4 and 5.
8 Remove the bleed tube.
9 Check operation of brake circuit warning light and ensure that the P.D.W.A. shuttle is centralized.

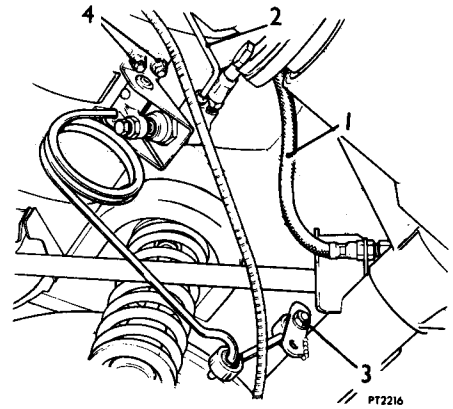
BRAKES

Adjust **70.25.03**

Self-adjusting brakes are fitted to front and rear. Front adjustment is hydraulically self-compensating to provide for brake pad wear. Rear adjustment is mechanically automatic via the hand brake linkage.

LOAD SENSING VALVE ASSEMBLY

Remove and refit **70.25.23**



Removing

1 Remove the rear brake hose, see 70.15.17.
2 Disconnect the brake fluid feed pipe from the sensing valve body.
3 Disconnect the sensing valve link from the axle bracket.
4 Remove the four nyloc nuts and plain washers securing the sensing valve bracket to the vehicle.
5 Withdraw the sensing valve assembly.

Refitting

6 Reverse instructions 1 to 5.
7 Bleed the brakes.

NOTE: If the sensing valve has been dismantled or if a replacement unit has been substituted it is necessary to reset the valve linkage, see 70.25.30.

LOAD SENSING LINKAGE

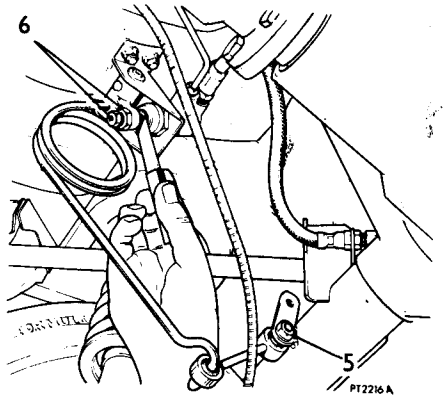
Adjust **70.25.30**

Adjustment to the load sensing linkage must be carried out with the vehicle on a level surface and with all wheels carrying their normal share of vehicle weight. **DO NOT** attempt to adjust the linkage with the rear axle raised on a jack.

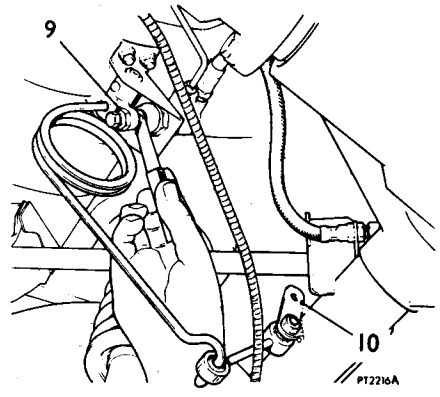
It is important to note that to obtain a correct setting the car must be complete in all respects, i.e. if the spare wheel, bumper, rear seat, etc. have been removed for repair they must be refitted **before** making adjustment to the sensing linkage.

The critical nature of sensing linkage adjustment is indicated by the presence of the table below which relates valve setting clearance to fuel tank capacity.

1 Drive the car on a ramp.
2 Ensure that the blakes have been bled.
3 Bounce the rear end of car to ensure that the suspension is 'settled', i.e. the car is in its normal static load condition.
4 Locate jacks (2) under the car rear jacking points and raise the jacks until they just touch the car. The object is not to [illegible] car but to prevent alteration to [illegible] suspension height when an assistant sits in the car to pump the brake pedal.



5 Move the sensing valve link to the lower hole in the axle bracket and secure with spring washer and nut.
6 Slacken the adjuster locknut and unscrew the adjuster.
7 Seat an assistant in the car and have him apply the brakes about six times to destroy the vacuum in the servo.
8 Have the assistant apply the brakes with a force of approximately 60 lbf (27 kgf): at the same time adjust the linkage gap by means of the adjusting screw. (Refer to table for required clearance.) It is important that adjustment is made as quickly as possible once the assistant presses the brake pedal. Force applied to the brake pedal must not be released or reduced until adjustment is complete. Note that delay in making adjustment by the assistant can allow the valve piston to move downwards and result in inaccurate setting. Where doubt exists or delay has occurred, repeat the above setting procedure.

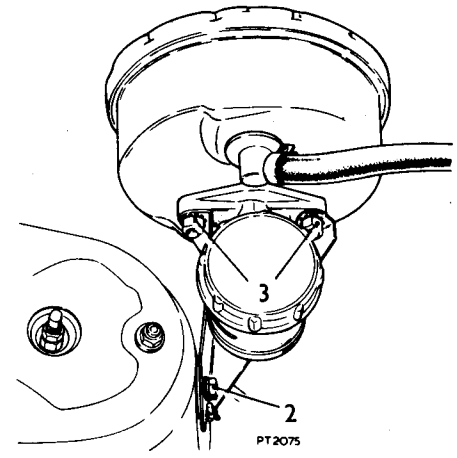


9 Tighten the adjuster locknut.
10 Move the adjuster link from the lower hole to the top hole in the axle bracket.
11 Remove the jacks.
12 Lower the ramp.

Fuel tank level	Empty	¼	½	¾	Full
Gap	0·035 in (0·89 mm)	0·025 in (0·64 mm)	0·015 in (0·38 mm)	0·005 in (0·13 mm)	0·005 in (0·13 mm) Pre-load, i.e. 0·002 in (0·051 mm) gap **plus** one flat of adjuster screwed **in**

MASTER CYLINDER

Remove and refit **70.30.01**



Removing

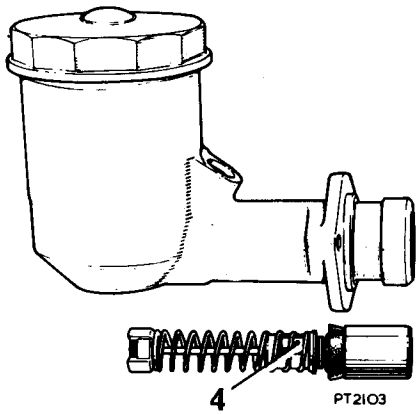
1 Disconnect the brake pipe(s) at the master cylinder. Plug the master cylinder to prevent fluid discharge from the reservoir. Seal the brake pipe to prevent ingress of foreign matter.
2 Remove the bolt securing the earth wires (where fitted) and the front end of the master cylinder bracket to the valance.
3 Remove the two nuts and shakeproof washers securing the bracket and master cylinder to the servo and withdraw the bracket and master cylinder.

Refitting

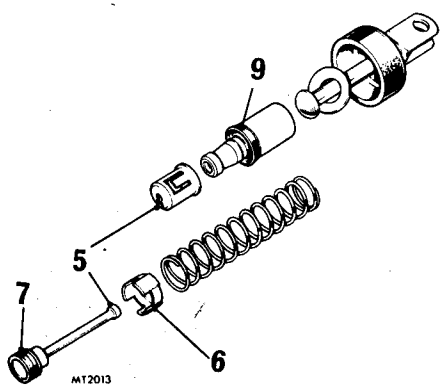
4 Reverse instructions 1 to 3.
5 Bleed the brakes.

MASTER CYLINDER

Overhaul **70.30.02**



1 Drain the fluid reservoir.
2 Apply a low pressure air-line to the fluid outlet and eject the piston and seal assembly from the cylinder.
3 Clean the cylinder bore and inspect it for damage and corrosion. Renew the cylinder if the bore is damaged or corroded.
4 Straighten the prong of the spring thimble and remove the thimble from the piston.

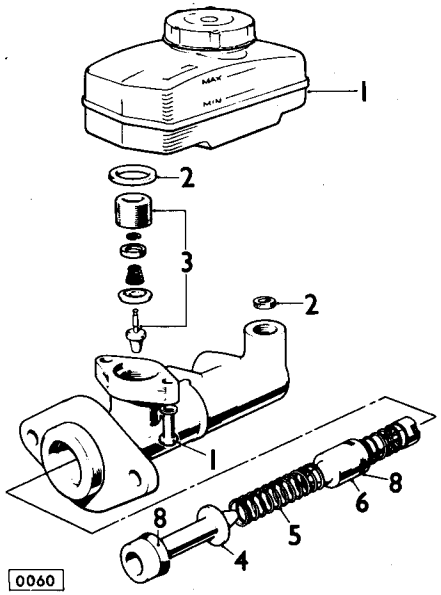


5 Release the valve stem from the keyhole slot in the thimble.
6 Slide the valve seal spacer along the valve stem.
7 Remove the valve seal from the valve stem and fit a new seal.
8 Assemble the spacer, spring and thimble to the valve stem.
9 Remove the seal from the piston and fit a new seal (seal lip towards the spring).
10 Engage the spring thimble on the piston and carefully depress the thimble prong.
11 Lubricate the bore of the master cylinder with clean brake fluid and insert the seal assembly, spring, and piston.

MASTER CYLINDER (Dual Braking System)

Overhaul **70.30.02**

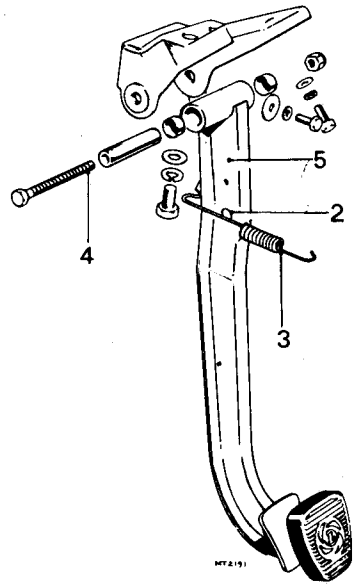
1 Remove two screws holding the reservoir to the master cylinder and prise the reservoir off the master cylinder.
2 Remove the reservoir seals.
3 Unscrew the tipping valve assembly.
NOTE: Do not dismantle the assembly at this stage.
4 Using a low pressure air-line, remove the primary piston assembly.
5 Remove the spring.
6 Using a low pressure air-line, remove the secondary piston assembly.
7 Clean the cylinder bore and inspect it for damage or corrosion. Renew the cylinder if the bore is damaged or corroded.



8 Replace the primary and secondary piston seals.
9 Renew the reservoir seals and the tipping valve as necessary.
10 Lubricate the bore with clean brake fluid. Fit the secondary piston assembly, spring and primary piston assembly to the master cylinder.
11 Hold the primary piston in place with finger pressure whilst replacing the tipping valve assembly. Tighten the tipping valve socket screw to a torque of 40 lbf ft (5·5 kgf m).
12 Fit the reservoir seals.
13 Fit the reservoir to the master cylinder, ensuring that it is correctly seated before fitting and tightening the two holding screws.

BRAKE PEDAL

Remove and refit **70.35.01**



Removing
1 Remove the instrument panel, see 88.20.01.
2 Remove the clevis pin securing the pedal to the master cylinder rod.
3 Disconnect the pedal return spring.
4 Remove the pedal pivot bolt and nut.
5 Withdraw the brake pedal complete with bushes and pivot sleeve.

Refitting
6 Reverse instructions 1 to 5.

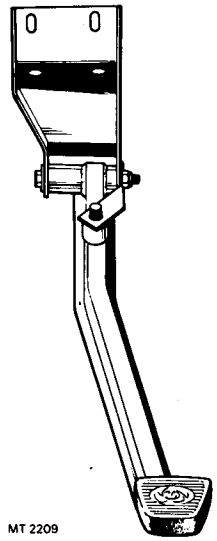
BRAKE PEDAL

Overhaul **70.35.02**

1 Remove the brake pedal, see 70.35.01.
2 Withdraw the sleeve from the pedal.
3 Remove the pedal bushes.
4 Fit new bushes, lubricate and insert a new sleeve.
5 Remove and renew the pedal pad rubber.
6 Fit the pedal to the car, see 70.35.01.

BRAKE PEDAL AND BRACKET

Remove and refit **70.35.05**

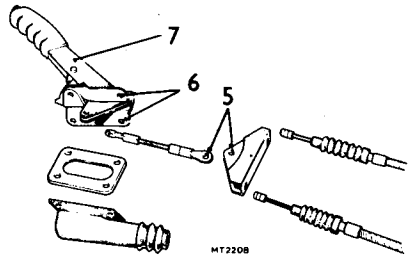


Removing
1 Remove the fascia, see 74.46.01.
2 Remove the windscreen wiper linkage.
3 Remove the clevis pin securing the brake pedal to the master cylinder rod.
4 Disconnect the pedal return spring.
5 Remove the bolts, spring washers and plain washers securing the pedal bracket to the scuttle.
6 Withdraw the brake pedal and bracket.

Refitting
7 Reverse instructions 1 to 6.

HAND BRAKE LEVER ASSEMBLY

Remove and refit **70.35.08**

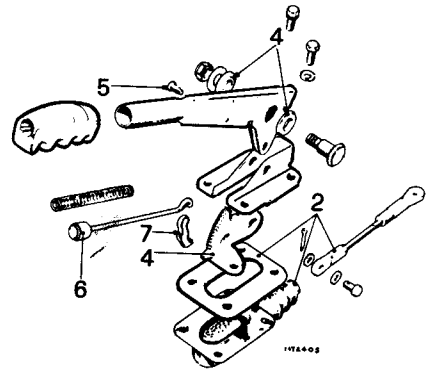


Removing
1 Remove both front seats and seat runners, see 76.70.04/05.
2 Peel back the carpet to expose the hand brake.
3 Remove the hand grip from the hand brake lever and withdraw the hand brake gaiter.
4 Release the hand brake.
5 Remove the clevis pin securing the hand brake rod to the compensator.
6 Remove the four bolts and spring washers securing the hand brake bracket to the floor of the car.
7 Withdraw the hand brake lever and bracket assembly.

Refitting
8 Reverse instructions 1 to 7.

HAND BRAKE LEVER, PAWL, AND RATCHET

Remove and refit **70.35.09**

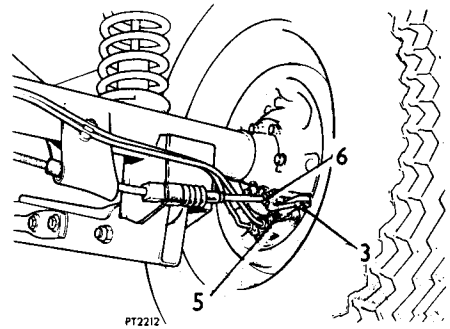


Removing
1 Remove the hand brake lever assembly, see 70.35.08.
2 Remove the link, gaiter and lower plate.
3 Remove the nut and fulcrum pin from the hand brake mounting bracket.
4 Withdraw the ratchet and bushes from the hand brake lever.
5 Drill or file the riveted end of the pawl fulcrum pin until the end of the pin is flush with the hand brake lever.
6 Depress the hand brake button and retain it in this position with tape.
7 Remove the pawl fulcrum pin and withdraw the pawl.

Refitting
8 Enter a new pawl in the hand brake lever, ensuring that the curved end of the pawl engages the release rod.
9 Fit a new pawl fulcrum and secure it by riveting.
10 Fit the ratchet and bushes to the hand brake lever.
11 Fit the hand brake bracket, ratchet and fulcrum pin.
12 Remove the tape from the release button.
13 Refit the hand brake link, and gaiter and lower plate.
14 Fit the hand brake lever assembly to the car, see 70.35.08.

HAND BRAKE CABLES

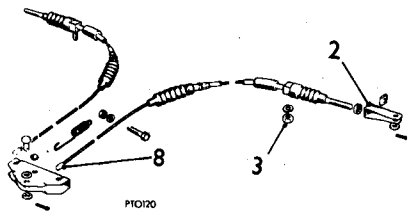
Adjust **70.35.10**



1 Jack up the rear wheels and support the car on stands.
2 Release the hand brake.
3 Disconnect the hand brake cables at the rear backplates.
4 Operate the hand brake lever on the backplates to obtain minimum brake-shoe/brake-drum clearance.
5 Maintaining the compensator in the central position, adjust the cable forks so that the clevis pins can be entered without straining the cables. Ensure that the rear wheels do not drag.
6 Tighten the locknuts on the cable forks and fit new cotters to the clevis pins.
7 Remove the stands and lower the jack.

HAND BRAKE CABLE ASSEMBLY

Remove and refit **70.35.16**



Removing

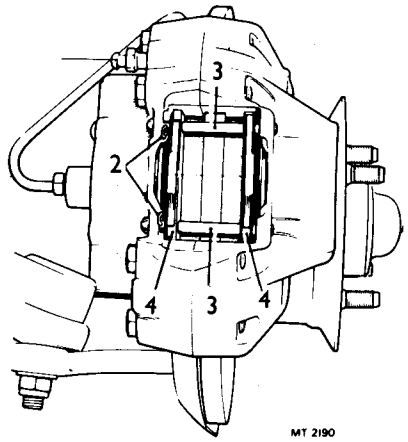
1 Release the hand brake.
2 Disconnect the cable fork from the backplate lever.
3 Remove the nut securing the cable rear support to the suspension bracket and detach the cable support.
4 Release the cable sheath and rubber bush from the clip on the axle casing.
5 Withdraw the cable fork through the bracket on the axle casing.
6 Remove the pinch-bolt, nut and plain washers from the cable sheath front bracket.
7 Withdraw the cable sheath rearwards clear of the front bracket and ease the cable wire downwards.
8 Release the nipple on the front end of the cable from the hand brake compensator, and withdraw the cable.

Refitting

9 Engage the nipple on the front end of the cable in the hand brake compensator.
10 Slide the cable into position in the front bracket and engage the cable sheath in the bracket. Fit the bolt, plain washers and nut. Do not overtighten the pinch bolt. Slide the rubber boot rearwards to engage the cable sheath.
11 Thread the cable fork through the bracket on the axle casing.
12 Insert the rubber bush and cable sheath into the axle casing clip.
13 Attach the cable sheath rear support to the suspension bracket and secure it with the nut.
14 Adjust the fork at the rear end of the cable so that the clevis pin engages the fork and backplate lever. Ensure that the hand brake compensator remains central.
15 Fit the cotter pin to the clevis pin.

FRONT BRAKE PADS

Remove and refit **70.40.02**

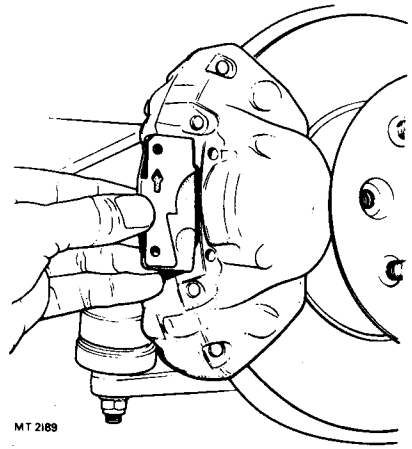


Removing

1 Jack up the car and remove the road wheel.
2 Withdraw the two spring pins from the brake pad retaining pins.
3 Withdraw the brake pad retaining pins (2).
4 Lift out the brake pads and damping shims or springs. If the brake pads and damping shims are not to be renewed, it is important to ensure that they are not intermixed.

Refitting

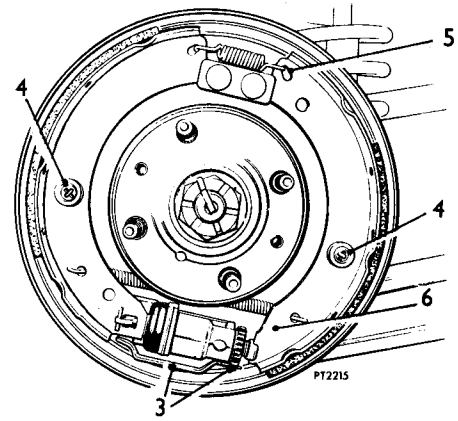
5 Ease the caliper pistons into the bores to provide the extra clearance to accommodate the new, unworn brake pads. This operation can be facilitated by applying pressure to the piston and at the same time opening the caliper bleed nipple. Close the nipple when the piston has moved the required amount and repeat on the opposite piston in the caliper. Subsequent bleeding is not usually necessary.
6 Remove dust and clean the brake pad locations in the caliper.



7 Fit the brake pads and damping shims or springs to the caliper. Ensure that the angled edge of the shim rests on the brake pad and that the arrow on the shim points in the direction of the disc forward rotation.
NOTE: Firmly depress the footbrake pedal several times to correctly locate the friction pads.
8 Engage the pad retaining pins in the caliper and secure with spring pins.
9 Fit the road wheel and remove the jack.
10 Check the fluid level in the reservoir, and top up as necessary.

REAR BRAKE-SHOES

Remove and refit **70.40.03**



Removing

1 Jack up the car and remove the road wheel.
2 Release the hand brake and remove the brake-drum.
3 Ease the operating lever on the underside of the wheel cylinder clear of the ratchet wheel and rotate the ratchet wheel to release brake adjustment.
4 Remove the shoe steady cups, springs and pins.
5 Release the trailing shoe from the anchor plate.
6 Release the trailing shoe from the ratchet end of the wheel cylinder.
7 Disconnect the shoe return springs and remove the brake-shoes.

Refitting

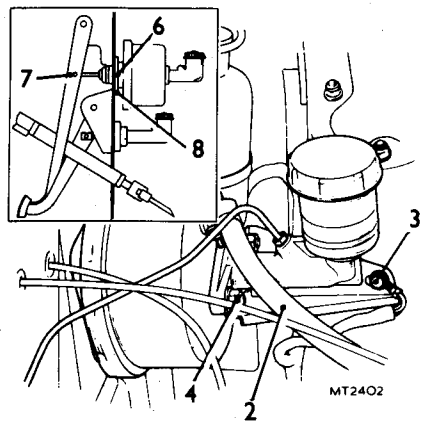
8 Arrange the shoes in the manner in which they are to be assembled on the backplate, ensuring that the small support plate is fitted to the hand brake lever slot in the leading shoe.
9 Attach the lower shoe return spring to both shoes (spring fitted inboard of shoe webs).

continued

10 Offer up the shoes to the backplate engaging the leading shoe in the hand brake lever, wheel cylinder and anchor plate.
11 Engage the trailing shoe in the ratchet end of the wheel cylinder.
12 Fit the upper, shoe return spring (spring fitted outboard of shoe webs) and engage the trailing shoe in the anchor plate.
13 Fit the shoe steady pins, springs and cups.
14 Centralize the shoes and fit the brake-drum and road wheel.
15 Operate and release the hand brake several times to adjust the brake.

BRAKE SERVO

Remove and refit 70.50.01

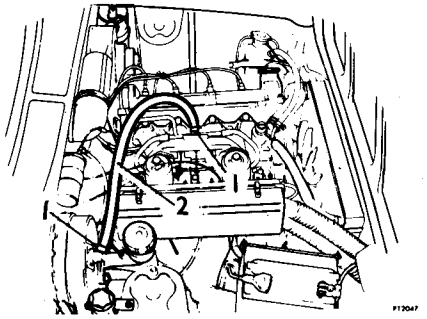


Removing
1 Remove the air cleaner (Right-hand Steering cars only).
2 Disconnect the vacuum hose at the servo non-return valve.
3 Remove the bolt and washers securing the master cylinder bracket to the suspension turret.
4 Remove the two nuts and spring washers securing the bracket and master cylinder flange to the servo, and withdraw the bracket.
5 Carefully ease the master cylinder clear of the servo, taking care to avoid damage to the master cylinder outlet pipe.
6 Remove the two nuts and spring washers securing the servo to the scuttle.
7 Remove the split pin, plain washer and clevis pin securing the servo operating rod to the brake pedal.
8 Release the two harness clips and carefully move the harness aside to gain access to the two nuts and spring washers securing the servo to the inside of the car. Remove the two nuts and spring washers.
9 Withdraw the servo.

Refitting
10 Reverse instructions 1 to 9.

VACUUM HOSE

Remove and refit 70.50.14



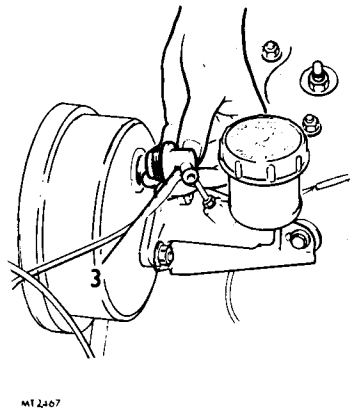
Removing
1 Slacken the vacuum hose clips at the manifold and servo non-return valve.
2 Release the hose from the manifold and non-return valve.

Refitting
3 Reverse instructions 1 and 2.

NON-RETURN VALVE

Remove and refit 70.50.15

Removing
1 With the engine stopped, depress the brake pedal to destroy the vacuum in the servo.
2 Slacken the hose clip securing the vacuum hose to the non-return valve and disconnect the hose.

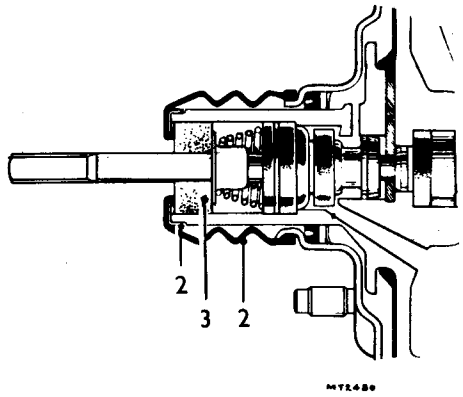


3 Withdraw the non-return valve from the servo.

Refitting
4 Renew the sealing rubber as necessary, and press the non-return valve into position in the servo.
5 Connect the vacuum hose to the non-return valve and tighten the hose clip.

BRAKE SERVO

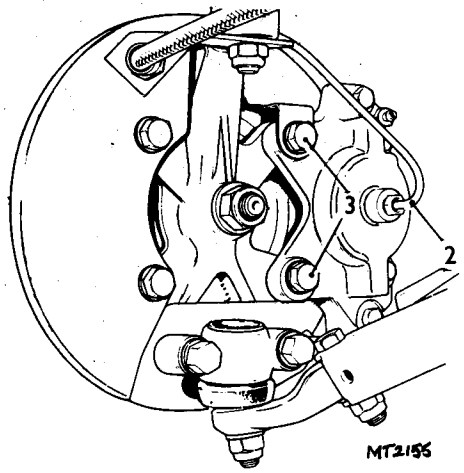
Renewing filter 70.50.25



1 Remove the servo from the car, see 70.50.01.
2 Remove the rubber boot and end-cap.
3 Remove the filter from the neck of the servo housing.
4 Fit the new filter into position in the servo housing.
5 Fit the end-cap and rubber boot.
6 Fit the servo to the car, see 70.50.01.

BRAKE CALIPER — FRONT

Remove and refit 70.55.02



Removing

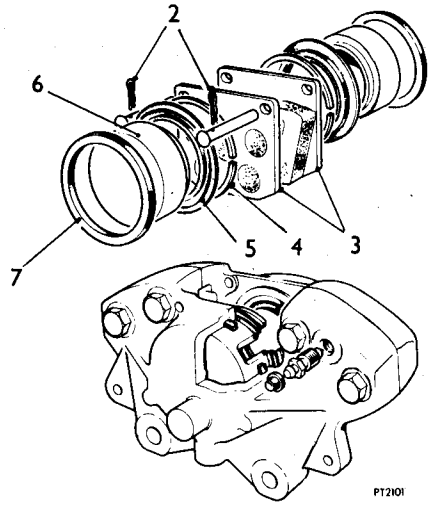
1 Jack up the car and remove the front wheel.
2 Disconnect the brake pipe union at the caliper and seal the fluid connections to prevent entry of grit.
3 Remove the two bolts and spring washers securing the caliper lugs to the vertical link.
4 Withdraw the caliper.

Refitting

5 Engage the caliper on the disc and align the locating lugs on the vertical link.
6 Fit and tighten the two bolts and spring washers.
7 Connect the brake pipe to the caliper.
8 Bleed the brakes.
9 Fit the road wheel and remove the jack.

BRAKE CALIPER — FRONT

Renew seals 70.55.13



Dismantling

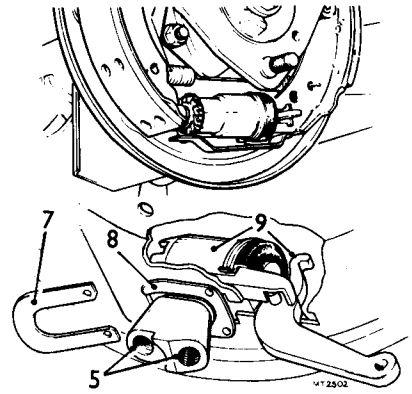
1 Remove the caliper, see 70.55.02.
2 Remove the spring pins from the brake pad retaining pins.
3 Withdraw the pad retaining pins and remove the brake pads and shims.
4 Remove the circlip retaining the piston dust covers.
5 Remove the dust covers.
6 Extract the caliper pistons. Piston removal may be facilitated by using a low pressure air-line. Do not interchange the pistons.
7 Prise out the cylinder seals, taking care not to damage the cylinder bore.
8 Thoroughly clean the caliper and pistons, using brake fluid or methylated spirit. If either pistons or bores are scored or corroded, a new caliper must be obtained.

Reassembling

9 Carefully install new seals in the cylinder bores.
10 Lubricate the bores and pistons with clean brake fluid.
11 Evenly enter the pistons into their original locations in the caliper.
12 Fit new dust covers and circlips.
13 Fit the caliper to the vertical link and connect the brake pipe, see 70.55.02.
14 Fit the brake pads and shims, ensuring that the arrow on the shims points in the direction of disc forward rotation.
15 Fit the pad retaining pins and spring pins.
16 Bleed the brakes.
17 Fit the road wheel and remove the jack.

REAR WHEEL CYLINDER

Remove and refit 70.60.18



Removing

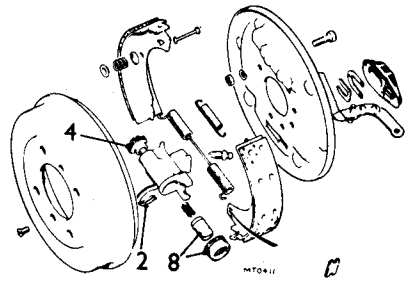
1 Jack up the car, remove the rear wheel and release the hand brake.
2 Remove the brake drum, see 70.10.03.
3 Remove the brake-shoes, see 70.40.03.
4 Disconnect the hand brake cable at the rear of the backplate.
5 Disconnect the fluid feed pipe union at the wheel cylinder (left-hand side only).
or
Disconnect the fluid feed and transfer pipe unions at the wheel cylinder (right-hand side only).
6 Remove the wheel cylinder rubber boot at the rear of the backplate.
7 Remove the horse-shoe clip securing the wheel cylinder to the backplate.
8 Remove the spring plate located behind the horse-shoe clip.
9 Withdraw the wheel cylinder complete with lever.

Refitting

10 Reverse instructions 1 to 9.
11 Apply and release the hand brake several times to adjust the rear brakes.
12 Bleed the brakes.

REAR WHEEL CYLINDER

Overhaul 70.60.26



1 Detach the lever from the wheel cylinder.
2 Remove the clip retaining the rubber boot to the wheel cylinder body.
3 Remove the rubber boot, piston and seal.
4 Remove the screwed rod and adjuster wheel from the closed end of the wheel cylinder.
5 Clean and examine the cylinder and piston, and renew as necessary.
6 Check that the adjusting wheel rotates freely on the screwed rod.
7 Smear the cylinder bore with clean brake fluid.
8 Renew the piston seal and rubber boot and insert the piston in the cylinder.
9 Fit the clip to the rubber boot.
10 Insert the adjuster wheel and screwed rod in the cylinder, ensuring that the adjustment is fully slackened off.
11 Fit the hand brake operating lever to the wheel cylinder.

TYRES

74.10.00

Tyres of the correct type and dimensions, at the correct cold inflation pressures, are an integral part of the vehicle's design and regular maintenance of tyres contributes not only to safety but to the designed functioning of the vehicle. Road-holding, steering and braking are especially vulnerable to incorrectly pressurized, badly fitted or worn tyres.

Tyres of the same size and type but of different make may have widely varying characteristics. It is therefore recommended that tyres of the same make and type are fitted to all wheels.

Radial and cross-ply tyres

Radial, tubeless tyres are fitted as original equipment. It is dangerous, and in the U.K. illegal, to use on public roads a vehicle fitted with unsuitable combinations of tyres. The following recommendations should be observed.

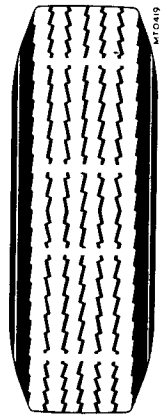
1 Do not mix radial and cross-ply tyres on the same axle.
2 Do not fit radial tyres to the front wheels and cross-ply tyres to the rear wheels.
3 With suitable tyre pressure adjustment it may be possible to obtain acceptable handling with cross-ply tyres on the front wheels and radial tyres on the rear wheels but this combination is not recommended.

Tyre Pressures

The tyre pressures recommended, see **Data**, provide optimum ride and handling characteristics for all normal conditions. Tyre pressures should be checked, and adjusted as necessary, at weekly intervals. Pressure checks should be carried out with the tyres cold, i.e. not immediately following a run, as pressure and temperature increase when running. 'Bleeding' a warm tyre to the recommended pressure can result in underinflation when the tyre cools. This can be dangerous and also harmful to the tyre. Pressure loss, with time, is normal but if a pressure drop exceeds 2 lbf/in² (0·14 kgf/cm²) in a period of one week, investigation should be made. In the U.K. it is an offence to use a vehicle with tyres improperly inflated.

The spare wheel tyre should be maintained at rear tyre pressure and adjusted if fitted to the front of the car.

Wear



All tyres fitted as original equipment incorporate wear indicators in the tread pattern. When the tread has worn to a depth of approximately 1·5 mm the wear indicators are exposed as bars which connect the tread pattern across the width of the tread. In the U.K. and some other countries it is illegal to use tyres when the tread has worn to a depth of less than 1 mm.

The characteristics of many tyres alter progressively with wear, particularly with regard to 'wet grip' and aquaplaning resistance which are gradually but substantially reduced. Extra care and speed restriction should therefore be exercised on wet roads as the effective tread depth diminishes.

Tyre wear is influenced by driving techniques, incorrect inflation, types of road surface and by misalignment and mechanical defects. Investigations into tyre wear must therefore consider a variety of factors.

Damage

Excessive localized distortion, caused by severe contact with kerbs or stones, can cause the tyre casing to fracture and may lead to premature tyre failure. Tyres should be periodically examined for cracks and cuts and all imbedded objects, flints, glass, etc. removed from the treads. Oil or grease on the rubber should not be allowed to remain but should be removed by the sparing use of fuel. Do not use kerosene which has a detrimental effect on rubber.

Heat

When paint spraying is to be carried out and the vehicle subjected to a drying or baking oven it is recommended that the wheels be removed, or at least that the tyres are relieved of the car weight.

Repairs – Tyres

A temporary repair can be made to tubeless tyres using a special kit provided that the puncturing hole is small and is within the central area. The following precautions must be observed:

1 Use only one plug in each hole.
2 Following a temporary repair, do not use the car at high speed.
3 At the earliest opportunity remove the tyre from the wheel and make an internal proper repair.

Winter tyres

Winter tyres are designed to provide improved traction and braking in conditions of mud and snow. Their performance on hard road surfaces may, however, be inferior to normal road tyres and extra care is therefore required when using them under normal conditions. The tyre manufacturer's recommendations regarding speed limitations must be observed.

Racing and competition tyres

Should the vehicle be tuned to increase its maximum speed, or be used for racing or competition, consult the respective tyre company regarding the need for tyres of special or racing construction.

Valves

When a new tubeless tyre is fitted the Schrader snap-in valve should also be renewed.

DATA

Type	Size	Vehicle Load	Pressures					
			Front			Rear		
			lbf/in²	kgf/cm²	bars	lbf/in²	kgf/cm²	bars
Radial ply—tubeless	175/70 HR—13	All conditions	22	1·55	1·5	24	1·69	1·7
Radial ply—tubeless	155 HR—13 (Special markets only)	All conditions	26	1·82	1·8	28	1·97	2·0

TYRE

Remove and refit **74.10.02**

Tyres will require replacement when the tread is worn below a safe limit or the tyre is damaged.
To avoid possible damage to either wheel or tyre, tyre removal should be entrusted to a specialist who will ensure that proper precautions on removal and fitment are observed.

WHEEL AND TYRE BALANCE

74.15.00

Alloy wheels
Using standard equipment, wheel and tyre assemblies should be dynamically balanced within $3\frac{1}{2}$ oz in.
Balance weights are available as follows: 15, 20, 30, 40, 50, 60 grams.

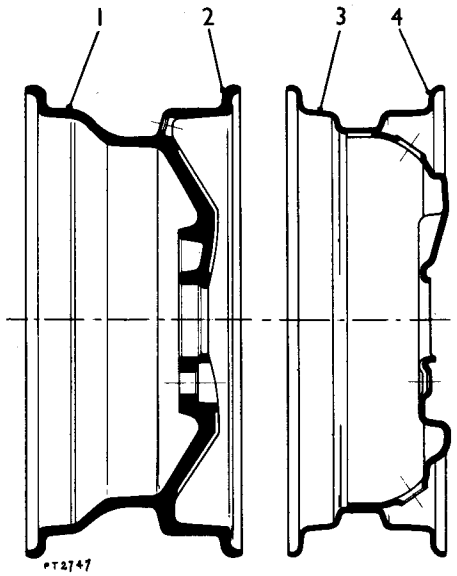
Steel wheels
Wheel and tyre assemblies should be statically balanced to within 5 ozf in. Balance weights are available in $\frac{1}{2}$ oz increments from $\frac{1}{2}$ oz to 3 oz.

WHEELS

General **74.20.00**

Standard fitting: 13 in (330 mm) cast alloy type, spigot mounted on hub $5\frac{1}{2}$J, flat safety ledge rims. Wheel retention on hubs by four $\frac{3}{8}$ in U.N.F. alloy special nuts tightened to 48 lbf ft (6·9 kgf m).
Special markets: Steel disc type, 13 in (330 mm). $4\frac{1}{2}$J, flat safety ledge rims. Wheel location and retention on hubs by four $\frac{3}{8}$ in U.N.F. studs and nuts tightened to 50 lbf ft (6·9 kgf m). When $\frac{7}{16}$ in U.N.F. studs are fitted, tighten nuts to 70 lbf ft (9·7 kgf m).

Wheel tolerances
On a wheel truly mounted and revolving about its axis:



Alloy wheels
1 **Lift:** Differences between the high and low points measured at any location on either tyre seat should not exceed 0·020 in (0·51 mm).
2 **Wobble:** Lateral variations measured on the vertical inside face of either rim flange should not exceed 0·020 in (0·51 mm).

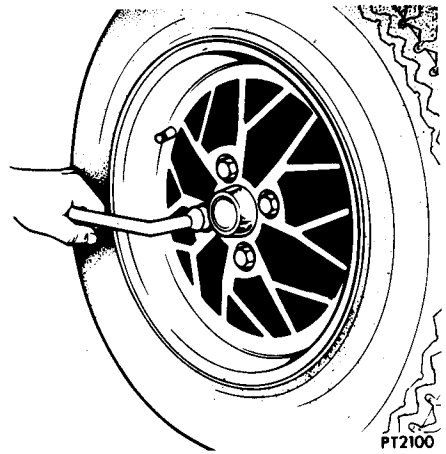
Steel wheels
3 **Lift:** The difference between the high and low points measured on either rim ledge should not exceed 0·045 in (1·143 mm).
4 **Wobble:** The lateral variation measured on the vertical inside face of a flange should not exceed 0·045 in (1·143 mm).

WHEEL

Remove and refit **74.20.01**

Removing
1 Slacken the road wheel retaining nuts.
2 Raise the car on a jack.
3 Remove the wheel nuts and withdraw the wheel.

Refitting
4 Ensure that the hub and wheel spigots are clean.
5 Engage the wheel in the hub spigot and the four hub studs.
6 Fit all four wheel nuts by hand.
7 Evenly tighten the wheel nuts, see 74.20.00.
8 Lower the car and remove the jack.

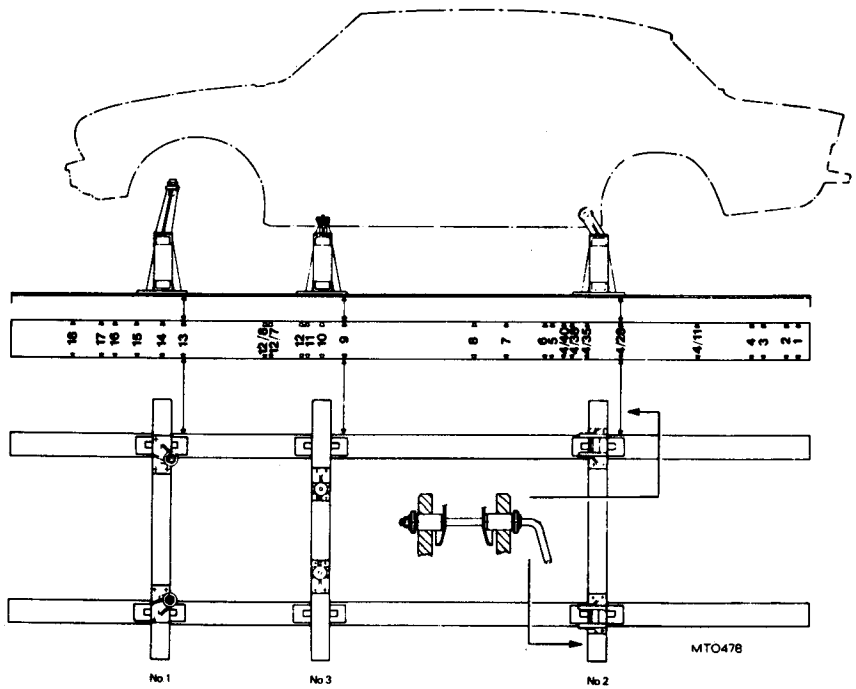


BODY UNIT

Alignment check **76.10.01**
(Using Churchill 700 or 707 system)

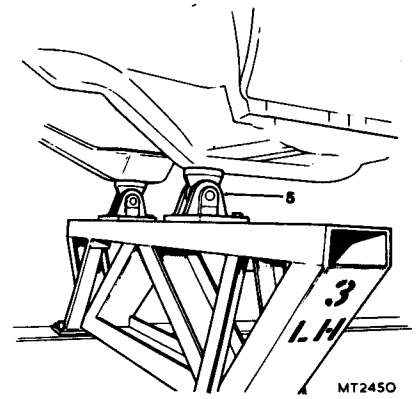
Whilst severe underframe damage is readily detected, less serious damage may cause distortion that is not visually apparent.
If steering or suspension checks indicate a fault which cannot be attributed to anything other than underframe distortion, initial checking should be carried out to determine the area and the extent of the distortion.

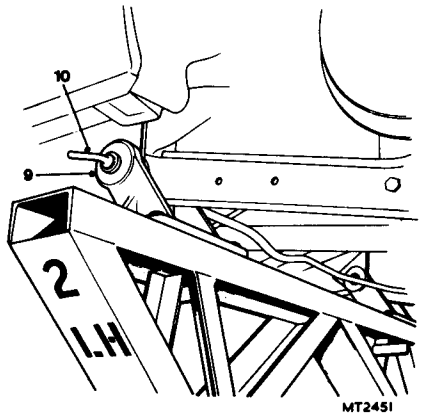
Initial check

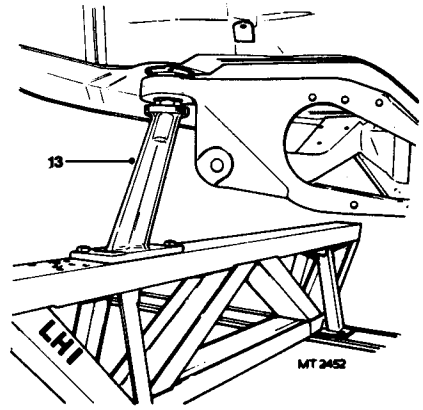


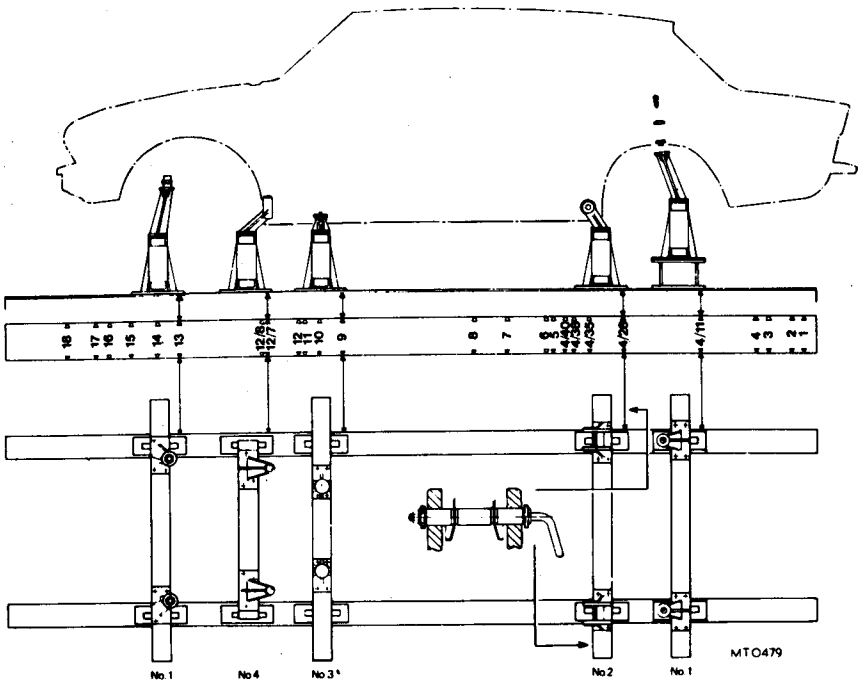
Transverse member locations for initial check

1 Clip the location tape to the right-hand side of the jig and make a chalk mark on the floor at each required location for initial checking.
2 Remove the tape to avoid damage.
3 Position the car centrally over the jig with the front wheel centres approximately 30 in (76 cm) from the front of the jig.
4 Raise the front of the car and fit transverse member No. 3 to the jig.
5 Fit two brackets (part No. S 700-38) to the transverse member, locating the inner bolt in hole 'J'.
6 Lower the car to locate the bracket pegs in the front tooling holes in the floor side-member.
NOTE: It may be necessary to slacken the adjacent exhaust clip bolt and move the exhaust pipe slightly to enable the L.H. bracket to be fitted correctly.
7 Raise the rear of the car by jacking on a wooden beam placed under the front edge of the luggage compartment floor. The beam must pass under the full width of the car and be notched to accept the exhaust and fuel feed pipes, etc.
8 Support the rear suspension arms, remove the forward pivot bolts and fit transverse member No. 2.
9 Fit brackets S 700-27/1 (L.H.) and S 700-27/2 (R.H.) to the transverse member, locating the outer bolt in hole 'G'.
10 Slacken the four anti-roll bar securing bolts. Lower the car and fit the four bushes S 700-27/3 and two pins S 700-27/5 to the trailing arm hangers.
11 Fit transverse member No. 1.
12 Support the sub-frame and remove the front mounting nuts, washers and the lower two retainers and mounting rubbers.
13 Fit brackets S 700-15/1 (L.H.) and S 700-15/2 (R.H.) together with adaptors S 700-15/4, locating the outer bracket bolt in hole 'D'.
14 Tighten the sub-frame front mounting bolts into the adaptors. Distortion, if any, of the underframe will now be apparent if the brackets do not engage with the body locations at any point. The following operations are only necessary if repairs are required.









Transverse member locations for repair

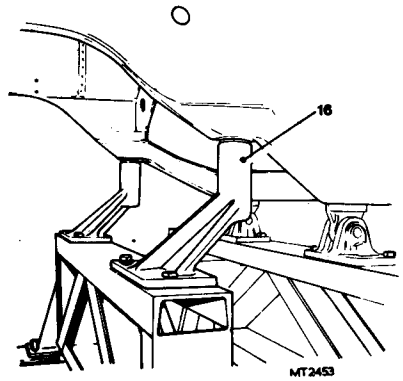
It may not be necessary to fit the full set of repair brackets. If damage is confined to the front end of the car, repair brackets can be fitted at the front and the initial check brackets retained at the rear or vice-versa in the case of rear-end damage.

Where it is necessary to remove sub-assemblies before fitting repair brackets, reference should be made to the appropriate repair operation manual section.

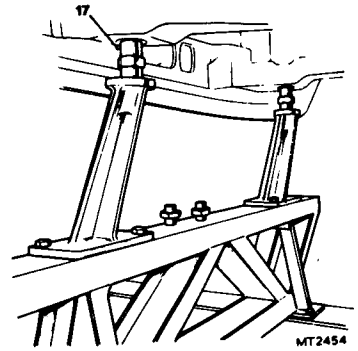
For front end repairs, the transverse members and brackets used for initial checking are used again in their original positions with the following additions:

15 Fit transverse member No. 4.

16 Fit brackets S 700-49/1 (L.H.) and S 700-49/2 (R.H.), locating the outer bracket bolt in hole 'C', with the brackets located on the sub-frame rear mounting tubes.



17 Remove the adaptors S 700-15/4 from transverse member assembly No. 1 and fit adaptors S 700-15/3, locating them in the sub-frame front mounting tubes.

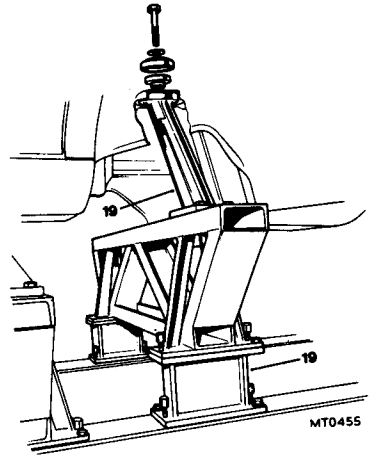


For rear end repairs, proceed as follows:

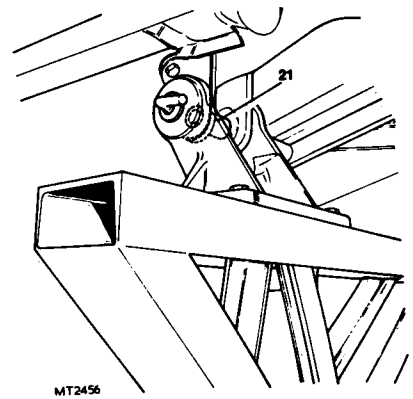
18 Fit transverse member No. 1 with the rear mounting holes at tape position 4/11.

19 Fit risers S 700-2A and brackets S 700-16/1 (L.H.) and S 700-16/2 (R.H.), locating the outer mounting bolts in hole 'G'.

20 Locate adaptors S 700-16/3 and S 700-16/4 with rear shock absorber upper mountings and fit bolts.



21 Fit two bushes S 700-27/6 to the trailing arm brackets in conjunction with transverse member assembly No. 2 and the bushes, pins and brackets used for initial checking.



SUB-FRAME

Alignment check **76.10.04**

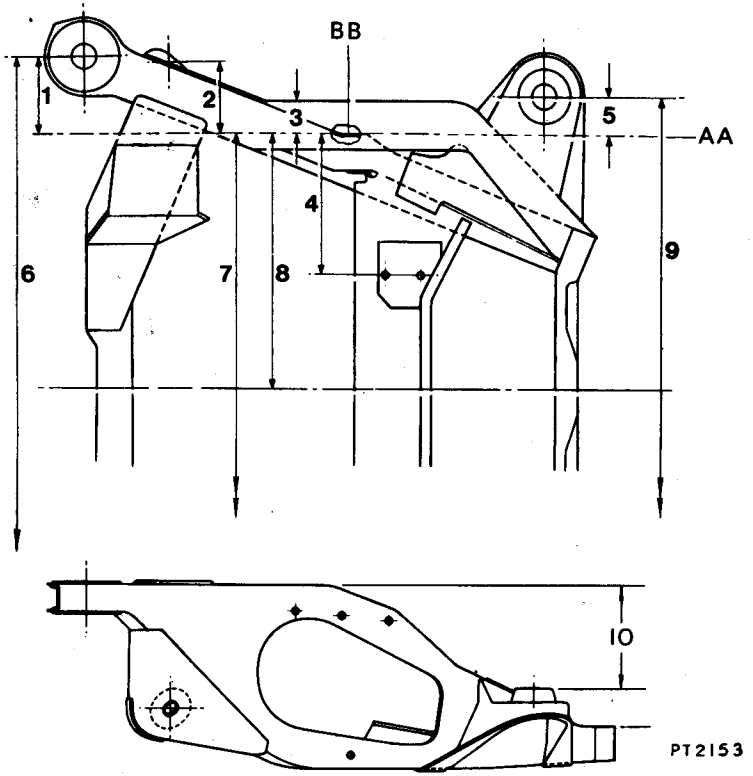
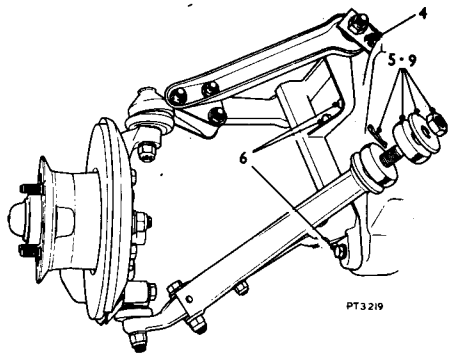


Diagram Number	Inches	Millimetres
AA Datum line		
BB Datum face		
1	3·57 ± 0·060	90·68 ± 1·53
2	3·19 ± 0·030	81·03 ± 0·76
3	1·47 ± 0·030	37·3 ± 0·76
4	6·256 ± 0·010	158·9 ± 0·25
5	1·72 ± 0·060	43·69 ± 1·53
6	30·20 ± 0·030	767·1 ± 0·76
7	23·06 ± 0·060	585·7 ± 1·53
8	11·53 ± 0·030	292·9 ± 0·76
9	26·50 ± 0·060	673·1 ± 1·53
10	5·01	127·2

FRONT SUB-FRAME

Renew **76.10.07**



Dismantling

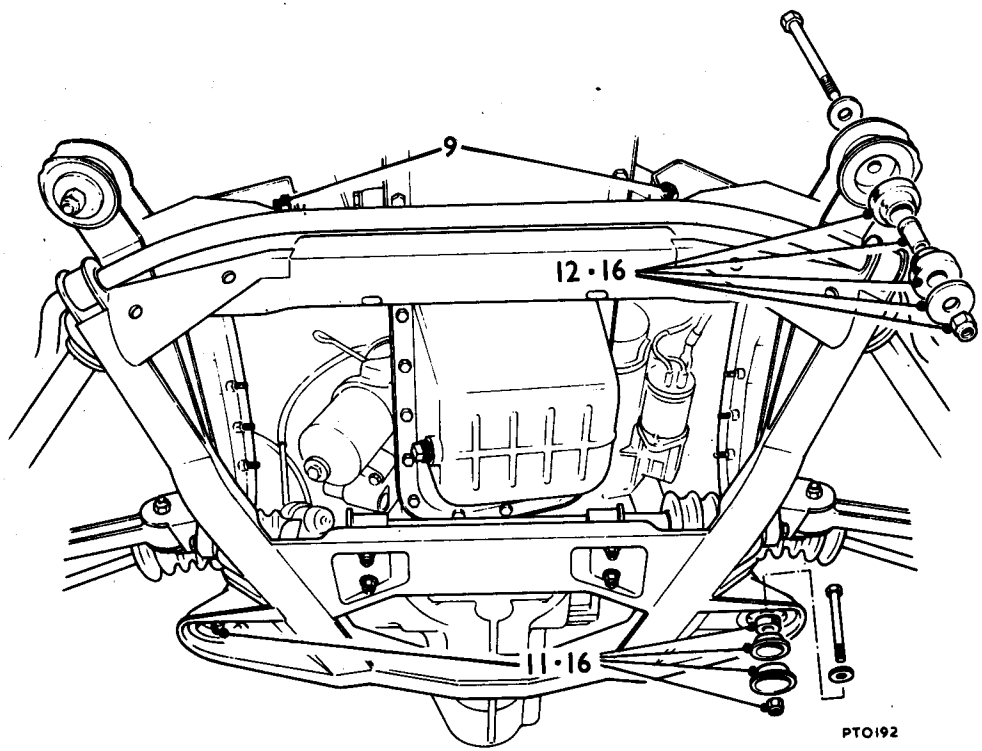
1 Remove the sub-frame assembly, see 76.10.29.
2 Remove the steering rack and pinion, see 57.25.01.
3 Remove the anti-roll bar, see 60.10.01.
4 Remove the four nuts, bolts and spring washers securing the wishbone stiffener brackets to the top of the sub-frame.
5 Remove the two spring clips, nuts, dished washers and outer rubber bushes from the sub-frame end of the radius rods.
6 Remove the eight nuts and bolts securing the mounting brackets to the sub-frame.
7 Detach the suspension and brake sub-assemblies and shims (if fitted) from the sub-frame.
8 Remove the two cable harness clips.

Assembly

9 Reverse instructions 1 to 8, ensuring that the radius rod nuts are tightened to 42 lbf ft (5·69 kgf m).
10 Check and adjust the camber angle, see 57.65.05.

FRONT SUB-FRAME ASSEMBLY

Remove and refit **76.10.29**



Removing

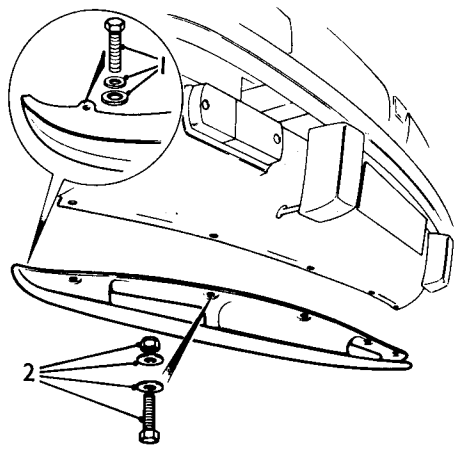
1 Remove the battery, see 86.15.01.
2 Jack up the front of the vehicle and support the body on stands. Support the sub-frame with a jack.
3 Support the engine with a hoist.
4 Set the road wheels in the straight-ahead position and lock the steering rack, see 57.40.22, instruction 5.
5 Remove the road wheels, see 74.20.01.
6 Remove the two nuts and brackets securing the brake hoses to the vertical links.
7 Remove the four bolts and spring washers securing the caliper lugs to the vertical link. Pull the calipers clear of the discs and support them.
8 Remove the two nuts and bolts securing the lower ends of the dampers to the wishbones.
9 Remove the four bolts securing the engine mountings to the sub-frame.
10 Remove the pinch-bolt from the lower end of the steering flexible coupling.
11 Remove the two nuts, retainers and mounting rubbers securing the rear of the sub-frame to the body.
12 Remove the two nuts, sleeves, retainers and mounting rubbers securing the front of the sub-frame to the body.
13 Slacken the two upper ball joint mounting bolts and ease out the shock absorbers.
14 Disconnect the cable harnesses from the two clips on the sub-frame.
15 Lower the jack and remove the sub-frame from the vehicle.

Refitting

16 Reverse instructions 1 to 15, ensuring that the nuts 12 and 11 are tightened to 48 lbf ft (6·9 kgf m).

SPOILER

Remove and refit **76.10.46**



Removing

1 Remove the two bolts, spring washers and plain washers.
2 Support the spoiler and remove the five nuts, bolts and ten plain washers securing it to the front panel.

Refitting

3 Reverse instructions 1 and 2.

'B' POST TRIM

Remove and refit **76.13.08**

Removing

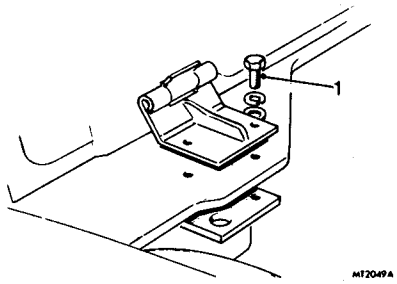
1 Remove the door draught welts.
2 Remove the safety harness top bolts.
3 Pull the trim pad edges from the body flanges, and detach.

Refitting

4 Reverse 1 to 3, using Dunlop SP758 adhesive on the trim pad and body flanges.

BONNET

Remove and refit **76.16.01**



Removing

1 Remove the four bolts, spring washers, plain washers, and two location plates. Lift off the bonnet, carefully releasing the bonnet stay from the rear end of the captive slide.

Refitting

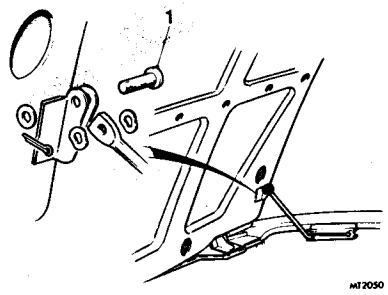
2 Reverse the above instruction, ensuring correct alignment.

BONNET STAY

Remove and refit **76.16.14**

Removing
1 Remove the split pin, washers and clevis pin.
2 Detach the bonnet stay.
CAUTION: Prevent the bonnet straining forward beyond its normal opening position when the bonnet stay is not fitted.

Refitting
3 Reverse instructions 1 and 2.

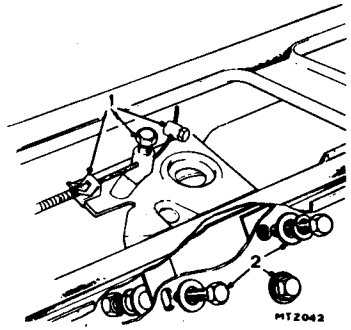


BONNET LOCK

Remove and refit **76.16.21**

Removing
1 Detach the release cable.
2 Remove the nut, bolts, spring and plain washers, and remove the lock.
NOTE: On L.H. Stg. models, the fan motor must be removed (see 80.20.15) before the lock can be removed.

Refitting
3 Reverse instructions 1 and 2, ensuring correct positioning of the lock.
4 Check release cable operation on lock before closing bonnet.

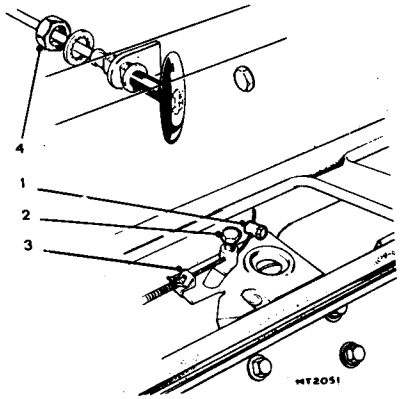


BONNET RELEASE CABLE

Remove and refit **76.16.29**

Removing
1 Remove the trunnion.
2 Slacken the pinch-bolt.
3 Pull the cable and clip from the catch plate.
4 Unscrew the nut.
5 Pull the cable out.
CAUTION: Do not close the bonnet with the cable removed or loose.

Refitting
6 Reverse instructions 1 to 5.
7 Check release cable operation on lock before closing bonnet.

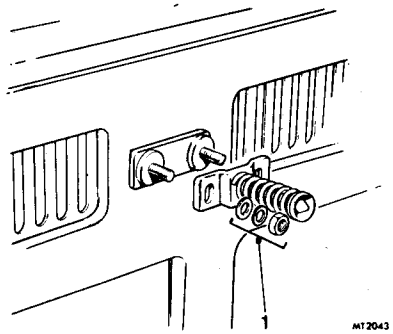


BONNET CATCH

Remove and refit **76.16.34**

Removing
1 Remove the two nuts, spring washers and plain washers.
Remove the catch from the bonnet.

Refitting
2 Reverse instruction 1, ensuring correct alignment of the catch and locking plate aperture.

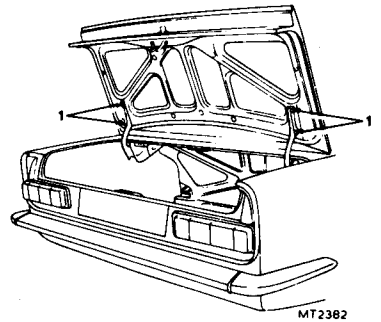


LUGGAGE COMPARTMENT LID

Remove and refit **76.19.01**

Removing
1 Disconnect the battery.
2 Remove the four bolts, spring washers and plain washers, and lift off the lid.

Refitting
3 Reverse instructions 1 and 2, ensuring correct alignment of the lid.

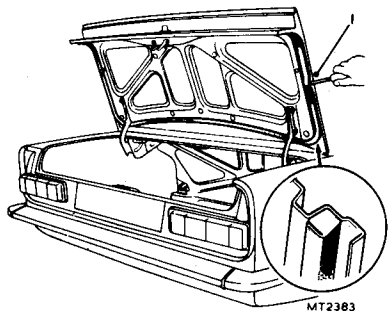


LUGGAGE COMPARTMENT LID SEAL

Remove and refit **76.19.06**

Removing
1 Free the seal from the trunk lid, using a suitably blunt tool if necessary.

Refitting
2 Fit the seal, using Dunlop SP758 adhesive.

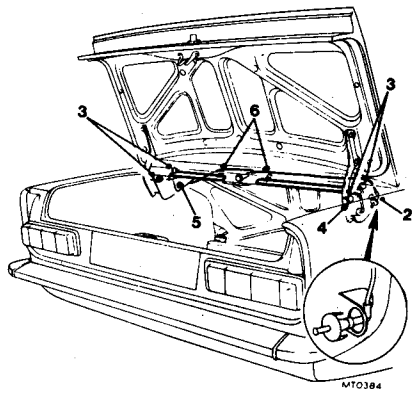


LUGGAGE COMPARTMENT LID HINGES

Remove and refit **76.19.07**

Removing
1 Remove the lid, see 76.19.01.
2 Disconnect the lead from the switch, and pull it clear of the hinge.
3 Remove the four nuts, spring and plain washers.
4 Disconnect the earth lead.
5 Remove one nut, bolt, plain washer and spring washer (L.H. hinge only).
6 Pull the hinges free of the clips.

Refitting
7 Reverse instructions 1 to 6, ensuring correct alignment of the lid.

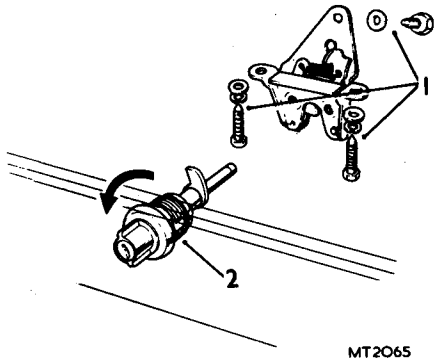


LUGGAGE COMPARTMENT LOCK

Remove and refit **76.19.11**

Removing
1 Remove the three bolts, spring washers and plain washers and lift off the latch.
2 Rotate the locking ring through 90 degrees and withdraw the lock assembly and sealing ring.

Refitting
3 Reverse 1 and 2.

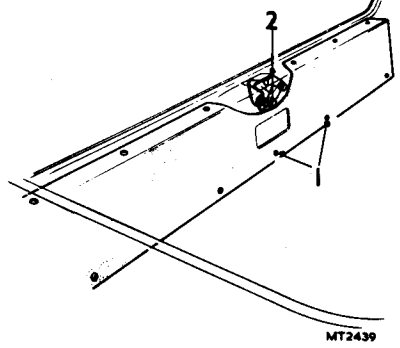


LUGGAGE COMPARTMENT LOCK STRIKER

Remove and refit **76.19.12**

Removing
1 Remove the trim pad — 11 screws.
2 Remove the three bolts, spring washers and plain washers and lift off the striker.

Refitting
3 Reverse 1 and 2, ensuring correct alignment of the trunk lid.



FRONT UNDER-RIDER

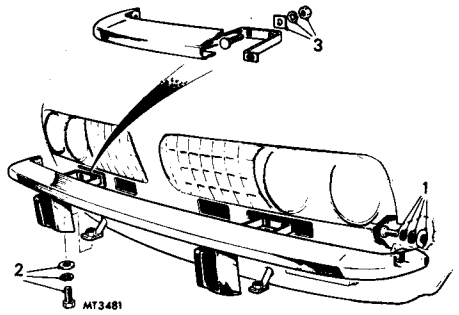
Remove and refit **76.22.01**

Removing
Earlier models
1 Remove the front bumper, see 76.22.08.
2 Remove two bolts and nuts and withdraw the under-rider from the bumper.
Later models
1 Remove two nuts holding the under-rider to the bumper.
2 Remove four bolts holding the under-rider to the bumper bracket and withdraw the under-rider from the bumper.

Refitting
3 Reverse instructions 1 and 2 as appropriate.

BUMPER — FRONT

Remove and refit **76.22.08**

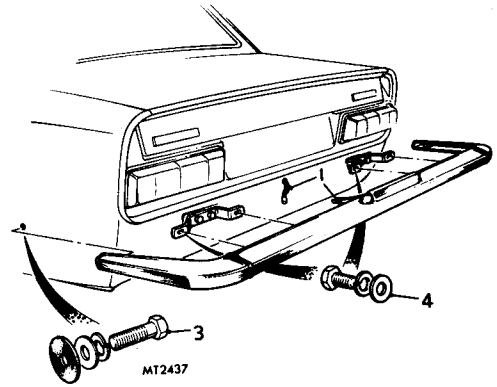


Removing
1 Remove the two bolts, spring washers, plain washers, and spacers.
2 Remove the two bolts, spring washers and plain washers (*earlier models only*).
3 *Earlier models*: Remove the four nuts and washers and lift off the bumper together with brackets and under-riders.
or
4 *Later models*: Remove four bolts holding the under-rider to the bumper bracket and four nuts holding the bumper to the bracket. Lift off the bumper together with brackets and under-riders.

Refitting
4 Reverse 1 to 4 as appropriate.

BUMPER — REAR

Remove and refit **76.22.15**



Removing
1 Disconnect the two number-plate lamp leads.
2 Remove the luggage compartment side trim pads, four screws and two clips.
3 Remove the two bolts, spring washers, plain washers and spacers.
4 Remove the four bolts (*earlier models*) or four nuts (*later models*), spring washers and plain washers and lift off the bumper.

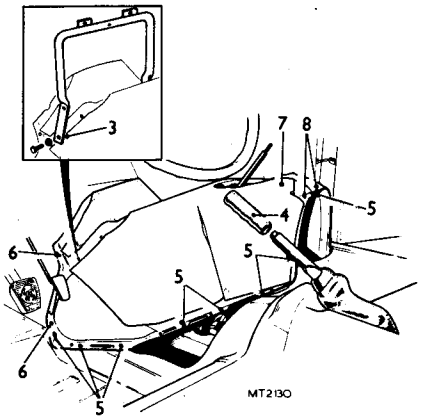
Refitting
5 Reverse 1 to 4.

GEARBOX TUNNEL COVER

Remove and refit **76.25.07**

Removing
1 Remove the front seats, see 76.70.04/ 76.70.05.
2 Remove the gear-change lever, see 37.16.04.
3 Remove the reinforcement tube.
4 Pull off the hand brake lever grip.
5 Remove the 15 bolts and (if fitted) washers.
6 Remove the four nuts and (if fitted) washers.
7 Break the seal between the tunnel cover and the floor and carefully lift out the tunnel cover over the gear-lever

Refitting
8 Reverse instructions 1 to 7. Apply Seelastik to the mating surfaces of seal, tunnel cover and floor. Ensure that the seal retainers are correctly located in the cover.

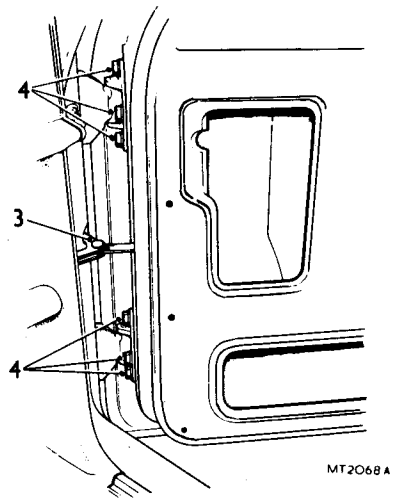


DOOR — FRONT

Remove and refit **76.28.01**

Removing
1 Disconnect the battery.
2 Remove the trim pad, see 76.34.01.
3 Drill out the rivet and remove the check strap.
4 Support the door and remove the six bolts and spring washers.

Refitting
5 Reverse instructions 1 to 4. Check the door closing action, and adjust if necessary, to ensure correct alignment before full tightening bolts 4.

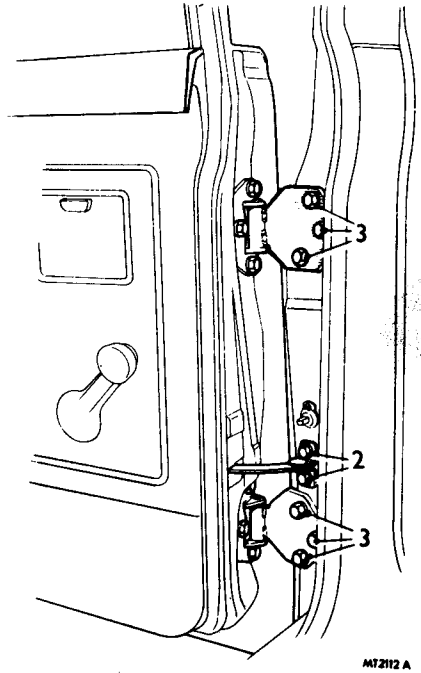


DOOR — REAR

Remove and refit **76.28.02**

Removing
1 Disconnect the battery.
2 Remove the two bolts and spring washers.
3 Support the door and remove the six bolts and spring washers.

Refitting
4 Reverse instructions 1 to 3. Check the door closing action, and adjust if necessary, to ensure correct alignment before fully tightening bolts 3.

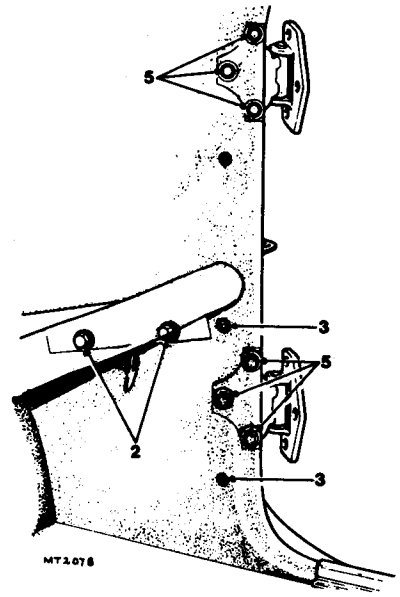


DOOR HINGES — FRONT

Remove and refit **76.28.42**

Removing
1 Remove the door, see 76.28.01.
2 Remove the two bolts, spring washers and plain washers.
3 Remove the two screws and washers.
4 Ease the parcel shelf slightly upwards and the dash side trim pad slightly outwards to gain access to the lower hinge fixings.
5 Remove the six nuts, spring washers and plain washers. Withdraw the hinges.

Refitting
6 Reverse 1 to 5. Check the door closing action, and adjust if necessary.



DOOR HINGES — REAR

Remove and refit **76.28.43**

Removing
1 Remove the door, see 76.28.02.
2 Remove the hinges, six bolts and spring washers.

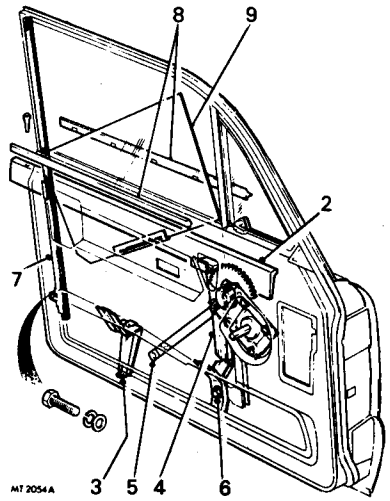
Refitting
3 Reverse instructions 1 and 2.

DOOR GLASS — FRONT

Remove and refit **76.31.01**

Removing
1 Remove the trim pad, see 76.34.01.
2 Remove the capping, see 76.34.15.
3 Remove the glass stop — three screws (earlier models).
4 Remove the anti-drum stiffener — three screws.
5 Wind the glass fully down and detach the regulator (later models only) and release the regulator arm from the channel.
6 Remove one bolt and plain washer.
7 Remove the channel, one bolt, spring washer and plain washer.
8 Detach the inner and outer door waist seals from the clips.
9 Turn the glass sideways and lift it clear. **NOTE:** Avoid scratching the glass on seal clips during removal.

Refitting
10 Reverse instructions 1 to 9.

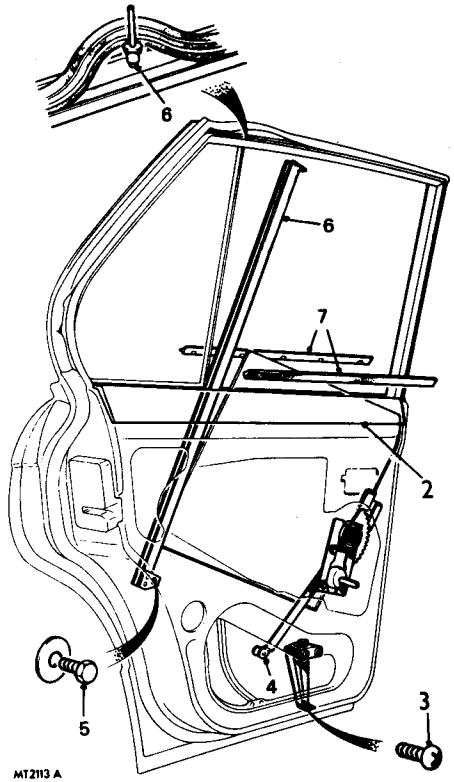


DOOR GLASS — REAR

Remove and refit **76.31.02**

Removing
1 Remove the trim pad, see 76.34.04.
2 Remove the capping, see 76.34.16.
3 Remove the glass stop—three screws (earlier models).
4 Wind the glass fully down and detach the regulator (later models only) and release the regulator arm from the channel.
5 Remove one bolt and plain washer.
6 Drill out the rivet and pull the channel away from the quarter-light glass.
7 Detach the inner and outer door waist seals from the clips.
8 Turn the glass sideways and lift it clear. **NOTE:** Avoid scratching the glass on the seal clips during removal.

Refitting
9 Reverse instructions 1 to 8.

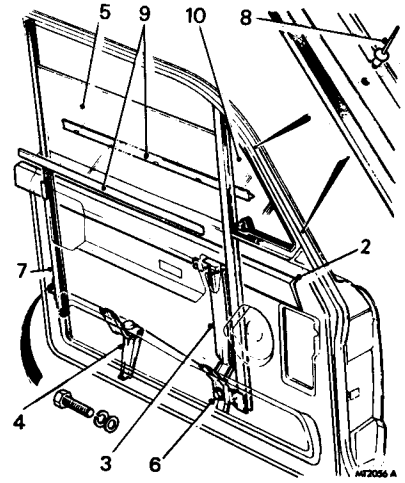


QUARTER VENT — FRONT DOOR

Remove and refit **76.31.28**

Removing
1 Remove the trim pad, see 76.34.01.
2 Remove the capping, see 76.34.15.
3 Remove the anti-drum stiffener — three screws.
4 Remove the glass stop — three screws (where fitted).
5 Wind the glass fully down.
6 Remove one bolt and plain washer.
7 Remove the channel — one bolt, spring washer and plain washer.
8 Pull away the weatherstrip to expose the two rivets. Drill out the rivets.
9 Detach the inner and outer door waist seals from the clips.
10 Lift out the vent assembly.

Refitting
11 Reverse instructions 1 to 10.



QUARTER-LIGHT — REAR

Remove and refit **76.31.31**

Removing
1 Follow instructions 1 to 7, operation 76.31.02.
2 Break the weatherstrip seal, using a suitable blunt tool.
3 Pull the glass out of the door frame.

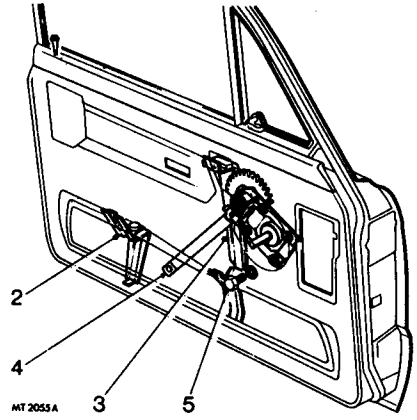
Refitting
4 Reverse instructions 1 to 3, using a new weatherstrip if necessary, and applying Seelastik to the mating surfaces before fitting.

DOOR GLASS REGULATOR

Remove and refit — front **76.31.45**
— rear **76.31.46**

Removing
1 Remove the trim pad, see 76.34.01.
2 Remove the glass stop — three screws (earlier models only).
3 Remove the anti-drum stiffener — three screws.
4 Wind the glass fully down and detach the regulator arm.
5 Remove the four bolts and plain washers. Withdraw the regulator.

Refitting
6 Reverse instructions 1 to 5.

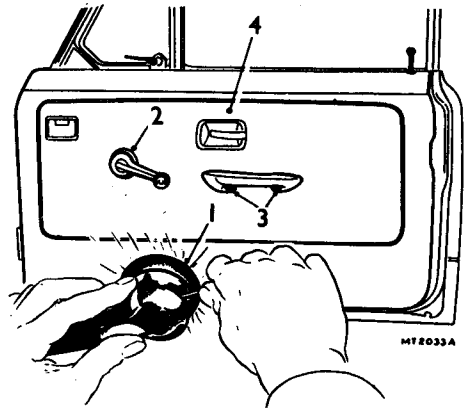


DOOR TRIM PAD

Remove and refit — front **76.34.01**
— rear **76.34.04**

Removing
1 Depress the bezel and press out the pin.
2 Remove the handle and bezel.
3 Remove the two screws and spring washers.
4 Prise off the trim pad — 10 clips.

Refitting
5 Reverse instructions 1 to 4.

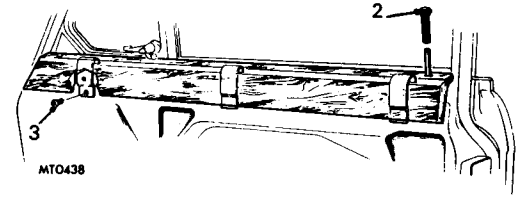


DOOR CAPPING

Remove and refit — front **76.34.15**
— rear **76.34.16**

Removing
1 Remove the trim pads, see 76.34.01/76.34.04.
2 Unscrew and remove the plunger knob.
3 Remove three screws (two on rear door) and push the capping upwards to detach the clips from the door.

Refitting
4 Reverse instructions 1 to 3.



DOOR ARM-REST

Remove and refit **76.34.23**

Removing
1 Remove the trim pad, see 76.34.01/76.34.04.
2 Remove the two screws and plain washers and detach the arm-rest.

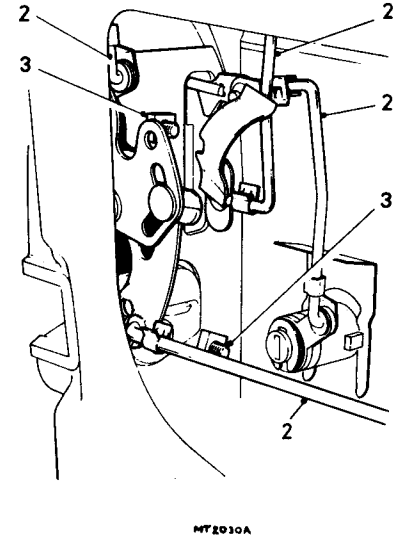
Refitting
3 Reverse instructions 1 and 2.

DOOR LOCK

Remove and refit — front **76.37.12**
— rear **76.37.13**

Removing
1 Remove the trim pad, see 76.34.01/76.34.04.
2 Release the linkages.
3 Remove the four screws and pull the lock clear.

Refitting
4 Reverse instructions 1 to 3.



DOOR LOCK STRIKER

Remove and refit — front **76.37.23**
— rear **76.37.24**

Removing
1 Remove the two screws and lift off the striker.

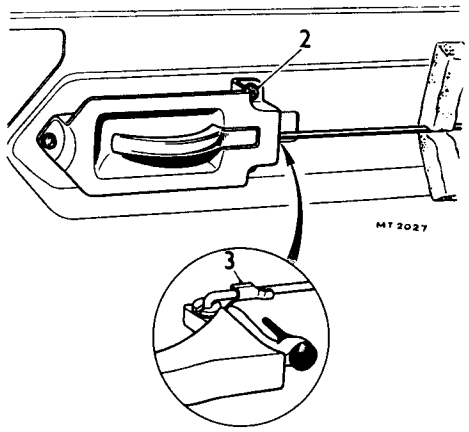
Refitting
2 Reverse instruction 1, adjusting if necessary to ensure correct door locking action.

REMOTE CONTROL — FRONT DOOR LOCK

Remove and refit **76.37.31**

Removing
1 Remove the trim pad, see 76.34.01.
2 Remove the three screws, spring washers and plain washers and remove the handle.
3 Detach the clip from the control rod.

Refitting
4 Reverse instructions 1 to 3.

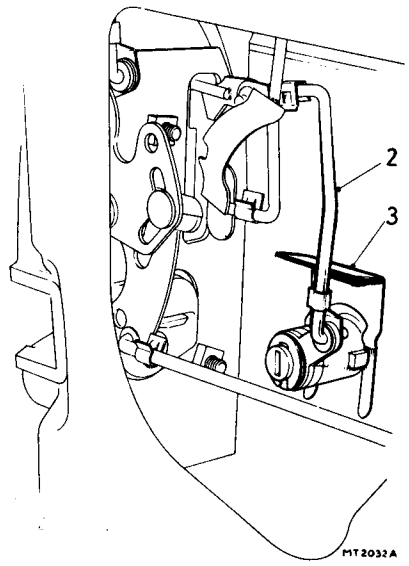


PRIVATE LOCK — FRONT DOOR

Remove and refit **76.37.39**

Removing
1 Remove the trim pad, see 76.34.01.
2 Release the linkage.
3 Remove the clip.
4 Push the lock out.

Refitting
5 Reverse instructions 1 to 4.



DOOR SEAL

Remove and refit — front **76.40.01**
— rear **76.40.02**

1 Pull the seal from the door, using a suitable blunt tool.
2 Ensure correct location in the channel when refitting.

DOOR CHECK STRAP — FRONT OR REAR

Remove and refit **76.40.27**

Removing
1 Disconnect the battery.
2 Remove the trim pad (front, see 76.34.01; rear, see 76.34.04).
3 Drill out the rivet (earlier models) or knock out the pin (later models).
4 Remove the check strap.

Refitting
5 Reverse instructions 1 to 4.

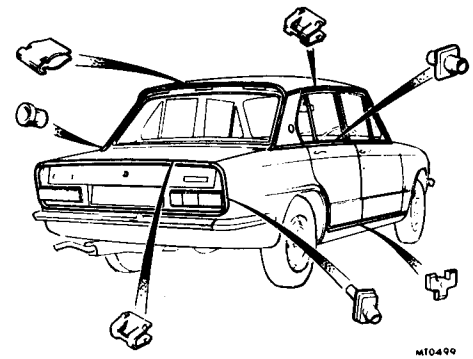
EXTERIOR MOULDINGS

Remove and refit **76.43.06**

The exterior mouldings, fitted to the doors, rear roof, sills, tonneau and luggage compartment lid, are secured to the body by clips and retainers.

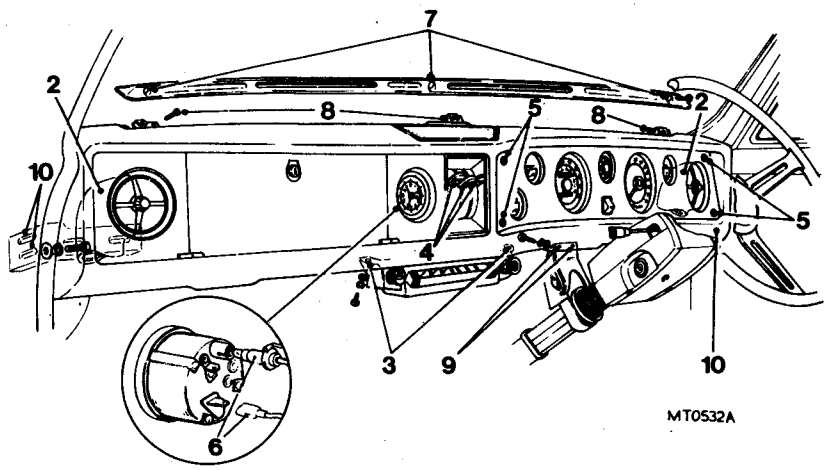
Removing
1 Starting at one end, pull the moulding firmly and progressively away from the panel.

Refitting
2 Renew worn or damaged clips or retainers, if any, and reverse instruction 1.



FASCIA

Remove and refit **76.46.01**



Removing
1 Disconnect the battery.
2 Remove the cold air hoses.
3 Remove the two screws, spring washers and plain washers supporting the ventilation outlet console.
4 Pull off the heater control knobs.
5 Remove the instrument panel, see 88.20.01.
6 Remove the clock, see 88.15.07.
7 Remove the demister grille — three screws.
8 Remove the three screws.
9 Remove the two bolts, spring washers, and plain washers.
10 Remove the four bolts, spring washers, and plain washers.
11 Remove the fascia.

Refitting
12 Reverse instructions 1 to 11.

CARPET — GEARBOX COVER

Remove and refit **76.49.01**

Removing
1 Remove the gear-lever knob and locknut.
2 Remove the console, see 76.25.01.
3 Lift out the carpet.

Refitting
4 Reverse instructions 1 to 3.

CARPET — REAR

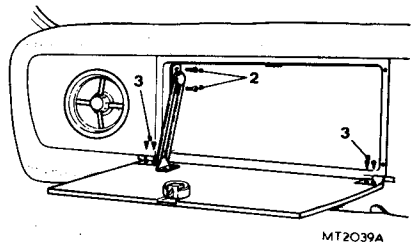
Remove and refit **76.49.03**

Removing
1 Remove the front seats, see 76.70.04/05.
2 Remove the front seat belts buckle unit, see 76.73.05.
3 Disconnect the four fasteners at the front and lift the carpet clear of the hand brake lever.

Refitting
4 Reverse instructions 1 to 3.

GLOVEBOX LID ASSEMBLY

Remove and refit **76.52.02**

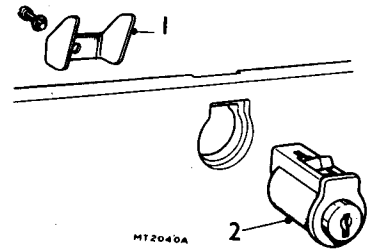


Removing
1 Disconnect the battery.
2 Remove the two screws securing the check link to the fascia.
3 Support the lid and remove the four screws. Remove the lid.

Refitting
4 Reverse instructions 1 to 3.

GLOVEBOX LOCK

Remove and refit **76.52.08**

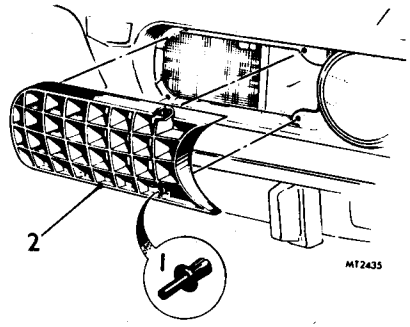


Removing
1 Remove the retainer — one screw and washer.
2 Withdraw the lock.

Refitting
3 Reverse instructions 1 and 2.

FRONT GRILLE

Remove and refit **76.55.03**



Removing
1 Press out the four retainer centres.
2 Withdraw the grille.

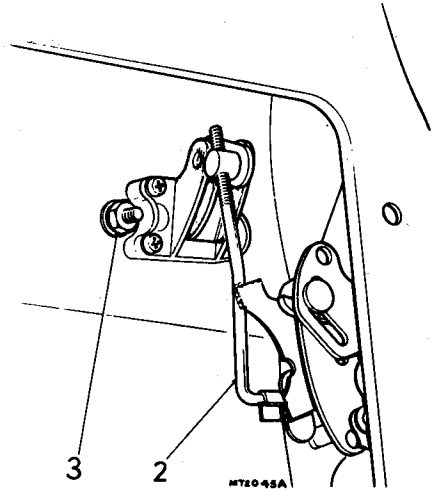
Refitting
3 Reverse instructions 1 and 2.

DOOR HANDLE

Remove and refit — front **76.58.01**
— rear **76.58.02**

Removing
1 Remove the trim pad, see 76.34.01/ 76.34.04.
2 Release the linkage from the lock.
3 Remove the two nuts, spring washers and plain washers, and remove the handle.

Refitting
4 Reverse instructions 1 to 3.

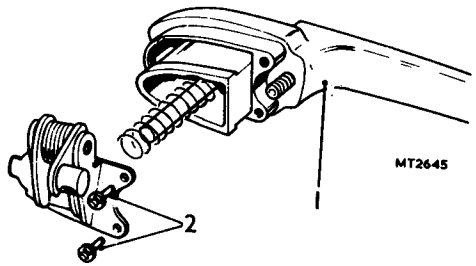


DOOR PUSH-BUTTON

Remove and refit **76.58.12**

Removing
1 Remove the door handle, see 76.58.01/ 76.58.02.
2 Remove the two screws and detach the push-button.

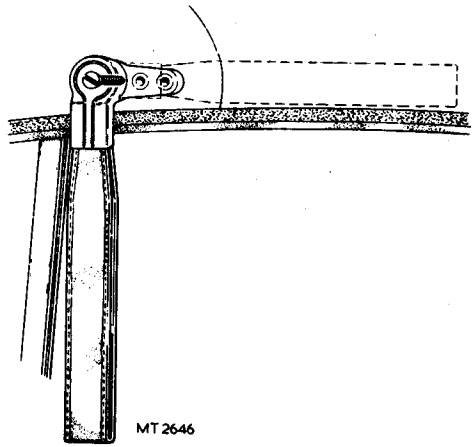
Refitting
3 Reverse instructions 1 and 2.



GRAB HANDLE

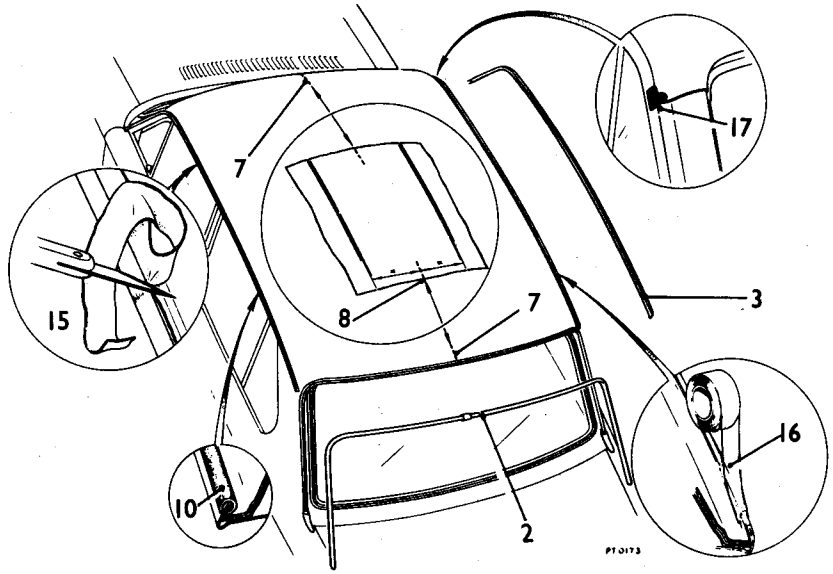
Remove and refit **76.58.30**

The grab handles are each secured by two screws.



EXTERNAL ROOF COVERING

Remove and refit **76.61.27**



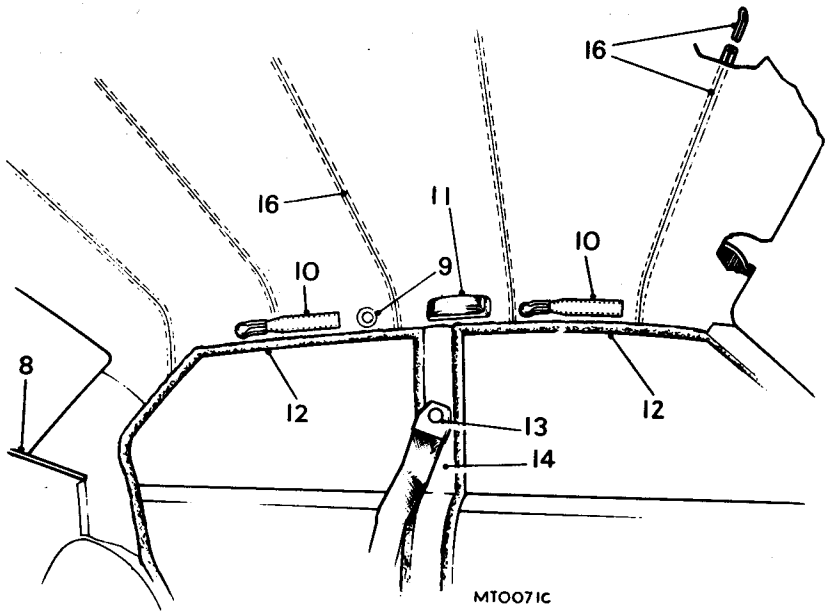
NOTE: This operation should not be carried out at temperatures below 16°C (60°F). The assistance of a second operative is necessary to ensure that time between adhesive application and fitting the cover is kept to a minimum.

Removing
1 Remove the windscreen, see 76.81.01.
2 Remove the rear roof moulding.
3 Remove the drain channel moulding.
4 Pull the roof cover off.
5 Dry scuff the area to be covered using 320 grade abrasive.
6 Ensure that the roof is clean, dry and free from remains of old adhesive.

Refitting
7 Ascertain and mark the centre line of the roof at each end.
8 Ascertain and mark the centre line of the roof cover by measuring between the seams.
9 Brush Plus A176 adhesive (part No. 613190) over the roof cover and mating surface of the roof.
10 Fit rubber piping over the drain channel flanges to prevent the cover adhering to them.
11 Press down the centre section of the cover and smooth out using a sleeker to ensure that the seams are straight.
12 Smooth out the cover over the styling lines, sleeking into the lower styling lines to remove any fullness. Do not stretch.
13 Smooth the cover into the windscreen aperture and cut out the seam ends. Trim off excess material.
14 Smooth the cover over the rear roof moulding flange and trim off excess material.
15 Secure the cover into the drain channels and cut off edges as shown.
16 Cover the drain channel flanges with Sellotape to protect the cover edges when the mouldings are replaced.
17 Fit the two clips to drain channels level with the weld lines at the top of the 'A' posts.
18 Refit the drain channel and rear roof mouldings, ensuring that the fourteen edge clips are equidistantly spaced.
19 Refit the windscreen.

HEADLINING

Remove and refit 76.64.01



Removing

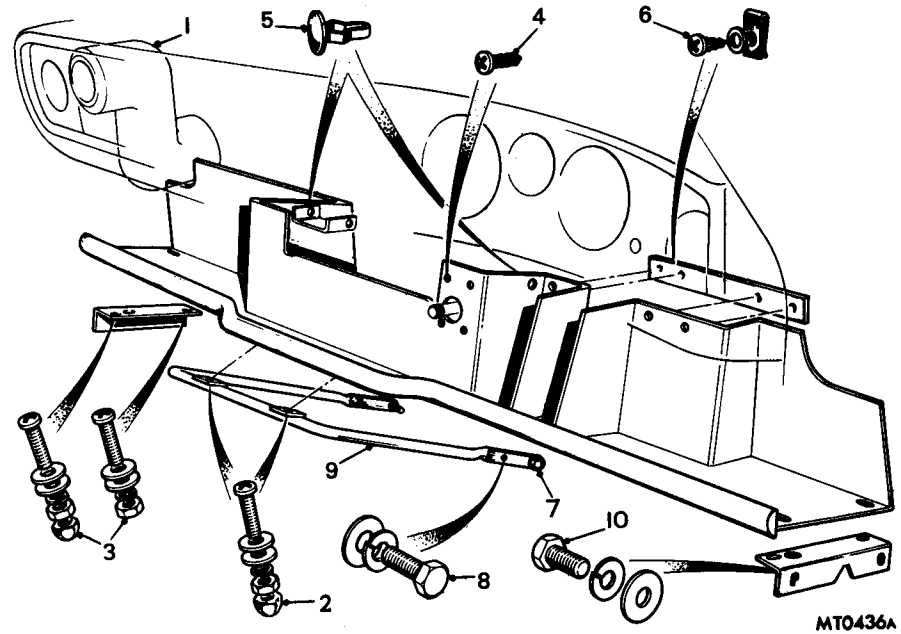
1 Disconnect the battery.
2 Remove the windscreen, see 76.81.01.
3 Remove the back-light, see 76.81.10.
4 Remove the interior mirror.
5 Remove the sun visors.
6 Remove the rear seat cushion, see 76.70.37.
7 Remove the rear seat squab, see 76.70.38.
8 Remove the rear parcel shelf, see 76.67.06.
9 Remove the coat-hangers.
10 Remove the grab handles, see 76.58.30.
11 Remove the roof lamp, see 86.45.02.
12 Remove the door draught welts.
13 Remove the safety harness top bolts.
14 Remove the 'B' post trims, see 76.13.08.
15 Pull the lining edges away from the body flanges.
16 Detach the listing rails and remove the headlining.

Refitting

17 Apply a two-inch border of Dunlop SP758 adhesive to the headlinings, around the roof light aperture and on the body flanges. Allow 10 minutes setting time.
18 Reverse instructions 1 to 16, cutting off any excess material.
NOTE: The listing rails are colour-coded and must be fitted in the following order from front to rear: Green, White, Brown, Orange, Purple.

PARCEL SHELF — FRONT

Remove and refit 76.67.01



Removing

1 Remove the cold air hoses.
2 Remove two screws, plain washers, cap nuts and nuts.
3 Remove four screws, plain washers, nuts and two cap nuts.
4 Remove four screws (earlier models only).
5 Remove two clips.
6 Remove four screws and lift off bracket.
7 Slacken two bolts.
8 Remove two bolts, spring washers, and plain washers.
9 Push the reinforcements tube downwards.
10 Remove brackets — four bolts, plain washers and spring washers.
11 Carefully pull the parcel shelf clear.

Refitting

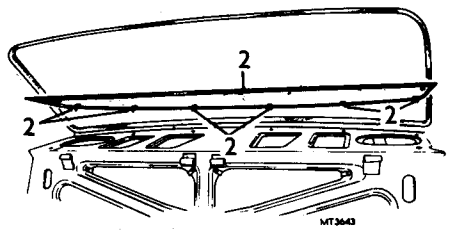
12 Reverse instructions 1 to 11.

PARCEL SHELF — REAR

Remove and refit **76.67.06**

Removing
1 Remove the rear seat squab, see 76.70.38.
2 Raise the front edge of the shelf and prise out the six clips at the rear.
3 Lift out the shelf.

Refitting
4 Reverse instructions 1 to 3.

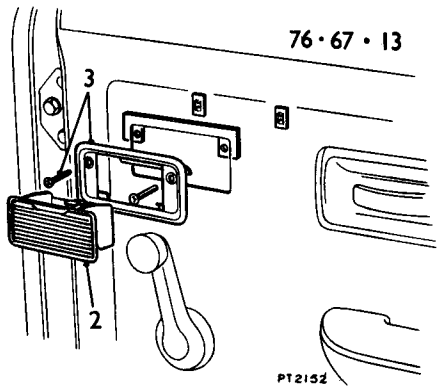


ASHTRAY

Remove and refit — front **76.67.13**
— rear **76.67.14**

Removing
1 Remove the trim pad, see 76.34.01/76.34.04.
2 Pull out the ashtray bowl.
3 Remove the retainer — two screws.

Refitting
4 Reverse instructions 1 to 3.

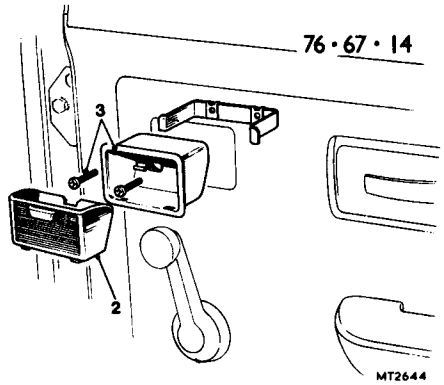


FRONT SEAT CUSHION COVER

Remove and refit **76.70.02**

Removing
1 Remove the seat(s), see 76.70.04/76.70.05.
2 Remove the cushion cover — eight clips.

Refitting
3 Reverse instructions 1 and 2.



FRONT SEAT SQUAB COVER

Remove and refit **76.70.03**

Removing
1 Remove the seat(s), see 76.70.04/76.70.05.
2 Remove the squab cover — fifteen clips.

Refitting
3 Reverse instructions 1 and 2.

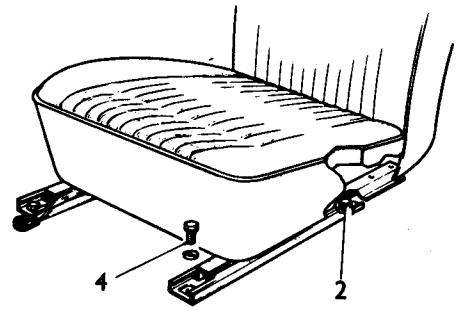
SEATS — FRONT

Remove and refit

Driver's seat **76.70.04**
Passenger's seat **76.70.05**

Removing
1 Move the seat fully forward.
2 Remove the two bolts and spring washers.
3 Move the seat fully rearwards.
4 Remove the two bolts and spring washers.
5 Lift out the seat complete with runners.

Refitting
6 Ensure that the packing washers are correctly positioned.
7 Reverse instructions 1 to 5.



SEAT RUNNERS

Remove and refit **76.70.21**

Removing
1 Remove the seat, see 76.70.04/76.70.05.
2 Detach the runners — two nuts, bolts and four plain washers.

Refitting
3 Reverse instructions 1 and 2.

SEAT — REAR

Remove and refit

Cushion **76.70.37**

Squab **76.70.38**

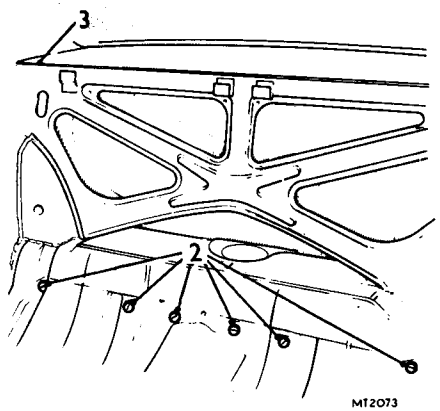
Removing
1 Lift out the cushion.
2 Remove the two screws, spring washers and plain washers securing the squab to the body.
3 Lift out the squab.

Refitting
4 Reverse instructions 1 to 3.

SEAT BELT — STATIC — REAR

Fitting **76.73.17**

1 Remove the rear seat cushion, see 76.70.37.
2 Remove the plugs.
3 Prise up the rear parcel shelf to reveal the fixing points. Cut through the trim above these points (shoulder strap type belts only).
4 Fit the seat belt in accordance with the manufacturer's instructions.



SILL TREAD PLATES

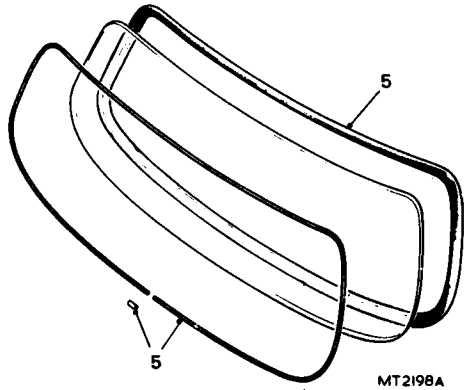
Remove and refit — front **76.76.01**
— rear **76.76.02**

The front tread plates are secured to the body by four self-tapping screws.
The rear tread plates are secured to the body by two self-tapping screws.

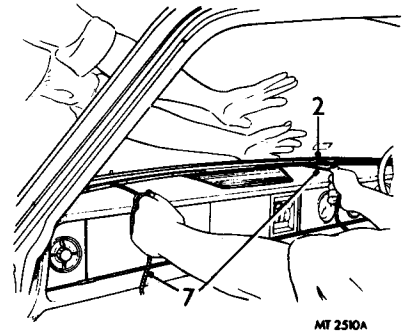
WINDSCREEN

Remove and refit **76.81.01**

Removing
1 Remove the wiper arms, see 84.15.01.
2 Remove the demister grille — three screws.
3 Break the seal, using a suitable blunt tool.
4 Push the glass outwards.
CAUTION: Take care to avoid scratching the glass, which must be steadied by an assistant.
5 Remove the cover and finisher and weatherstrip, noting positions for refitting.



Refitting
6 Reverse instruction 5, using new weatherstrip if necessary, and applying Seelastik to the glass channel before fitting.
7 Insert a strong cord into the weatherstrip inner channel, allowing the ends to protrude from the lower edge.
8 Have an assistant position the glass centrally in the aperture, and maintain a steady pressure whilst the cord ends are pulled to locate the weatherstrip on the body flange.
9 Seal the outer channel of weatherstrip to the body using Seelastik.

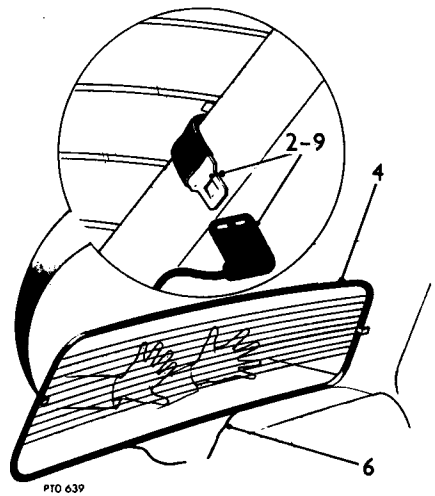


BACK-LIGHT

Remove and refit **76.81.11**

Removing
1 Break the seal, using a suitably blunt tool.
2 Disconnect the two Lucar connectors from the back-light.
3 Push the glass outwards.
CAUTION: Take care to avoid scratching the glass, which must be steadied by an assistant.
4 Remove the weatherstrip from the glass.

Refitting
5 Reverse instruction 4, using a new weatherstrip if necessary, and applying Seelastik to the glass channel before fitting.
6 Insert a strong cord into the weatherstrip inner channel, allowing the ends to protrude from the lower edge.
7 Have an assistant position the glass centrally in the aperture, and maintain a steady pressure whilst the cord ends are pulled to locate the weatherstrip on the body flange.
8 Seal the outer channel of weatherstrip to the body using Seelastik.
9 Reconnect the two Lucar connectors.



HEATING AND VENTILATING SYSTEM 80.00.00

The heater unit comprises a water-heated element 'E' mounted inside a distribution box 'D' having two flap valves which are independently connected to three levers on the fascia. One inlet 'A' and three outlet apertures 'C', 'G' and 'H' are formed in the distribution box.

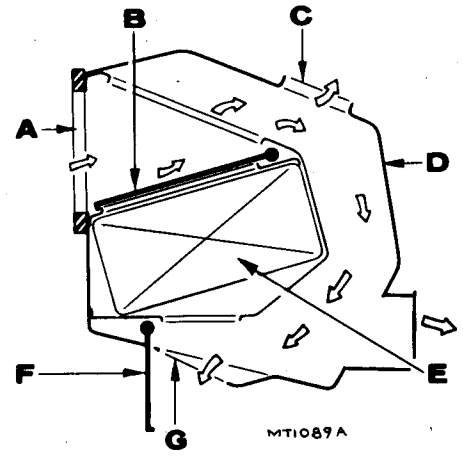
Fresh air flowing into the plenum chamber via an air intake at the base of the screen passes through the blower rotor into the distribution box. From there it is directed, by manipulating the levers, either through top aperture 'C' to the screen, through apertures 'G' and 'H' to the car interior, or through all three at the same time. The right-hand lever operates the top flap 'B' which, when moved to its 'hot' position, directs all incoming air through the heating element. As the lever is moved down the quadrant, the flap gradually closes. giving a progressively varying mixture of hot and cold air. Further movement of the lever to the 'cold' position closes the water valve so that the heater is no longer effective.

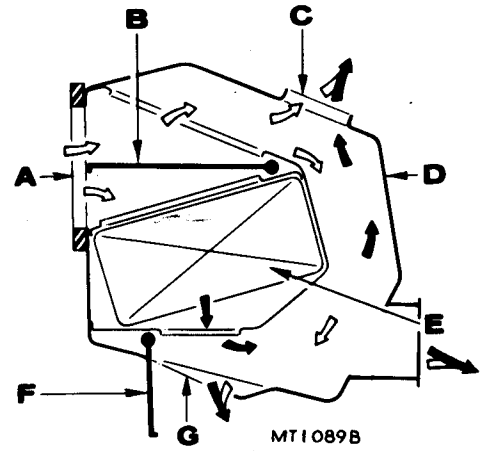
The left-hand lever operates the bottom flap 'F' which, when moved to its 'off' position, directs all air to the screen. Downward movement of the lever causes air to be distributed progressively to both the screen and the car interior.

The central lever operates a valve in the blower which controls the flow of air through inlet 'A'. When the lever is in the 'off' position the passage of air to the heater is cut off. Downward movement of the lever operates the two-stage blower to give high- or low-speed air flow as required.

Cold air ventilation

Move the right-hand lever to the 'cold' position and set the left-hand lever to 'screen' or 'screen and car' as required. Place the central lever in its midway position. Further movement of the lever will operate the blower to provide greater air flow if needed.





Warm air ventilation

Move the right-hand lever to the position required. Position the left-hand lever to 'screen and car'. Move the central lever to its midway position and, if necessary, switch on the blower by moving the lever to either the low or fast-speed position.

Windscreen defrosting

Move the right-hand lever to 'hot', the left-hand lever to 'screen', and the central lever to its midway position.

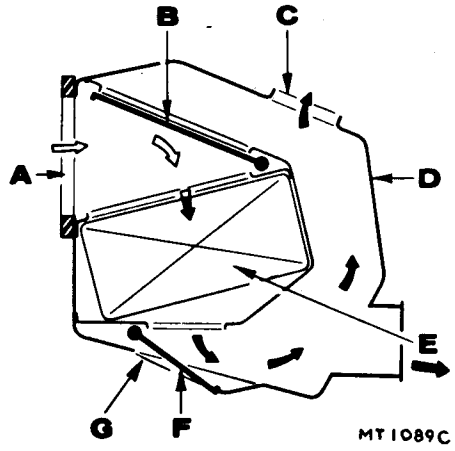
NOTE: Any desired combination of temperature and distribution may be obtained by suitable manipulation of the controls.

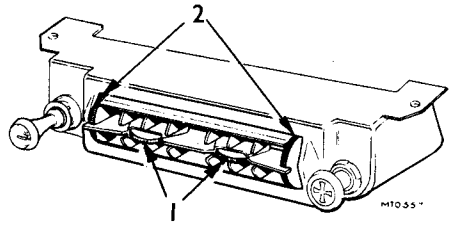
Variable direction heater outlet

This outlet is an additional facility to those previously described; the condition and air-flow intensity are nevertheless governed by positioning of the heater control levers.

From outlet 'H' air is passed through louvres that may be swivelled to direct warm or cold air to the left or right of the car interior or vertically as required. The knurled knobs (1) control the position of the louvres in the horizontal plane and knobs (2) provide vertical adjustment. Air from the variable outlet may be shut off by turning knobs (2) downwards. To ensure maximum air-flow to the windscreen for defrosting, the variable outlet should be closed.

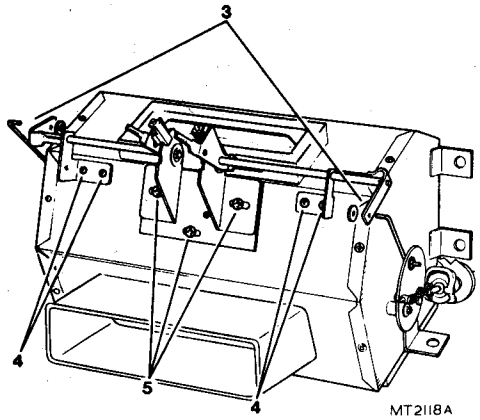
NOTE: The controls are progressively variable; hence any desired combination of temperature and distribution may be obtained by suitable manipulation of the controls.





CONTROL ASSEMBLY

Remove and refit **80.10.02**



Removing
1 Remove the fascia, see 76.46.01.
2 Follow instructions 3 to 5 inclusive, operation 80.10.22.
3 Detach the control rods.
4 Drill out the four rivets (earlier models) or remove four screws (later models).
5 Remove the three screws and lift off the distribution and temperature switch assemblies.

Refitting
6 Reverse instructions 1 to 5.

HEATER AIR-FLOW CONTROL CABLE

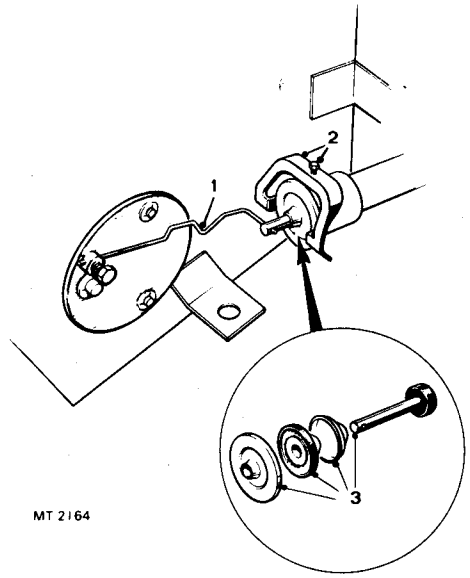
Remove and refit **80.10.06**

Removing
1 Slacken the trunnion on the blower flap lever and detach the cable.
2 Detach the inner cable from the fan switch and pull the cable assembly clear.

Refitting
3 Reverse instructions 1 and 2, ensuring that the fan switch is in the 'off' position and the blower flap lever positioned fully to the left (R.H. Stg.) or right (L.H. Stg.) before refitting.

HEATER WATER VALVE

Remove and refit **80.10.16**

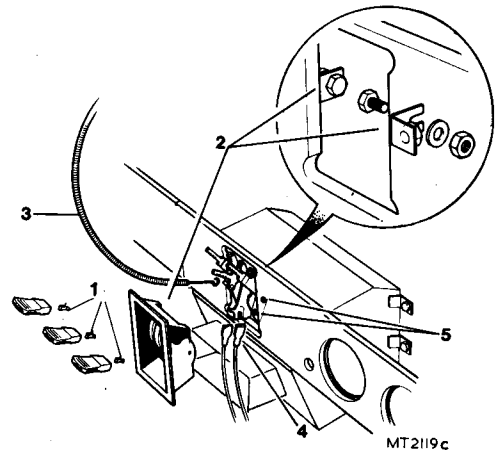


Removing
1 Detach the control rod.
2 Slacken the screw and remove the retainer.
3 Withdraw the valve assembly.

Refitting
4 Reverse instructions 1 to 3, ensuring that the control rod is positioned to allow free movement of the valve.

FAN SWITCH

Remove and refit **80.10.22**



Earlier models
Removing
1 Pull off the heater control knobs.
2 Remove the escutcheon — two nuts, bolts and plain washers (remove the instrument panel and/or clock as necessary to gain access to the bolts).
3 Disconnect the control cable.
4 Disconnect the two leads.
5 Remove the switch — two screws.

Refitting
6 Reverse instructions 1 to 5.

Later models
Removing
1 Remove the control assembly, see 80.10.02.
2 Drill out the rivets to release the switch.

Refitting
3 Reverse instructions 1 and 2.

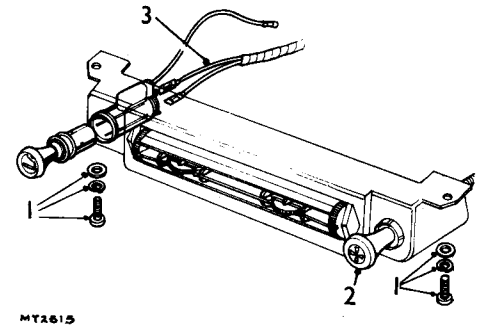
AIR VALVE ASSEMBLY

Remove and refit **80.10.35**

The air valve is secured to the fan motor by three screws.

VENTILATION OUTLET CONSOLE

Remove and refit **80.15.09**



Removing
1 Support the console and remove two screws, spring washers and plain washers.
2 Remove the mixture control cable, see 19.20.13.
3 Disconnect three leads.
4 Remove the console.

Refitting
5 Reverse instructions 1 to 4.

SWIVELLING COLD AIR VENT

Remove and refit — L.H. **80.15.22**
— R.H. **80.15.23**

Removing
1 Remove the cold air hose.
2 Remove the two nuts, spring washers and plain washers.
3 Withdraw the vent from behind the fascia.

Refitting
4 Reverse instructions 1 to 3.

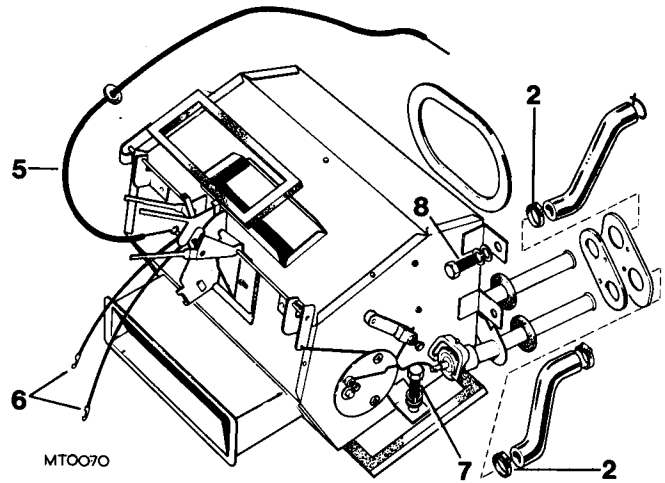
AIR INTAKE HOSE

Remove and refit **80.15.30**

The fresh-air intake hose is secured by two clips.

HEATER UNIT

Remove and refit **80.20.01**

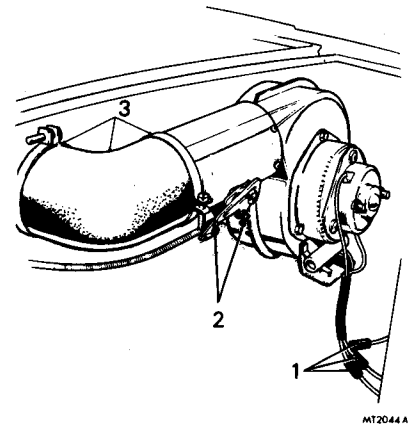


Removing
1 Drain the cooling system.
2 Slacken the clips and disconnect the hoses.
3 Remove the fascia, see 76.46.01.
4 Remove the demister duct.
5 Disconnect the control cable from the central lever.
6 Disconnect the two leads from the central lever.
7 Remove the two nuts, bolts and plain washers.
8 Remove the four nuts, bolts, plain washers and spring washers.
9 Pull the heater unit clear, taking care to avoid spillage of coolant remaining in the matrix.

Refitting
10 Reverse instructions 1 to 9, applying Seelastik S.R.51 to the dash seals and rear fixing brackets.

FAN MOTOR

Remove and refit **80.20.15**



Removing
1 Disconnect the three leads.
2 Slacken the trunnion bolt and detach the cable and clip.
3 Remove the air tube — two clips.
4 Remove the fan motor, three bolts (*earlier models*) or three screws (*later models*), spring washers and plain washers.

Refitting
5 Reverse instructions 1 to 4, using Seelastik S.R.51 to seal the fan motor to the dash.
NOTE: Ensure that the heater central control lever is in the 'off' position and the fan motor flap lever is positioned fully to the left (R.H. Stg.) or right (L.H. Stg.) before refitting the cable.

FAN MOTOR RESISTOR UNIT

Remove and refit **80.20.17**

The resistor unit is secured to the fan motor by two rivets.

HEATER WATER HOSES

Remove and refit

Feed hose	**80.25.07**
Return hose	**80.25.10**

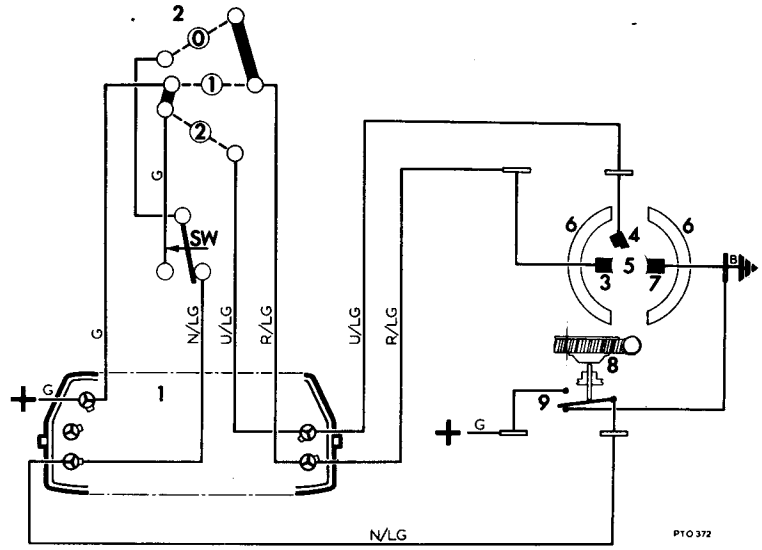
The heater water hoses are each secured by two clips. Drain the cooling system before removal.

WINDSCREEN WIPER SYSTEM

Data and description

84.00.01

Motor	
Manufacturer	Lucas
Type	15W
Lucas Part No.:	
Motor minus gear assembly	75680
Gear assembly—R.H. Steering	54702978
L.H. Steering	54702983
Stanpart No.: Motor minus gear assembly	520162
Gear assembly—R.H. Steering	520161
L.H. Steering	520359
Running current—after 60 seconds from cold with linkage arm disconnected from crank:	
Normal speed	1·5 amp
High speed	2·0 amp
Running speed—crank after 60 seconds from cold with linkage arm disconnected from crank:	
Normal speed	46 to 52 rev/min
High speed	60 to 70 rev/min
Armature end-float	0·002 to 0·008 in (0·05 to 0·20 mm)
Brush length—new	0·250 in (6 mm)
renew if less than	0·125 in (3 mm)
	For high-speed brush this is when narrow section is worn into full width section
Brush spring pressure—when compressed so that brush bottom is aligned with brushbox slot end	5 to 7 ozf (140 to 200 gf)



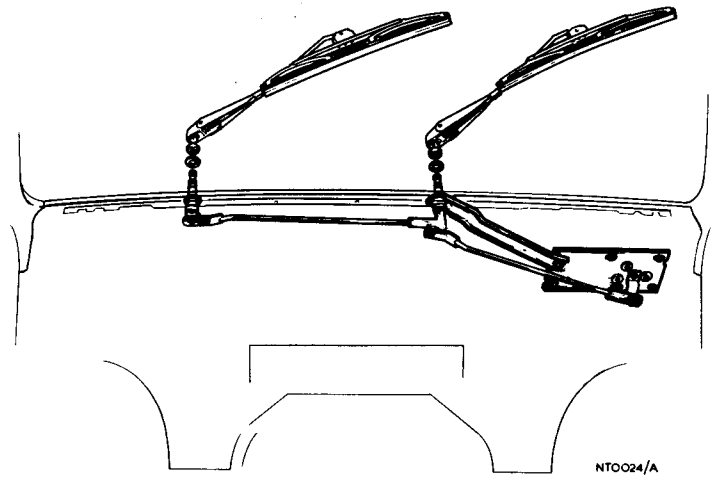
+	Supply	3	Normal-speed brush
1	Steering-column in-line plug and socket	4	High-speed brush
2	Steering-column switch	5	Commutator
	O OFF	6	Permanent magnet
	1 NORMAL SPEED	7	Earth brush
	2 HIGH SPEED	8	Final gear cam
	SW SWEEP WIPE FACILITY	9	Limit switch unit

The motor unit consists of a permanent-magnet motor and a gearbox unit which drives a rotating crank arm.

Two-speed operation is provided by a third brush. When high-speed is selected the positive supply is transferred from the normal-speed brush to the high-speed brush.

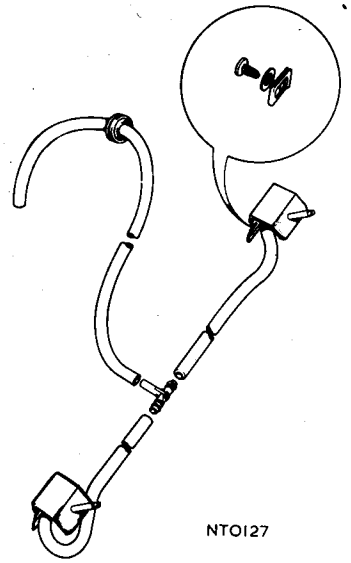
A switching feature stops the blades in the 'park' position irrespective of their position when the steering-column switch is selected 'off'. This is effected by a two-stage limit switch unit attached to the gearbox. The contacts are actuated by a cam on the final gear. When the steering-column switch is selected 'off', the motor will continue to run until the limit switch first stage contacts open. A momentary period follows during which no contact is made. The second stage contacts then close causing regenerative braking of the armature which maintains consistent parking of the blades.

The motor and one spindle assembly are mounted to a plate and arm unit. Rotation of the motor crank-arm is converted to a reciprocating motion of the spindle lever by a 'solid' primary link. The second spindle assembly is mounted direct to the vehicle body and is driven by a 'solid' secondary link positioned between the two spindle levers.



WINDSCREEN WASHER JET

Remove and refit **84.10.09**



Removing

1 Remove the two screws and washers.
2 Pull the pipe from the jet.

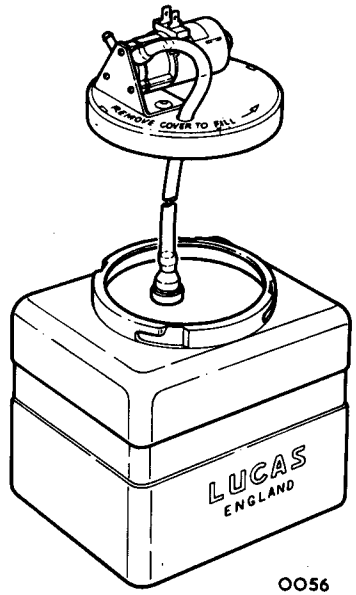
Refitting

3 Reverse 1 to 2.
4 Close the bonnet and operate the pump to check the jet aim. The jet must pass unobstructed through a bonnet air intake louvre and provide satisfactory windscreen washing.
5 If necessary, adjust the jet aim by slight bending of the jet tube bracket or slackening the two screws and repositioning the jet.

WINDSCREEN WASHER PUMP AND RESERVOIR

Remove and refit **84.10.21**

NOTE: Three types of washer pump and reservoir may be found on Dolomite Sprint models.
The first type 'A' (Lucas type 9SJ) is illustrated opposite.
The second type 'B' has a motor mounted on the reservoir bracket separate to the reservoir.
The third type 'C' is illustrated against the instructions below.



0056

Removing

Type applicability

1 *A B* Remove the cover.
A B C Pull off the outlet pipe and withdraw it from the cover.
A B Refit the cover.
2 *A B C* Disconnect the two Lucar connectors, noting position for refitting.
3 *A B C* Manoeuvre the unit upwards from the carrier.
4 *A C* If necessary, remove two screws and detach the carrier.
5 *B* Remove the carrier bracket and motor.

Refitting

6 Reverse instructions 1 to 5 as appropriate.

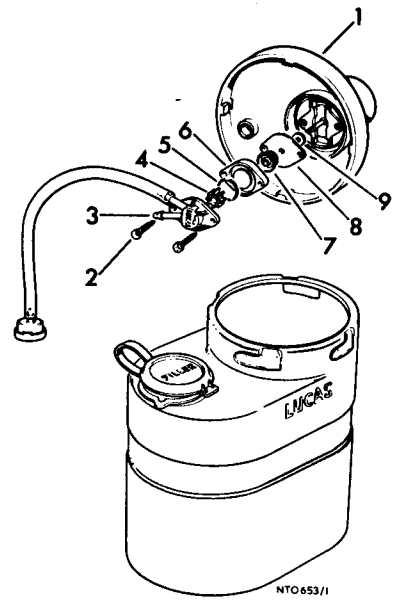
WINDSCREEN WASHER PUMP AND RESERVOIR — LUCAS TYPE 9SJ (ILLUSTRATED) AND OTHER LATER TYPES

Overhaul **84.10.24**

It is not advisable to attempt to overhaul the pump assembly. If the pump operation is suspect, replace the complete pump and cover assembly or the pump and motor unit as appropriate.
The motor is a sealed unit and cannot be serviced. It is possible to dismantle and clean the interior of the pump on 9SJ type units as detailed below but no individual Unipart spare parts are available.

Dismantling

1 Rotate the cover anti-clockwise to release the bayonet fitting. Lift the pump and cover assembly from the reservoir.
2 Remove two screws.
3 Lift off the pump housing.



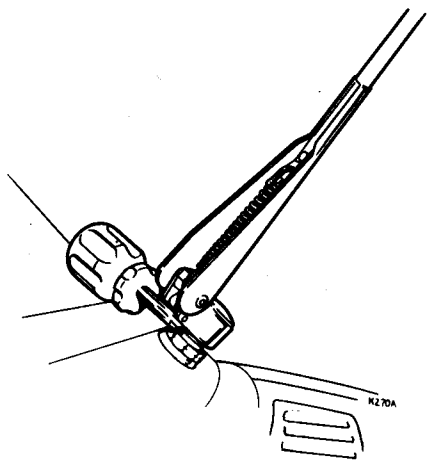
4 Carefully withdraw the rotor and rotor drive plate.
5 Lift out the rubber 'O' ring.
6 Lift off the seal housing.
7 Withdraw the seal from the shaft.
8 Remove the plate.
9 Withdraw the small rubber disc from the shaft.

Assembling

10 Reverse instructions 1 to 9.

WINDSCREEN WIPER ARM

Remove and refit **84.15.01**



Removing

1 Lift the wiper arm and blade from the screen so that it falls into its service position.
2 Position a screwdriver as shown and impart a twisting action to lift the clip from the spindle groove.
3 The assembly may now be removed by hand.

Refitting

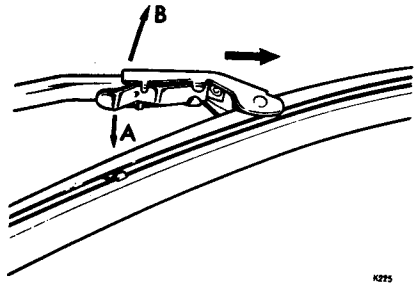
4 Ensure that the spindles are in the 'park' position.
5 Hinge the wiper arm against the spring to adopt its service position.
6 Locate the splines for a suitable 'park' position. Push on to engage the clip to the spindle groove.
7 Lower the wiper arm to the screen.

WINDSCREEN WIPER BLADE

Remove and refit **84.15.05**

Removing

1 Lift the wiper arm and blade from the screen so that it falls into its service position.
2 Simultaneously lift the clip 'A', tilt cage 'B' and gently pull the wiper blade from the arm.

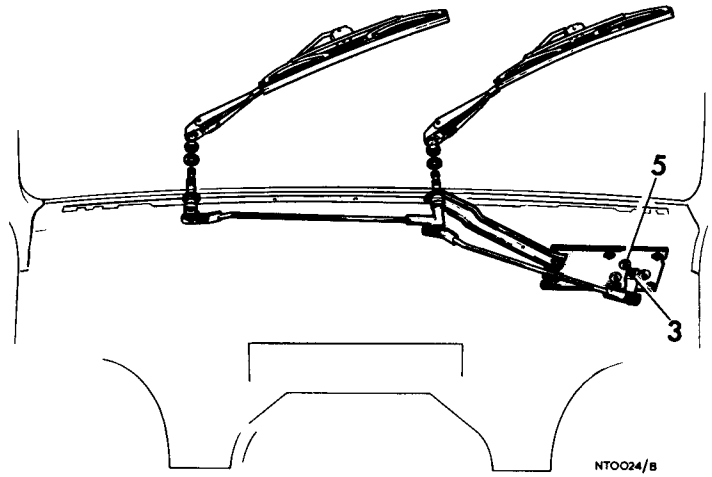


Refitting

3 Locate the cage and clip assembly to the wiper arm. Push on to engage 'pip'.
4 Lower the wiper arm to the screen.

WINDSCREEN WIPER MOTOR

Remove and refit **84.15.12**

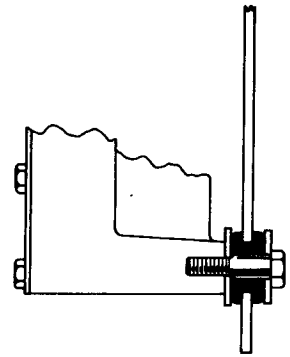


Removing

1 Isolate the battery.
2 From inside the car, below the fascia, prise out two button clips and withdraw the millboard cover.
3 Remove the motor shaft nut and withdraw the crank.
4 Collect the shaft washer.
5 Remove the three bolts and lift off the motor.
6 Disconnect the harness plug.
7 Collect the six washers.

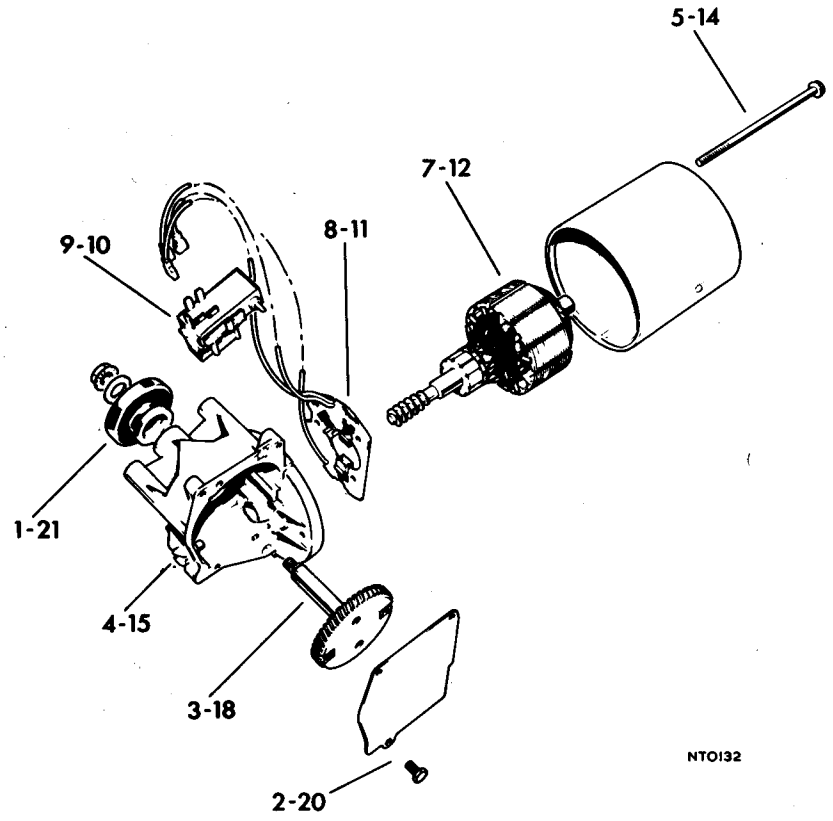
Refitting

8 Reverse 1 to 7. Three washers have large holes and fit to the bolt heads. Three washers have small holes and fit to the bolt steps.



WINDSCREEN WIPER MOTOR

Overhaul **84.15.18**



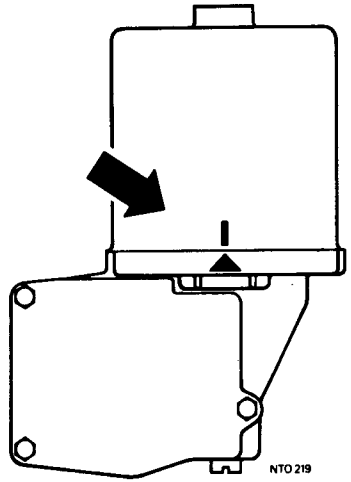
Dismantling

1 Remove the rubber seal.
2 Remove three screws. Lift off the gearbox cover.
3 Ensure that the shaft is burr-free and withdraw it. Remove the dished washer.
4 Remove the thrust screw or the thrust screw and locknut as fitted.
5 Remove the through-bolts.
6 Carefully withdraw the cover and armature about 0·2 in (5 mm). Continue withdrawal, allowing the brushes to drop clear of the commutator. Ensure that the three brushes are not contaminated with grease.
7 Pull the armature from the cover against the action of the permanent magnet.
8 Remove three screws to release the brush assembly. Lift the assembly from the recess.
9 Lift and slide the limit switch out sideways to release the spring clip. Remove the limit switch and brush assembly joined together by the wires.

Reassembling

NOTE: The following lubricants are required during assembly: Shell Turbo 41 oil and Ragosine Listate grease.

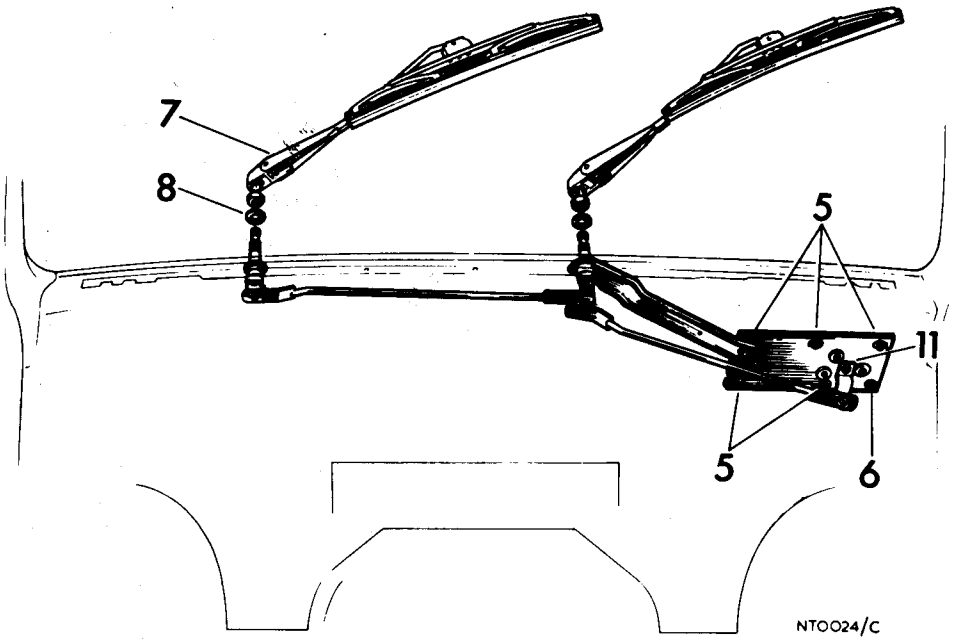
10 Slide the limit switch in sideways to secure with the spring clip.
11 Position the brush assembly. Secure with three screws.
12 Lubricate the cover bearing and saturate the cover bearing felt washer with Shell Turbo 41 oil. Position the armature to the cover against the action of the permanent magnet.
13 Lubricate the self-aligning bearing with Shell Turbo 41 oil. Carefully insert the armature shaft through the bearing. Ensure that the brushes are not contaminated with lubricant. Push the three brushes back to clear the commutator.
14 Seat the cover against the gearbox. Turn the cover to align the marks shown. Fit the through-bolts.
15 Fit the thrust screw or the thrust screw and locknut as fitted.
16 If a non-adjustable thrust screw is fitted, check the armature end-float as follows:
Position a feeler gauge between the armature shaft and the thrust screw.
Push the armature towards the cover.
End-float should be 0·002 to 0·008 in.
In the unlikely event of adjustment being required, end-float may be increased by fitting shim washer/washers under the thrust screw head or reduced by mounting the thrust screw in a lathe and removing metal from the underside of the head.
17 If an adjustable thrust screw and locknut is fitted, adjust the armature end-float as follows:
Slacken the locknut. Screw the thrust screw in until resistance is felt. Screw the thrust screw out a quarter of a turn — maintain in this position and tighten the locknut.
18 Lubricate the final gear bushes with Shell Turbo 41 oil. Lubricate the final gear cam with Ragosine Listate grease. Fit the dished washer with its concave surface facing the final gear. Insert the shaft.



19 Pack Ragosine Listate grease around the worm gear and final gear.
20 Position the gearbox cover. Secure with three screws.
21 Fit the rubber seal.

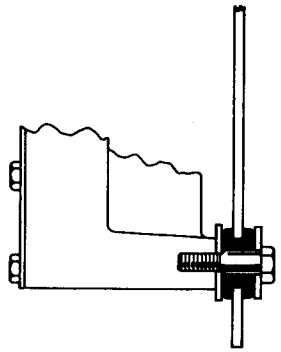
WINDSCREEN WIPER LINKAGE

Remove and refit **84.15.26**



Removing

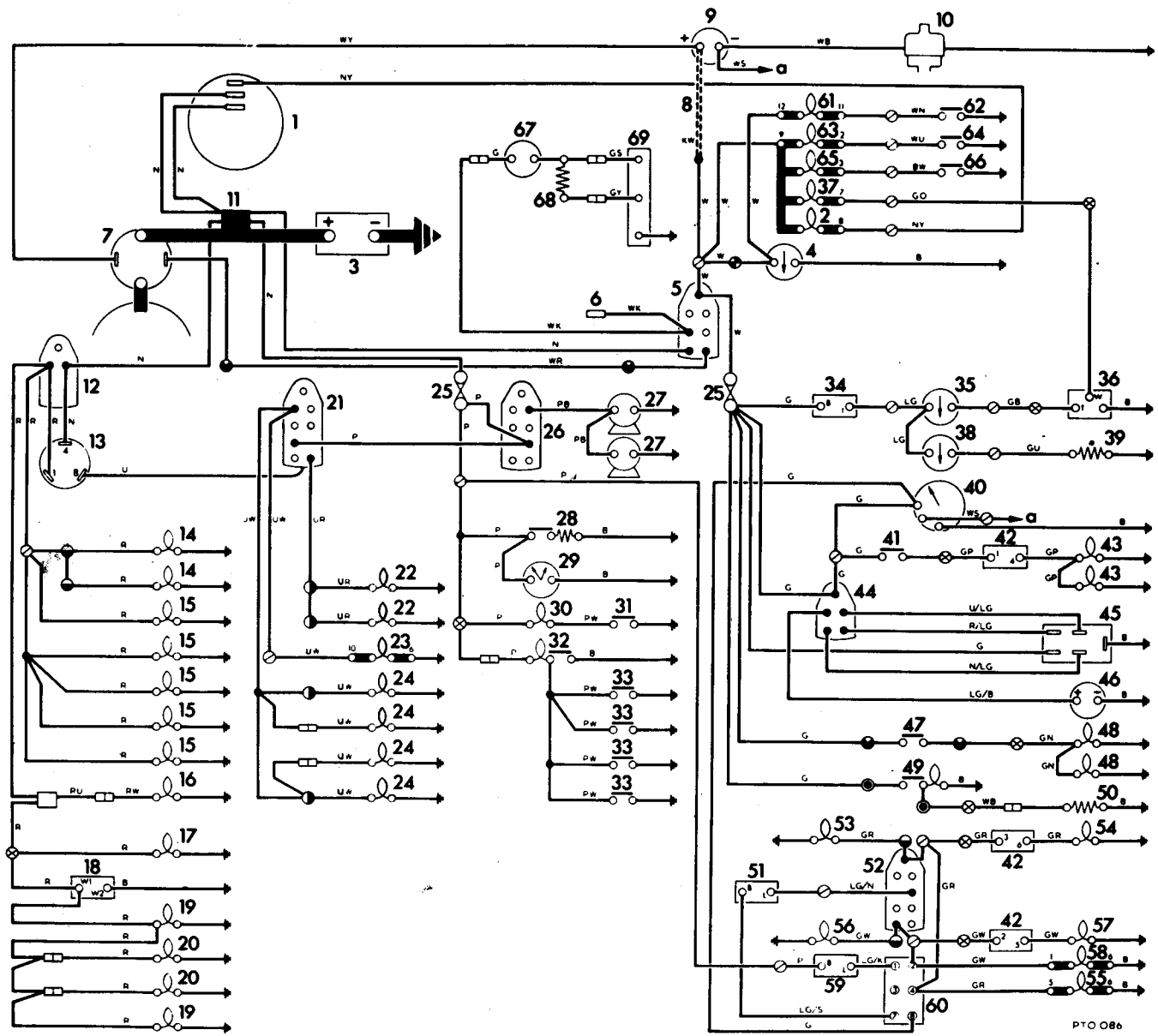
1 Isolate the battery.
2 Remove the parcel shelf, see 76.67.01.
3 Remove the fascia, see 76.46.01.
4 Prise out two button clips and withdraw the millboard cover.
5 Remove the five bolts indicated.
6 Slacken the sixth bolt. Leave it in position to support the plate.
7 Remove the two wiper arms, see 84.15.01.
8 Remove the two spindle nuts and rubber washers.
9 Withdraw the linkage and motor assembly. The lower right-hand aperture on the plate is slotted to allow withdrawal without removing the sixth bolt.
10 Disconnect the harness plug from the motor.
11 If necessary, remove the motor from the linkage as follows:
Remove the motor shaft nut and withdraw the crank. Collect the shaft washer. Remove the three bolts and lift off the motor.



Refitting

12 Reverse 1 to 11. Three motor mounting bolt washers have large holes and fit to the bolt heads. Three washers have small holes and fit to the bolt steps.

WIRING DIAGRAM
RIGHT-HAND STEERING—UP TO COMMISSION NUMBER VA 15000



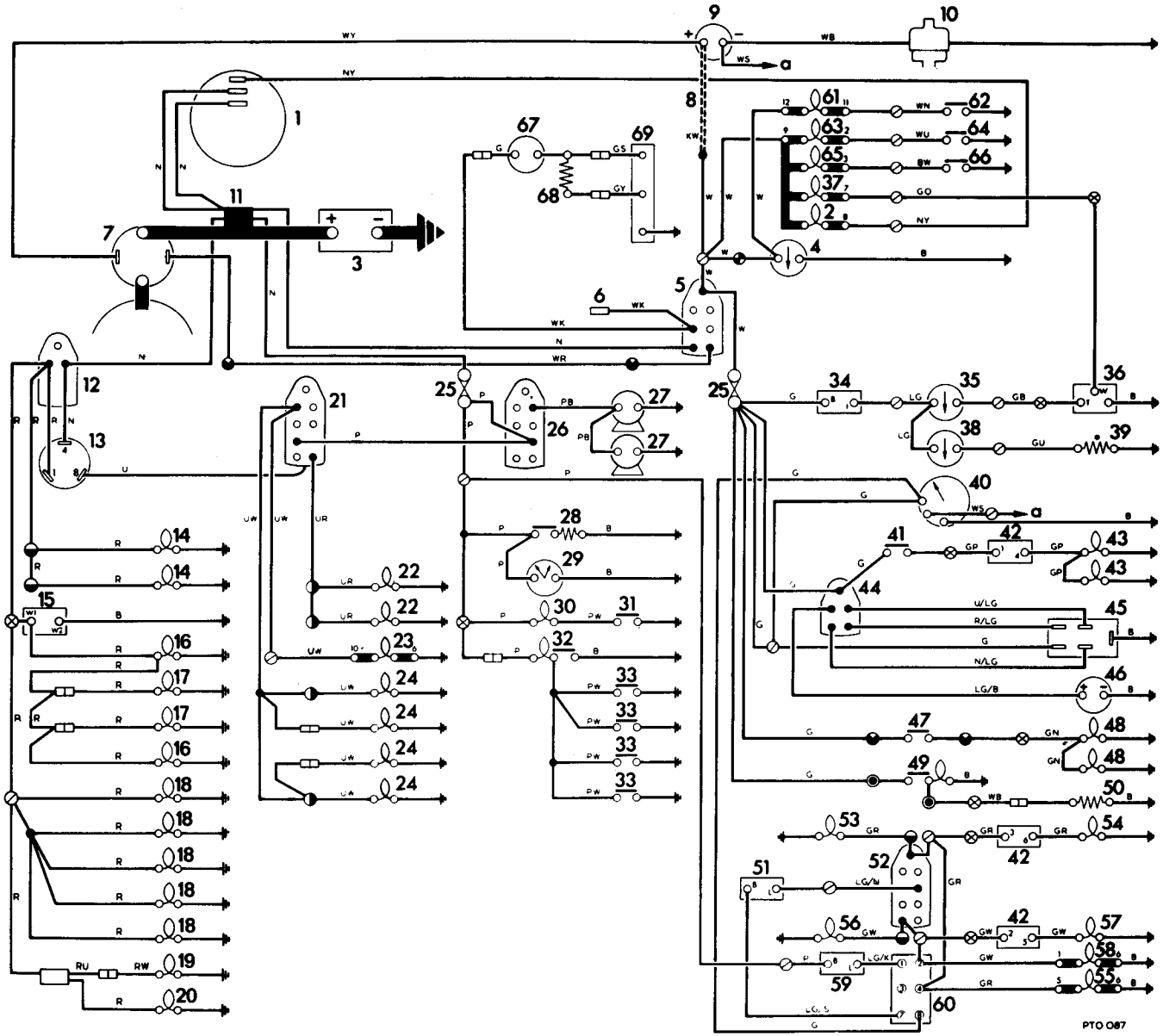
KEY TO WIRING DIAGRAM

1 Alternator
2 Ignition warning light
3 Battery
4 Battery condition indicator
5 Ignition/starter switch
6 Radio supply
7 Starter motor
8 Ballast resistor wire
9 Ignition coil — 6 volt
10 Ignition distributor
11 Battery lead connector
12 Two plug pins and two harness wires of ignition/starter switch assembly — used to make connections to master light switch
13 Master light switch
14 Front parking lamp
15 Instrument illumination
16 Cigarette lighter illumination
17 Clock illumination
18 Night dimming relay winding (*earlier models*)
19 Tail lamp
20 Plate illumination lamp
21 Main/dip/flash switch
22 Dip beam
23 Main beam warning light
24 Main beam
25 Fuse
26 Horn switch
27 Horn
28 Cigarette lighter
29 Clock
30 Luggage boot lamp
31 Luggage boot lamp switch
32 Roof lamp
33 Door switch
34 Voltage stabilizer
35 Fuel indicator
36 Fuel tank unit
37 Fuel warning light
38 Temperature indicator
39 Temperature transmitter
40 Tachometer
41 Stop lamp switch
42 Night dimming relay contacts (*earlier models*)
43 Stop lamp
44 Windscreen washer/wiper switch
45 Windscreen wiper motor
46 Windscreen washer pump
47 Reverse lamp switch
48 Reverse lamp
49 Heated back-light switch
50 Heated back-light
51 Turn signal flasher unit
52 Turn signal switch
53 L.H. front flasher lamp
54 L.H. rear flasher lamp
55 L.H. turn signal warning light
56 R.H. front flasher lamp
57 R.H. rear flasher lamp
58 R.H. turn signal warning light
59 Hazard flasher unit
60 Hazard switch
61 Oil pressure warning light
62 Oil pressure switch
63 Choke warning light
64 Choke switch
65 Hand brake warning light
66 Hand brake switch
67 Heater motor
68 Heater resistor
69 Heater switch

COLOUR CODE

B	Black	R	Red
G	Green	S	Slate
LG	Light Green	U	Blue
N	Brown	W	White
P	Purple	Y	Yellow

WIRING DIAGRAM
LEFT-HAND STEERING—UP TO COMMISSION NUMBER VA 15000



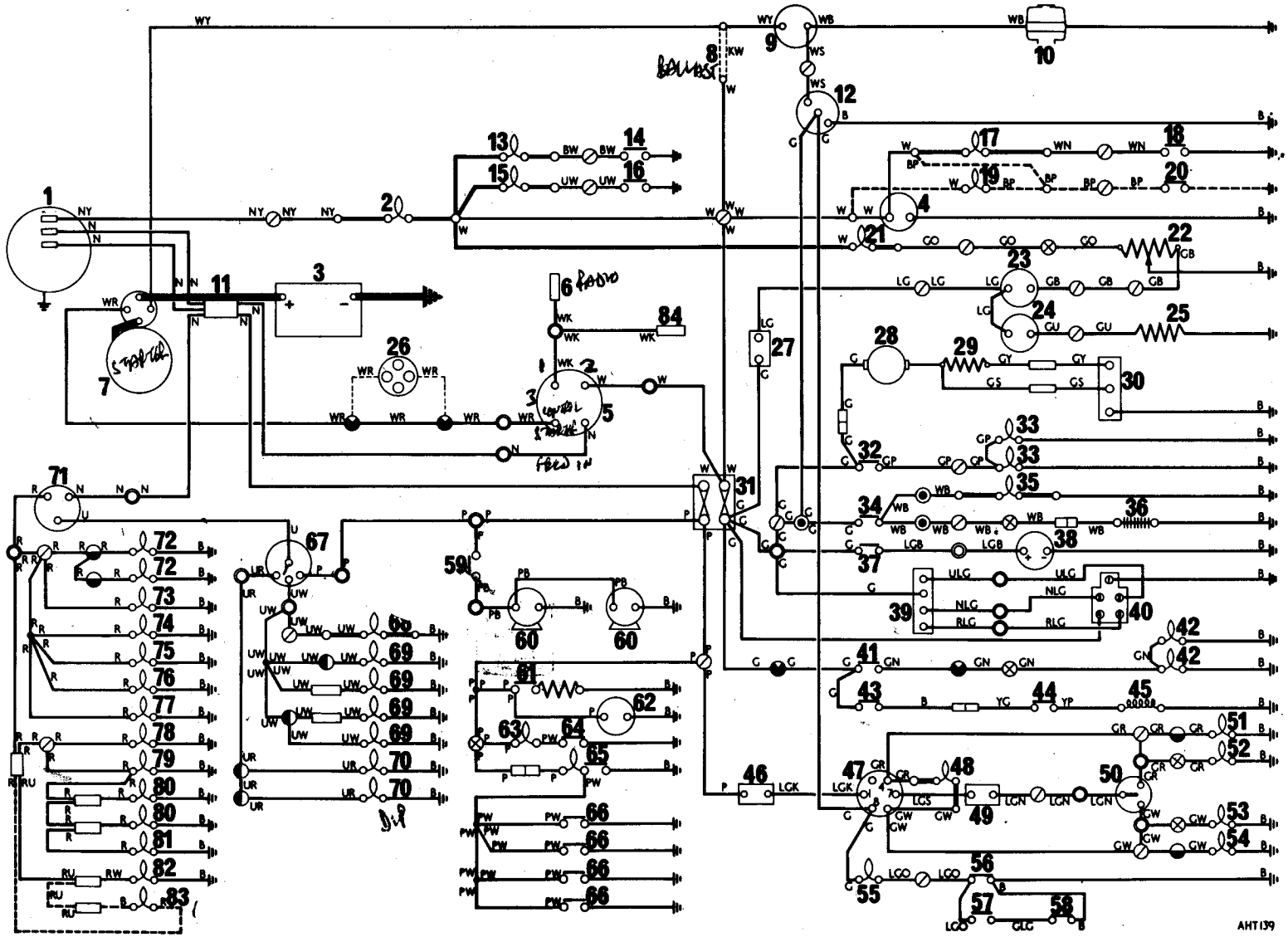
KEY TO WIRING DIAGRAM

1 Alternator
2 Ignition warning light
3 Battery
4 Battery condition indicator
5 Ignition/starter switch
6 Radio supply
7 Starter motor
8 Ballast resistor wire
9 Ignition coil — 6 volt
10 Ignition distributor
11 Battery lead connector
12 Two plug pins and two harness wires of ignition/starter switch assembly — used to make connections to master light switch
13 Master light switch
14 Front parking lamp
15 Night dimming relay winding (*earlier cars only*)
16 Tail lamp
17 Plate illumination lamp
18 Instrument illumination
19 Cigarette lighter illumination
20 Clock illumination
21 Main/dip/flash switch
22 Dip beam
23 Main beam warning light
24 Main beam
25 Fuse
26 Horn switch
27 Horn
28 Cigarette lighter
29 Clock
30 Luggage boot lamp
31 Luggage boot lamp switch
32 Roof lamp
33 Door switch
34 Voltage stabilizer
35 Fuel indicator
36 Fuel tank unit
37 Fuel warning light
38 Temperature indicator
39 Temperature transmitter
40 Tachometer
41 Stop lamp switch
42 Night dimming relay contacts (*earlier models*)
43 Stop lamp
44 Windscreen washer/wiper switch
45 Windscreen wiper motor
46 Windscreen washer pump
47 Reverse lamp switch
48 Reverse lamp
49 Heated back-light switch
50 Heated back-light
51 Turn signal flasher unit
52 Turn signal switch
53 L.H. front flasher lamp
54 L.H. rear flasher lamp
55 L.H. turn signal warning light
56 R.H. front flasher lamp
57 R.H. rear flasher lamp
58 R.H. turn signal warning light
59 Hazard flasher unit
60 Hazard switch
61 Oil pressure warning light
62 Oil pressure switch
63 Choke warning light
64 Choke switch
65 Hand brake warning light
66 Hand brake switch
67 Heater motor
68 Heater resistor
69 Heater switch

COLOUR CODE

B	Black	R	Red
G	Green	S	Slate
LG	Light Green	U	Blue
N	Brown	W	White
P	Purple	Y	Yellow

WIRING DIAGRAM
RIGHT-HAND STEERING—FROM COMMISSION NUMBER VA 15001



KEY TO WIRING DIAGRAM

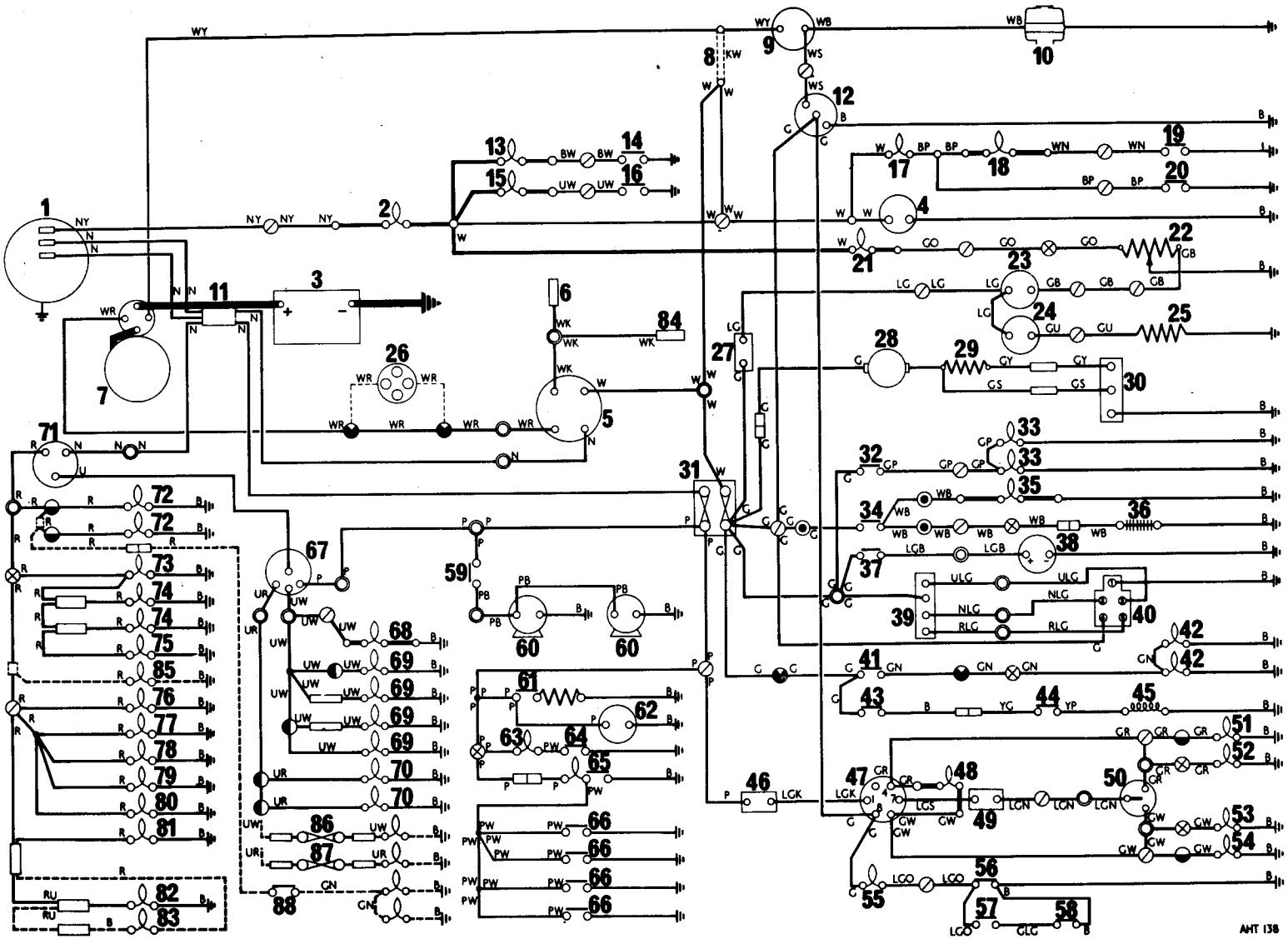
1 Alternator
2 Ignition warning light
3 Battery
4 Battery condition indicator
5 Ignition/starter switch
6 Radio supply
7 Starter motor
8 Ballast resistor wire
9 Ignition coil
10 Ignition distributor
11 Battery lead connector
12 Tachometer
13 Hand brake warning light
14 Hand brake switch
15 Choke warning light
16 Choke switch
17 Oil pressure warning light
18 Oil pressure switch
19 ‡Brake failure warning light
20 ‡Brake failure switch
21 Fuel warning light
22 Fuel tank unit
23 Fuel indicator
24 Temperature indicator
25 Temperature transmitter
26 ‡Starter inhibitor switch (*automatic only*)
27 Voltage stabilizer
28 Heater motor
29 Heater resistor
30 Heater switch
31 Fusebox
32 Stop lamp switch
33 Stop lamp
34 Heated back light switch
35 Heated back light warning light
36 Heated back light
37 Windscreen washer switch
38 Windscreen washer pump
39 Windscreen wiper switch
40 Windscreen wiper motor
41 Reverse lamp switch
42 Reverse lamp
43 ‡Overdrive selector switch
44 ‡Overdrive gearbox switch
45 ‡Overdrive solenoid
46 Hazard flasher unit
47 Headlamp flasher switch
48 Direction indicator warning light
49 Direction indicator flasher unit
50 Direction indicator switch
51 Front direction indicator lamp — L.H.
52 Rear direction indicator lamp — L.H.
53 Rear direction indicator lamp — R.H.
54 Front direction indicator lamp — R.H.
55 Seat belt warning light
56 Seat belt switch
57 Seat sensor switch
58 Seat belt switch
59 Horn switch
60 Horn
61 Cigarette lighter
62 Time clock
63 Luggage compartment lamp
64 Luggage compartment switch
65 Courtesy lamp
66 Door switch
67 Headlamp selector switch
68 Main beam warning light
69 Main beam filament
70 Dip beam filament
71 Master lighting switch
72 Front parking lamp
73 Fuel indicator illumination
74 Temperature indicator illumination
75 Speedometer illumination
76 Tachometer illumination
77 Battery condition indicator illumination
78 Time clock illumination
79 Tail lamp — R.H.
80 Plate illumination lamp
81 Tail lamp — L.H.
82 Cigarette lighter illumination
83 ‡Selector panel illumination (B/W)
84 Alternative heater supply

‡ where fitted

COLOUR CODE

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

WIRING DIAGRAM
LEFT-HAND STEERING—FROM COMMISSION NUMBER VA 15001



KEY TO WIRING DIAGRAM

1 Alternator
2 Ignition warning light
3 Battery
4 Battery condition indicator
5 Ignition/starter switch
6 Radio supply
7 Starter motor
8 Ballast resistor wire
9 Ignition coil
10 Ignition distributor
11 Battery lead connector
12 Tachometer
13 Hand brake warning light
14 Hand brake switch
15 Choke warning light
16 Choke switch
17 Brake failure warning light
18 Oil pressure warning light
19 Oil pressure switch
20 Brake failure switch
21 Fuel warning light
22 Fuel tank unit
23 Fuel indicator
24 Temperature indicator
25 Temperature transmitter
26 ‡Starter inhibitor switch (*automatic only*)
27 Voltage stabilizer
28 Heater motor
29 Heater resistor
30 Heater switch
31 Fusebox
32 Stop lamp switch
33 Stop lamp
34 Heated back-light switch
35 Heated back-light warning light
36 Heated back-light
37 Windscreen washer switch
38 Windscreen washer pump
39 Windscreen wiper switch
40 Windscreen wiper motor
41 Reverse lamp switch
42 Reverse lamp
43 ‡Overdrive selector switch
44 ‡Overdrive gearbox switch
45 ‡Overdrive solenoid
46 Hazard flasher unit
47 Headlamp flasher switch
48 Direction indicator warning light
49 Direction indicator flasher unit
50 Direction indicator switch
51 Front direction indicator lamp — L.H.
52 Rear direction indicator lamp — L.H.
53 Rear direction indicator lamp — R.H.
54 Front direction indicator lamp — R.H.
55 Seat belt warning light
56 Seat belt switch
57 Seat sensor switch
58 Seat belt switch
59 Horn switch
60 Horn
61 Cigarette switch
62 Time clock
63 Luggage compartment lamp
64 Luggage compartment switch
65 Courtesy lamp
66 Door switch
67 Headlamp selector switch
68 Main beam warning light
69 Main beam filament
70 Dip beam filament
71 Master lighting switch
72 Front parking lamp
73 Tail lamp — L.H.
74 Plate illumination lamp
75 Tail lamp — R.H.
76 Hazard flasher warning light
77 Battery condition indicator illumination
78 Temperature indicator illumination
79 Speedometer illumination
80 Tachometer illumination
81 Time clock illumination
82 Cigarette lighter illumination
83 ‡Selector panel illumination (B/W)
84 Alternative heater supply

Italy only
85 Parking lamp indicator
86 Fuse (main beam)
87 Fuse (dip beam)
88 Reverse lamp switch

‡where fitted

COLOUR CODE

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

BULB CHART

	Watts	Lucas Part No.	Unipart No.	Stanpart No.	
Headlamps:					
L.H. dip—Normal—Outer	37·5/60	54526139	GLU 103		†
Inner	75	54523449	GLU 105		†
R.H. dip—Normal—Outer	45/40	410	GLB 410	510218	●
Inner	45/40	410	GLB 410	510218	‡
France—Outer	45/40	411		510219	●
Inner	45/40	411		510219	‡
U.S.A.—Outer	37·5/50	54521335			†
Inner	37·5	54521334			†
Front parking lamps	5	989	GLB 989	59467	
Front flasher lamps	21	382	GLB 382	502379	
Rear flasher lamps	21	382	GLB 382	502379	
Tail/stop lamps	5/21	380	GLB 380	502287	
Reverse lamps	21	382	GLB 382	502379	
Plate illumination lamp—					
Earlier models	5	207	GLB 207	57591	
Later models	4		BLB 233		
Luggage boot illumination	2·2	987	GLB 987	59492	
Roof lamp	5			631729	
Instrument illumination	2·2	987	GLB 987	59492	
Clock illumination	2	281	GLB 281	513000	
Warning light cluster	1·5	280	GLB 280	502288	
Cigarette lighter illumination	2·2	543		516266	
Heated back-light switch	2	281	GLB 281	512000	
Selector panel—automatic transmission only	3	256	GLB 256	57599	

† —Sealed beam light unit.
● —The 45 watt filament positioned at the focal point of the reflector provides the dip beam. The 40 watt filament provides part of the main beam.
‡ —The 45 watt filament positioned at the focal point of the reflector provides part of the main beam. The 40 watt filament is not used.

ALTERNATOR DATA CHART

CAUTION: The alternator contains polarity sensitive components that may be irreparably damaged if subjected to incorrect polarity.
Do not connect or disconnect any part of the charging circuit—including the battery leads—while the engine is running. Run the alternator with all connections made or with the unit disconnected.

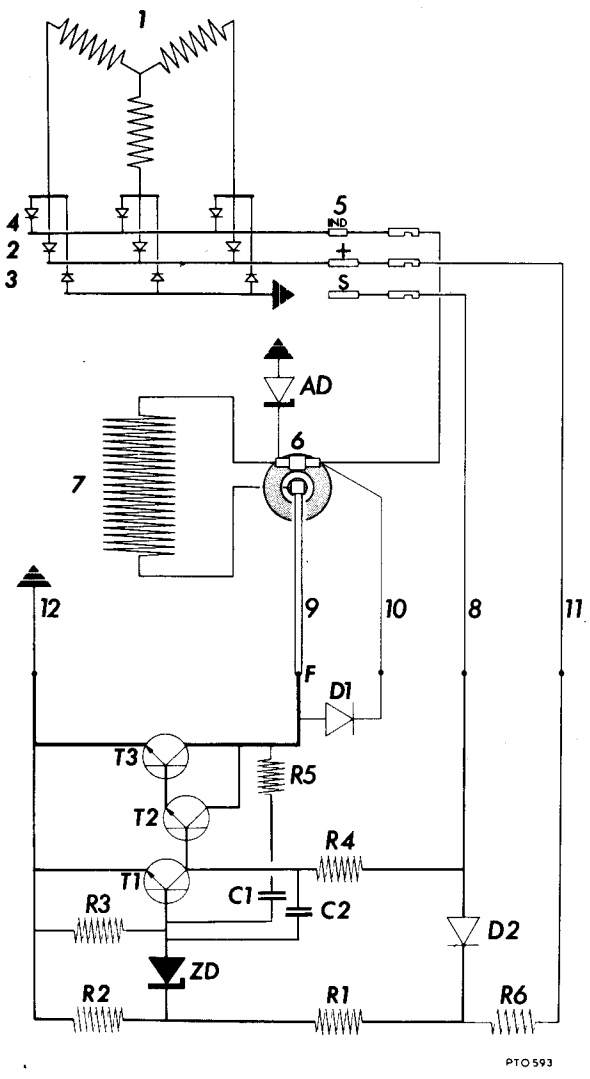
NOTE: Two Lucas alternators have been fitted to the Dolomite Sprint model range. Identify the unit on the specific vehicle to ensure that information obtained from this manual refers to the appropriate alternator.

Manufacturer	Lucas		Lucas	
Type	17 ACR. Dual sensed—battery sensed with machine sensed safety control. European terminations		17 ACR. Dual sensed—battery sensed with machine sensed safety control. European terminations	
Part numbers—	**Lucas Part No.**	**Stanpart No.**	**Lucas Part No.**	**Stanpart No.**
assembly	—	219269	—	219269
comprising—				
alternator	23745	219270	23796	219270
fan	54217652	147990	54217652	147990
pulley	54217767 or 54219467	154334	54217767 or 54219467	154334
Polarity	Negative earth only		Negative earth only	
Brush length—new	0·5 in (12·70 mm)		0·5 in (12·70 mm)	
—renew if less than	0·2 in (5·00 mm) protrudes from brushbox when free		0·2 in (5·00 mm) protrudes from brushbox when free	
Brush spring pressure	9 to 13 ozf (255 to 370 gf) at face flush with brushbox		9 to 13 ozf (255 to 370 gf) at face flush with brushbox	
Rectifier pack—output rectification	6 diodes (3 live side and 3 earth side)		6 diodes (3 live side and 3 earth side)	
—field winding supply rectification	3 diodes		3 diodes	
Stator windings	Three phase—star connected		Three phase—star connected	
Field winding rotor				
—poles	12		12	
—maximum permissible speed	15,000 rev/min		15,000 rev/min	
—shaft thread	$\frac{5}{16}$"—18 U.N.F.		$\frac{5}{16}$"—18 U.N.F.	
Field winding resistance at 20°C	3·2±5% ohm		3·2±5% ohm	
Regulator—type	8 TRD		14 TR	
Nominal output—condition	Hot		Hot	
—alternator speed	6000 rev/min		6000 rev/min	
—engine speed	2540 rev/min		2540 rev/min	
—control voltage	14 volt		14 volt	
—amp	36 amp		36 amp	

The mechanical features of the alternator are a rotor supported by two ball bearings. No periodic lubrication is required. The field winding carried on the rotor is energized via a pair of brushes and slip-rings. Cooling air is drawn through the unit by a fan mounted at the drive end.
Electrically, an alternating current produced in the three-phase, star-connected static stator windings is rectified by six diodes — three on the live side and three on the earth side — to supply direct current to the vehicle electrical circuits and battery.
The field winding circuit is energized by part of the stator output which is rectified by the three field winding supply diodes.
The integral control unit is electrically positioned in the field winding earth return path. Until a measure of control is required terminal 'F' is connected via the output transistor to earth. As the alternator output rises, the reference voltage felt at terminal 'S' rises. When control is required the solid-state switching circuit governed by the voltage-sensitive electronic circuit turns the output transistor off. The control unit thus finely adjusts the current flow through the field winding to balance the alternator output to suit the electrical requirements of the vehicle and the state of charge of the battery.

ALTERNATOR WIRING DIAGRAM

Lucas 17ACR alternator with 14TR regulator (Lucas part No. 23796)



KEY TO ALTERNATOR WIRING DIAGRAM

Lucas 17 ACR alternator (Lucas part No. 23796) with 14 TR regulator

1	Stator windings	
2	Live side output diodes	
3	Earth side output diodes	
4	Field winding supply diodes	
5	European terminations	IND Ignition warning light + Main to battery S Sense to battery
6	Brushes and slip-rings	
7	Field winding	
8	Battery sensed lead — white	
R4	Resistor	Restricts T2 base current supplied from 'battery sensed lead'
T2	Intermediate transistor	Controls T3 base current direct
9	Metal connector link	
T3	Output transistor	Controls field winding earth return circuit
R1 and R2	Resistors	Potential divider — used in normal operation. Senses battery reference voltage
ZD	Zener diode	Voltage sensitive component. Opposes passage of current until breakdown voltage — approximately 8 volts — is reached. Controls T1 base current direct
T1	Input transistor	Controls T2 base current by diverting current passing through R4 to earth when ZD is conducting
C1 and R5	Capacitor and resistor	Prevents transistor overheating by providing positive feedback circuit to ensure quick switching of transistors from 'fully on' to 'fully off'
R3	Resistor	Path for small leakage current which may pass through ZD at high temperatures
10	Surge lead — yellow	
D1	Surge quench diode	Connected across field winding. Protects T3 from field winding high induced voltage surge and smooths field winding current
C2	Condenser	Radio interference suppression
11	Machine sensed lead — red	
R6	Resistor	Fail-safe component. If main alternator to battery wire disconnects, battery sensed lead voltage will fall. Alternator runaway voltage is clamped by high voltage on machine sensed lead. Modified potential divider R1, R2 and addition R6
D2	Diode	Fail-safe component. If battery sensed lead disconnects alternator shuts down as supply via R4 to transistors T2 and T3 stops. D2 blocks feed into this circuit from machine sensed lead via R6
AD	Avalanche diode	Protects output transistor from high transient voltage which may occur from faulty charging circuit connections
12	Earth lead — black	Regulator earth

ALTERNATOR

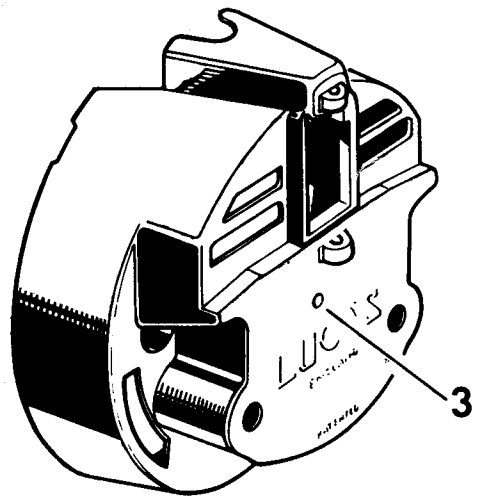
Functional check 86.10.01

This operation must be performed in two parts. The first to prove the alternator's capacity to produce current. The second to prove the performance of the integral regulator.

Check capacity to produce current

NOTE: The stated output may be exceeded slightly when the alternator is cold. To avoid misleading results, the check should be performed with the unit as near to its normal operating temperature as possible.

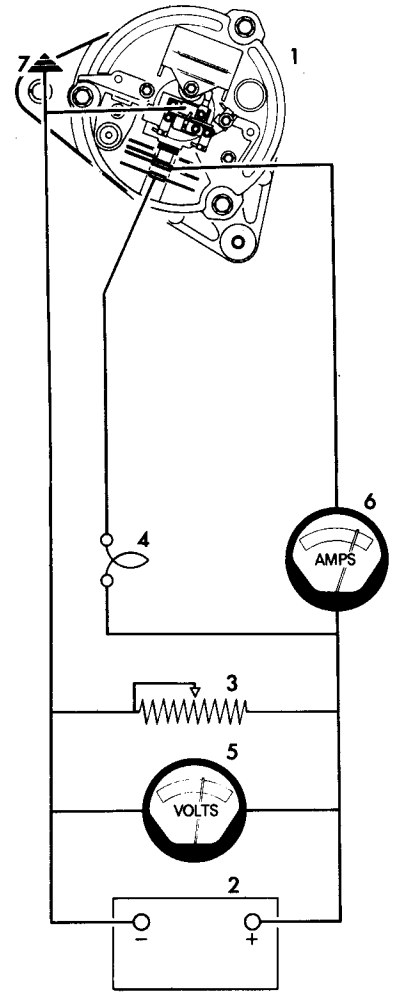
1 Check drive belt adjustment, see 86.10.05.
2 Disconnect the multi-socket connector.



PTO 813

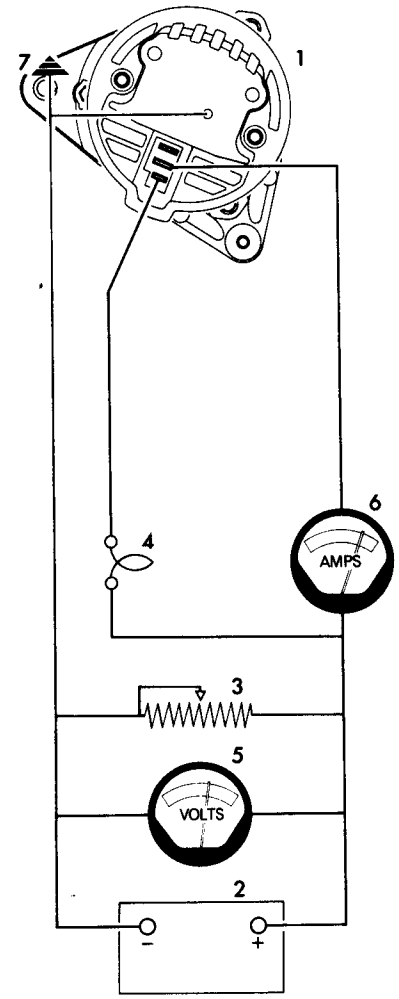
3 Inspect the cover to determine if a membrane facility exists.
4 Cover with no membrane facility only: Remove the cover.
5 Cover with membrane facility only: Pierce the membrane and provide a suitable probe and wire to enable the field winding earth brush to be earthed direct thus by-passing the regulator.
6 Read off the Lucas part number and identify the unit using the Alternator Data Chart, see 86.10.00.
7 Provide a test circuit as shown for the appropriate alternator.
CAUTION: The alternator contains polarity-sensitive components that may be irreparably damaged if subjected to incorrect polarity. Observe polarity of alternator and battery terminals.
8 Do not connect the variable resistor across the battery for longer than is necessary to perform the check.
9 Run the engine.
10 Gradually increase the speed. At 1,550 alternator rev/min (660 engine rev/min) the light should be extinguished.
11 Hold the speed at approximately 6,000 alternator rev/min (2,540 engine rev/min). Adjust the variable resistor so that voltmeter reads 14 volts. The ammeter reading should now be approximately equal to the nominal output given in data for the appropriate alternator.
12 If the ammeter reading is not correct the indication is that the alternator requires overhaul or replacement.

continued



PTO 866

Test circuit for alternator with no membrane facility



PTO 812

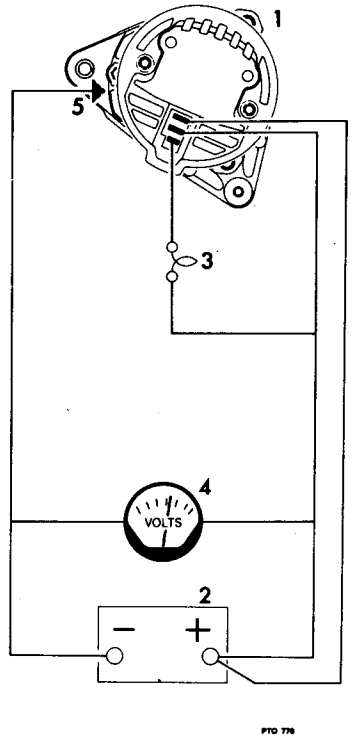
Test circuit for alternator with membrane facility

1	Alternator	
2	Battery	12 volt
3	Variable resistor	70 amp
4	Light	12 volt—2·2 watt
5	Voltmeter	0—20 volt
6	Ammeter	0—40 amp
7	Earth connection to alternator body	

Check control unit

NOTE: The stated output may be exceeded slightly when the alternator is cold. To avoid misleading results, the check should be performed with the unit as near to its normal operating temperature as possible.

13 Check drive belt adjustment, see 86.10.05.
14 Disconnect multi-socket connector.
15 Read off the Lucas part number and identify the unit using the Alternator Data Chart, see 86.10.00
16 Provide a test circuit as shown for the appropriate alternator.
CAUTION: The alternator contains polarity-sensitive components that may be irreparably damaged if subjected to incorrect polarity. Observe polarity of alternator and battery terminals.
17 Run the engine.
18 Gradually increase the speed. At 1,550 alternator rev/min (660 engine rev/min) the light should be extinguished.
19 Hold the speed at approximately 6,000 alternator rev/min (2,540 engine rev/min). The voltmeter reading should now be steady at 13·6 to 14·4 volts.
20 If the voltmeter reading is not steady at the above figure — and a satisfactory 'Check capacity to produce current' has been performed — the indication is that the control unit should be replaced.

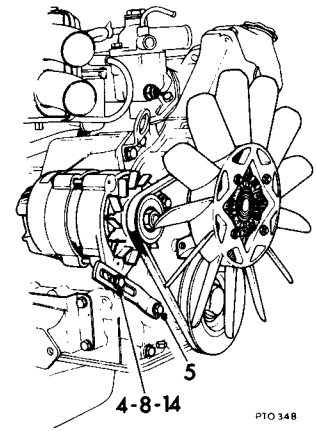


PTO 776

1 Alternator
2 Battery 12 volt
3 Light 12 volt — 2·2 watt
4 Voltmeter 0 — 20 volt
5 Earth connection to alternator body

ALTERNATOR

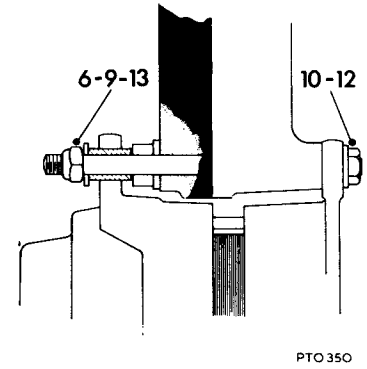
Remove and refit **86.10.02**



PTO 348

Removing

1 Isolate the battery.
2 *Earlier models only*: Remove the radiator assembly, see 26.40.01. This is necessary to provide the required clearance to withdraw the main mounting bolt.
NOTE: On later models. Provision is made to fit the bolt from the back.
3 Disconnect the multi-socket connector.
4 Slacken the adjustment bolt.
5 Slacken the link bolt.
6 Slacken the main mounting bolt.
7 Push the alternator towards the engine and remove the drive belt from the pulley.



PTO 350

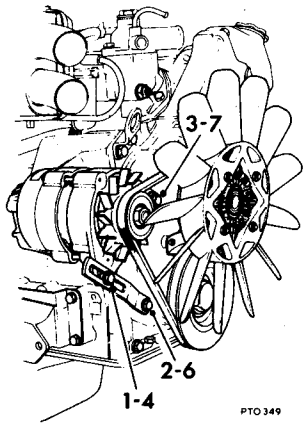
8 Remove the adjustment bolt and washer.
9 Remove the nut and washer.
10 Support the weight of the alternator. Withdraw the main mounting bolt and washer.
11 Collect up the spacer and distance washer.

Refitting

12 Position the alternator, distance washer and spacer. Insert the main mounting bolt and washer.
13 Fit the washer and nut.
14 Fit the adjustment bolt and washer.
15 Push the alternator towards the engine and fit the drive belt to the pulley.
16 Adjust the drive belt, see 86.10.05.
17 Connect the mult-socket connector.
18 *Earlier models only*: Fit the radiator assembly, see 26.40.01.
19 Connect the battery.

ALTERNATOR

Drive belt — adjust **86.10.05**



1 Slacken the adjustment bolt.
2 Slacken the link bolt.
3 Slacken the main mounting bolt.
4 Carefully lever the alternator away from the engine to tension the belt. Tighten the adjustment bolt.
CAUTION: To prevent bearing damage when tensioning the belt use a lever of soft material — preferably wood — applied to the alternator drive-end bracket. Do not lever on any other part of the alternator.
5 Check the belt tension. Total movement should be 0·75 to 1·00 in (20 to 25 mm) at the mid-point of the longest run.
6 Tighten the link bolt.
7 Tighten the main mounting bolt.

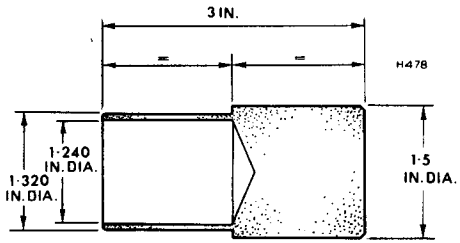
ALTERNATOR

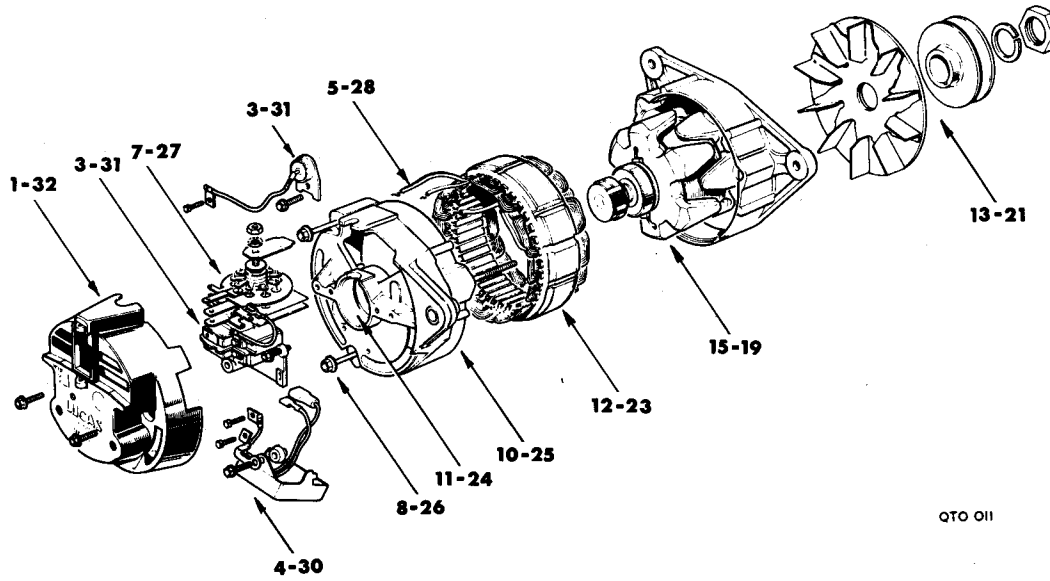
Overhaul **86.10.08**

This overhaul instruction is specific to Lucas alternator part number 23796. Other units may differ slightly.

Dismantling

1 Remove the moulded cover.
2 Before disturbing any wires, note the wire position and colour.
3 Remove the brushbox, regulator and surge protection diode assembly as follows:
Remove screw to release surge protection diode.
Disconnect three Lucar connectors from the rectifier pack.
Remove two screws to release the brushbox.
Lift away the assembly.
4 If required, the regulator may be detached from the assembly as follows:
Remove screw to release one wire eyelet.
Remove screw to release the regulator.
Disengage two lugs and lift away the regulator.
Collect up the spacer.
5 Note the position of the three stator wires on the rectifier pack.
6 Unsolder the three stator wire connections. Do not overheat the diodes or bend the diode pins. Solder quickly and provide a heat sink by gripping the diode pin with pliers.
7 Remove screw to release the rectifier pack earth strip. Slacken the nut and withdraw the rectifier pack.
8 Remove the through-bolts.
9 Provide an extractor tool as shown.





10 To remove the slip-ring end bracket, position the extractor tool to engage with the outer journal of the slip-ring end bearing. Employ a second operator to support the slip-ring end bracket by hand. Carefully tap the extractor tool to drive the bearing from the housing.
NOTE: It may be necessary to carefully file away surplus solder from the two field winding connections on the slip-ring moulding if the exterior tool will not pass over the moulding.
11 The rubber 'O' ring fitted in the slip-ring end bracket bearing housing may remain *in situ* unless replacement is contemplated.
12 Remove the stator windings from the drive end bracket.
13 Prevent the rotor turning by wrapping a scrap fan belt round the pulley and retaining by hand or vice. Remove the nut, spring washer, pulley and fan. If necessary, use a suitable extractor.
14 Remove the key.
15 Using a suitable press, remove the rotor from the drive end bracket.
CAUTION: Do not attempt to remove the rotor by applying hammer blows to the shaft end. Such action may burr over and damage the thread.
16 Collect up the thick spacer.
17 Remove the thin spacer from the rotor shaft.

Assembling

18 Fit the thin spacer to the rotor shaft.
19 Using a suitable press, the thick spacer and a suitable tube, fit the rotor to the drive end bracket by applying pressure to the bearing inner journal.
CAUTION: Do not use the drive-end bracket as a support while fitting the rotor. If the spacer is not employed, the felt ring may be damaged.
20 Fit the key.
21 Fit the fan, pulley, spring washer and nut. Prevent the rotor turning by wrapping a scrap fan belt round the pulley and retaining by hand or vice. Torque load the nut to 25 to 30 lbf ft (3·46 to 4·15 kgf m).

continued

22 Observe the relationship of the stator windings to the drive-end bracket determined by the stator wire connections, the rectifier pack position on the slip-ring end bracket, the alignment of the mounting lugs on the end brackets and the through-bolt clearances on the stator windings.
23 Position the stator windings to the drive-end bracket.
24 Ensure that the rubber 'O' ring is fitted correctly in the slip-ring end bracket bearing housing.
25 Fit the slip-ring end bracket by carefully pushing the bearing into the housing.
26 Fit the through-bolts, tightening evenly.
27 Position the rectifier pack. Fit screw to secure the rectifier pack earth strip. Tighten the nut to secure the rectifier pack.
28 Position three stator wires on the rectifier pack as noted operation 5.
29 Solder three stator wire connections. Note the precautions stated in operation 6 and use 'M' grade 45 – 55 resin cored solder.
30 If required, attach the regulator to the brushbox, regulator and surge protection diode assembly as follows:
Position the spacer.
Position the regulator.
Fit screw to secure the regulator.
Fit screw to secure one wire eyelet.
31 Fit the brushbox, regulator and surge protection diode assembly as follows:
Position the assembly.
Fit two screws to secure the brushbox, include one earth wire eyelet under one screw head.
Connect three Lucar connectors to the rectifier pack.
Fit screw to secure surge protection diode.
32 Fit the moulded cover.

BATTERY

Remove and refit **86.15.01**

Removing
1 Remove the battery leads.
2 Unscrew the two nuts until they are near the ends of the threads.
3 Pull the retainer upwards and lift the battery from the vehicle.

Refitting
4 Pull the retainer upwards and lift the battery into the tray.
5 Locate the retainer against the battery and screw down the two nuts.
6 Fit the battery leads. Do not hammer the terminals to the terminal posts.
7 Coat the terminals with petroleum jelly (Vaseline) to prevent corrosion.

SPARK PLUG

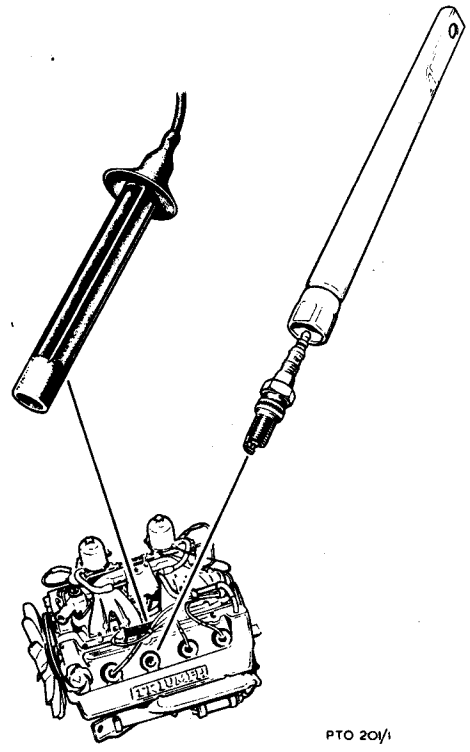
Remove and refit **86.35.02**

Tool: S 357A Plug spanner with rubber insert to hold spark plug. Supplied in vehicle tool kit.

Removing
1 Pull off the high tension lead including the rubber moulding.
2 Locate the spanner to the spark plug.
3 Unscrew the spark plug.
4 Withdraw the spark plug and spanner together from the engine spark plug tube.
5 Pull the spark plug from the spanner.

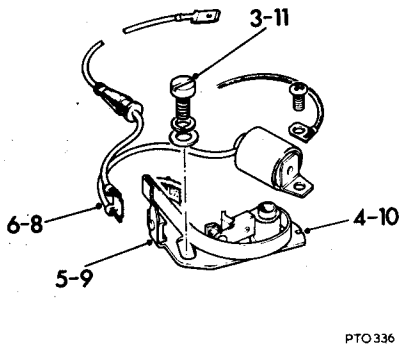
Refitting
6 Locate the spark plug to the spanner.
7 Insert the spark plug and spanner together into the engine spark plug tube.
8 Screw in the spark plug. Torque load to 6 to 8 lbf ft (0·8 to 1·1 kgf m).
NOTE: No gasket is fitted to the spark plug.
The cylinder head threads and tapered seat are aluminium alloy. Do not overtighten, otherwise great difficulty will be experienced when the plug is next removed and damage may be caused to the cylinder head.
The spark plug with a gasket on a conventional Triumph engine is torque loaded to 14 to 20 lbf ft (1·9 to 2·8 kgf m). The above requirement is approximately half this figure.

9 Pull the spanner from the spark plug.
10 Push on the high tension lead including the rubber moulding to engage the connector to the spark plug terminal.


PTO 201/1

IGNITION DISTRIBUTOR

Contact assembly — remove and refit **86.35.13**



Removing

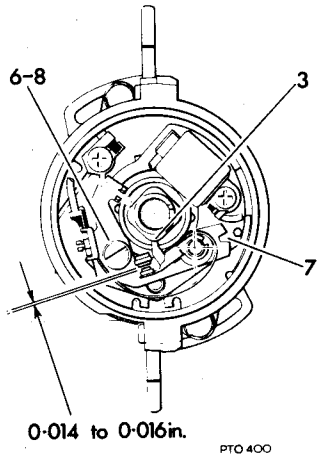
1 Remove the cover and rotor.
2 Lift off the plastic anti flash cover.
3 Remove the lock screw, spring washer and washer.
4 Lift out the Quikafit contact assembly.
5 Disengage the contact spring from the insulation pad.
6 Unclip the terminal plate from the contact spring.

Refitting

7 Wipe preservative from the new contact faces.
8 Clip the terminal plate to the contact spring.
9 Engage the contact spring to the insulation pad.
10 Position the Quickfit contact assembly.
11 Fit the lock screw, spring washer and washer.
12 Adjust the contact gap, see 86.35.14.

IGNITION DISTRIBUTOR

Contact gap — adjust **86.35.14**



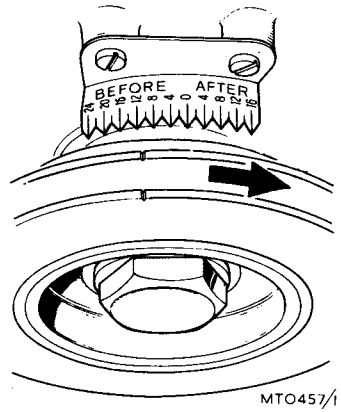
1 Remove the cover and rotor.
2 Lift off the plastic anti flash cover.
3 Rotate the crankshaft to position the contact heel on a cam peak.
4 If the contact gap is correct a 0·014 to 0·016 in (0·36 to 0·41 am) feeler gauge will just slide between the contacts.
5 When the contact gap is correct, operations 6 to 9 may be ignored.
6 If a correction is required, slacken the lock screw.
7 Move the fixed contact about the pivot to adjust the gap. This may be facilitated by inserting a screwdriver between the slot and the pip as shown and twisting to position the fixed contact.
8 Tighten the lock screw.
9 Check that the correct gap has been maintained.

IGNITION DISTRIBUTOR

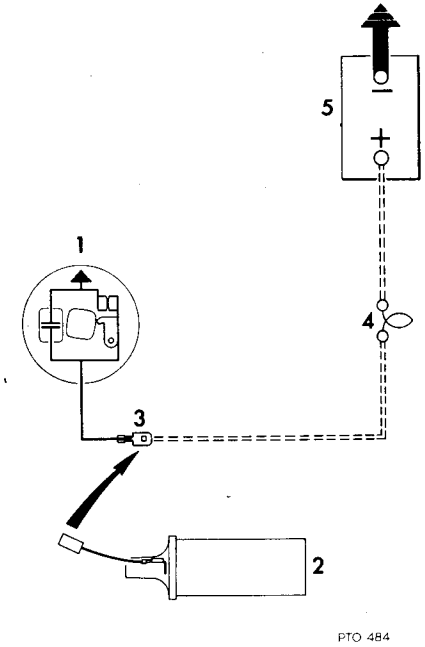
Ignition timing — adjust **86.35.15**

Static

1 Adjust the contact gap, see 86.35.14.
2 Disconnect the distributor low tension fly lead from the floating connection.
3 Provide a test circuit as shown.
4 Rotate the crankshaft in engine run direction to approximately align the mark on the pulley with the 24 degree BEFORE on the scale. The test lamp should now be illuminated.
5 Carefully rotate the crankshaft further until the lamp just goes out.



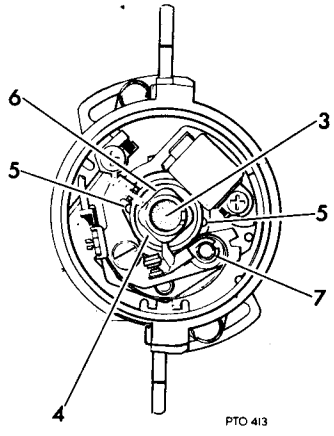
6 If the timing is correct, the mark on the pulley will be aligned with the 10 degree BEFORE on the scale.
7 When the timing is correct operations 8 to 9 may be ignored.
8 If a correction is required, slacken the two distributor mounting bolts. Align the mark on the pulley with the 10 degree BEFORE on the scale. Rotate the distributor body anti-clockwise past the test lamp illumination position. Carefully rotate clockwise until the lamp just goes out. Tighten the two mounting bolts with the unit in this position.
9 Repeat operation 4 onwards.



1 Distributor – diagrammatic layout
2 Ignition coil
3 Distributor fly lead removed from coil
4 Test lamp – 12 volt
5 Vehicle battery

IGNITION DISTRIBUTOR

Lubrication

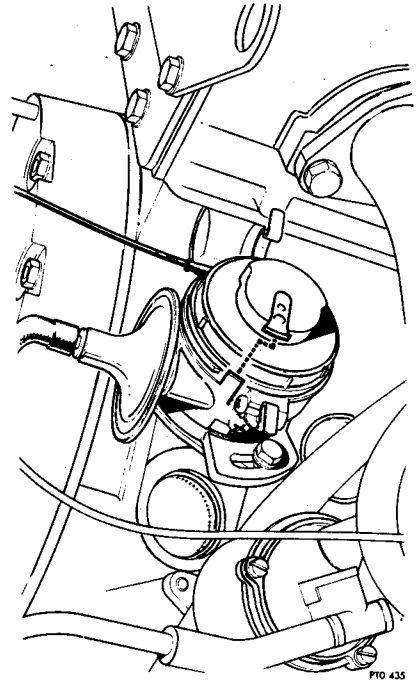


1 Remove the cover and rotor.
2 Lift off the plastic anti flash cover.
3 Apply a few drops of engine oil to the felt pad to lubricate the cam spindle bearing.

4 Inject a few drops of engine oil through the apertures to lubricate the centrifugal timing control.
5 Apply one drop of engine oil to each of the two lubrication apertures of the contact plate bearing.
6 Lightly grease the cam with Shell Retinax A or equivalent.
7 If the moving contact is removed from the post lightly grease the post with Shell Retinax A or equivalent.

IGNITION DISTRIBUTOR

Remove and refit **86.35.20**



Removing
1 Disconnect the distributor low tension fly lead from the floating connection.
2 Pull off the vacuum timing control pipe.
3 Remove the distributor cover and position clear of the working area.
4 Remove two distributor mounting bolts, spring washers and washer.
5 Carefully withdraw and manoeuvre the distributor from the block.

Refitting
6 Ensure that the mounting plate is correctly fitted to the block. The mounting plate is symmetrical and may be fitted either way round.
7 Remove No. 1 cylinder sparking plug, see 86.35.02.
8 Insert a suitable probe into the plug hole to indicate No. 1 piston position.
9 Rotate the crankshaft in the engine run direction to align the mark on the pulley with the 0 degree on the scale and bring No. 1 piston to T.D.C.
10 Carefully manoeuvre and insert the distributor into the block with the vacuum unit facing exactly rearwards. Engage the drive gear so that the rotor is finally pointing approximately towards the vacuum unit mounting plate projection shown. Fit two distributor mounting bolts, spring washers and washers finger tight.
11 Fit No. 1 cylinder sparking plug, see 86.35.02.
12 Push on the vacuum timing control pipe.
13 Adjust ignition timing, see 86.35.15.

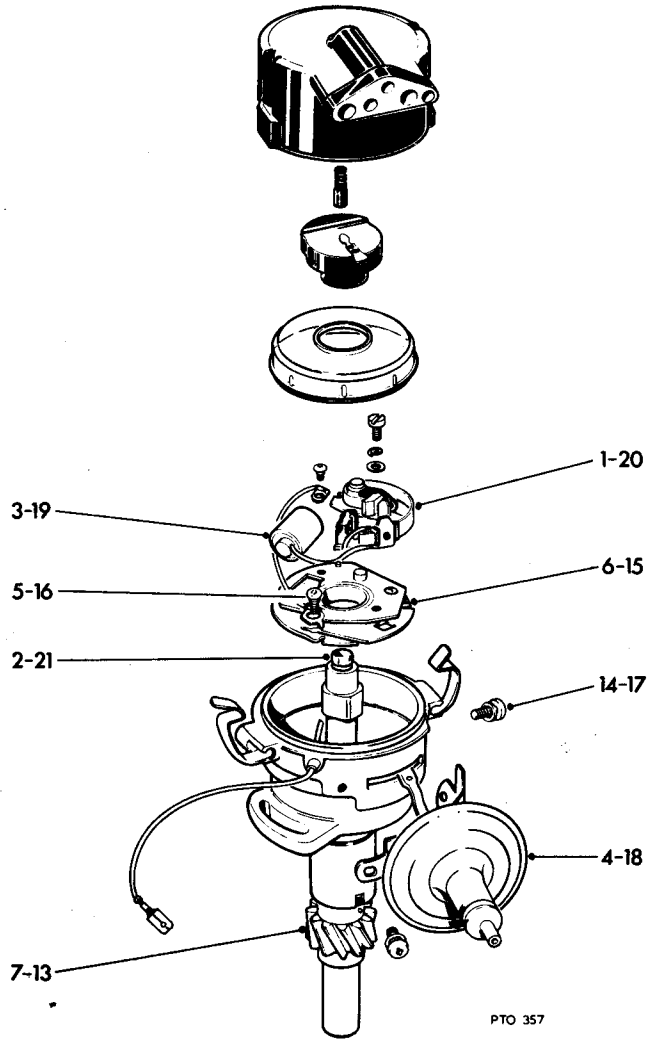
IGNITION DISTRIBUTOR

Overhaul **86.35.26**

This overhaul instruction is specific to Lucas distributor part number 41402. Other units may differ slightly.

Dismantling
1 Remove the contact assembly, see 86.35.13.
2 Withdraw the felt pad.
3 Remove the capacitor screw. Manoeuvre the low tension lead grommet inwards towards the centre of the unit. Remove the capacitor and low tension lead connected together.
4 Remove two screws and anti-vibration washers. Withdraw the vacuum advance unit.
5 Remove the screw to release the expandable limb. Lift out the moving plate earth lead.
6 Use a small screwdriver to push the expanded limb of the base plate inwards to release it from the body chamfered undercut. Lift out the plate assembly.
7 Tap out the drive gear pin. Remove the drive gear and thrust washer. Ensure that the shaft is burr-free and withdraw it.
8 Remove the distance collar.
9 Remove the control springs, exercising care not to distort the springs.

continued



Reassembling

10 Lubricate the action plate, weight and cam assembly working surfaces with Rocol 'Molypad'.
11 Fit the control springs, exercising care not to distort the springs.
12 Fit the distance collar.
13 Lubricate the shaft with Rocol 'Molypad' and insert it into the body. Fit the thrust washer and drive gear. Secure with the drive gear pin.
14 Temporarily fit one screw and anti-vibration washer adjacent to one clip as shown. This is to facilitate operation 15 below.
15 Lubricate the moving plate pin with Rocol 'Molypad'. Position the plate assembly so that the two downward-facing prongs straddle the screw fitted at operation 14 above. Push the plate assembly downwards until it 'clicks' into the body chamfered undercut.
16 Position the moving plate earth lead tag. Fit the screw to expand the expandable limb.
17 Temporarily remove one screw and anti-vibration washer fitted at operation 14 above.
18 Lubricate the vacuum advance unit link hole with Rocol 'Molypad'. Insert the vacuum advance unit so that the moving plate pin engages correctly in the link hole. Secure first with one screw and anti-vibration washer in the round hole. Secure secondly with one screw and anti-vibration washer in the elongated hole.
19 Thread the low tension lead outwards through the body hole. Manoeuvre the lead grommet into position. Position the capacitor and the moving plate earth lead tag. Secure with the capacitor screw.
20 Fit the contact assembly, see 86.35.13.
21 Insert the felt pad.
22 Lubricate, see 86.35.18.

IGNITION COIL

Remove and refit **86.35.32**

Removing

1 Locate the ignition coil mounted on the bulkhead.
2 Pull off the high tension lead.
3 Disconnect the low tension lead Lucar connectors, noting position for refitting.
4 *Earlier models*: Remove one nut, one spring washer, two washers and one bolt.
5 *Earlier models*: Support the weight of the ignition coil. Remove one nut, one spring washer, two washers and one bolt. Lift out the ignition coil.
Later models: Remove two bolts with washers and nuts securing the coil to the bulkhead. Lift off the coil with mounting bracket.
6 *Later models*: Remove the mounting bracket from the coil.

Refitting

7 Reverse 2 to 6 as appropriate.

LAMPS

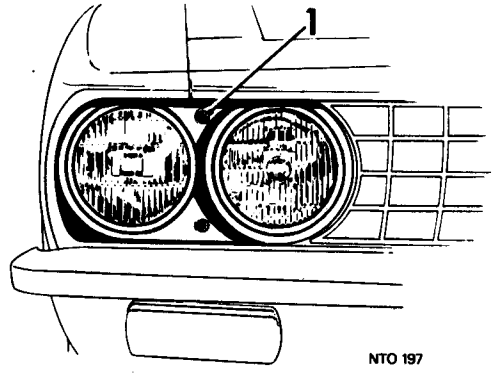
Headlamp—remove and refit—outer 86.40.02
inner 86.40.03

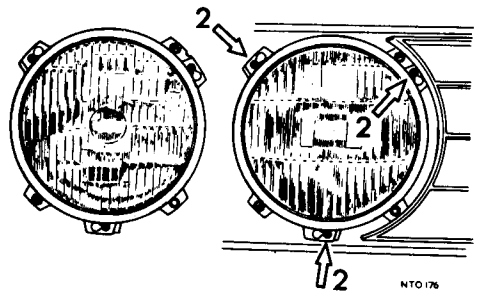
Removing

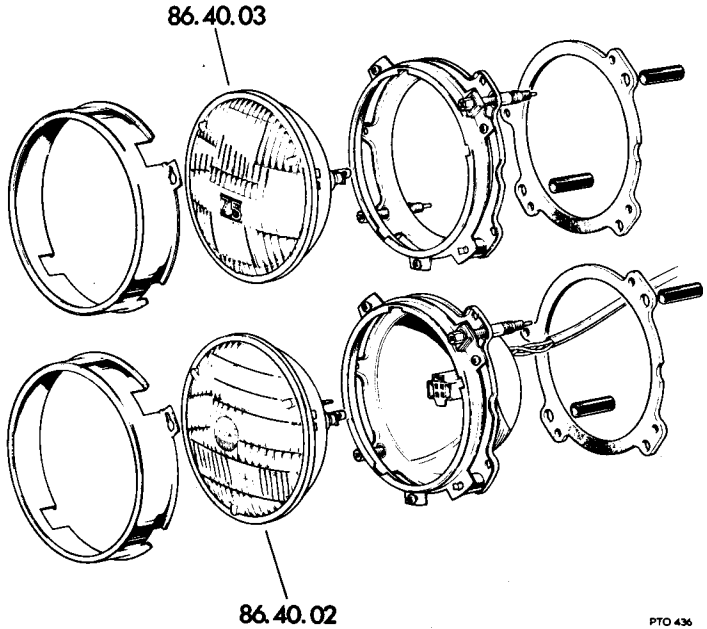
1 Remove two screws and carefully withdraw the bezel panel.
2 Slacken three screws.
3 Rotate the retaining rim anti-clockwise to release the retaining rim and light unit.
4 Pull the connector block from the light unit.
5 Outer lamp only: If required, remove the housing assembly and gasket by disconnecting the appropriate harness plug identified by the wire colour codes and drilling out four rivets.
6 Inner lamp only: If required, remove the mounting ring assembly and gasket by drilling out four rivets.

Refitting

7 Reverse 1 to 6.



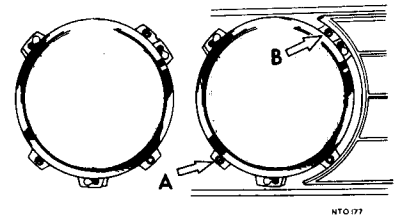




LAMPS

Headlamp—beam aiming 86.40.18

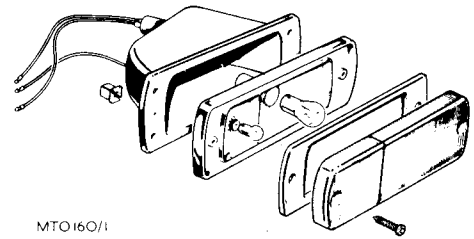
Beam aiming can best be accomplished using equipment such as Lucas 'Beamsetter', 'Lev-L-Lite' or 'Beam tester'.



1 Remove two screws and carefully withdraw the bezel panel.
2 Screw 'A' positions the beam in the horizontal plane.
3 Screw 'B' controls beam height.

LAMPS

Front parking and flasher lamp—remove and refit 86.40.26



Removing

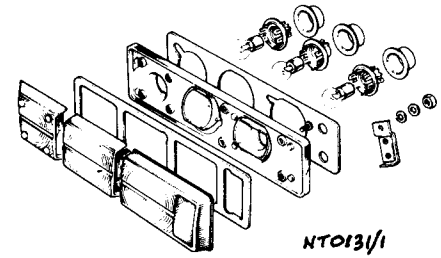
1 Remove the two screws and withdraw the lens.
2 Remove the two bulbs from the bayonet fittings.
3 Disconnect the appropriate harness plug identified by the wire colour codes.
4 Withdraw the complete lamp assembly from the panel.

Refitting

5 Reverse 1 to 4.

LAMPS

Rear flasher, tail/stop and reverse lamp—remove and refit 86.40.70



Removing

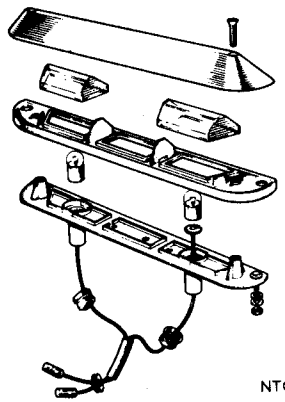
1 Open the luggage boot lid. Remove the floor mat.
2 Right-hand lamp only: Remove the floor panel.
3 Remove sufficient screws to enable the appropriate half of the rear trim panel to be swung forward to allow access to the lamp.
4 Pull back the side trim panel edge.
5 Pull three bulb holders from the lamp base. Remove the bulbs from the bayonet fittings.
6 Disconnect two red wire Lucar connectors from the resistor unit — *earlier models only.*
7 Remove one nut, spring washer and washer. Remove the resistor unit — *earlier models only.*
8 Disconnect the single Lucar earth-connection.
9 Remove five nuts, spring washers and washers.
10 Withdraw the lamp from the panel.
11 The three lenses are attached to the lamp base with 'Pozidriv' screws. A lens may be replaced individually after removing the lamp.

Refitting

12 Reverse 1 to 11. The two red wire Lucar connectors may be fitted either way round.

LAMPS

Plate illumination lamp—remove and refit **86.40.86**



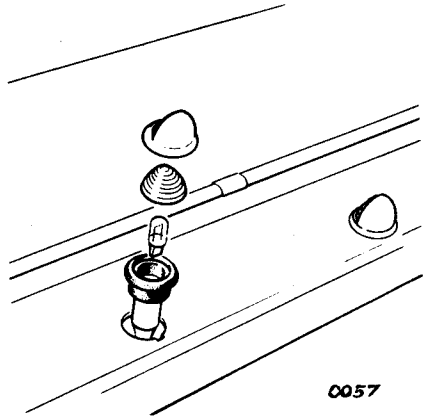
Earlier models

Removing

1 Remove two screws and lift off the chrome cover.
2 Disengage the small lens lugs from the rubber moulding.
3 Remove the two bulbs from the bayonet fittings.
4 Open the luggage boot lid.
5 Pull up three press-studs and turn back the rear edge of the floor mat.
6 Remove sufficient screws to enable the rear trim panel to be swung forward to allow access to the harness connectors.
7 Disconnect the two lamp wires from the harness and pull through the panel grommet.
8 Remove two nuts, spring washers, washers and earthing star washers' Remove the lamp base from the bumper.

Refitting

9 Reverse 1 to 8.



Later models

Removing

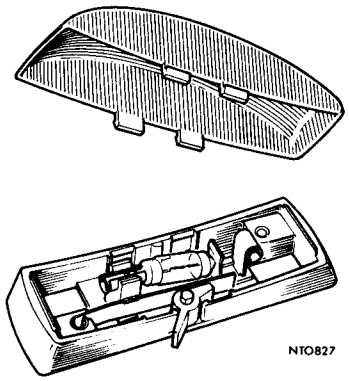
1 Raise the boot lid and remove the rear trim panel.
2 Disconnect the two lamp leads.
3 Withdraw the lamp leads through the body grommet.
4 Push the lamp body upwards to withdraw it from the bumper.

Refitting

5 Reverse instructions 1 to 4, ensuring that the lamp is located correctly in the bumper.

LAMPS

Roof lamp—remove and refit **86.45.02**



Removing

1 Isolate the battery.
2 Gently squeeze the lens adjacent to the clip projections and remove the lens.
3 Carefully remove the festoon bulb.
4 Note the wire colour codes and positions.
5 Disconnect the two bullet connectors.
6 Remove two screws and lift off the lamp base.

Refitting

7 Reverse 1 to 6. Include the earth wire tag under the appropriate screw head.

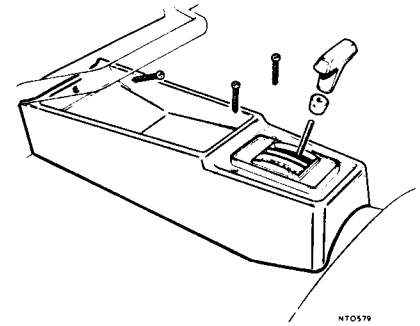
LAMPS

Selector panel lamp—remove and refit **86.45.40**

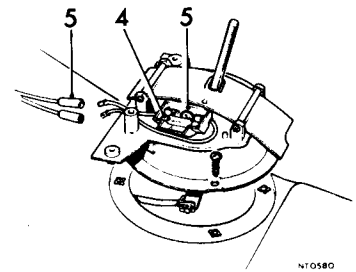
Automatic transmission only

Removing

1 Slacken the ferrule located under the selector lever handle using a 'C' spanner with a suitable pin to locate into the drilling on the ferrule.



2 Unscrew the selector lever handle and ferrule.
3 Remove three screws and lift out the centre console moulding. A screwdriver with a flexible extension end will facilitate the removal of the single forward screw.



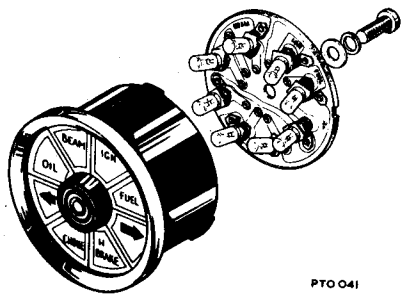
4 To renew the festoon bulb, carefully lever the bulb from the contacts.
5 To renew the lamp, proceed as follows. Disconnect two snap connectors. Remove the screw and washer. Withdraw the lamp moulding.

Refitting

6 Reverse 1 to 5.

LAMPS

Warning light cluster—remove and refit **86.45.62**



Removing

1 Lower the instrument panel to the service position, see 88.20.01.
2 Carefully pull the harness plug from the assembly.
3 If renewing a bulb proceed as follows: Remove the screw, spring washer and washer. Withdraw the plate. Renew the appropriate bulb.
4 If removing the assembly proceed as follows: Rotate the retaining ring and remove with the spring. Withdraw the warning light cluster from the panel.

Refitting

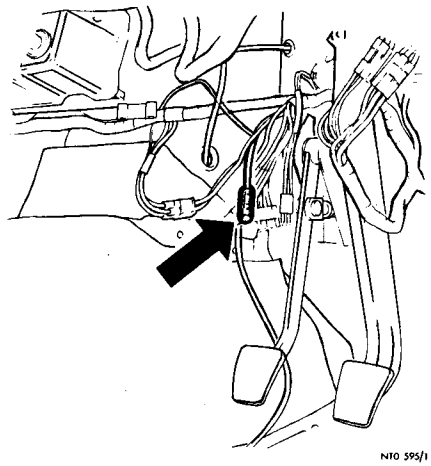
5 Reverse 1 to 4.

NOTE: The warning light arrangement may differ on later models to that illustrated.

RADIO FACILITY

Description

The wiring harnesses include a facility for this optional extra item. A white/pink wire provides a positive 12-volt radio supply controlled by the ignition/starter switch.



Right-hand steering vehicles

To locate the wire, open the front right-hand door and with the head near the floor, look upwards between the parcel tray side and gearbox cover. At the top of this space is a wiring harness. A wire 'break out' point will be found which includes the three wires to the heated back-light switch, a white/blue wire to the choke switch, a black sleeve covered wire to the hand brake switch and the required white/pink wire which terminates in a 3 mm socket connector.

Left-hand steering vehicles

To locate the wire, open the front right-hand door and with the head near the floor, look upwards between the parcel tray side and gearbox cover. At the top of this space is a wiring harness. A wire 'break out' point will be found which includes a white/blue wire to the choke switch, a black sleeve covered wire to the hand brake switch, a black/purple wire to the brake line failure switch (when fitted) and the required white/pink wire which terminates in a 3 mm socket connector.

NOTE: For clarity the illustrations show a condition with the parcel trays removed. It should not be necessary to remove the parcel tray to locate the wire.

RADIO

Front speaker grille—remove and refit **86.50.09**

Front speaker—remove and refit **86.50.11**

Removing

1 Disconnect the battery to ensure that the radio cannot be operated with the speaker disconnected.
2 The front speaker grille is retained by three plastic spigots which locate into plastic 'snap backs' secured to the fascia.
3 Using a wide bladed screwdriver, carefully prise up the grille.
4 Remove the speaker securing screws, lift out the speaker and disconnect the leads.

Refitting

5 Refit the speaker by reversing instruction 4.
6 Locate the grille spigots into the 'snap backs' and press down into position.
7 Reconnect the battery.

RADIO AERIAL

Remove and refit **86.50.18**

Removing

1 The aerial is secured by the chrome nut visible on top of the wing.
2 Remove the nut and withdraw the aerial from under the front wing. noting the position of the spacers and fixing.

Refitting

3 Reverse instructions 1 and 2.

NIGHT DIMMING RELAY
(early models only)

Remove and refit **86.55.03**

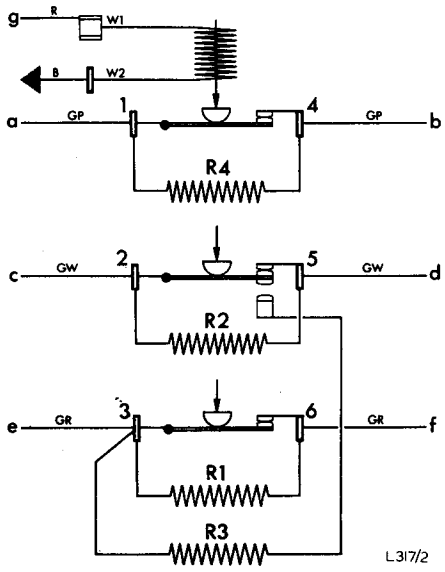
Removing
1 Open the luggage boot lid.
2 Remove the floor mat.
3 Remove two screws and washers and prise out one button clip. Manoeuvre out the left-hand side trim panel.
4 Remove two screws and withdraw the relay.
5 Disconnect eight Lucar connectors.

Refitting
6 To ensure the correct operation of the compensation circuit the following test is necessary to establish which green/red wire is from the turn signal switch and which is to the left-hand rear flasher lamp. The pair of green/white wires must similarly be identified.
7 In order to perform the test a positive supply may be obtained in the area by connecting a short slave wire to the red wire and switching on the side lamp circuit.
8 Using the lift slave wire, touch each green/red wire in turn. Illumination of the left-hand rear flasher lamp will identify the wire to be connected to terminal 6. Connect the remaining green/red wire to terminal 3.
9 Using the live slave wire, touch each green/red wire in turn. Illumination of the right-hand rear flasher lamp will identify the wire to be connected to terminal 5. Connect the remaining green/white wire to terminal 2.
10 Connect the green/purple wires to terminals 1 and 4. They may be fitted either way round.
11 Remove the slave wire and connect the red wire to terminal W1.
12 Connect the black wire to terminal W2.
13 Reverse 1 to 4.

Data and description

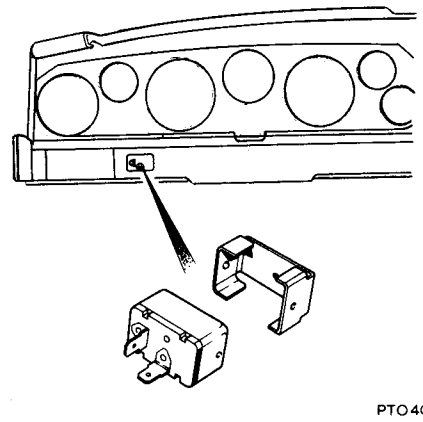
Manufacturer	Lucas
Type	11RA
Lucas Part No.	33329
Stanpart No.	217177
Body colour	Yellow
Winding resistance	36 ohms
Pull-in voltage	4 to 10 volts
Release voltage	0 to 1 volt
R1 resistance	3 ohms
R2 resistance	3 ohms
R3 resistance	30 ohms
R4 resistance	1·5 ohms

This relay dims stop lamps and rear flasher lamps when the parking lamps are illuminated. At night minimum discomfort to other road users is ensured. During daylight the safety of full intensity is provided.
The relay winding is controlled by the parking lamp circuit. Three sets of normally closed contacts with associated resistors permanently connected in parallel are featured. The pair of stop lamps, the left-hand rear flasher lamp and the right-hand rear flasher lamp are each associated with one contact/resistor set.
When the relay is not energized the contacts are closed and the lamps operate at full intensity. When the relay is energized the contacts are open. The resistors are positioned in series with the lamps which then operate at reduced voltage.
To maintain the correct frequency of operation of the turn signal flasher unit the current must be kept constant. To provide current compensation for either flasher circuit a fourth resistor is used. This resistor is brought into circuit by the double contact set between terminals 2 and 5. The switching is such that when either flasher circuit is selected, a parallel path exists through R3, the resistor of the unselected flasher circuit and across the filament of the unselected rear flasher lamp to earth. While providing compensation, this current is not large enough to illuminate the unselected lamp.



FLASHER UNIT

Turn signal flasher unit—remove and refit **86.55.11**

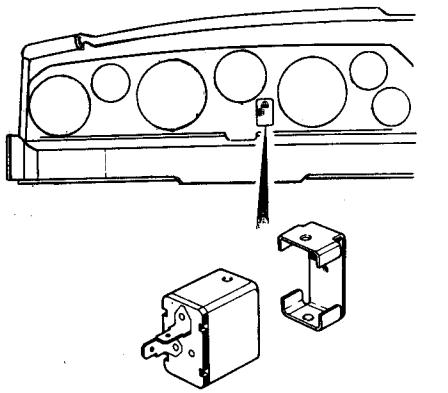


Removing
1 Locate the flasher unit mounted in a clip attached to the lower edge of the fascia almost below the tachometer.
2 Pull the flasher unit from the clip.
3 Disconnect two Lucar connectors.

Refitting
4 Connect two Lucar connectors:
Light green/slate wire to terminal B.
Light green/brown wire to terminal L.
5 Fit the flasher unit to the clip.

FLASHER UNIT

Hazard flasher unit—remove and refit **86.55.12**



Removing

1 Lower the instrument panel to the service position, see 88.20.01.
2 Locate the flasher unit mounted in a clip attached to the instrument panel adjacent to the hazard switch.
3 Pull the flasher unit from the clip.
4 Disconnect two Lucar connectors.

Refitting

5 Connect two Lucar connectors:
Purple wire to terminal B.
Light green/pink wire to terminal L.
6 Reverse 1 to 3.

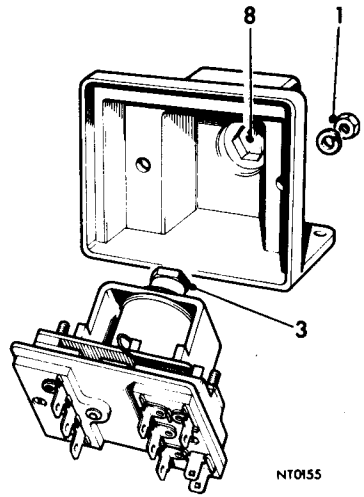
NIGHT DIMMING RELAY

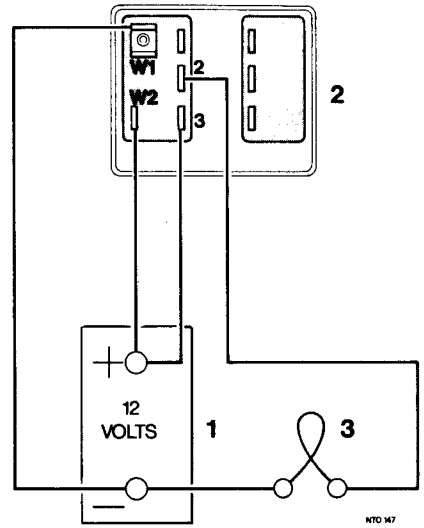
(early models only)

Contacts adjust **86.55.14**

The contacts are set during production and normally require no attention in service. If the relay cover has been removed and the hexagon rotated, re-set as follows:

1 Remove the cover.
2 Provide a test circuit as shown.
3 With the winding not energized, rotate the hexagon by hand fully clockwise.
4 Check that the three contact sets are correctly closed.
5 Energize the winding by applying 12 volts between W1 and W2 .
6 Rotate the hexagon anti-clockwise until the test lamp just illuminates.
7 Rotate the hexagon a further 90 degrees anti-clockwise.
8 Observe the recess for the hexagon in the cover. If necessary, rotate the hexagon a little further anti-clockwise to achieve alignment.
9 Fit the cover.





1. Battery . . . . . 12 volt
2. Night dimming relay
3. Light . . . . . 12 volt–2·2 watt

STARTER MOTOR

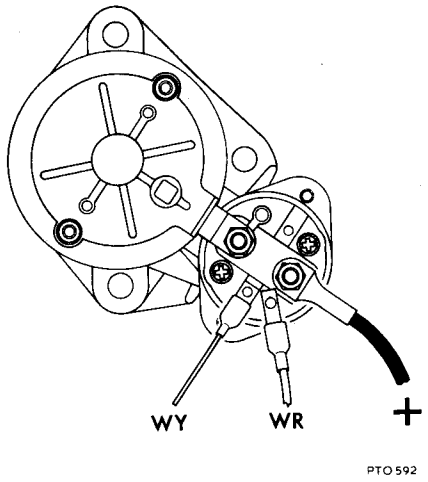
Remove and refit **86.60.01**

Removing

1 Drive the vehicle onto a ramp.
2 Isolate the battery.
3 Raise the ramp.
4 Disconnect two Lucar connectors.
5 Remove the nut and spring washer. Disconnect the battery lead from the solenoid.
6 Remove the lower mounting bolt and spring washer.
7 Remove the middle mounting bolt and spring washer. This operation may be achieved working from below the engine with a socket extension build up of approximately 18 in (450 mm) running forward.
8 Remove the top mounting bolt and spring washer. This operation may be achieved as operation 7 above.
9 Manoeuvre the starter motor downwards from the vehicle and collect the shim (if fitted).
CAUTION: Some vehicles may be fitted with a packing shim, which must be replaced when the starter motor is refitted.
If rattling occurs betweeen starter motor and flywheel, add one shim between starter and rear engine plate (manual transmission vehicles only).

Refitting

10 Position the starter motor upwards to the vehicle.
11 Fit three mounting bolts and spring washers finger tight.
12 Tighten the top mounting bolt.
13 Tighten the middle mounting bolt.
14 Tighten the lower mounting bolt.



15 Connect the battery lead to the solenoid as shown. Fit the nut and spring washer.
16 Connect two Lucar connectors as shown.
17 Reverse 1 to 3.

NOTE: On later manual gearbox models the starter motor securing bolts are replaced by nuts and studs.
Automatic transmission models may use either nuts and studs or bolts.

Data

Manufacturer	Lucas
Type	2M100 PE
Lucas Part No.	25698
Stanpart No.	218432
Motor	
Yoke diameter	4 in (101·60 mm)
Light running—speed	6,000 rev/min
current	40 amp
torque	Not stated
Load running—speed	1,000 rev/min
current	300 amp
torque	7·3 lbf ft (1·01 kgf m)
Locked—speed	Nil
current	463 amp
torque	14·4 lbf ft (1·99 kgf m)
Commutator minimum skimming thickness	0·140 in (3·56 mm)
Brush length—new	0·710 in (18·03 mm)
renew if less than	0·375 in (9·53 mm)
Brush spring pressure	36 ozf (1000 gf)
Shaft end-float: maximum between bush and spire retaining ring	0·010 in (0·25 mm)
Bearing renewal mandrel diameter:	
Commutator end cover bearing	0·4377 in (11·118 mm)
Drive end bracket bearing	0·4729 in (12·012 mm)
Solenoid	
Pull-in winding resistance—measured between unmarked 'WR wire' connector and 'STA' terminal	0·25 to 0·27 ohm
Hold-in winding resistance—measured between unmarked 'WR wire' connector and unit body	0·76 to 0·80 ohm

SWITCHES

Master light switch—remove and refit **86.65.09**

Removing

1 Isolate the battery.
2 Remove two screws and washers and lift off the nacelle upper half.
3 Disconnect three Lucar connectors from the master light switch, noting wire colours for refitment.
4 Insert a suitable probe into the hole in the knob and depress the spring plunger while pulling the knob from the shaft.
5 Remove the nut. Withdraw the switch and collect up the washer(s).

Refitting

6 Reverse 1 to 5.

SWITCHES

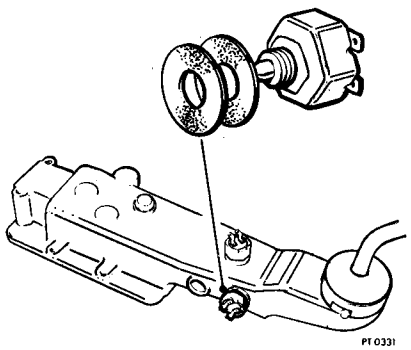
Door switch—remove and refit **86.65.14**

Removing
1 Disconnect the battery.
2 Open the appropriate door.
3 Remove the single screw.
4 Withdraw the switch.
5 Disconnect the Lucar connector.

Refitting
6 Reverse 1 to 5.

SWITCHES

Reverse lamp switch—remove and refit **86.65.20**



Removing
1 Drive the vehicle onto a ramp.
2 Raise the ramp.
3 Working from below the gearbox locate the reverse lamp switch.
4 Disconnect two Lucar connectors.
5 Using a spanner on the hexagon unscrew the switch.
6 Collect up the fibre washer(s) as fitted.

Refitting
7 Assemble with the same number of washers as originally fitted. Most assemblies are fitted with two. Use new fibre washer(s) if available.
8 Fit the switch and fibre washer(s) to the gearbox.
9 Connect two Lucar connectors. The connectors may be fitted either way round.
10 Perform a functional check of the reverse lamp circuit. If lamps fail to light, adjust switch operation by altering the number of washer(s) used in instruction 7.

SWITCHES

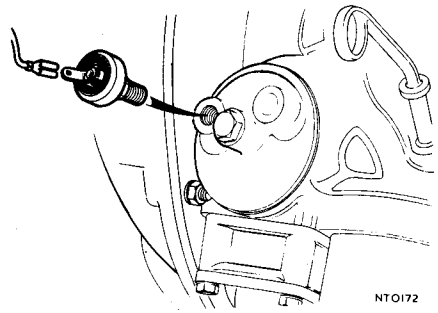
Luggage boot illumination switch—remove and refit **86.65.22**

Removing
1 Disconnect the battery.
2 Open the luggage boot lid.
3 Locate the switch mounted on the right-hand hinge assembly.
4 Pull the switch from the bracket.
5 Disconnect the bullet connector.

Refitting
6 Reverse 1 to 5. Ensure good electrical contact between the switch and the vehicle body.

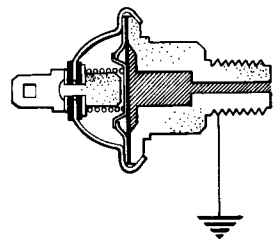
SWITCHES

Oil pressure switch—remove and refit **86.65.30**



Removing
1 Locate the switch on the right-hand side of the engine adjacent to the dipstick.
2 Disconnect the Lucar connector.
3 Using a spanner, unscrew the switch from the oil transfer adaptor.

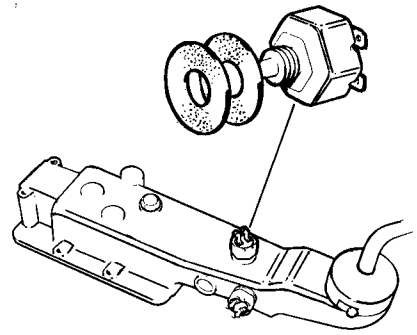
Refitting
4 Screw the switch into the oil transfer adaptor. The thread is tapered, so do not attempt to seat the switch shoulder.
5 Connect the Lucar connector.



SWITCHES

Overdrive gearbox switch—remove and refit **86.65.33**

Overdrive vehicles only



Removing
1 Remove the gearbox tunnel cover, see 76.25.07.
2 Locate the overdrive gearbox switch.
3 Disconnect two Lucar connectors.
4 Using a spanner on the hexagon unscrew the switch.
5 Collect up the fibre washer(s) as fitted.

Refitting
6 Assemble with the same number of fibre washers as originally fitted. Most assemblies are fitted with two. Use new fibre washer(s) if available.
7 Fit the switch and fibre washer(s) to the gearbox.
8 Connect two Lucar connectors. The connectors may be fitted either way round.
9 Perform a functional check of the overdrive circuit.
10 Refit the gearbox tunnel cover, see 76.25.07.

SWITCHES

Overdrive manual switch—remove and refit **86.65.35**

Overdrive vehicles only



Removing

1 Insert a wide bladed screwdriver into the slot provided in the forward side of the gear-lever knob. Twist the screwdriver to prise the switch unit from the gear-lever knob.
2 Pull the wire pins from the switch lugs.

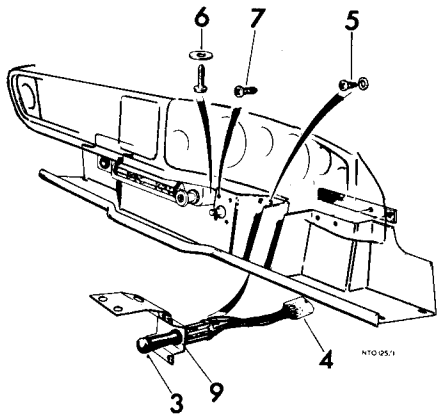
Refitting

3 Screw the tapered locking collar fully down the thread of the gear-lever.
4 Screw the retaining nut inside the gear-lever knob downwards until the upper face of the nut is flush with the top of the threads.
5 Screw the tapered locking collar upwards to secure the gear-lever knob.
6 Connect the two leads to the switch and fit it to the gear-lever knob.

SWITCHES

Heated back-light switch—remove and refit **86.65.36**

Earlier models—Switch located below instrument panel



Removing

1 Isolate the battery.
2 Slacken the steering-column adjustment knob and move the column to its highest position to provide improved access.
3 Unscrew the switch knob. Collect up the bulb and spring.
4 Disconnect the harness plug about 6 in (150 mm) from the switch.
5 Remove two parcel shelf screws and washers to provide some flexibility of the parcel shelf.
6 Remove appropriate console air outlet screw and washer.
7 Remove four screws.
8 Manoeuvre the switch and bracket assembly from its trapped position.
9 Unscrew the bezel. Remove the spring washer. Withdraw the switch from the bracket.

Refitting

10 Reverse 1 to 9. Fit the top flange of the bracket between the fascia and the console air outlet assembly.

SWITCHES

Heated back-light switch—remove and refit **86.65.36**

Later models—Switch located on the instrument panel

Removing

1 Isolate the battery.
2 Insert a suitable probe in the hole beneath the switch knob to release the holding button. Withdraw the switch knob.
3 Lower the instrument panel to its service position, see 88.20.01.
4 Disconnect the leads at the back of the switch.
5 Remove the bezel nut from the front of the switch and withdraw the switch from the back of the panel.

Refitting

6 Reverse instructions 1 to 5.

SWITCHES

Windscreen washer/wiper switch—remove and refit **86.65.41**

Removing

1 Perform 86.65.02, operations 1 to 8.
2 Remove two screws and withdraw the windscreen washer/wiper switch.
3 Remove the switch with its harness.

Refitting

4 Position the switch with its harness.
5 Secure the switch with two screws.
6 Reverse 86.65.02, operations 1 to 8.

SWITCHES

Hand brake switch—remove and refit **86.65.45**

Removing

1 Pull apart the Velcro touch-and-close fastener strips along the top edge of the hand brake gauntlet.
2 Disconnect the Lucar connector.
3 Remove the single 'Pozidriv' screw and detach the switch.

Refitting

4 Reverse 1 to 3.

SWITCHES

Brake line failure switch—remove and refit **86.65.47**

Left-hand steering vehicles to specific markets only

Removing

1 Open the bonnet.
2 Locate the pressure differential warning actuator mounted on the right hand side of the bulkhead.
3 Release the plug claws and pull the harness plug from the switch.
4 Using a spanner on the nylon switch body carefully unscrew the switch.

Refitting

5 Carefully screw the switch to the actuator body. Do not overtighten. Torque load to only 12 to 15 lbf in (0·14 to 0·17 kgf m).
6 Fit the harness plug to the switch. Ensure that the plug claws are correctly located. Note that the single wire, but twin socket, harness plug may be fitted either way round as the twin switch pins are electrically common.

SWITCHES

Hazard switch—remove and refit 86.65.50

Earlier models—Rocker type switch, depress to operate.

Removing
1 Lower the instrument panel to the service position, see 88.20.01.
2 Disconnect five Lucar connectors.
3 Push inwards four plastic clips on the nacelle and withdraw the nacelle and switch assembly from the panel.
4 Push inwards two plastic clips on the switch and withdraw the switch from the nacelle.

Refitting
5 Reverse 1 to 4. Insert the nacelle and switch assembly so that the triangle apex is pointing upwards. Connect the Lucar connectors.

SWITCHES

Hazard switch—remove and refit 86.65.50
Later models—Push-pull type switch, pull to operate

Removing
1 Disconnect the battery.
2 Unscrew the switch knob and remove the bulb.
3 Release the locking nut at the front of the switch.
4 Lower the instrument panel to its service position, see 88.20.01.
5 Disconnect the switch harness plug.
6 Remove the front locking nut and withdraw the switch body from the back of the instrument panel.

Refitting
7 Reverse instructions 1 to 6.

SWITCHES

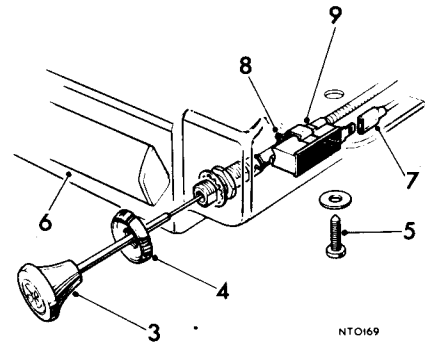
Stop lamp switch—remove and refit 86.65.51

Removing
1 Isolate the battery.
2 Locate the switch adjacent to the brake pedal arm above the steering-column.
3 Disconnect the two Lucar connectors.
4 Slacken the large hexagon nut.
5 Unscrew the switch from the nut and remove it from the vehicle. The nut and washer may remain *in situ* retained by the spring-loaded brake pedal arm.

Refitting
6 Reverse 1 to 5. Do not overtighten the nut on the plastic threads or the switch may be damaged.
7 Switch on the ignition and perform functional check of the stop lamp circuit.

SWITCHES

Choke switch—remove and refit 86.65.53

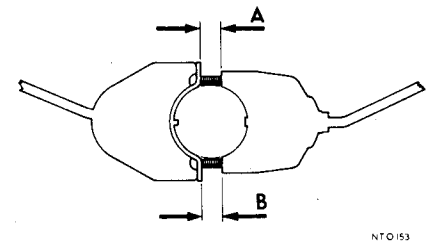


Removing
1 Isolate the battery.
2 Disconnect the inner choke cable from the trunnion on the front carburetter.
3 Pull the choke knob to withdraw the inner cable and remove from the vehicle.
4 Unscrew the choke control bezel.
5 Remove two screws and washers to release the console air outlet assembly.
6 Carefully withdraw the console air outlet assembly.
7 Disconnect the choke switch Lucar connector.
8 Remove the small screw.
9 Slide the clip from the switch and remove both items.

Refitting
10 Position the switch and clip over the reduced diameter of the cable. Slide the clip onto the switch.
11 Position the assembly so that the switch plunger is located in the hole provided in the outer cable housing. Secure with the small screw.
12 Reverse 1 to 7. Include the top flange of the heated back-light switch bracket between the fascia and the console air outlet assembly.

SWITCHES

Steering-column combination switch—remove and refit 86.65.55



Removing
1 Perform 86.65.02, operations 1 to 8.
2 Remove two screws and withdraw the windscreen washer/wiper switch.
3 Note dimension 'A' and 'B'.
4 Remove two screws and withdraw the steering-column combination switch. Collect up the clamp member.
5 Remove the switch with its harness.

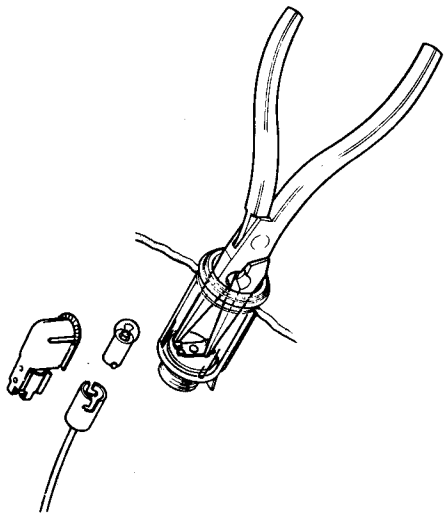
Refitting
6 Position the switch with its harness.
7 Assemble the switch with the clamp member and two screws finger-tight.
8 To ensure that the switch stalk operates centrally through the nacelle aperture, tighten two screws to achieve dimension 'A' and 'B' as noted above.
9 Secure the windscreen washer/wiper switch with two screws.
10 Reverse 86.65.02, operations 1 to 8. Connect three Lucar connectors to the master light switch as follows:
Brown wire to terminal 4.
Red wire to terminal 1.
Blue wire to terminal 8.

CIGARETTE LIGHTER

Remove and refit **86.65.60**

Removing

1 Isolate the battery.
2 Disconnect the inner choke cable from the trunnion on the front carburetter.
3 Pull the choke knob to withdraw the inner cable and remove from the vehicle.
4 Unscrew the choke control bezel.
5 Remove two screws and washers to release the console air outlet assembly.
6 Carefully withdraw the console air outlet assembly.
7 Withdraw the cigarette lighter heating unit.
8 Disconnect two 3 mm connectors and one Lucar connector.



9 Squeeze the sides of the bulb cowl and withdraw.
10 If necessary, renew the bulb as follows. Unclip the bulb cowl from the bulb holder.
11 Carefully insert a pair of long nosed pliers into the inner well to locate on the stronger cross piece as shown. Holding the outer well, unscrew the inner well from the outer well. Collect up the illumination ring.

Refitting

12 Reverse 1 to 11. Fit the cigarette lighter so that the slots for the bulb cowl are uppermost. Connect the connectors as follows:
Purple wire to centre terminal.
Red/blue wire to bulb red/white wire.
Black wire to body earth terminal.

FUSE

Remove and refit **86.70.02**

Removing

1 Lift the bonnet and locate the fusebox on the bulkhead.
2 Pull off the plastic cover.
3 Identify the defective fuse.
4 Carefully lever the fuse from the contacts.

Refitting

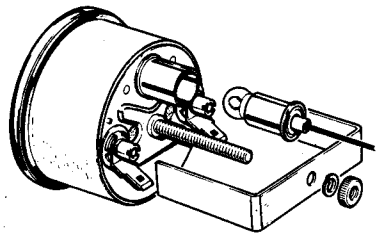
5 Reverse 1 to 4.

Fuse chart

Fuse	Circuits	Amps.	Colour Code	Lucas Part No.	Stanpart No.
BATTERY CONTROL	Hazard warning system Horn Headlamp flash Cigarette lighter Clock Luggage boot lamp Roof lamp	35	White	188218	58465
IGNITION CONTROL	Fuel indication (indicator but not fuel warning light) Temperature indication Reverse lamp Windscreen wiper Stop lamp Windscreen washer Heated back-light Tachometer (instrument power but not pulse lead) Turn signal Heater motor	35	White	188218	58465

BATTERY CONDITION INDICATOR

Remove and refit **88.10.07**



Removing

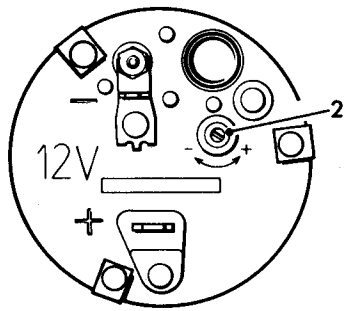
1 Lower the instrument panel to the service position.
2 Disconnect two Lucar connectors.
3 Pull out the panel light bulb holder.
4 Remove the knurled nut, spring washer, harness earth tag and clamp bracket.
5 Withdraw the indicator from the panel.

Refitting

6 Reverse 1 to 5. Connect the Lucar connectors either way round.

CLOCK

Adjust **88.15.04**

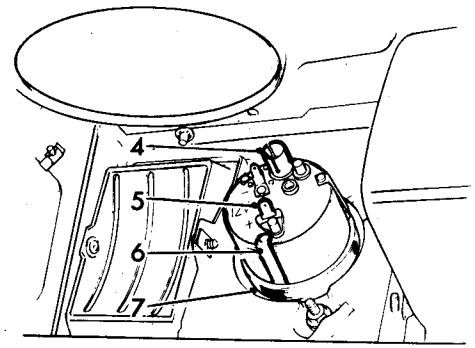


1 Remove the clock, see 88.15.07.
2 Using a small instrument screwdriver, rotate the adjustment screw in the required direction: towards + to increase the speed, towards − to decrease the speed. As a guide to the amount of adjustment required, turning the adjustment screw through 10 degrees may alter the timekeeping by about one minute in 24 hours.

CLOCK

Remove and refit **88.15.07**

NOTE: The Kienzle car clock is a mechanical unit which is wound by electricity. It will continue to run for about two to three minutes after the electrical supply has been disconnected.



Removing

1 Isolate the battery.
2 Remove the glovebox lid assembly, see 76.52.02.
3 Remove six screws and withdraw the glovebox.
4 Pull out the panel light bulb holder.
5 Disconnect the Lucar connectors.
6 Compress three spring clips inwards and push the clock from the panel.
7 Collect up the retaining ring, and (when fitted) the rubber sealing ring.

Refitting

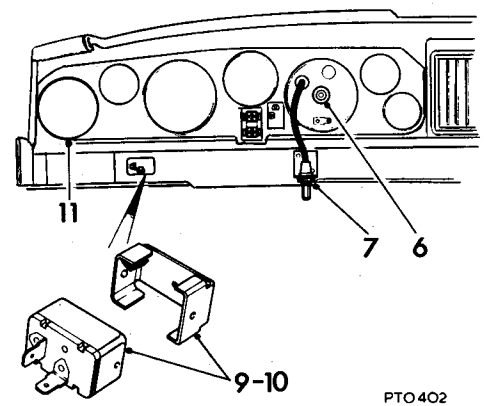
8 Insert the clock (and when fitted the rubber sealing ring) into the panel. Fit the retaining ring to secure.
9 Connect the purple wire Lucar connector to the larger Lucar positive terminal.
Note that no wire is fitted to the smaller Lucar negative terminal. The clock is earthed via the black wire fitted to the bulb holder.
10 Reverse 1 to 4.
11 To set the hands and start the clock depress and turn the central knob on the clock face.

INSTRUMENT PANEL

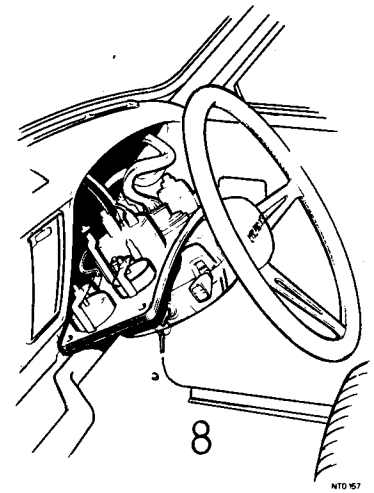
Remove and refit **88.20.01**

Removing

1 Isolate the battery.
2 Slacken the steering-column adjustment knob and move the column to its lowest position.
3 Remove four instrument panel screws and countersunk washers.
4 Pull off the duct feeding the face-level ventilator at its bottom connection.
5 Carefully withdraw the panel until it is possible to reach behind it. Do not pull it out to an extent that may damage any equipment.



6 If necessary, detach the speedometer cable as follows:
Unscrew the knurled nut. Withdraw the speedometer cable from the instrument.
7 If necessary, detach the speedometer trip cable as follows:
Unscrew the speedometer trip cable knurled nut at the attachment to the lower edge of the fascia. Collect up the washer.



8 Lower the instrument panel to its service position as shown.
9 Locate the turn signal flasher unit mounted in a clip attached to the lower edge of the fascia almost below the tachometer.
10 Pull the flasher unit from the clip.
11 Pull off the duct feeding the face-level ventilator at its top connection.
12 Disconnect three harness plugs.
13 Remove the instrument panel from the vehicle.

Refitting

14 Reverse 1 to 13. When inserting the panel ensure that the duct feeding the face-level ventilator is correctly located at both its top and bottom connections.

VOLTAGE STABILIZER

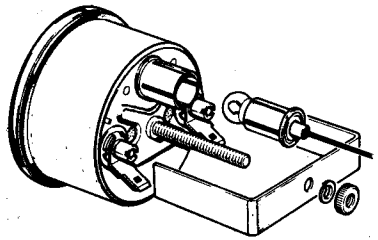
Remove and refit **88.20.26**

Removing
1 Open the bonnet.
2 Locate the voltage stabilizer on the bulkhead above the fusebox.
3 Disconnect the two Lucar connectors.
4 Remove two screws and washers to release the voltage stabilizer.

Refitting
5 Reverse 1 to 4. Connect the Lucar connectors as follows:
Green wire to terminal B.
Light green wire to terminal I.

TEMPERATURE INDICATOR

Remove and refit **88.25.14**

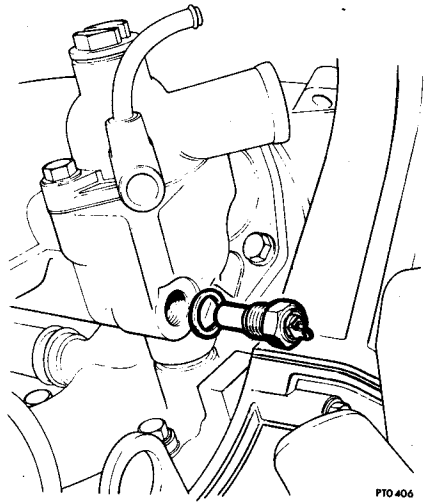


Removing
1 Lower the instrument panel to the service position, see 88.20.01.
2 Disconnect two Lucar connectors.
3 Pull out the panel light bulb holder.
4 Remove the knurled nut, spring washer, harness earth tag and clamp bracket.
5 Withdraw the indicator from the panel.

Refitting
6 Reverse 1 to 5. Connect the Lucar connectors either way round.

TEMPERATURE TRANSMITTER

Remove and refit **88.25.20**

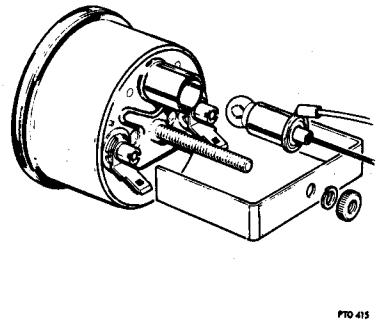


Removing
1 Drain part of the coolant, see 26.10.01.
2 Locate the transmitter on the inlet manifold.
3 Disconnect the Lucar connector.
4 Unscrew the transmitter from the inlet manifold.

Refitting
5 Reverse 1 to 4. Fit a new sealing washer if available.

FUEL INDICATOR

Remove and refit **88.25.26**



Removing
1 Lower the instrument panel to the service position, see 88.20.01.
2 Disconnect two Lucar connectors.
3 Pull out the panel light bulb holder.
4 Remove the knurled nut, spring washer and clamp bracket.
5 Withdraw the indicator from the panel.

Refitting
6 Reverse 1 to 5. Connect the Lucar connections either way round.

FUEL TANK UNIT

Remove and refit **88.25.32**

Removing
1 Open the luggage boot lid.
2 Remove the luggage boot floor covering.
3 Release three pieces of adhesive tape and swing back the cover board.
4 Disconnect the three Lucar connectors.
5 Release the locking ring by tapping anti-anti-clockwise. Remove the locking ring.
6 Carefully withdraw the tank unit.
7 Remove the sealing washer.

Refitting
8 Reverse 1 to 7. Fit a new sealing washer if available.
Connect the Lucar connectors as follows
Green/black wire to terminal T.
Green/orange wire to terminal W.
Black wire to earth terminal.

SPEEDOMETER

Remove and refit **88.30.01**

Removing
1 Lower the instrument panel to the service position, see 88.20.01.
2 Disconnect the Lucar connector from the speedometer earth terminal.
3 Pull out the panel light bulb holder.
4 Remove two knurled nuts, anti-vibration washers and clamp legs.
5 Withdraw the speedometer from the panel.

Refitting
6 Reverse 1 to 5.

SPEEDOMETER CABLE

Complete—remove and refit **88.30.06**

Removing

1 Drive the vehicle onto a ramp.
2 Lower the instrument panel to the service position, see 88.20.01.
3 Raise the ramp.
4 Manual gearbox only:
Remove the bolt and spring washer to release the clamp plate. Withdraw the speedometer cable from the gearbox.
5 Automatic transmission only:
Remove the bolt, spring washer and washer to release the clamp plate. Withdraw the speedometer cable from the gearbox.
6 To assist refitting, carefully note the cable clip positions and the cable run relative to other components from the instrument down to the gearbox.
7 Manoeuvre the speedometer cable downwards through the grommet aperture and remove from the vehicle.

Refitting

8 Reverse 1 to 7. Seal the grommet to the body panel with an approved sealer to ensure a waterproof joint.

SPEEDOMETER CABLE

Inner—remove and refit **88.30.07**

Removing

1 Lower the instrument panel to the service position, see 88.20.01.
2 Withdraw the inner cable. Take care not to contaminate the upholstery or fittings with grease.

Refitting

3 Sparingly grease the inner cable. Do not use oil.
4 Feed the inner cable into the outer cable. Rotate slightly to assist the operation.
5 Withdraw the inner cable about 8 in (200 mm) and wipe off the surplus grease.
6 Re-insert the inner cable. Rotate slightly to assist engagement of the squared end to the drive gear.
7 Reverse operation 1.

TACHOMETER

Remove and refit **88.30.21**

CAUTION: A Smiths negative earth, four cylinder, integrated circuit tachometer is fitted. It contains polarity sensitive components that may be irreparably damaged if subjected to incorrect polarity. For reference the following information is given.

TACHOMETER CONNECTIONS

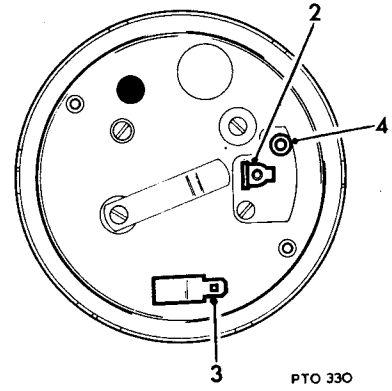
Circuit		Wire colour code	Terminal on tachometer	Illustration ref. No.
Instrument power	Fused ignition switch controlled positive supply	Green	17½-amp Lucar blade	2
	Negative earth	Black	10-amp Lucar blade on instrument body	3
Pulse lead	From tachometer connection to ignition coil negative terminal	White/Slate	Male bullet-type terminal	4

Removing

1 Lower the instrument panel to the service position, see 88.20.01.
2 Disconnect the green wire Lucar connector.
3 Disconnect the black wire Lucar connector.
4 Pull out the white/slate wire snap-type connector.
5 Pull out the panel light bulb holder.
6 Remove two knurled nuts and spring washers. Remove the clamp bracket.
7 Withdraw the tachometer from the panel.

Refitting

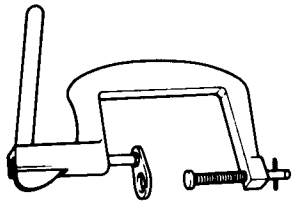
8 Reverse 1 to 7. Include the harness clip under the appropriate knurled nut. Connect the electrical connections precisely as detailed above.



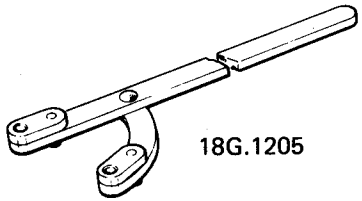
SERVICE TOOLS

All Service Tools mentioned in this Manual must be obtained direct from the manufacturers:

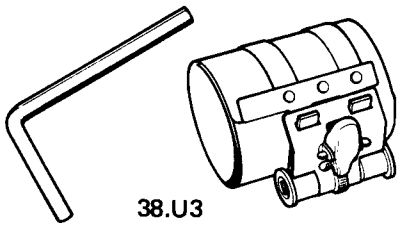
Messrs. V. L. Churchill & Co. Ltd.
P.O. Box No. 3
London Road
Daventry
Northants NN11 4NF



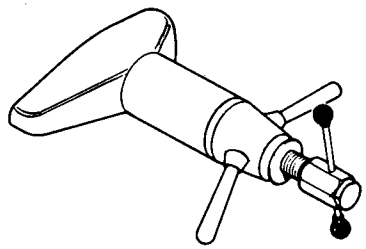
18G 106. Valve spring compressor



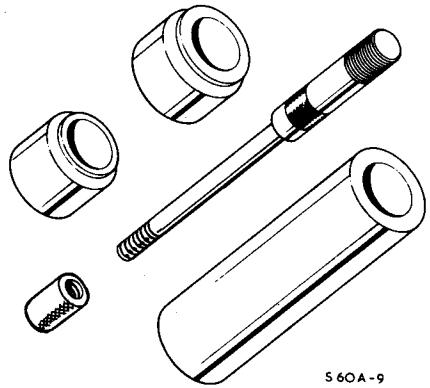
18G 1205. Propeller shaft flange wrench



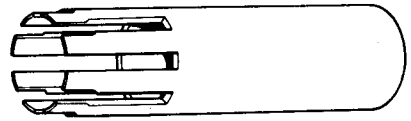
38U 3 18G 55A. Piston ring compressor



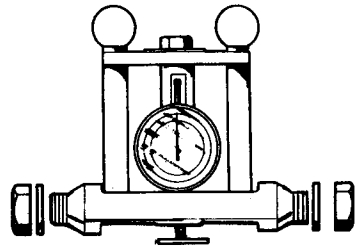
60A. Valve guide remover/replacer



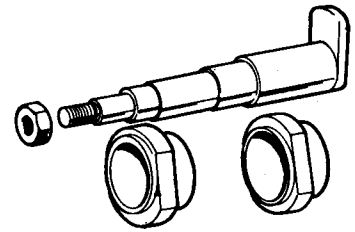
S 60A-9. Valve guide remover/replacer adaptors



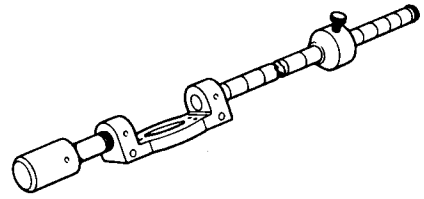
S 69B. Gearbox mainshaft circlip remover



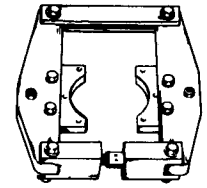
M 84B. Pinion bearing setting gauge



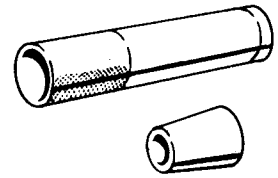
M 84B-1. Pinion and dummy bearing set



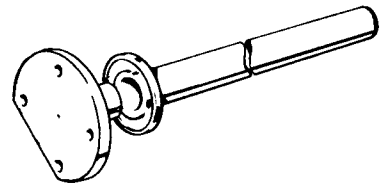
S 98A. Pre-load gauge



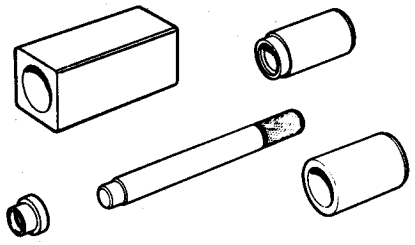
S 101. Differential case spreader



S 167A. Circlip installer

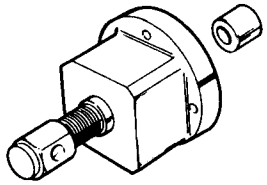


S 314. Mainshaft ball bearing replacer



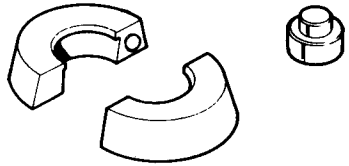
S 348

S 348. Water pump overhaul kit



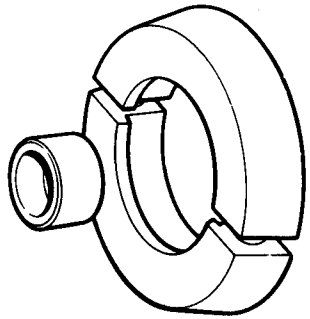
S 356

S 356A (or S 109D). Hub remover



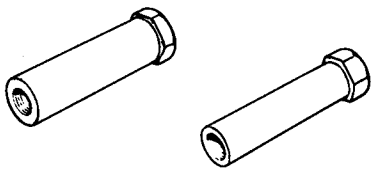
S4221A--10

S 4221A-10. Differential bearing remover adaptor



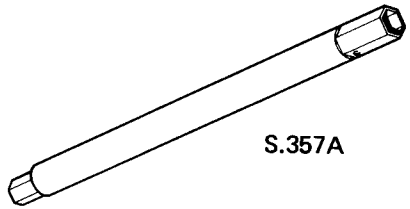
S4221A–21

S 4221A-21. Hub bearing remover



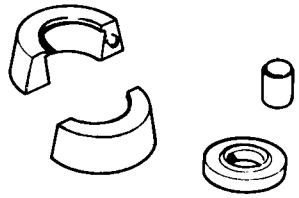
S 350

S 350. Cylinder head stud remover/replacer



S.357A

S 357A. Plug spanner



S4221A–11

S 4221A-11. Pinion bearing cone remover and replacer adaptor



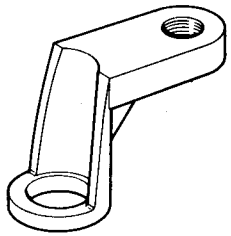
4235A

4235A or 3072. Impact remover



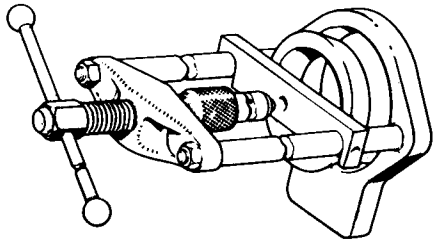
RG. 421

RG 421 (or S 337). Flange holder



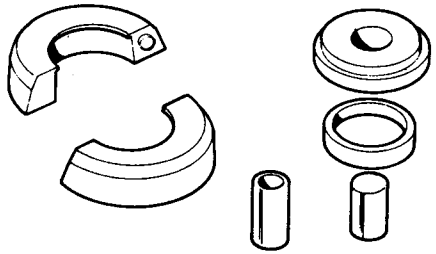
S 352

S 352. Valve spring compressor adaptor



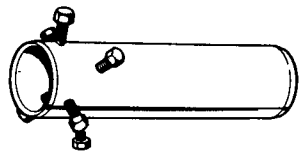
4221A

S 4221A or 47. Multi-purpose hand press



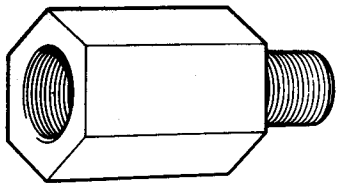
S4221A–15A

S 4221A-15A. Gearbox ball race remover/ replacer adaptor



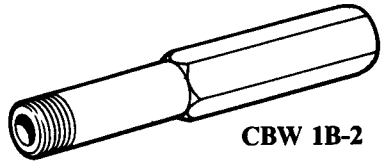
S4235A–2

S 4235A-2. Constant pinion remover adaptor

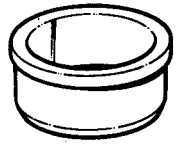


S4235A–10

S 4235A-10. Water pump assembly remover

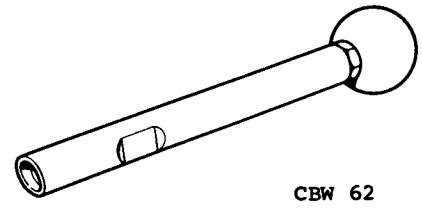


CBW 1C-2. Pressure test adaptor ($\frac{1}{8}$" B.S.P.)

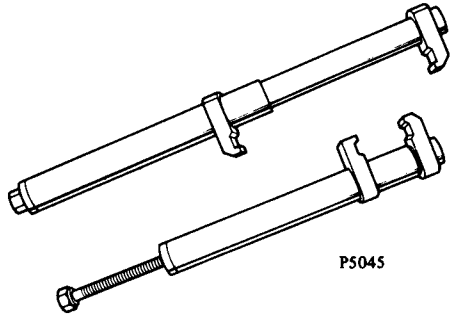


CBW 42

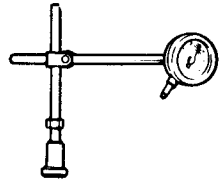
CBW 42A. Front clutch piston replacer



CBW 62. Throttle cable mounting seal remover

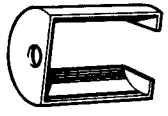


P 5045. Suspension coil spring remover and replacer



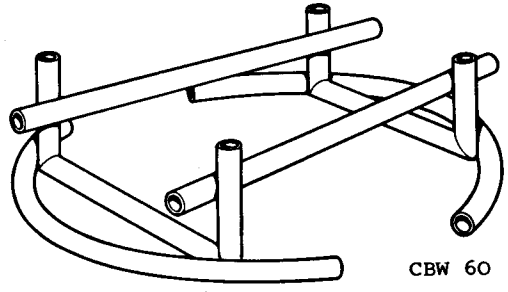
CBW 33

CBW 33. Mainshaft end-float gauge

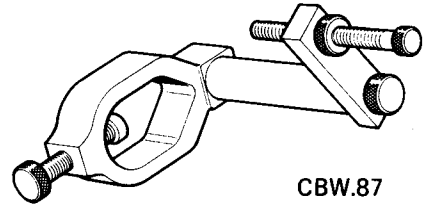


CBW 37A

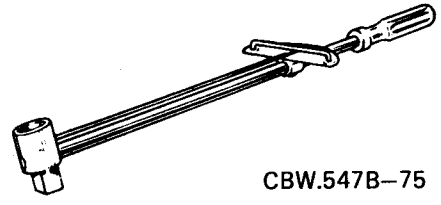
CBW 37A. Clutch spring compressor



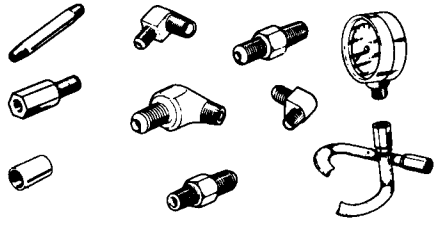
CBW 60. Bench cradle



CBW 87. End-float checking gauge



CBW 547B-75. Tension wrench



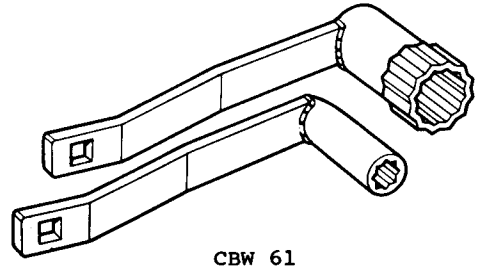
CBW 1A

CBW 1C. Pressure test equipment

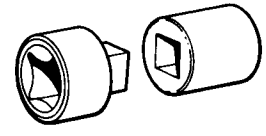


CBW 41

CBW 41. Rear clutch piston replacer

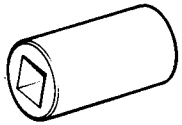


CBW 61. Front/rear servo adjuster and lock-nut adaptor



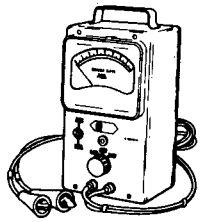
CBW 547A-
50-1A

CBW 547A-50-1B. Set of two adaptors



CBW.547A–50–2A

CBW 547A-50-2A. Rear servo adjuster adaptor



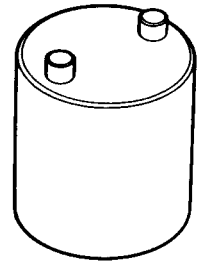
642

642. Electronic tachometer



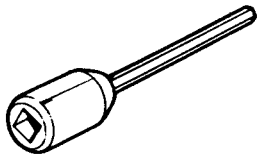
L178A

L 178A. Free wheel assembly ring



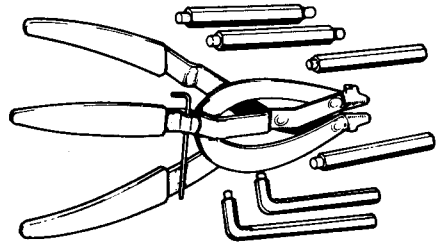
L354A

L 354A. Oil pump plug spanner



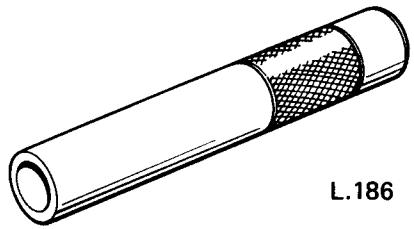
CBW 547A
-50-4

CBW 547A-50-4. Take-off plug adaptor



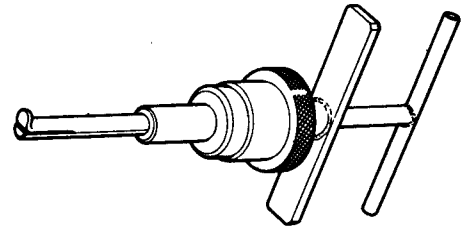
7066

7066. Circlip pliers



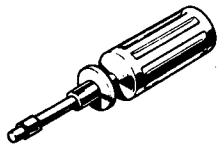
L.186

L 186 (or 18G 186). Mainshaft bearing replacer



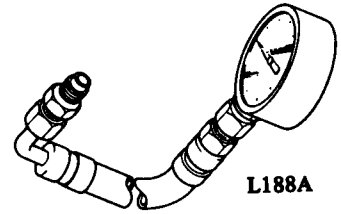
L401A

L 401A. Relief valve body and dashpot sleeve remover/replacer



CBW 548

CBW 548. Torque screwdriver



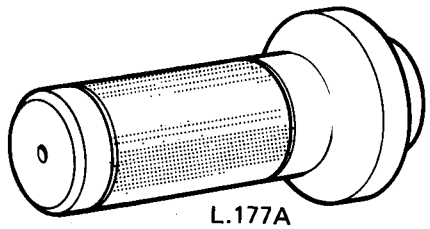
L188A

L 188A (or 18G 251). Hydraulic test equipment



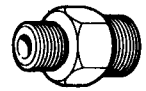
CBW 548-1

CBW 548-1. Screwdriver bit adaptors



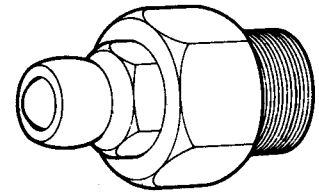
L.177A

L 177A (or 18G 177). Oil seal replacer



L188A–2

L 188A-2. Pressure take-off adaptor



L402

L 402. Pressure adaptor spline release