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SERVICE

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MANUAL

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AKM 6353

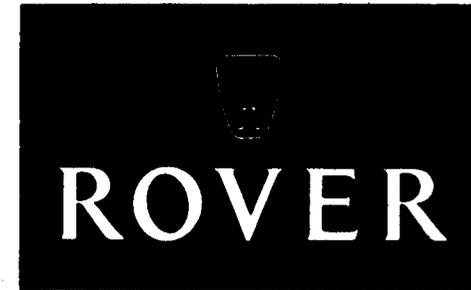


This manual is applicable to the Mini range of vehicles produced from March 1976, commencing Chassis No. 340001 and includes information on the ERA Mini Turbo.

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## **SPECIFICATION**

Rover Cars is constantly seeking ways to improve the specification of its vehicles and alterations take place continually. While every effort is made to produce up-to-date literature this Manual should not be regarded as an infallible guide to current specifications. Furthermore, the specification details set out in this Manual apply to a range of vehicles and not to any particular one.

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## INTRODUCTION

The purpose of this manual is to assist skilled mechanics in the efficient repair and maintenance of the range of vehicles given on the title-page. The procedures detailed, carried out in the sequence given and using the appropriate service tools, will enable the operations to be completed in the time stated in the Repair Operation Times.

### Indexing

The content pages list the titles and reference numbers of the divisions in alphabetical order.

### Operation Numbering

Each operation is followed by the number allocated to it in a master index. The number consists of six digits arranged in three pairs.

The master index of operations has been compiled for universal application to vehicles manufactured by Austin Rover and therefore continuity of the numbering sequence is not maintained throughout this manual.

Each instruction within an operation has a sequence number, and to complete the operation in the minimum time it is essential that these instructions are performed in numerical sequence commencing at 1 unless otherwise stated. Where applicable, the sequence numbers identify the components in the appropriate illustration.

Where performance of an operation requires the use of a service tool, the tool number is quoted under the operation heading and is repeated in, or following, the instruction involving its use. An illustrated list of all service tools necessary to complete the operation described in the manual is also included.

### References

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

To reduce repetition, operations covered in this manual do not include reference to testing the vehicle after repair. It is essential that work is inspected and tested after completion and if necessary a road test of the vehicle is carried out particularly where safety related items are concerned.

### Dimensions

The dimensions quoted are to design engineering specification. Alternative unit equivalents, shown in brackets following the dimensions, have been converted from the original specification. During the period of running-in from new, certain adjustments may vary from the specification figures given in this manual. These adjustments will be re-set by the Distributor or Dealer at the After Sales Service, and thereafter should be maintained at the figures specified in this manual.

## REPAIRS AND REPLACEMENTS

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

Safety features and corrosion prevention treatments embodied in the car may be impaired if other than Austin Rover Parts or Unipart replacements are fitted.

In certain territories, legislation prohibits the fitting of parts not to the manufacturer's specification.

Torque wrench setting figures given in this Manual must be used. Locking devices, where specified, must be fitted. If the efficiency of a locking device is impaired during removal it must be renewed.

Owners purchasing accessories while travelling abroad should ensure that the accessory and its fitted location on the car conform to legal requirements.

The Terms of the vehicle Warranty may be invalidated by the fitting of other than Austin Rover and Unipart parts.

All Austin Rover Parts and Unipart replacements have the full backing of the vehicle Warranty.

Austin Rover Cars dealers are obliged to supply only Austin Rover and Unipart parts.

## ABBREVIATIONS AND SYMBOLS IN THIS MANUAL

Across flats (bolt size)	A.F.	Gallons (U.S.)	U.S. gal.	Miles per hour	m.p.h.	Right-hand	R.H.
After bottom dead centre	A.B.D.C.	Grammes (force)	gf	Millimetres	mm	Right-hand steering	R.H. Stg.
After top dead centre	A.T.D.C.	Grammes (mass)	G	Millimetres of Mercury	mmHg		
Alternating current	a.c.			Minimum	min.	Second (angle)	"
Amperes	A	High compression	h.c.	Minus (of tolerance)	-	Second (numerical order)	2nd
Ampere-hour	Ah	High tension (electrical)	h.t.	Minute (of angle)	'	Single carburetter	SC
		Horse-power	hp			Society of Automobile	
Before bottom dead centre	B.B.D.C.	Hundredweight	cwt	Negative (electrical)	-	Engineers	S.A.E.
Before top dead centre	B.T.D.C.			Newton metre	Nm.	Specific Gravity	sp. gr.
Bottom dead centre	B.D.C.	Inches	in	Number	No.	Square centimetres	cm <sup>2</sup>
Brake horse power	b.h.p.	Inches of Mercury	inHg			Square inches	in <sup>2</sup>
Brake mean effective pressure	b.m.e.p.	Independent front suspension	i.f.s.	Ounces (force)	ozf	Standard	std
British Standards	B.S.	Internal diameter	i.dia	Ounces (mass)	oz	Standard wire gauge	s.w.g.
				Ounce inch (torque)	ozf in	Synchronizer/synchromesh	synchro.
Carbon monoxide	CO	Kilogrammes (force)	kgf	Outside diameter	o.dia.	Third	3rd
Centigrade (Celsius)	C	Kilogrammes (mass)	kg	Overdrive	O/D	Top dead centre	T.D.C.
Centimetres	cm	Kilogramme centimetre	kgf cm			Twin carburetters	TC
Cubic centimetres	cm <sup>3</sup>	Kilogramme metres	kgf m	Paragraphs	para.		
Cubic inches	in <sup>3</sup>	Kilogrammes per square		Part Number	Part No.	United Kingdom	UK
Cycles per minute	c/min	centimetre	kgf/cm <sup>2</sup>	Percentage	%		
		Kilometres	km	Pints (Imperial)	pt	Volts	V
Degree (angle)	deg. or °	Kilometres per hour	km/h	Pints (U.S.)	U.S. pt		
Degree (temperature)	deg. or °	Kilovolts	kV	Plus or minus	±	Watts	W
Diameter	dia	King pin inclination	k.p.i.	Plus (tolerance)	+		
Direct current	d.c.			Positive (electrical)	+	Screw threads	
		Left-hand	L.H.	Pounds (force)	lbf	American Standard Taper	
Fahrenheit	F	Left-hand steering	L.H. Stg.	Pounds (mass)	lb	Pipe	N.P.T.F.
Feet	ft	Left-hand thread	L.H. Thd.	Pounds feet (torque)	lbf ft	British Association	B.A.
Feet per minute	ft/min	Low compression	l.c.	Pounds inches (torque)	lbf in	British Standard Pipe	B.S.P.
Fifth	5th	Low tension	l.t.	Pounds per square inch	lb/in <sup>2</sup>	British Standard Fine	B.S.F.
Figure (illustration)	Fig.					British Standard Whitworth	B.S.W.
First	1st	Maximum	max.	Radius	r	Unified Coarse	U.N.C.
Fourth	4th	Metres	m	Ratio	:	Unified Fine	U.N.F.
		Miniature Edison Screw	MES	Reference	ref.		
Gallons (Imperial)	gal.	Miles per gallon	m.p.g.	Revolutions per minute	rev/min		



## GENERAL SPECIFICATION DATA

### ENGINE - 848 cc

Type .....	85H	
Number of cylinders .....	4	
Bore .....	2.478 in	62.94 mm
Stroke .....	2.687 in	68.25 mm
Capacity .....	51.7 in <sup>3</sup>	848 cc
Firing order .....	1-3-4-2	
Valve operation .....	Overhead by push-rods	
Compression ratio .....	8.3 : 1	
Torque .....	42 lbf ft	5.80 kgf m
	@ 3,000 rev/min	

### Crankshaft

Main journal diameter .....	1.7505 to 1.751 in	44.46 to 44.47
Min. regrind diameter .....	1.7105 in	43.45 mm
Crankpin journal diameter .....	1.6254 to 1.6259 in	41.28 to 41.29 mm
Min. regrind diameter .....	1.5854 in	40.27 mm
Crankshaft end-thrust .....	Taken on thrust washers at centre main bearing	
Crankshaft end-float .....	0.001 to 0.005 in	0.025 to 0.127 mm

### Main bearings

Number and type .....	3 steel backed thin wall	
Width: .....	1.053 in	26.75 mm
Diametrical clearance .....	0.001 to 0.0027 in	0.025 to 0.068 mm

### Connecting rods

Type .....	45° split big end, clamped small end	
Length between centres .....	5.75 in	146.05 mm
Locking method, big end .....	Bolts and locking tabs	

### Big-end bearings

Type .....	Steel-backed thin wall	
Width .....	0.875 in	22.22 mm
Diametrical clearance .....	0.001 to 0.0025 in	0.025 to 0.064 mm

### Pistons

Type .....	Aluminium, split skirt	
Clearance of skirt in cylinder:		
Top .....	0.0026 to 0.0036 in	0.066 to 0.081 mm
Bottom .....	0.0006 to 0.0016 in	0.015 to 0.030 mm
Number of rings .....	4 (3 compression, 1 oil control)	
Width of ring grooves:		
Top, second and third .....	0.0715 to 0.0725 in	1.805 to 1.843 mm
Oil control .....	0.1265 to 0.1275 in	3.213 to 3.238 mm
Gudgeon pin bore .....	6.245 to 0.6247 in	15.867 to 15.872 mm
Oversizes .....	0.010, 0.020, 0.030, 0.040 in 0.254, 0.508, 0.762, 1.016 mm	

### Piston rings

Compression:		
Type:		
Top .....	Plain, chrome faced	
Second and third .....	Tapered	
Width .....	0.069 to 0.070 in	1.75 to 1.78 mm
Fitted gap .....	0.007 to 0.012 in	0.178 to 0.305 mm
Ring to groove clearance .....	0.0015 to 0.0035 in	0.038 to 0.089 mm
Oil control:		
Type .....	Slotted scraper	
Width .....	0.124 to 0.125 in	3.15 to 3.175 mm
Fitted gap .....	0.007 to 0.012 in	0.178 to 0.305 mm
Ring to groove clearance .....	0.0015 to 0.0035 in	0.038 to 0.089 mm

### Gudgeon pins

Type .....	Clamped in little end	
Diameter .....	0.624 in	15.85 mm
Fit in piston .....	Drop through to hand push fit at 20°C 68°F	

**Camshaft**

End thrust .....	Taken on locating plate	
End float .....	0.003 to 0.007 in	0.076 to 0.178 mm
Drive .....	Chain and sprocket from crankshaft	
Timing chain .....	3/8 in 9.52 mm pitch x 52 pitches	
Valve timing marks .....	Dimples on timing wheels, marks on flywheel	

## Journal diameters:

Front .....	1.6655 to 1.6660 in	42.304 to 42.316 mm
Centre .....	1.62275 to 1.62325 in	41.218 to 41.231 mm
Rear .....	1.3727 to 1.3735 in	34.857 to 34.887 mm

## Bearing liner inside diameter:

(reamed after fitting)

Front: .....	1.6670 to 1.6675 in	42.342 to 42.355 mm
Centre .....	1.6245 to 1.6255 in	41.262 to 41.288 mm
Rear .....	1.3747 to 1.3755 in	34.908 mm to 34.938 mm

## Bearings:

Front: .....	White-metal-lined, steel-backed	
Centre and rear .....	Direct in cylinder block	

## Diametrical clearance:

Front .....	0.0004 to 0.002 in	0.012 to 0.051 mm
Centre and rear .....	0.00125 to 0.00275 in	0.0318 to 0.0699 mm

**Tappets**

Type .....	Bucket with radiused base	
Outside diameter .....	0.812 in	20.625 mm
Length .....	1.5 in	38.10 mm

**Rocker gear**

## Rocker shaft:

Length .....	11.625 in	279.44 mm
Diameter .....	0.5615 to 0.5625 in	14.26 to 14.29 mm
Rocker arm:		
Bore .....	0.687 to 0.688 in	17.45 to 17.48 mm
Bush inside diameter (reamed) .....	0.5630 to 0.5635 in	14.300 to 14.313 mm

**Valves**

Seat angle .....	45°	
Head diameter:		
Inlet .....	1.093 to 1.098 in	27.76 to 27.89 mm
Exhaust .....	1.000 to 1.005 in	25.40 to 25.53 mm
Stem diameter:		
Inlet .....	0.2793 to 0.2798 in	7.094 to 7.107 mm
Exhaust .....	0.2788 to 0.2793 in	7.082 to 7.094 mm
Stem to guide clearance:		
Inlet .....	0.0015 to 0.0025 in	0.038 to 0.064 mm
Exhaust .....	0.002 to 0.003 in	0.051 to 0.076 mm
Valve lift .....	0.285 in	7.24 mm

**Valve guides**

Length .....	1.687 in	42.85 mm
Outside diameter .....	0.470 to 0.471 in	11.94 to 11.97 mm
Inside diameter .....	0.2813 to 0.2818 in	7.145 to 7.157 mm
Fitted height above head .....	0.54 in	13.72 mm
Interference fit in head .....	0.0005 to 0.0015	0.01 to 0.04 mm

**Valve springs**

Free length .....	1.75 in	44.45 mm
Load at fitted length .....	55 lbf	24.9 kgf
Load at top of lift .....	88 lbf	39.9 kgf
Number of working coils .....	4 <sup>1</sup> / <sub>2</sub>	

---

**Valve timing**

Timing marks ..... Dimples on timing wheels, marks on flywheel

**Rocker clearance:**

Running (cold) ..... 0.012 in            0.305 mm

Timing ..... 0.019 in            0.48 mm

**Inlet valve:**

Opens ..... 5° B.T.D.C.

Closes ..... 45° A.B.D.C.

**Exhaust valve:**

Opens ..... 40° B.B.D.C.

Closes ..... 10° A.T.D.C.

**Lubrication**

System ..... Wet sump, pressure-fed

**System pressure:**

Running ..... 60 lb/in<sup>2</sup>            4.22 kg/cm<sup>2</sup>

Idling ..... 15 lb/in<sup>2</sup>            1.05 kg/cm<sup>2</sup>

Oil pressure light switch ..... 6 to 10 lbf/in<sup>2</sup>            0.4 to 0.7 kgf/cm<sup>2</sup>

Oil pump ..... Hobourn-Eaton rotor type or Concentric

Relief pressure valve opens ..... 60 lb/in<sup>2</sup>            4.22 kg/cm<sup>2</sup>

Oil filter ..... Full flow with renewable element cartridge

**ENGINE - 998 cc**

Type .....	99H	
Number of cylinders .....	4	
Bore .....	2.543 in	64.59 mm
Stroke .....	3.0 in	76.2 mm
Capacity .....	60.96 in <sup>3</sup>	998 cc
Firing order .....	1 - 3 - 4 - 2	
Valve operation .....	Overhead by push-rods	
Compression ratio .....	8.3 : 1	
Torque .....	51 lbf ft	7.05 kgf m
<b>Crankshaft</b> .....	@ 2,600 rev/min	
Main journal diameter .....	1.7505 to 1.751 in	44.46 to 44.47 mm
Min. regrind diameter .....	1.7105 in	43.45 mm
Crankpin journal diameter .....	1.6254 to 1.6259 in	41.28 to 41.29 mm
Min. regrind diameter .....	1.6052 in	40.77 mm
Crankshaft end thrust .....	Taken on thrust washers at centre main bearing	
Crankshaft end-float .....	0.001 to 0.005 in	0.025 to 0.127 mm
<b>Main bearings</b> .....		
Number and type .....	3 steel backed; thin wall	
Width .....	1.053 in	26.75 mm
Diametrical clearance .....	0.001 to 0.0027 in	0.025 to 0.068 mm
<b>Connecting rods</b> .....		
Type .....	45° split big-end, plain small-end	
Length between centres .....	5.75 in	146.05 mm
Locking method, big-end .....	Bolts and locking tabs	
<b>Big-end bearings</b> .....		
Type .....	Steel-backed thin wall	
Width .....	0.875 in	22.22 mm
Diametrical clearance .....	0.001 to 0.0025 in	0.025 to 0.064 mm

**Pistons**

Type .....	Aluminium, solid skirt	
Clearance of skirt in cylinder:		
Top .....	0.0022 to 0.0033 in	0.060 to 0.085 mm
Bottom .....	0.0004 to 0.0014 in	0.010 to 0.026 mm
Number of rings .....	4 (3 compression, 1 oil control)	
Width of ring grooves:		
Top, second and third .....	0.0645 to 0.0655 in	1.638 to 1.663 mm
Oil control .....	0.1265 to 0.1275 in	3.213 to 3.238 mm
Gudgeon pin bore .....	0.6247 to 0.6249 in	15.867 to 15.872 mm
Oversize .....	0.010, 0.020, 0.030, 0.040 in	
<b>Piston rings</b> .....	0.254, 0.508, 0.762, 1.016 mm	
Compression:		
Type:		
Top .....	Plain, chrome faced	
Second and third .....	Tapered	
Width .....	0.0615 to 0.0625 in	1.580 to 1.587 mm
Fitted gap .....	0.007 to 0.012 in	0.178 to 0.305 mm
Ring to groove clearance .....	0.002 to 0.004 in	0.051 to 0.102 mm
Oil control		
Type .....	Slotted scraper	
Width .....	0.124 to 0.125 in	3.15 to 3.175 mm
Fitted gap .....	0.007 to 0.012 in	0.178 to 0.305 mm
Ring to groove clearance .....	0.0015 to 0.0035 in	0.038 to 0.089 mm
<b>Gudgeon pins</b> .....		
Type .....	Fully floating with circlip location	
Diameter .....	0.624	15.86 mm
Fit in Piston .....	Drop through to hand push fit at 20°C 68°F	

**Camshaft**

End thrust .....	Taken on locating plate	
End float .....	0.003 to 0.007 in	0.076 to 0.178 mm
Drive .....	Chain and sprocket from crankshaft	
Timing chain .....	$\frac{3}{8}$ in 9.52 mm pitch x 52 pitches	
Valve timing marks .....	Dimples on timing wheels, marks on flywheel	
Journal diameters:		
Front .....	0.6655 to 1.6660 in	42.304 to 42.316 mm
Centre .....	1.62275 to 1.62325 in	41.218 to 41.231 mm
Rear .....	1.3727 to 1.3735 in	34.857 to 34.887 mm
Bearing liner inside diameter: (reamed after fitting)		
Front .....	1.6670 to 1.6675 in	42.342 to 42.355 mm
Centre .....	1.6242 to 1.6247 in	41.225 to 41.267 mm
Rear .....	1.3745 to 1.3750 in	34.912 to 34.925 mm
Bearings .....	3, white-metal-lined, steel-backed	
Diametrical clearance .....	0.001 to 0.002 in	0.025 to 0.051 mm

**Tappets**

Type .....	Bucket with radiused base	
Outside diameter .....	0.812 in	20.62 mm
Length .....	1.5 in	38.10 mm

**Rocker gear**

Rocker shaft:		
Length .....	11.625 in	279.4 mm
Diameter .....	0.5615 to 0.5625 in	14.26 to 14.29 mm
Rocker arm:		
Bore .....	0.687 to 0.688 in	17.45 to 17.48 mm
Bush inside diameter (reamed) .....	0.5630 to 0.5635 in	14.30 to 14.313 mm

**Valves**

Seat angle .....	45°	
Head diameter:		
Inlet .....	1.093 to 1.098 in	27.76 to 27.89 mm
Exhaust .....	1.000 to 1.005 in	25.40 to 25.53 mm
Stem diameter:		
Inlet .....	0.2793 to 0.2798 in	7.094 to 7.107 mm
Exhaust .....	0.2788 to 0.2793 in	7.082 to 7.094 mm
Stem guide to clearance:		
Inlet .....	0.0015 to 0.0025 in	0.038 to 0.064 mm
Exhaust .....	0.002 to 0.003 in	0.051 to 0.076 mm
Valve lift .....	0.285 in	7.24 mm
Valve guides		
Length .....	1.687 in	42.85 mm
Outside diameter: Inlet and exhaust		
.....	0.470 to 0.471 in	11.94 mm to 11.97 mm
Inside diameter .....	0.2813 to 0.2818 in	7.145 to 7.157 mm
Fitted height above head .....	0.54 in	13.72 mm
Interference fit in head .....	0.0005 to 0.0015 in	0.01 to 0.04 mm
Valve springs		
Free length .....	1.750 in	44.45 mm
Load at fitted length .....	55 lbf	24.9 kgf
Load at top of lift .....	88 lbf	39.9 kgf
Number of working coils .....	4 $\frac{1}{2}$	

**Valve timing**

Timing marks	Dimples on timing wheels, marks on flywheel	
Rocker clearance:		
Running (cold)	0.012 in	0.305 mm
Timing	0.019 in	0.48 mm
Inlet valve:		
Opens	5° B.T.D.C.	
Closes	45° A.B.D.C.	
Exhaust valve:		
Opens	40° B.B.D.C.	
Closes	10° A.T.D.C.	

**Lubrication**

System	Wet sump, pressure fed	
System pressure:		
Running	60 lb/in <sup>2</sup>	4.2 kg/cm <sup>2</sup>
Idling	15 lb/in <sup>2</sup>	1.05 kg/cm <sup>2</sup>
Oil pressure warning light switch	6 to 10 lb/in <sup>2</sup>	0.4 to 0.7 kg/cm <sup>2</sup>
Oil pump	Hobourn-Eaton rotor type or Concentric	
Pressure relief valve opens	60 lb/in <sup>2</sup>	4.2 kg/cm <sup>2</sup>
Oil filter	Full flow with renewable element cartridge	

**ENGINE - 1098 cc**

Type	10H	
Number of cylinders	4	
Bore	2.543 in	64.59 mm
Stroke	3.296 in	83.72 mm
Capacity	67 in <sup>3</sup>	1098 cc
Firing order	1 - 3 - 4 - 2	
Valve operation	Overhead by push-rods	
Compression ratio	8.5:1	
Torque	60 lbf ft	8.3 kgf m
	@ 2,450 rev/min	

**Crankshaft**

Main journal diameter	1.7505 to 1.7512 in	44.46 to 44.48 mm
Min. regrind diameter	1.7105 in	43.45 mm
Crankpin journal diameter	1.6252 to 1.6259 in	41.28 to 41.29 mm
Min. regrind diameter	1.5854 in	40.27 mm
Crankshaft end-thrust	Taken on thrust washers at centre main bearing	
Crankshaft end-float	0.001 to 0.005 in	0.025 to 0.127 mm

**Main bearings**

Number and type	3 steel-backed thin-wall type	
Width	1.053 in	26.75 mm
Diametrical clearance	0.001 to 0.0027 in	0.025 to 0.068 mm

**Connecting rods**

Type	45° split big-end, bushed small end	
Length between centres	5.75 in	146.05 mm
Locking method, big-end	Bolts and locking tabs	

**Big-end bearings**

Type	Steel-backed thin-wall	
Width	0.875 in	22.22 mm
Diametrical clearance	0.001 to 0.0025 in	0.025 to 0.064 mm

**Pistons**

Type .....	Aluminium, solid skirt	
Clearance of skirt in cylinder:		
Top .....	0.0021 to 0.0033 in	0.05 to 0.08 mm
Bottom .....	0.0005 to 0.0015 in	0.013 to 0.040 mm
Number of rings .....	4 (3 compression, 1 oil control)	
Width of ring grooves		
Top, second and third .....	0.0645 to 0.0655 in	1.638 to 1.663 mm
Oil control .....	0.1265 to 0.1275 in	3.213 to 3.238 mm
Gudgeon pin bore .....	0.6247 to 0.6249 in	15.867 to 15.872 mm
Oversize pistons .....	0.010, 0.020 in	0.254, 0.51 mm

**Piston rings**

Compression:		
Type:		
Top .....	Plain, chrome faced	
Second and third .....	Tapered, cast iron alloy	
Width .....	0.0615 to 0.0625 in	1.562 to 1.588 mm
Fitted gap .....	0.007 to 0.012	0.178 to 0.305 mm
Ring to groove clearance .....	0.002 to 0.004 in	0.051 to 0.102 mm

**Oil control:**

Type .....	Duaflex 61	
Fitted gap:		
Rails .....	0.012 to 0.028 in	0.305 to 0.711 mm
Side springs .....	0.10 to 0.15 in	2.54 to 3.81 mm

**Gudgeon pins**

Type .....	Fully floating with circlip location	
Diameter .....	0.624 in	15.86 mm
Fit in: Piston and connecting rod .....	Drop through to hand push fit at 20°C 68°F	

**Camshaft**

End thrust .....	Taken on locating plate	
End float .....	0.003 to 0.007 in	0.076 to 0.178 mm
Drive .....	Chain and sprocket from crankshaft	
Timing chain .....	3/8 in (9.52 mm) pitch x 52 pitches	
Valve timing marks .....	Dimples on timing gears, marks on flywheel	
Journal diameters:		
Front .....	1.6655 to 1.6660 in	42.304 to 42.316 mm
Centre .....	1.62275 to 1.62325 in	41.218 to 41.231 mm
Rear .....	1.3727 to 1.3735 in	34.857 to 34.887 mm
Bearing liner inside diameter (reamed after fitting)		
Front .....	1.6670 to 1.6675 in	42.342 to 42.355 mm
Centre .....	1.6242 to 1.6247 in	41.255 to 41.275 mm
Rear .....	1.3745 to 1.3750 in	34.91 to 34.93 mm
Bearings .....	White-metal-lined, steel-backed	
Diametrical clearance .....	0.001 to 0.002 in	0.025 to 0.051 mm

**Tappets**

Type .....	Barrel with radiused base	
Outside diameter .....	0.812 in	20.64 mm
Length .....	1.5 in	38.10 mm

**Rocker gear**

Rocker shaft:		
Length: .....	11.625 in	279.4 mm
Diameter .....	0.5615 to 0.5625 in	14.26 to 14.29 mm
Rocker arm:		
Bore: .....	0.687 to 0.688 in	17.45 to 17.48 mm
Bush inside diameter (reamed) .....	0.5630 to 0.5635 in	14.30 to 14.313 mm

**Valves**

Seat angle .....	45°	
Head diameter:		
Inlet .....	1.151 to 1.156 in	29.23 to 29.36 mm
Exhaust .....	1.00 to 1.005 in	25.40 to 25.53 mm
Stem diameter:		
Inlet .....	0.2793 to 0.2798 in	7.094 to 7.107 mm
Exhaust .....	0.2788 to 0.2793 in	7.082 to 7.094 mm
Stem to guide clearance .....	0.0015 to 0.0025 in	0.040 to 0.080 mm
Valve lift .....	0.285 in	7.24 mm

**Valve guides**

Length .....	1.531 in	38.89 mm
Outside diameter .....	0.469 to 0.470 in	11.91 to 11.94 mm
Inside diameter .....	0.2813 to 0.2818 in	7.145 mm to 7.151 mm
Fitted height above head .....	0.594 in	15.09 mm
Interference fit in head .....	0.0005 to 0.0015 in	0.01 to 0.04 mm

**Valve springs**

Free length .....	1.96 in	49.7 mm
Fitted length .....	1.34 in	33.0 mm
Load at fitted length .....	70 lbf	31.8 kgf
Load at top of lift .....	106 lbf	48.1 kgf
Number of working coils .....	4½	

**Valve timing**

Timing marks .....	Dimples on timing gears, marks on flywheel	
Rocker clearance:		
Running (cold) .....	0.012 in	0.305 mm
Timing .....	0.021 in	0.533 mm
Inlet valve:		
Opens .....	5° B.T.D.C.	
Closes .....	45° A.B.D.C.	
Exhaust valve:		
Opens .....	51° B.B.D.C.	
Closes .....	21° A.T.D.C.	

**Lubrication**

System .....	Wet sump, pressure-fed	
System pressure:		
Running .....	60 lbf/in <sup>2</sup>	4.221 kgf/cm <sup>2</sup>
Idling .....	15 lbf/in <sup>2</sup>	1.05 kgf/cm <sup>2</sup>
Oil pressure warning light switch .....	6 to 10 lbf/in <sup>2</sup>	0.4 to 0.7 kgf/cm <sup>2</sup>
Oil pump .....	Hobourn-Eaton rotor type or Concentric	
Relief pressure valve opens .....	60 lbf/in <sup>2</sup>	4.21 kgf/cm <sup>2</sup>
Oil filter .....	Full flow with renewable element cartridge	

**ENGINE - 1275 CC**

Type .....	12H	
Number of cylinders .....	4	
Bore .....	2.78 in	70.61 mm
Stroke .....	3.2 in	81.28 mm
Capacity .....	77.8 in <sup>3</sup>	1275 cc
Firing order .....	1 - 3 - 4 - 2	
Valve operation .....	Overhead by push-rods	
Compression ratio .....	8.8:1	
Torque .....	68.5 lbf ft	9.4 kgf m
	@ 3,000 rev/min	

**Crankshaft**

Main journal diameter .....	2.0012 to 2.0017 in	50.83 to 50.84 mm
Min. regrind diameter .....	1.9605 in	49.78 mm
Crankpin journal diameter .....	1.7497 to 1.7504 in	44.44 to 44.46 mm
Min. regrind diameter .....	1.7102 in	43.44 mm
Crankshaft end-thrust .....	Taken on thrust washers at centre main bearing	
Crankshaft end-float .....	0.001 to 0.005 in	0.025 to 0.127 mm

**Main bearings**

number and type .....	3, steel backed thin wall	
Width .....	0.975 to 0.985 in	24.76 to 25.02 mm
Diametrical clearance .....	0.001 to 0.0027 in	0.025 to 0.068 mm

**Connecting rods**

Type .....	Horizontal split big-end, push fit small-end	
Length between centres .....	5.75 in	146.05 mm
Locking method, big-end .....	Multisided nut	

**Big-end bearings**

Type .....	Steel backed thin-wall	
Width .....	0.840 to 0.850 in	21.33 to 21.59 mm
Diametrical clearance .....	0.001 to 0.0025 in	0.025 to 0.064 mm

**Pistons**

Type .....	Aluminium, solid skirt, dished crown	
Clearance of skirt in cylinder:		
Top .....	0.0029 to 0.0045 in	0.070 to 0.114 mm
Bottom .....	0.0012 to 0.0022 in	0.031 to 0.056 mm
Number of rings .....	4 (3 compression, 1 oil control)	
Width of ring grooves:		
Top, second and third .....	0.0484 to 0.0494 in	1.230 to 1.250 mm
Oil control .....	0.1578 to 1.1588 in	4.001 to 4.003 mm
Gudgeon pin bore .....	0.8128 to 0.813 in	20.640 to 20.650 mm
Oversize pistons .....	0.010, 0.020 in	0.254, 0.51 mm

**Piston rings**

Compression:		
Type:		
Top .....	Internally chamfered chrome	
Second and third .....	Tapered, cast iron	
Width .....	0.0615 to 0.0625 in	1.562 to 1.588 mm
Fitted gap:		
Top .....	0.011 to 0.016 in	0.28 to 0.41 mm
Second and third .....	0.008 to 0.013 in	0.20 to 0.33 mm
Ring to groove clearance .....	0.0015 to 0.0035 in	0.038 to 0.089 mm
Oil control:		
Type .....	Apex	
Width .....	0.156 to 0.158 in	3.962 to 4.013 mm
Fitted gap: Rails and side springs .....	0.010 to 0.040 in	0.254 to 1.02 mm

**Gudgeon pins**

Type .....	Press fit in connecting rod	
Diameter .....	0.8123 to 0.8125 in	20.63 to 20.64 mm
Fit in:		
Piston .....	Drop through to hand push fit at 20°C 68°F	
Connecting rod .....	0.0008 to 0.0015 in	0.02 to 0.04 mm

**Camshaft**

End-thrust	Taken on locating plate	
End-float	0.003 to 0.007 in	0.076 to 0.178 mm
Drive	Chain and sprocket from crankshaft	
Timing chain	$\frac{3}{8}$ in 9.52 mm pitch x 52 pitches	
Valve timing marks	Dimples on timing gears, marks on flywheel	

**Journal diameters:**

Front	1.6655 to 1.6660 in	42.304 to 42.316 mm
Centre	1.62275 to 1.62325 in	41.218 to 41.231 mm
Rear	1.3727 to 1.3750 in	34.857 to 34.92 mm

**Bearing liner inside diameter:  
(reamed after fitting)**

Front	1.6670 to 1.6775 in	42.342 to 42.355 mm
Centre	1.6242 to 1.6255 in	41.262 to 41.288 mm
Rear	1.3748 to 1.3755 in	34.920 to 34.938 mm

**Bearings** White-metal-lined, steel-backed

Diametrical clearance	0.001 to 0.002 in	0.025 to 0.051 mm
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**Tappets**

Type	Bucket with radiused base	
Outside diameter	0.812 in	20.62 mm
Length	1.5 in	38.1 mm

**Rocker gear**

<b>Rocker shaft:</b>		
Length	11.625 in	279.4 mm
Diameter	0.5615 to 0.5625 in	14.26 to 14.29 mm
<b>Rocker arm:</b>		
Bore	0.687 to 0.688 in	17.45 to 17.48 mm
Bush inside diameter (reamed)	0.5630 to 0.5635 in	14.30 to 14.313 mm

**Valves**

Seat angle	45°	
<b>Head diameter:</b>		
Inlet	1.307 to 1.312 in	33.2 to 33.2 mm
Exhaust	1.1515 to 1.1565 in	29.24 to 29.37 mm

**Stem diameter:**

Inlet	0.2793 to 0.2798 in	7.094 to 7.107 mm
Exhaust	0.2788 to 0.2793 in	7.081 to 7.09 mm
Stem guide to clearance	0.0015 to 0.0025 in	0.040 to 0.080 mm
Valve lift	0.318 in	8.06 mm

**Valve guides**

Length: Inlet and exhaust	1.687 in	42.85 mm
Outside diameter	0.470 to 0.471 in	11.94 to 11.97 mm
Inside diameter	0.2813 to 0.2818 in	7.145 to 7.157 mm
Fitted height above head	0.54 in	13.72 mm
Interference fit in head	0.0005 to 0.0015 in	0.01 to 0.04 mm

**Valve springs**

Free length	1.95 in	49.53 mm
Fitted length	1.383 in	34.715 mm
Load at fitted length	79.5 lbf	36.03 kgf
Load at top of lift	124 lbf	56.3 kgf
Number of working coils	4 $\frac{1}{2}$	

**Valve timing**

Timing marks	Dimples on timing gears, marks on flywheel	
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**Rocker clearance:**

Running (cold)	0.012 in	0.305 mm
Timing	0.021 in	0.533 mm

**Inlet valve:**

Opens	5° B.T.D.C.	
Closes	45° A.B.D.C.	

**Exhaust valve:**

Opens	51° B.B.D.C.	
Closes	21° A.T.D.C.	

**Lubrication**

System	Wet sump, pressure-fed	
System pressure:		
Running	60 lbf/in <sup>2</sup>	4.21 kgf/cm <sup>2</sup>
Idling	15 lbf/in <sup>2</sup>	1.05 kgf/cm <sup>2</sup>
Oil pressure warning light switch	6 to 10 lbf/in <sup>2</sup>	0.4 to 0.7 kgf/cm <sup>2</sup>
Oil pump	Hobourn-Eaton rotor type or Concentric	
Relief pressure valve opens	60 lbf/in <sup>2</sup>	4.21 kgf/cm <sup>2</sup>
Oil filter	Full flow with renewable element cartridge	

**ENGINE - TURBO MODELS ONLY**

Type	12H	
Number of cylinders	4	
Bore	2.78 in	70.61 mm
Stroke	3.2 in	81.28 mm
Capacity	77.8 in <sup>3</sup>	1275 cc
Firing order	1 - 3 - 4 - 2	
Compression ratios	See Engine Tuning data	

**Crankshaft**

Main journal diameter	2.0009 to 2.0013 in	50.82 to 50.83 mm
Clearance in main bearings	0.0007 to 0.0023 in	0.018 to 0.058 mm
Min. regrind diameter	1.9811 in	50.32 mm
Crankpin journal diameter	1.7497 to 1.7504 in	44.44 to 44.46 mm
Clearance in big-end bearings	0.0015 to 0.0032 in	0.0381 to 0.0813 mm
Min. regrind diameter	1.7297 in	43.93 mm
End-float	0.002 to 0.003 in	0.051 to 0.076 mm
Adjustment	Selective thrust washers	
Primary gear end-float	0.0035 to 0.0065 in	0.089 to 0.165 mm
Adjustment	Selective thrust washers	
Thrust washers available	0.112 to 0.114 in	2.85 to 2.90 mm
	0.114 to 0.116 in	2.90 to 2.95 mm
	0.116 to 0.118 in	2.95 to 3.00 mm
	0.118 to 0.120 in	3.00 to 3.05 mm

**Connecting rods**

Length between centres	5.75 in	146.05 mm
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**Pistons**

Clearance of skirt in cylinder:		
Top	0.0029 to 0.0045 in	0.074 to 0.114 mm
Bottom	0.0009 to 0.0025 in	0.023 to 0.056 mm
Oversize	0.010 to 0.020 in	0.254 to 0.508 mm

### Piston rings

Clearance in groove:		
Compression:	0.0015 to 0.0035 in	0.038 to 0.089 mm
Fitted gap:		
Top	0.010 to 0.017 in	0.25 to 0.45 mm
Second	0.008 to 0.013 in	0.20 to 0.33 mm
Oil control	0.015 to 0.041 in	0.38 to 1.04 mm

### Gudgeon pins

Diameter	0.8123 to 0.8125 in	20.63 to 20.64 mm
Fit in piston	Drop through to hand push fit at 68°F 20°C	
Interference fit in connecting rod	0.0008 to 0.0015 in	0.02 to 0.04 mm

### Camshaft

Journal diameters:		
Front	1.6655 to 1.6660 in	42.304 to 42.316 mm
Centre	1.62275 to 1.62325 in	41.218 to 41.231 mm
Rear	1.37275 to 1.3750 in	34.868 to 34.887 mm
Clearance in bearings		
End-float	0.003 to 0.007 in	0.076 to 0.178 mm
Valve lift	0.318 in	8.08 mm

### Tappets

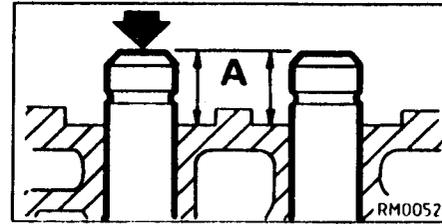
Outside diameter	0.812 in	20.62 mm
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### Rocker gear

Rocker shaft diameter	0.5615 to 0.5625 in	14.26 to 14.29 mm
Clearance in rockers	0.0005 to 0.0025 in	0.01 to 0.07 mm

### Valves

Seat angle	45°	
Head diameter:		
Inlet	1.307 to 1.312 in	33.20 to 33.32 mm
Exhaust	1.1515 to 1.1565 in	29.25 to 29.38 mm
Stem diameter:		
Inlet	0.2793 to 0.2798 in	7.094 to 7.107 mm
Exhaust	0.3131 to 0.3137 in	7.955 to 7.970 mm



### Clearance in guide:

Inlet	0.0015 to 0.0025 in	0.038 to 0.064 mm
Exhaust	0.0031 to 0.0032 in	0.079 to 0.081 mm

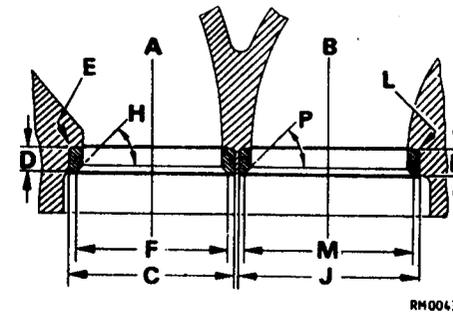
### Valve guides

Length	1.687 in	42.85 mm
Outside diameter	0.470 to 0.471 in	11.94 to 11.96 mm
Inside diameter (reamed):		
Inlet	0.2813 to 0.2818 in	7.145 to 7.1577 mm
Exhaust	0.3164 to 0.3169 in	8.036 to 8.049 mm

### Fitted height above head: - 'A'

Valve seat inserts	0.540 in	13.72 mm
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### Machining dimensions:



### Exhaust (A)

C	1.2505 to 1.2515 in	31.76 to 31.78 mm
D	0.186 to 0.188 in	4.72 to 4.77 mm
E	Maximum radius	
	0.015 in	0.38 mm
F	1.144 to 1.164 in	29.06 to 29.56 mm
H	45°	

### Inlet (B)

J	1.3805 to 1.3815 in	33.063 to 35.088 mm
K	0.186 to 0.188 in	4.72 to 4.77 mm
L	Maximum radius:	
	0.015 in	0.38 mm
M	1.2995 to 1.3195 in	33.01 to 33.52 mm
P	45°	

**Valve springs**

Inner:

Free length .....	1.703 in	43.256 mm
Fitted length .....	1.27 in	32.26 mm
Load at fitted length .....	25 lbf	11.34 kgf
Load at top of lift .....	44 lbf	19.96 kgf
Number of working coils .....	6 <sup>1</sup> / <sub>2</sub>	

Outer:

Free length .....	1.74 in	44.2 mm
Fitted length .....	1.38 in	35.05 mm
Load at fitted length .....	49 lbf	22.23 kgf
Load at top of lift .....	94 lbf	42.64 kgf
Number of working coils .....	4 <sup>1</sup> / <sub>2</sub>	

**Valve timing**

Rocker clearance: Timing ..... 0.021 in      0.53 mm

Inlet valve:

Opens ..... 9° B.T.D.C.  
 Closes ..... 41° A.B.D.C.

Exhaust valve:

Opens ..... 55° B.B.D.C.  
 Closes ..... 17° A.T.D.C.

**Lubrication**

System ..... Wet sump, pressure-fed with remote oil filter and cooler.

System pressure:

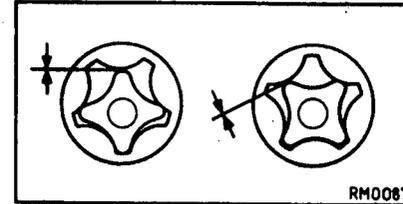
Running .....	60 lbf/in <sup>2</sup>	4.2 kgf/cm <sup>2</sup>
Idling (approximate) .....	15 lbf/in <sup>2</sup>	1.05 kgf/cm <sup>2</sup>
Warning light switch pressure .....	6 to 10 lbf/in <sup>2</sup>	0.4 to 0.7 kgf/cm <sup>2</sup>
Pressure relief valve opens .....	60 lbf/in <sup>2</sup>	4.2 kgf/cm <sup>2</sup>
Pressure relief valve spring - free length .....	2.86 in	72.63 mm

Oil filter ..... Full flow with renewable cartridge element

Oil pump:

Outer ring end-float ..... 0.005 in      0.127 mm

Inner rotor end-float .....	0.005 in	0.127 mm
Outer ring to body diametrical clearance .....	0.010 in	0.254 mm
Rotor lobe clearance .....	0.006 in	0.152 mm



**COOLING SYSTEM - ALL MODELS**

Type .....	Pressurised radiator, thermo-siphon, pump and fan assisted, Auxiliary radiator fitted on Turbo Models only	
Thermostat: Standard .....	88°C	188°F
Pressure cap .....	15 lb/in <sup>2</sup>	1.05 kg/cm <sup>2</sup>
Drive belt tension .....	0.5 in (13 mm) deflection on longest run	

**FUEL SYSTEM**

Carburettor see 'ENGINE TUNING DATA'

Air cleaner .....	Paper element with intake from hot box and air temperature control device	
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Fuel pump

Make and type - Not Turbo Models .....	S.U. mechanical, AUF 700 or AUF 800	
- Turbo Models .....	Lucas/Bosch Type 4FP	

**CLUTCH - NOT TURBO MODELS**

Make and type .....	Borg and Beck, diaphragm type	
Clutch plate diameter .....	7 <sup>1</sup> / <sub>8</sub> in	180.9 mm
Facing material .....	Wound yarn	
Diaphragm spring colour:		
848 cc .....	Brown	
998 cc .....	Brown	
1098 cc .....	Light Green	
1275 cc .....	Dark Blue	
Master cylinder diameter .....	0.75in	19.05 mm
Slave cylinder diameter .....	0.875 in	2.22 mm
Clutch release lever clearance .....	0.020 in	0.508 mm

**CLUTCH - TURBO MODELS**

Type .....	Single dry plate, hydraulically operated	
Clutch plate diameter .....	7 <sup>1</sup> / <sub>8</sub> in	181 mm

**MANUAL GEARBOX**

Number of forward speeds .....	4	
Synchromesh .....	All forward gears	
Ratios: 848 cc, 998 cc, 1098 cc		
Fourth .....	1.00:1	
Third .....	1.43:1	
Second .....	2.22:1	
First .....	3.52:1	
Reverse .....	3.54:1	
Ratios: 1275 cc		
Fourth .....	1.00:1	
Third .....	1.35:1	
Second .....	2.09:1	
First .....	3.33:1	
Reverse .....	3.34:1	
Speedometer gear ratio .....	6/17	

**AUTOMATIC GEARBOX**

**Torque converter**

Make and type .....	Automotive Products, torque converter	
Ratio .....	2:1 Maximum	

**Gearbox**

Ratios:		
Fourth .....	1.0:1	
Third .....	1.46:1	
Second .....	1.845:1	
First .....	2.69:1	
Reverse .....	2.69:1	
Speedometer gear ratio .....	7/17	

**FINAL DRIVE**

Type .....	Helical gears and differential	
Ratio:		
848 cc .....	3.76:1	(17/64)

998 cc .....	3.44:1	(18/62)
1098 cc .....	3.44:1	18/62)
1275 cc .....	3.44:1	(18/62)
998 cc automatic .....	3.27:1	
Road speed at 1,000 rev/min in top gear		
848 cc and 998 cc automatic .....	15 mph	24 km/h
998 and 1098 cc .....	16 mph	26 km/h
1275 cc .....	16.8 mph	28.5 km/h

#### DRIVE SHAFTS - ALL MODELS

Make and type .....	Hardy Spicer, solid shaft, with outboard constant velocity joints	
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#### STEERING - NOT TURBO MODELS

Front wheel alignment .....	Toe-out $\frac{1}{16}$ in 1.6 mm or 0°15' include angle	
Steering angle of outer wheel with inner wheel at 20° .....	21.5° ± 1.5° or 0°15' include angle	
Camber angle .....	2° ± 1° positive	
Caster angle .....	3° ± 1° positive	
Steering wheel diameter		
850 and 1000 .....	15.75 in	400 mm
Clubman and 1275 GT .....	15 in	381 mm
Type .....	Rack and pinion	
Steering wheel turns - lock to lock .....	2.7	

#### STEERING - Turbo Models

Front wheel alignment .....	$\frac{3}{16}$ to $\frac{1}{4}$ in 4.7 to 6.3 mm Toe out	
Camber angle .....	1½° negative	
Caster angle .....	3° ± 1° positive	
Steering wheel diameter .....	14 in	355.6 mm
Type .....	Rack and pinion	
Track:		
Front .....	52.0 in	1321 mm
Rear .....	49¼ in	1251 mm

#### SUSPENSION - NOT TURBO MODELS

Type .....	Rubber cone spring	
Rear suspension:		
Toe-in .....	$\frac{1}{8}$ in	3.18 mm

Camber .....	1° + 1.5° max. - 0.5° min. positive	
Radius arm bushes (reamed bore) .....	0.8145 to 0.8150 in	20.69 to 20.70 mm
Hydraulic dampers .....	Tubular telescopic	

#### SUSPENSION - Turbo Models

Type .....	Rubber cone spring.	
Rear suspension		
Toe in .....	$\frac{1}{8}$ in	3.18 mm
Camber .....	1° + 1.5° max - 0.5° min positive	
Radius arm bushes (reamed bore) .....	0.8145 to 0.8150 in	20.69 to 20.70 mm
Hydraulic dampers .....	Adjustable*, tubular telescopic	
Trim height:		
Front .....	14½ ± ¼ in	368.3 ± 6.3 mm
Rear .....	14.0 ± ¼ in	355.6 ± 6.3 mm
Ground clearance (lowest point) .....	6 in	152.4 mm * Fitted to some production models.

#### BRAKES

Type:		
850, 1000 and Clubman .....	Lockheed hydraulic, drum front with twin leading shoes and manual adjustment, drum rear with leading and trailing shoes and manual adjustment	
1275 GT .....	Lockheed hydraulic, disc front with fixed calipers, drum rear with leading and trailing shoes and manual adjustment	
Split line systems: .....	Split diagonally front to rear Split front to rear	

Front - 850, 1000 and Clubman		
Drum diameter .....	7.0 in	177.8 mm
Swept frictional area - per wheel .....	33.0 in²	212.9 cm²
Total frictional area .....	41.0 in²	264.5 cm²
Lining dimensions .....	6.75 x 1.5 in	171.5 x 38.1 mm
Wheel cylinder diameter .....	$\frac{15}{16}$ in	23.8 mm
Master cylinder bore diameter .....	0.7 in	17.8 mm

Tandem master cylinder bore diameter .....	0.7 in	17.8 mm
<b>Rear - 850, 1000 and Clubman</b>		
Drum diameter .....	7.0 in	177.8 mm
Lining dimensions .....	6.75 x 1.25 in	171.5 x 31.75 mm
Swept frictional area - per wheel .....	27.5 in <sup>2</sup>	117.42 cm <sup>2</sup>
Total frictional area .....	34.2 in <sup>2</sup>	220.6 cm <sup>2</sup>
Wheel cylinder diameter:		
Single line system .....	0.75 in	19.05 mm
Diagonal split system .....	0.526 in	13.35 mm
Front to rear split system .....	0.687 in	17.46 mm
Front to rear split system with pressure reducing valve .....	0.75 in	19.05 mm
<b>Front - 1275 GT</b>		
Disc diameter .....	8.4 in	213.4 mm
Swept frictional area - per wheel .....	67.23 in <sup>2</sup>	433.7 cm <sup>2</sup>
Total frictional area .....	16.6 in <sup>2</sup>	107.1 cm <sup>2</sup>
Minimum pad thickness .....	1/16 in	1.6 mm
Caliper piston diameter .....	2.0 in	50.8 mm
Master cylinder bore diameter .....	0.7 in	17.8 mm
Tandem master cylinder bore diameter .....	0.7 in	17.8 mm
<b>Rear - 1275 GT</b>		
Drum diameter .....	7.0 in	177.8 mm
Lining dimensions .....	6.75 x 1.25 in	171 x 31.75 mm
Swept frictional area - per wheel .....	27.5 in <sup>2</sup>	117.42 cm <sup>2</sup>
Total frictional area - per wheel .....	34.2 in <sup>2</sup>	220.6 cm <sup>2</sup>
Wheel cylinder diameter .....	0.5 in	12.7 mm

## WHEELS

Type and size:

850, 1000 and Clubman .....	Ventilated disc, 3.5B x 10
1275 GT .....	Ventilated disc, 4.5J x 12

## 'DENOVO' WHEELS

.....	Divided inner and outer pressed steel rim with replaceable lubricant canisters
Size .....	80 x 310 mm

## TYRES

Size and type:

850, 100 and Clubman .....	5.20 - cross ply
	145 - 10 radial ply
1275 GT .....	145/70 SR - 12 radial ply
'DENOVO' .....	155/65 SF - 310 Dunlop
Pressures .....	see 'MAINTENANCE'

## WINDSCREEN WIPERS

Motor type .....	Lucas 14 WA
	Low speed                      High speed
Running current (drive disconnected) .....	1.5A                      2A
Wiper speed (after 60 seconds) .....	46 to 52 rev/min                      60 to 70 rev/min
Armature end float .....	0.002 to 0.010 in                      0.051 to 0.254 mm
Brush spring tension .....	5 to 7 ozf                      140 to 200 gmf
Minimum brush length .....	0.18 in                      4.57 mm

## ELECTRICAL

Charging system .....	12-volt, negative earth return with current voltage control
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## Fuses

Circuits - Fuse 1 - 2 .....	17A	current rated
Circuits - Fuse 3 - 4, 5 - 6 .....	12A	current rated
Circuits - Fuse 7 - 8 .....	8A	current rated
Radio .....	1.5A	current rated

## Battery

Type: Lucas .....	A7	A9	A 11/9
Capacity at 20-hr rate .....	30 Ah	40 Ah	50 Ah

**Alternator - up to 1982**

Type .....	Lucas 16ACR	
Output at 14v and 6,000 alternator rev/min .....	34A	
Rotor winding resistance at 20°C (68°) ± 5% .....	4.33 ohms	
Colour identification .....	Pink	
Regulator, alternator at 6,000 rev/min and current less than 10A .....	13.6 to 14.4V	
Maximum permissible rotor speed .....	15,000 rev/min	
Brush length:		
new .....	0.5 in	12.6 mm
Minimum (protruding from moulding) .....	0.3 in	7.5 mm
Brush spring tension (brush face flush with brush box) .....	9 to 13 ozf	255 to 369 gmf

**Starter motor**

Type .....	Lucas M35J, inertia type	
Minimum brush length .....	0.310 in	8.0 mm
Insulation test equipment .....	110-V a.c. and 15-W test lamp	
Continuity test equipment .....	12-V d.c. and 12-V test lamp	
Light running current .....	50A at 8,000 to 11,500 rev/min	
Lock torque at 350 to 375A .....	6.7 lbf ft	0.91 kgf/m
Brush spring tension .....	28 ozf	0.8 kgf

**GENERAL DIMENSIONS**

Wheel base:		
Saloon .....	6 ft 8 <sup>5</sup> / <sub>32</sub> in	2.036 m
Van, pick-up and estate .....	7 ft 0 in	2.138 m
Overall height:		
Saloon* 850, 1000 .....	4 ft 5 in	1.346 m
Van, pick-up and estate* .....	4 ft 5 <sup>1</sup> / <sub>2</sub> in	1.359 m
Overall width .....	4 ft 7 <sup>1</sup> / <sub>2</sub> in	1.41 m
Overall length:		
Saloon .....	10 ft 0 <sup>1</sup> / <sub>4</sub> in	3.054 m
Van .....	10 ft 9 <sup>7</sup> / <sub>8</sub> in	3.3 m
Clubman Saloon .....	10 ft 4 <sup>5</sup> / <sub>8</sub> in	3.166 m
Estate .....	11 ft 2 in	3.402 m
Pick-up .....	10 ft 10 <sup>1</sup> / <sub>2</sub> in	3.315 m

Ground clearance* .....	6 <sup>1</sup> / <sub>4</sub> in	16.03 cm
Track except 11275 GT:		
Front .....	47 <sup>1</sup> / <sub>2</sub> in	1.215 m
Rear .....	46 <sup>3</sup> / <sub>8</sub> in	1.178 m
1275 GT (standard radial ply tyres):		
Front .....	48 <sup>3</sup> / <sub>4</sub> in	1.239 m
Rear .....	47 <sup>7</sup> / <sub>16</sub> in	1.205 m
1275 GT (DENOVO tyres):		
Front .....	48 <sup>3</sup> / <sub>4</sub> in	1.230 m
Rear .....	47 <sup>1</sup> / <sub>4</sub> in	1.200 m
Turning circle (kerb to kerb):		
Saloon .....	28 ft 6 in	8.55 m
Van, pick-up and estate .....	29 ft	8.84 m

\* unladen condition

**WEIGHTS (approximate)**

Vehicle loading, 4 persons plus 100 lb (45 kg) luggage .....	700 lb	318 kg
To be taken into account with loading figure:		
Maximum roof rack load .....	90 lb	40 kg
* Towing hitch load .....	75 to 100 lb	34 to 45 kg
* Maximum towing weight for 1 in 8 gradient in first gear:		
Saloon .....	8 cwt	406.5 kg
Estate, Van and Pick-up .....	6 cwt	305 kg
* Tow bars should not be fitted to Turbo models		
Kerbside:		
Saloon (manual gearbox) .....	1406 lb	638 kg
Saloon (automatic gearbox) .....	1450 lb	658 kg
Turbo models .....	1624 lb	736.6 kg
Estate .....	1514 lb	686.7 kg
Van .....	1369 lb	621.5 kg
Pick-up .....	1371 lb	622.4 kg
Power unit .....	333 lb	151 kg

**Mini City E, Mini HLE and Mayfair models**

**CLUTCH**

Make and type	Verto, diaphragm spring	
Clutch plate diameter	7.125 in	181 mm
Master cylinder bore	0.625 in	15.88 mm
Slave cylinder bore	0.875 in	22.22 mm
Throw-out stop clearance	0.260 in	6.5 mm

**MANUAL GEARBOX**

Ratios:

Fourth	1.000:1
Third	1.425:1
Second	2.185:1
First	3.647:1
Reverse	3.667:1

Primary drive:

Primary gear end-float	0.0004 to 0.007 in	0.10 to 0.18 mm
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Thrust washers available	0.110 to 0.112 in	2.79 to 2.84 mm
	0.112 to 0.114 in	2.84 to 2.89 mm
	0.114 to 0.116 in	2.89 to 2.94 mm
	0.116 to 0.118 in	2.94 to 2.99 mm
Idler gear end-float	0.118 to 0.120 in	2.99 to 3.04 mm
	0.004 to 0.007 in	0.10 to 0.18 mm
Thrust washers available	0.132 to 0.133 in	3.35 to 3.37 mm
	0.134 to 0.135 in	3.40 to 3.42 mm
	0.136 to 0.137 in	3.45 to 3.47 mm
	0.138 to 0.139 in	3.50 to 3.53 mm

**FINAL DRIVE**

Type	Helical gears and differential	
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Manual gearbox:

Ratio	(20/59)	2.95:1
Road speed at 1000 rev/min in top gear	18.7 mph	30 km/h

Automatic gearbox:

Ratio	25/69)	2.76:1
Road speed at 1000 rev/min in top gear	19.9 mph	32 km/h

**TYRES**

Size and type	145 SR - 10 radial-ply
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**WARNING: Mini City E and Mini HLE cars are fitted with Low Rolling Resistance tyres, and replacement tyres should be of the same type and specification.**

Model year - 1982 -1986

**ELECTRICAL**

Alternator

Type	Lucas A115	
Output at 14 V (nominal) and 6,000 alternator rev/ min	45A	
Rotor winding resistance at 20°C (68°F)	3.2 ± 5%ohms	
Stator winding resistance per phase at 20°C (68°F)	0.092 ± 5%ohms	
Regulator controlled voltage (measured across battery)	13.6 to 14.4	
Type of winding	Star	
Maximum permissible rotor speed	15,000 rev/min	
Brush length:		
New	0.8 in	20 mm
Minimum	0.4 in	10 mm
Brush spring pressure	4.7 to 9.8 oz	1.3 to 2.7 N

Model year - 1984 on

**MANUAL GEARBOX - NOT TURBO MODELS**

Ratios:

Fourth	1.000:1
Third	1.425:1
Second	2.185:1
First	3.647:1
Reverse	3.667:1

## MANUAL GEARBOX - TURBO MODELS

Ratios:		
Fourth	1.000 : 1	
Third	1.425 : 1	
Second	2.185 : 1	
First	3.647 : 1	
Reverse	3.667 : 1	
Primary drive idler gear end-float	0.003 to 0.006 in	0.076 to 0.152 mm
Adjustment	Selective thrust washers	
Thrust washers available	0.132 to 0.133 in	3.35 to 3.37 mm
	0.134 to 0.135 in	3.40 to 3.42 mm
	0.136 to 0.137 in	3.45 to 3.47 mm
	0.138 to 0.139 in	3.50 to 3.53 mm
Laygear end-float	0.002 to 0.006 in	0.05 to 0.15 mm
Adjustment	Selective thrust washers	
Thrust washers available	0.121 to 0.123 in	3.07 to 3.12 mm
	0.124 to 0.126 in	3.15 to 3.20 mm
	0.127 to 0.129 in	3.23 to 3.28 mm
	0.130 to 0.132 in	3.30 to 3.35 mm

## FINAL DRIVE

Type	Helical gears and differential	
Ratio: Manual gearbox		
UK/Europe	3.105:1	
Except UK/Europe	3.44:1	
Automatic gearbox	3.272:1	
Turbo models	3.21 : 1	
Road speed at 1,000 rev/min in top gear:		
UK/Europe	18.7 mph	30 km/h
Except UK/Europe	16 mph	26 km/h
Automatic	17.7 mph	28.5 km/h
Turbo Models	18.6 mph	29.9 km/h

## STEERING

Steering wheel diameter:		
- Not Turbo models	15 in	381 mm
- Turbo models	14 in	355.6 mm

## BRAKES

Type	Lockheed hydraulic, disc front with fixed calipers, drum rear with leading and trailing shoes and manual adjustment	
Split line system	Split front to rear with pressure reducing valve	

### Front

Disc diameter	8.4 in	213.4 mm
Swept frictional area - per wheel	67.23 in <sup>2</sup>	433.7 cm <sup>2</sup>
Total frictional area	16.6 in <sup>2</sup>	107.1 cm <sup>2</sup>
Minimum pad thickness	1/8 in	3 mm
Caliper piston diameter	2.0 in	50.8 mm
Tandem master cylinder bore diameter	0.7 in	17.8 mm

### Rear

Drum diameter	7.0 in	177.8 mm
Lining dimensions	6.75 x 1.25 in	171.5 x 31.75 mm
Total frictional area	34.2 in <sup>2</sup>	220.6 cm <sup>2</sup>
Minimum lining thickness	1/8 in	3 mm
Wheel cylinder diameter	0.75 in	19.05 mm

## WHEELS

Type and size:	
- Not Turbo models	Ventilated disc, 4.5J x 12
- Turbo models Only	6.0J x 13

## TYRES

Size and type:	
- Not Turbo Models	145/70SR - 12 radial ply
- Turbo Models Only	165/60 HR13 Steel belted, radial ply
Pressures - All Models	
Front	2.0 bar 1.97 kgf/cm <sup>2</sup> 28 lbf/in <sup>2</sup>
Rear	2.0 bar 1.97 kgf/cm <sup>2</sup> 28 lbf/in <sup>2</sup>

**GENERAL DIMENSIONS**

Wheel base: .....	6 ft 8 <sup>5</sup> / <sub>32</sub> in	2.036 m
Overall height* .....	4 ft 5 <sup>1</sup> / <sub>4</sub> in	1.333 m
Overall width .....	4 ft 7 <sup>1</sup> / <sub>2</sub> in	1.41 m
Overall length:		
- Not Turbo Models .....	10 ft 0 <sup>1</sup> / <sub>4</sub> in	3.054 m
- Turbo Models Only .....	10 ft 0 <sup>1</sup> / <sub>2</sub> in	3.060 m
Ground clearance*:		
- Not Turbo Models .....	6 <sup>1</sup> / <sub>2</sub> in	16.70 cm
- Turbo Models Only .....	6.0 in	15.24 cm
Track:		
Front		
- Not Turbo Models .....	48 <sup>3</sup> / <sub>4</sub> in	1.239 m
- Turbo Models Only .....	49 <sup>1</sup> / <sub>4</sub> in	1.251 m
Rear		
- Not Turbo Models .....	47 <sup>7</sup> / <sub>16</sub> in	1.205 m
- Turbo Models Only .....	52 in	1.321 m
Turning circle (kerb to kerb) .....	28 ft 6 in	8.55 m

\* unladen condition

**ELECTRICAL - 1986 on - Including Turbo****Alternator**

Type .....	Lucas A127	
Output at 6,000 alternator rev/min .....	45 A	
Rotor winding resistance at 20°C (68°F) .....	2.9 ohms	
Stator winding resistance per phase at 20°C (68°F) .....	0.25 ohms	
Regulator controlled voltage (measured across battery) .....	13.6 to 14.4	
Maximum permissible rotor speed .....	15,000 rev/min	
Type of winding .....	Delta	
Brush length (measured from moulding):		
New .....	0.67 in	17 mm
Minimum .....	0.20 in	5 mm
Brush spring pressure (press brush to moulding) .....	4.7 to 9.8 oz	1.3 to 7.2 N

**Starter motor**

Type .....	Lucas M79 (pre-engaged)	
Minimum brush length .....	0.15 in	3.5 mm
Brush spring pressure .....	40 to 64 oz	12 to 20 N
Insulation test equipment .....	110-V a.c. and 15-W test lamp	
Continuity test equipment .....	12-V d.c. and 12-V test lamp	
Lock torque at 7 V .....	6.5 lbf ft, 9.0 Nm at 360 amps	

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**BRAKES - 1989 Model Year on - Including Turbo**

Type .....	Servo assisted Lockheed hydraulic, disc front with fixed calipers, drum rear with leading and trailing shoes and manual adjustment	
Split line system - Not Turbo .....	Split front to rear with pressure reducing valve	
Turbo .....	Dual system. Primary operates on rear brakes and one pair of pistons in each of the front calipers. Secondary operates on remaining pistons in front calipers	

**Front - Not Turbo Models**

Disc diameter .....	8.4 in	213.4 mm
Swept frictional area - per wheel .....	67.23 in <sup>2</sup>	433.7 cm <sup>2</sup>
Total frictional area .....	16.6 in <sup>2</sup>	107.1 cm <sup>2</sup>
Minimum pad thickness .....	1/8 in	3 mm
Caliper piston diameter .....	2.0 in	50.8 mm
Tandem master cylinder bore diameter .....	0.8 in	20.6 mm
Servo type .....	Lockheed T28 DA	

**Front - Turbo Models Only**

Disc diameter .....	8.39 in	213 mm
Maximum permissible run-out at centre of working surface .....	0.006 in	0.15 mm
Caliper piston diameter .....	1.41 in	36 mm
Pad material - minimum thickness .....	1/8 in	3 mm
Tandem master cylinder bore diameter .....	0.8 in	20.6 mm
Servo type .....	Lockheed T28 DA	

**Rear - All Models**

Drum diameter .....	7.0 in	177.8 mm
Lining dimensions .....	6.75 x 1.25 in	171.5 x 31.75 mm
Total frictional area .....	34.2 in <sup>2</sup>	220.6 cm <sup>2</sup>
Minimum lining thickness .....	1/8 in	3 mm
Wheel cylinder diameter .....	0.75 in	19.05 mm

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## ENGINE TUNING DATA

Model: **Mini 850** - Saloon and variants to European emission control requirements (ECE 15)      Year: **1976 on**

### ENGINE

Type ..... **85H**  
Capacity ..... **51.7 in<sup>3</sup>**      **848 cc**  
Compression ratio ..... **8.3:1**  
Firing order ..... **1, 3, 4, 2**  
Compression pressure ..... **170 lb/in<sup>2</sup>**      **11.9 kgf/cm<sup>2</sup>**  
Idling speed ..... **750 rev/min**  
Fast idle speed ..... **1200 rev/min**  
Valve rocker clearances (cold) ..... **0.012 in**      **0.30 mm**  
Timing marks ..... **Dimples on timing wheels, marks on flywheel**

### Ignition timing:

Stroboscopic at 1000 rev/min\*<sup>t</sup> ..... **7° B.T.D.C.**

### DISTRIBUTOR

Make/type ..... **Lucas 45D4**  
Rotation of rotor ..... **Anti-clockwise**  
Dwell angle:  
Non-sliding contacts ..... **51° ± 5°**  
Sliding contacts ..... **57° ± 5°**  
Contact breaker gap ..... **0.014 to 0.016 in**      **0.35 to 0.40 mm**  
Condenser capacity ..... **0.18 to 0.24 microfarad**

### Serial number:

Non-sliding contacts ..... **41417**  
Sliding contacts ..... **41767**

### Centrifugal advance

Decelerating check\*<sup>t</sup> ..... **24° to 28° at 4,800 rev/min**  
..... **18° to 22° at 2,800 rev/min**  
..... **12° to 16° at 1,600 rev/min**  
..... **0° to 4° at 800 rev/min**

No advance below ..... **300 rev/min**

Vacuum advance ..... **(3 - 15 - 9)**

Starts ..... **3 in Hg**      **76.2 mm Hg**  
Finishes\* ..... **18° at 15 in Hg**      **381 mm Hg**

\*Crankshaft degrees and rev/min <sup>t</sup> Vacuum pipe disconnected

### SPARK PLUGS

Type ..... **GSP 161**  
Gap ..... **0.025 in**      **0.65 mm**

### IGNITION COIL

Make/type ..... **Lucas LA12**  
Primary resistance at 20° (68°F) ..... **3.2 to 3.4 ohms**  
Consumption - ignition on ..... **3.9 A**

### CARBURETTER

Type ..... **HS4**  
Specification ..... **FZX 1043 FZX 1064, FZX 1142 or FZX 1143**

Piston spring ..... **Red**  
Jet size ..... **0.090 in**      **3 mm**  
Needle ..... **ADH**  
Fuel - minimum octane rating ..... **97 RON LEADED**

### EXHAUST EMISSION

Exhaust gas content (carbon monoxide) at engine idle speed ..... **3% with carburetter FZX 1043, FZX 1142 or FZX 1143**  
..... **3 to 4.5% with carburetter FZX 1064**

## ENGINE TUNING DATA

Model:	Year: 1976-78	
<b>Mini Clubman</b> - (Manual and automatic)		
<b>Mini 1000</b> - Saloon and variants (Manual)		
<b>Mini 1000</b> - Saloon (Automatic)		
To European emission control requirements (ECE 15)		
<b>ENGINE</b>		
Type .....	99H	
Capacity .....	60.96 in <sup>3</sup>	998 cc
Compression ratio .....	8.3:1	
Firing order .....	1, 3, 4, 2	
Compression pressure .....	170 lb/in <sup>2</sup>	11.9 kg/cm <sup>2</sup>
Idling speed .....	750 rev/min	
Fast idle speed:		
Manual .....	1300 rev/min	
Automatic .....	1200 rev/min	
Ignition timing:		
Stroboscopic at 1000 rev/min*† .....	7° B.T.D.C.	
Timing marks .....	Dimples on timing wheels, marks on flywheel or converter	
Valve rocker clearance (cold) .....	0.012 in	0.30 mm
<b>DISTRIBUTOR</b>		
Make/type .....	Lucas 45D4 or Ducellier	
Rotation of rotor .....	Anti-clockwise	
Dwell angle:		
Lucas non-sliding contacts .....	51° ± 5°	
Lucas sliding contacts .....	57° ± 5°	
Ducellier .....	57° ± 2° 30'	
Contact breaker gap:		
Lucas .....	0.014 to 0.016 in	0.35 to 0.40 mm
Ducellier (preliminary setting only) .....	0.015 in	0.38 mm
Condenser capacity .....	0.18 to 0.24 microfarad	
Serial number:		
Lucas non-sliding contacts .....	41418	
Lucas sliding contacts .....	41793	

## Centrifugal advance

Decelerating check*† .....	14° to 18° at 4,000 rev/min
	9° to 13° at 2,400 rev/min
	6° to 10° at 1,500 rev/min
	0° to 1° at 900 rev/min
No advance below .....	800 rev/min

<b>Vacuum advance</b> .....	(6 - 14 - 8)	
Starts .....	8 in Hg	152 mm Hg
Finishes* .....	16° at 14 in Hg	356 mm Hg

\* Crankshaft degrees and rev/min † Vacuum pipe disconnected

## SPARK PLUGS

Type .....	GSP 161	
Gap .....	0.025 in	0.65 mm

## IGNITION COIL

Make/type .....	Lucas LA 12
Primary resistance at 20°C (68°F) .....	3.2 to 3.4 ohms
Consumption - ignition on .....	3.9A

## CARBURETTER

Type .....	HS4	
Specification .....	FZX 1044, FZX 1065, FZX 1146 or FZX 1147	
Piston spring .....	Red	
Jet size .....	0.090 in	3 mm
Needle .....	ADE	
Fuel - minimum octane rating .....	97 RON LEADED	

## EXHAUST EMISSION

Exhaust gas content (carbon monoxide) at engine idle speed .....	3% with carburetter FZX 1044, FZX 1164 or FZX 1147
	3 to 4.5% with carburetter FZX 1065







## ENGINE TUNING DATA

Model: Mini 1275 GT - (Manual) Year: 1978

To European emission control requirements  
(ECE 15)

### ENGINE

Type	12H	
Capacity	77.8 in <sup>3</sup>	1275 cc
Compression ratio	8.8:1	
Firing order	1, 3, 4, 2	
Compression pressure	175 lb/in <sup>2</sup>	12.3 kg/cm <sup>2</sup>
Idling speed	750 rev/min	
Fast idle speed	1300 rev/min	
Ignition timing:		
Stroboscopic at 1000 rev/min*†	13° B.T.D.C.	
Timing marks	Dimples on timing wheels, marks on flywheel	
Valve rocker clearance (cold)	0.012 in	0.30 mm

### DISTRIBUTOR

Make/type	Lucas 45D4	
Rotation of rotor	Anti-clockwise	
Dwell angle:		
Non-sliding contacts	51° ± 5°	
Sliding contacts	57° ± 5°	
Contact breaker gap	0.014 to 0.16 in	0.35 to 0.40 mm
Condenser capacity	0.18 to 0.24 microfarad	

### Serial number:

Non-sliding contacts	4149
Sliding contacts	41768

### Centrifugal advance

Decelerating check*†	18° to 22° at 4,000 rev/min
	11° to 15° at 2,800 rev/min
	6½° to 10° at 2,100 rev/min
	4° to 8° at 1,600 rev/min
	1° to 3° at 800 rev/min
No advance below	300 rev/min

Vacuum advance	(3 - 10 - 10)	
Starts	3 in Hg	76 mm Hg
Finishes*	20° at 10 in Hg	254 mm Hg

\*Crankshaft degrees and rev/min † Vacuum pipe disconnected

### SPARK PLUGS

Type	GSP 161	
Gap	0.025 in	0.65 mm

### IGNITION COIL

Make/type	Lucas 15C8
Primary resistance at 20°C (68°F)	3.2 to 3.4 ohms
Consumption - ignition on	3.9A

### CARBURETTER

Type	HS4	
Specification	FZX 1174	
Piston spring	Red	
Jet size	0.090 in	3.0 mm
Needle	AAT	
Fuel - minimum octane rating	97 RON LEADED	

### EXHAUST EMISSION

Exhaust gas content (carbon monoxide) at engine idle speed	3% ± 1%
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## ENGINE TUNING DATA

### Model year - 1982 on

#### Engine

Type	99H	
Capacity	60.96 in <sup>3</sup>	998 cm <sup>3</sup>
Compression ratio	10.3:1	
Firing order	1, 3, 4, 2	
Idling speed	750 ± 50 rev/min	
Fast idle	1100 ± 50 rev/min	
Ignition timing at 1500 rev/min* <sup>t</sup>	8° + 0° - 2° B.T.D.C.	
Timing marks - ignition		
L.E.D.	L.E.D. sensor bracket and timing disc	
Stroboscopic	Groove in crankshaft pulley and timing plate	
Valve rocker clearance (cold)	0.012 to 0.014 in	0.30 to 0.35 mm
Exhaust gas CO content at idle	2.5 ± 1% (hot)	

#### DISTRIBUTOR

Make/type	Lucas 59D4 or Ducellier
Rotation of rotor	Anti-clockwise
Dwell angle:	
Lucas	54° ± 5°
Ducellier	57° ± 2° 30'
Contact breaker gap	0.014 to 0.016 in   0.35 to 0.40 mm
Condenser capacity	0.18 to 0.25 microfarad

#### Serial number:

Lucas	41765
Ducellier	525389

#### Centrifugal advance

Decelerating check* <sup>t</sup>	24° to 28° at 6000 rev/min
(Ignition set at T.D.C. static for check)	25° to 27° at 4800 rev/min
	8° to 12° at 1600 rev/min

#### No advance below:

Lucas	300 rev/min
Ducellier	800 rev/min

#### Vacuum advance - Lucas

Identification	3 - 13 - 12	
Starts	2 to 4 in Hg	51 to 102 mm Hg
Finishest	24° at 8 in Hg	203 mm Hg

#### Vacuum advance - Ducellier

Starts	6 in Hg	152 mm Hg
Finishest	16° at 14 in Hg	356 mm Hg

#### SPARK PLUGS

Type	GSP 4382	
Gap	0.025 in	0.65 mm

#### IGNITION COIL

Make/type	AC Delco 9977230 or Ducellier 520035A
Primary resistance at 20°C (68°F)	1.2 to 1.5 ohms
Consumption - engine idling	4.5 to 5 amps
Ballast resistance	1.3 to 1.5 ohms

#### CARBURETTER

Type	HS4
Specification	FZX 1415
Piston spring colour	Red
Jet size	0.090 in
Needle	AAC
Fuel, minimum octane rating	97 RON LEADED

\*Vacuum disconnected <sup>t</sup> Crankshaft degrees and rev/min

**WARNING: Wearers of surgically implanted pacemaker devices should not be in close proximity to ignition circuits or diagnostic equipment.**

## ENGINE TUNING DATA

Model year - 1983 on

### ENGINE

Type	99H	
Capacity	60.96 in <sup>3</sup>	998 cm <sup>3</sup>
Compression ratio	10.3:1	
Firing order	1, 3, 4, 2	
Idling speed	750 ± 50 rev/min	
Fast idle	1100 ± 50 rev/min	
Ignition timing at 1500 rev/min*†	8° + 0° - 2° B.T.D.C.	
Timing marks - ignition		
L.E.D.	L.E.D. sensor bracket and timing disc	
Stroboscopic	Groove in crankshaft pulley and timing plate	
Valve rocker clearance (cold)	0.012 to 0.014 in	0.30 to 0.35 mm
Exhaust gas CO content at idle	2.5 ± 1% (hot)	

### DISTRIBUTOR

Make/type	Lucas 59D4	
Rotation of rotor	Anti-clockwise	
Dwell angle	54° ± 5°	
Contact breaker gap	0.014 to 0.016 in	0.35 to 0.40 mm
Condenser capacity	0.18 to 0.25 microfarad	
Serial number	41882	

### Centrifugal advance

Decelerating chuck*†	22° to 26° at 6000 rev/min	
(Ignition set at T.D.C. static for check)	20° to 24° at 4800 rev/min	
	4° to 8° at 1000 rev/min	
No advance below	400 rev/min	

### Vacuum advance

Identification	3 - 9 - 8	
Starts	2 to 4 in Hg	51 to 102 mm Hg
Finishest	16° at 8 in Hg	203 mm Hg

### SPARK PLUGS

Type	GSP 4382	
Gap	0.025 in	0.65 mm

### IGNITION COIL

Type	GCL 144
Primary resistance at 20°C (68°F)	1.4 ± 0.1 ohms
Consumption - engine idling	2.6 ± 0.2 amps
Ballast resistance	1.5 ohms

### CARBURETTER

Type	HS4
Specification	FZX 1415
Piston spring colour	Red
Jet size	0.090 in
Needle	AAC
Fuel, minimum octane rating	97 RON LEADED

† Vacuum disconnected \*Crankshaft degrees and rev/min

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**ENGINE TUNING DATA****Model year - 1988 on - Category C****Emissions****ENGINE**

Type .....	99H	
Engine No. prefix .....	99 HD81	
Capacity .....	60.96 in <sup>3</sup>	998 cm <sup>3</sup>
Compression ratio .....	9.6:1	
Firing order .....	1, 3, 4, 2	
Idling speed .....	750 ± 50 rev/min	
Fast idle .....	1100 ± 50 rev/min	
Ignition timing at 1500 rev/min*† .....	10° + 0° - 2° B.T.D.C.	
Timing marks - ignition		
L.E.D. ....	L.E.D. sensor bracket and timing disc	
Stroboscopic .....	Groove in crankshaft pulley and timing plate	
Valve rocker clearance (cold) .....	0.011 to 0.013 in	0.28 to 0.33 mm
Exhaust gas CO content at idle .....	1.5 to 3.5% (hot)	

**DISTRIBUTOR**

Make/type .....	Lucas 59D4	
Rotation of rotor .....	Anti-clockwise	
Dwell angle .....	54° ± 5°	
Contact breaker gap .....	0.014 to 0.016 in	0.35 to 0.40 mm
Condenser capacity .....	0.18 to 0.25 microfarad	
Serial number .....	41907	

**Centrifugal advance**

Decelerating check*† .....	16° to 20° at 4600 rev/min	
(Ignition set at T.D.C. static for check) .....	13° to 17° at 3700 rev/min	
	6° to 10° at 2000 rev/min	
No advance below .....	400 rev/min	

**Vacuum advance**

Identification .....	3 - 9 - 8	
Starts .....	2 to 4 in Hg	51 to 102 mm Hg
Finishest .....	16° at 9 in Hg	228 mm Hg

**SPARK PLUGS**

Type .....	GSP 4382 or GSP 3372	
Gap .....	0.025 in	0.65 mm

**IGNITION COIL**

Type .....	GCL 144	
Primary resistance at 20°C (68°F) .....	1.4 ± 0.1 ohms	
Consumption - engine idling .....	2.6 ± 0.2 amps	
Ballast resistance .....	1.5 ohms	

**CARBURETTER**

Type .....	HS4	
Specification .....	FZX 1415	
Piston spring colour .....	Red	
Jet size .....	0.090 in	
Needle .....	AAC	
Fuel, minimum octane rating .....	95 RON - UNLEADED	

\*Vacuum disconnected †Crankshaft degrees and rev/min

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## ENGINE TUNING DATA

Model year - 1989 on - low  
compression

### ENGINE

Type	99H	
Engine No. prefix	99 HE22	
Capacity	60.96 in <sup>3</sup>	998 cm <sup>3</sup>
Compression ratio	8.3:1	
Firing order	1, 3, 4, 2	
Idling speed	750 ± 50 rev/min	
Fast idle	1100 ± 50 rev/min	
Ignition timing at 1500 rev/min*†	8° + 0° - 2° B.T.D.C.	
Timing marks - ignition		
L.E.D.	L.E.D. sensor bracket and timing disc	
Stroboscopic	Groove in crankshaft pulley and timing plate	
Valve rocker clearance (cold)	0.011 to 0.013 in	0.28 to 0.33 mm
Exhaust gas CO content at idle	1.5 to 3.5% (hot)	

### DISTRIBUTOR

Make/type	Lucas 59D4	
Rotation of rotor	Anti-clockwise	
Dwell angle	54° ± 5°	
Contact breaker gap	0.014 to 0.016 in	0.35 to 0.40 mm
Condenser capacity	0.18 to 0.25 microfarad	
Serial number	41765	

### Centrifugal advance

Decelerating check*†	23° to 27° at 4800 rev/min	
(Ignition set at T.D.C. static for check)	16° to 20° at 2500 rev/min	
	8° to 12° at 1600 rev/min	
No advance below	300 rev/min	

### Vacuum advance

Identification	3 - 13 - 12	
Starts	2 to 4 in Hg	51 to 102 mm Hg
Finishest	24° at 13 in Hg	330 mm Hg

### SPARK PLUGS

Type	GSP 4382 or GSP 3372	
Gap	0.025 in	0.65 mm

## IGNITION COIL

Type	GCL 144
Primary resistance at 20°C (68°F)	1.4 ± 0.1 ohms
Consumption - engine idling	2.6 ± 0.2 amps
Ballast resistance	1.5 ohms

## CARBURETTER

Type	HS4
Specification	FZX 1146
Piston spring colour	Red
Jet size	0.090 in
Needle	ADE
Fuel, minimum octane rating	95 RON - UNLEADED or LEADED

\*Vacuum disconnected † Crankshaft degrees and rev/min

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## ENGINE TUNING DATA

Model year - 1989 on - high  
compression

### ENGINE

Type	99H	
Engine No. prefix	99 HE20	
Capacity	60.96 in <sup>3</sup>	998 cm <sup>3</sup>
Compression ratio	9.6:1	
Firing order	1, 3, 4, 2	
Idling speed	750 ± 50 rev/min	
Fast idle	1100 ± 50 rev/min	
Ignition timing at 1500 rev/min*†	10° + 0° - 2° B.T.D.C.	
Timing marks - ignition		
L.E.D.	L.E.D. sensor bracket and timing disc	
Stroboscopic	Groove in crankshaft pulley and timing plate	
Valve rocker clearance (cold)	0.011 to 0.013 in	0.28 to 0.33 mm
Exhaust gas CO content at idle	1.5 to 3.5% (hot)	

### DISTRIBUTOR

Make/type	Lucas 59D4	
Rotation of rotor	Anti-clockwise	
Dwell angle	54° ± 5°	
Contact breaker gap	0.014 to 0.016 in	0.35 to 0.40 mm
Condenser capacity	0.18 to 0.25 microfarad	
Serial number	41907	

### Centrifugal advance

Decelerating check*†	16° to 20° at 4800 rev/min	
(Ignition set at T.D.C. static for check)	13° to 17° at 3700 rev/min	
	6° to 10° at 2000 rev/min	
No advance below	400 rev/min	

### Vacuum advance

Identification	3 - 9 - 8	
Starts	2 to 4 in Hg	51 to 102 mm Hg
Finishes†	16° at 9 in Hg	228 mm Hg

### SPARK PLUGS

Type	GSP 4382 or GSP 3372	
Gap	0.025 in	0.65 mm

## IGNITION COIL

Type	GCL 144
Primary resistance at 20°C (68°F)	1.4 ± 0.1 ohms
Consumption - engine idling	2.6 ± 0.2 amps
Ballast resistance	1.5 ohms

## CARBURETTER

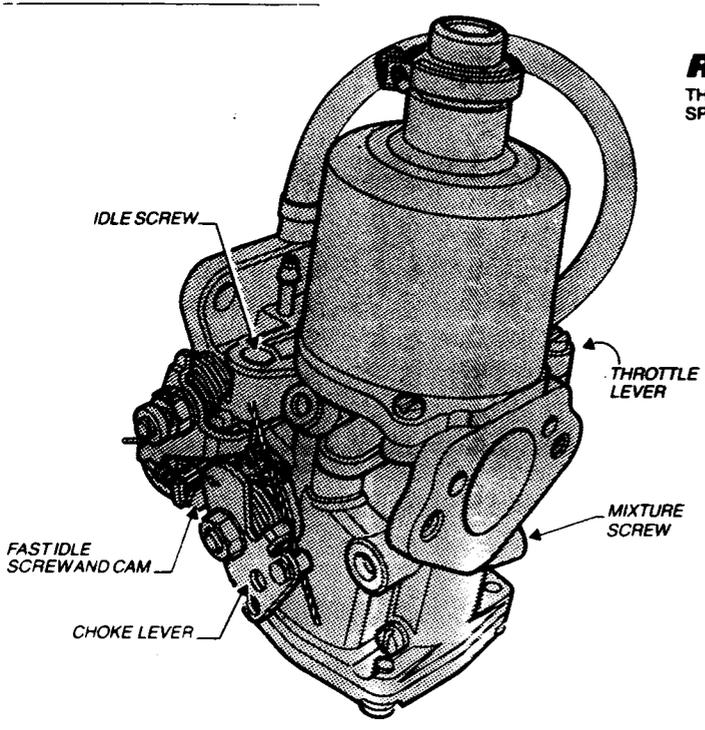
Type	HS4
Specification	FZX 1415
Piston spring colour	Red
Jet size	0.090 in
Needle	AAC
Fuel, minimum octane rating	95 RON - UNLEADED or LEADED

\*Vacuum disconnected † Crankshaft degrees and rev/min

**WARNING: Wearers of surgically implanted pacemaker devices should not be in close proximity to ignition circuits or diagnostic equipment.**



# ERA MINI TURBO



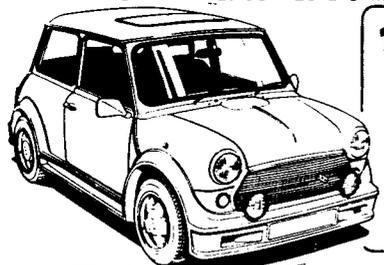
**REMEMBER BEFORE YOU START**  
 THE FOLLOWING ITEMS CAN INFLUENCE ENGINE TUNING.  
 SPARKING PLUGS ● VALVE CLEARANCES ● IGNITION CHARACTERISTICS.

## MAKE SURE...

<p>AIR FILTER ELEMENT IS CLEAN.</p>	<p>PISTON DAMPER IS TOPPED-UP WITH ENGINE OIL AND PISTON MOVES UP AND DOWN FREELY.</p>
<p>BREATHER HOSES ARE SECURE AND HAVE NO KINKS, LEAKS OR RESTRICTIONS.</p>	<p>THROTTLE OPENS FULLY AND CABLE HAS CORRECT FREE PLAY.</p>
<p>CHOKE RETURNS FULLY. CABLE HAS CORRECT FREE PLAY.</p>	<p>CLEARANCE EXISTS BETWEEN FAST IDLE SCREW AND CAM WITH CHOKE CONTROL OFF.</p>

## WARM-UP & TUNE

MAKE SURE YOUR TUNING EQUIPMENT IS WARMED-UP ● CALIBRATED CORRECTLY ● AVAILABLE FOR IMMEDIATE USE



<p><b>1</b> DRIVE VEHICLE ON ROAD FOR APPROX 4 MILES TO ATTAIN NORMAL OPERATING TEMPERATURE.</p> <p>TUNING SHOULD BE COMPLETED WITHIN 5 MINUTES OF RETURN, WITHOUT STOPPING THE ENGINE AND BEFORE COOLING FAN OPERATES.</p>	<p><b>2</b> IF TUNING CANNOT BE COMPLETED WITHIN 2 MINUTES, OR COOLING FAN OPERATES.</p> <p>WAIT FOR FAN TO SWITCH OFF. INCREASE ENGINE SPEED TO 2000 RPM FOR 30 SECS AND CONTINUE TUNING.</p>	<p><b>3</b> ELECTRICAL LOADS.</p> <p>ENSURE ALL ELECTRICAL LOADS ARE SWITCHED OFF.</p>
<p><b>4</b> CONNECT TACHOMETER.</p> <p>RPM</p>	<p><b>5</b> IDLE SCREW.</p> <p>TURN TO OBTAIN SPECIFIED IDLE SPEED.</p>	<p><b>6</b> INSERT GAS ANALYSER PROBE TO CORRECT DEPTH.</p> <p>C.O. %</p> <p>CHECK CO% READING AT IDLE SPEED.</p>
<p><b>8</b> IDLE SCREW.</p> <p>RE-ADJUST TO OBTAIN SPECIFIED IDLE SPEED.</p>	<p><b>9</b> CHECKING AND ADJUSTING FAST IDLE SPEED.</p> <p>PULL OUT THE CHOKE CONTROL UNTIL ARROW ON CHOKE LEVER ALIGNS WITH FAST IDLE SCREW. TURN SCREW TO OBTAIN SPECIFIED FAST IDLE.</p>	

RM 2904

**REMOVE EQUIPMENT - TUNING IS NOW COMPLETE.**



## TORQUE WRENCH SETTINGS

Engine - Not Turbo Models				Engine - Turbo Models Only			
	Nm	lbf ft	kgf m		Nm	lbf ft	kgf m
Camshaft nut	88	65	8.9	Brake servo vacuum pipe banjo bolt	50	37	5.1
Connecting rod big-end:				Camshaft locating plate to crankcase	11	8	1.1
bolts	50	37	5.1	Camshaft nut	88	65	9.0
nuts	45	33	4.6	Carburettor to manifold nuts	22	16	2.2
Crankshaft pulley nut	102	75	10.3	Coolant drain plug	37	27	3.7
Cylinder head nuts:				Coolant temperature transmitter	54	40	5.5
Emission control engine	54	40	5.5	Connecting rod big-end nuts	45	33	4.6
850,1000,1100 and 1275	68	50	6.9	Crankshaft pulley nut	142	105	14.5
Cylinder side cover	4.7	3.5	0.5	Cylinder head bypass plug	16	12	1.7
Clutch spring housing to pressure plate set screws	22	16	2.2	Cylinder head nuts * t	75	55	7.6
Driving strap to flywheel set screw	22	16	2.2	Front plate to bearing cap:			
Flywheel centre bolt	152	112	15.5	1/4 in setscrews	7	5	0.7
Flywheel housing bolts and stud nuts	25	18	2.5	Front plate to crankcase:			
Gudgeon pin clamp screws	32	24	3.2	5/16 in setscrews	22	16	2.2
Heater control to cylinder head	11	8	1.1	Gearbox adaptor plate	25	18	2.5
Main bearing bolts	85	63	8.7	Main bearing bolts *	85	65	8.7
Manifold to cylinder head nuts	19	14	1.9	Manifold to cylinder head nuts	22	16	2.2
Oil pump bolts	11	8	1.1	Oil filter	11	8	1.1
Oil pipe banjo	52	38	5.3	Oil pressure switch	25	18	2.5
Oil filter head nuts	19	14	1.9	Oil pipe to crankcase banjo bolt	75	55	7.6
Oil pressure release valve - dome nut	59	43	5.9	Oil pump bolts	11	8	1.1
Rocker cover	4.7	3.5	0.5	Oil pressure relief valve cap nut	61	45	6.1
Rocker shaft bracket nuts	32	24	3.2	Rocker cover	4	3	0.4
Spark plugs	25	18	2.5	Rocker shaft bracket nuts	32	24	3.3
Timing cover and front plate:				Spark plugs	25	18	2.5
1/4 in dia. U.N.F. bolts	7	5	0.7	Sump drain plug	38	28	3.9
5/16 in dia. U.N.F. bolts	16	12	1.7	Sump screws	11	8	1.1
Top engine tie rod - Nyloc nut	23	17	2.4	Throttle cable trunnion screw	1	9 lbf in	0.1
Water pump bolts	22	16	2.2	Timing cover to front plate:			
Water outlet elbow nuts	11	8	1.1	1/4 in bolts	7	5	0.7
Coolant temperature transmitter	22	16	2.2	5/16 in dia. bolts	16	12	1.7
				Water outlet elbow nuts	22	16	2.2
				Water pump bolts	22	16	2.2

<b>Turbo charger:</b>						
to Exhaust manifold	38	28	3.8			
to Exhaust elbow	21	15	2.1			
<b>Oil drain:</b>						
Housing and engine adaptor setscrews	22	16	2.3			
Oil feed reducer, adaptor, banjo bolt	15	11	1.5			
to Wastegate bracket, compressor pipe setscrew	22	16	1.6			
Plenum chamber to carburetter	22	16	1.6			
Heat shield, diffuser pipe to plenum chamber	11	8	1.1			
Non-return valve to manifold	25	18	2.5			
Throttle cable trunnion screw	1	9 lbf in	0.1			
* Thread lightly oiled						
† Correct tightening procedure must be followed						
			<b>Engine Mountings</b>			
				<b>Nm</b>	<b>lbf ft</b>	<b>kgf m</b>
			$\frac{3}{8}$ in U.N.C. screws	40	30	4.1
			M8 screws	30	22	3.0
			M10 screws	45	33	4.6
			M12 bolts	72	53	7.3
			<b>Gearbox - manual - All Models</b>			
				<b>Nm</b>	<b>lbf ft</b>	<b>kgf m</b>
			Drain plug	34	25	3.5
			Third motion shaft bearing retainer screws	18	13	1.8
			First motion shaft nut	203	150	20.7
			Third motion shaft nut	203	150	20.7
			Gearbox case to crankcase	8	6	0.8
			Gearbox case studs:			
			$\frac{3}{8}$ in dia. U.N.C.	11	8	1.1
			$\frac{5}{16}$ in dia. U.N.C.	8	6	0.8
			Gearbox case stud nuts:			
			$\frac{3}{8}$ in dia. U.N.F.	34	25	3.5
			$\frac{5}{16}$ in dia. U.N.F.	25	18	2.5
			Bottom cover set screws - $\frac{1}{4}$ in dia.			
			U.N.C. (change speed tower)	8	6	0.8
			Speedometer drive housing nuts	25	18	2.5
			<b>Gearbox - automatic</b>			
			Converter centre bolt	152	112	15.5
			Converter (six central bolts)	29	21	2.9
			Converter drain plugs	27	20	2.8
			Converter housing bolts	25	18	2.5
			Differential driving flange securing bolts	59	43	5.9
			Gear train bearing caps	16	12	1.7
			Drain plug - brass sealing washer	38	28	3.8
			Drain plug - fibre or nylon sealing washer - re-torque after 1500 km; 1000 miles	40	30	4.1
			Gear train carrier strap	16	12	1.7
			Governor to auxiliary pump housing bolts	18	13	1.8
			Kickdown control assembly to gearbox casing (on nylon housing)	7	5	0.7
			Oil filter bowl	19	14	1.9
			Input shaft nut	95	70	9.7
			Servo unit securing bolts	23	17	2.3

	Nm	lbf ft	kgf m		Nm	lbf ft	kgf m
<b>Gearbox - automatic (continued)</b>				<b>Suspension FRONT</b>			
Top and reverse clutch hub nut	203	150	20.7	Hub ball joints:			
Gearbox to engine securing nut	16	12	1.7	Nut	52	38	5.3
Valve block securing bolts	14	10	1.4	Ball pin housing	102	75	10.3
Valve block bolts (securing three sections)	10	7	1.0	Hub nut - drive shaft (up to 1984)(align to next split pin hole):			
5/16 in U.N.F. bolts	26	19	2.6	except 1275 GT	81	60	8.3
3/8 in U.N.F. bolts	41	30	4.1	1275 GT	203	150	20.7
<b>Final drive - Not Turbo Models</b>				Hub nut - drive shaft (1984 onwards) - TWO HOLES (align to next split pin hole)			
Driven gear to differential cage	81	60	8.3	Hub nut - drive shaft (1984 onwards) - ONE HOLE (tighten to specified torque then tighten further, if necessary, to align nut with split pin hole)	262	193	26.2
Driving flange to differential nut (align to next split pin hole)	95	70	9.7	Drive shaft coupling 'U' bolts	14	10	1.4
End cover bolts (differential housing)	25	18	2.5	Tie-rod to lower arm	26	19	2.6
<b>Final drive - Turbo Models Only</b>				Tie-rod to body bracket			
Differential housing:				Upper arm pivot shaft nut	72	53	7.3
5/16 U.N.F. nuts	25	18	2.5	Lower arm pivot shaft nut	45	33	4.5
3/8 U.N.F. nuts	34	25	3.5	<b>REAR</b>			
End cover bolts (differential housing)	25	18	2.5	Hub nut (align to next split pin hole)	81	60	8.3
Final drive gear to differential cage	65	48	6.0	Radius arm pivot shaft nut	72	53	7.3
<b>Steering</b>				<b>Brakes</b>			
Steering-column/rack pinion clamp bolt	16	12	1.7	Caliper retaining bolts	52	38	5.3
Steering lever to hub	45	33	4.5	Disc to driving flange	57	42	5.8
Steering wheel nut	47	35	4.8	Backplate to radius arm bolts	28	20	2.8
Tie-rod ball pin nut	30	22	3.0	Master cylinder reservoir flange screws	7	5	0.7
Tie-rod ball joint to rack locknut	52	38	5.3	Cylinder body outlet plugs	39	28	3.9
Steering-rack 'U' bolts	15	11	1.5	Pressure differential warning actuator end plug - (type integral with master cylinder)	45	33	4.5
Steering-column clip bracket to column clip and parcel self shear bolt, min	19	14	1.9	Pressure failure switch	19	14	1.9
<b>Road wheels</b>				Pressure failure switch body end plug			
Wheel nuts				Inertia valve plug	63	45	6.4
(steel)	63	45	6.4				
(alloy)	50	37	5.1				

<b>Electrical - Not Turbo Models</b>	<b>Nm</b>	<b>lbf ft</b>	<b>kgf m</b>
<b>Distributor:</b>			
plate retaining screws .....	11	8	1.1
clamp bolt .....	3.4	2.5	0.3
Alternator shaft nut .....	39	28	3.9
<b>Electrical - Turbo Models Only</b>			
<b>Alternator:</b>			
adjusting link to alternator .....	12	9	1.2
adjusting link to front plate .....	37	27	3.7
bracket to crankcase .....	22	16	2.2
pulley nut .....	37	27	3.7
top fixings .....	22	16	2.2
Distributor fork clamp screw .....	21	15	2.1
Starter motor to flywheel housing .....	37	27	3.7
<b>Mini City E, Mini HLE and Mayfair models</b>			
<b>ENGINE</b>			
Flywheel housing nuts and bolts .....	25	18	2.5
Clutch pressure plate to flywheel bolts .....	25	18	2.5
Flywheel retaining bolt .....	152	112	15.5
First motion shaft nut .....	203	150	20.7
Top engine tie rod - Nyloc nut .....	23	17	2.4
<b>Model year - 1984 on</b>			
<b>Suspension</b>			
Hub nut - drive shaft (1984 onwards) - <b>TWO</b>			
<b>HOLES</b> (align			
to next split pin hole) .....	203	150	20.7
Hub nut - drive shaft (1984 onwards) - <b>ONE</b>			
<b>HOLE</b> (tighten to specified torque then tighten further,			
if necessary, to			
align nut with split pin hole) .....	262	193	26.2
Nut upper damper fixing .....	37	27.5	3.8
Nut lower damper fixing .....	48	35	4.8
<b>Road wheels</b>			
Wheel nuts (alloy wheels):			
Not Turbo Models .....	50	37	5.1
Turbo Models Only .....	57	42	5.8

## GENERAL PRECAUTIONS AND FITTING INSTRUCTIONS

### Ignition system safety precautions

**WARNING:** Before commencing work on an ignition system, all high tension terminals, adaptors and diagnostic equipment for testing should be inspected to ensure that they are adequately insulated and shielded to prevent accidental personal contacts and minimize the risk of shock. Wearers of surgically implanted pacemaker devices should not be in close proximity to ignition circuits or diagnostic equipment.

### Dangerous substances

**WARNING:** Many liquids and other substances used in motor vehicles are poisonous and should under no circumstances be consumed and should, as far as possible, be kept from contact with the skin. These substances among others include acid, anti-freeze, asbestos, brake fluid, fuel, windscreen washer additives, lubricants, refrigerant and various adhesives

Always read carefully the instructions printed on labels or stamped on components and obey them implicitly. Such instructions are included for reasons of your health and personal safety. Never disregard them.

**Used engine oils:** Prolonged exposure to used engine oils can cause serious skin disorders. Avoid excessive skin contact and always adhere to the following recommendations:

### Engine oils

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains poten-

tially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities should be provided.

### Health Protection Precautions

Avoid prolonged and repeated contact with oils, particularly used engine oils.

Wear protective clothing, including impervious gloves where practicable.

Do not put oily rags in pockets.

Avoid contaminating clothes, particularly underpants, with oil.

Overalls must be cleaned regularly. Discard unwashable clothing and oil impregnated footwear.

First aid treatment should be obtained immediately for open cuts and wounds.

Use barrier creams, applying before each work period, to help the removal of oil from the skin.

Wash with soap and water to ensure all oil is removed (skin cleansers and nail brushes will help). Preparations containing lanolin replace the natural skin oils which have been removed.

Do not use petrol, kerosene, diesel fuel, gas oil, thinners or solvents for washing skin.

If skin disorders develop, obtain medical advice.

Where practicable, degrease components prior to handling.

Where there is a risk of eye contact, eye protection should be worn, for example, chemical goggles or face shields; in addition an eye wash facility should be provided.

### Environmental Protection Precautions

It is illegal to pour used oil on the ground, down sewers or drains, or into water courses.

The burning of used engine oil in small space heaters or boilers is not recommended unless emission control equipment is fitted: in cases of doubt check with the local Authority.

Dispose of used oil through authorised waste disposal contractors to licensed waste disposal sites, or to the waste oil reclamation trade. If in doubt, contact the Local Authority for advice on disposal facilities.



### Typical asbestos warning label

### Components containing asbestos

**WARNING:** Certain components fitted to motor vehicles may contain asbestos. The following list should be used as a general guide to components containing asbestos, but is not exhaustive. If in doubt seek professional advice.

### Heat shields

Cylinder head and heat resistant gaskets  
Clutch plates

Automatic transmission clutch plates  
and brake bands

### Safety Instructions

*Inhaling asbestos dust is dangerous to health. The following safety instructions must be observed when working with components that contain asbestos.*

Wear a protective breathing mask suitable for asbestos dust.

Never use an airline to blow dust from components.

Clean friction components with methylated spirits or denatured alcohol.

Replace worn components with recommended replacements.

Operate if possible out of doors or in a well ventilated place.

Preferably use hand tools or low speed tools equipped, if necessary, with an appropriate dust extraction facility. If high speed tools are used they should always be so equipped.

If possible dampen before cutting or drilling.

Use methylated spirit or denatured alcohol as a damping and cleaning agent. Do not use petroleum based fluids.

Dampen dust and place in a properly closed receptacle and dispose of it safely.

To reduce the possibility of dust, used gaskets should be soaked in oil or water before removal.

Automatic transmission clutch plates and brake bands should be stored and handled in a wet condition.

All dust, scrap material and displaced components should be placed in sealed containers, labelled (see sample label illustrated), and disposed of in a safe manner.

## Jacking

Always ensure that any lifting apparatus has adequate load and safety capacity for the weight to be lifted. Ensure the vehicle is standing on level ground prior to lifting or jacking. Apply the handbrake and chock the wheels.

Never rely on a jack as the sole means of support when working beneath the vehicle. Use additional safety supports beneath the vehicle.

Do not leave tools, lifting equipment, spill oil, etc. around or on the work bench area.

## Precautions against damage

Always fit wing and seat covers before commencing work. Avoid spilling brake fluid or battery acid on paintwork. Wash off with water immediately if this occurs.

Disconnect the battery earth lead before starting work.

Always use the recommended service tool or a satisfactory equivalent where specified.

Protect exposed screw threads from damage.

## Brake shoes and pads

**WARNING:** Always fit the correct grade and specification of brake linings and renew brake pads and brake shoes in axle sets only.

## Brake hydraulics

**WARNING:** It is imperative that the correct brake fittings are used and that threads of components are compatible.

Always use two spanners when slackening or tightening brake pipe or hose connections. Ensure that hoses run in a natural curve and are not kinked or

twisted. Fit brake pipes securely in their retaining clips and ensure that the pipe run does not pass any potential chafing points.

Containers used for hydraulic fluid must be kept absolutely clean. Do not store hydraulic fluid in an unsealed container. It will absorb water, and fluid in this condition would be dangerous to use. Do not allow hydraulic fluid to be contaminated with mineral oil, or use a container which has previously contained mineral oil. Do not re-use fluid from the system. Always use clean brake fluid or a recommended alternative to clean hydraulic components. Fit a blanking cap to an hydraulic union and a plug to its socket after removal to prevent ingress of dirt. Absolute cleanliness must be observed with hydraulic components.

## Engine coolant caps and plugs

Extreme care is necessary when removing engine coolant caps and plugs when the engine is hot and especially if it is overheated. To avoid the possibility of scalding allow the engine to cool before attempting coolant cap or plug removal.

## Cleaning components

Always use the recommended cleaning agent or equivalent.

Do not use degreasing equipment for components containing items which could be damaged by the use of this process. Whenever possible clean components and the area surrounding them before removal. Always observe scrupulous cleanliness when cleaning dismantled components.

## Joints and joint faces

Fit joints dry unless otherwise specified in this Manual.

If gaskets and/or jointing compound is recommended for use; remove all traces of old jointing material prior to reassembly. Do not use a tool which will damage the joint faces and smooth out any scratches or burrs on the joint faces using an oil stone. Do not allow dirt or jointing material to enter any trapped holes.

Prior to reassembly, blow through any pipes, channels or crevices with compressed air.

## Five Thread Forms Replaced by ISO Metric

B.A.	B.S.W.	B.S.F.	U.N.C.	U.N.F.	Metric Size	
2	1/8	1/8	10	10	M5	
1			12	12		
0	1/4	1/4	1/4	1/4	M6	
			1/2	1/2		M8
			3/8	3/8		
	1/2	1/2	1/2	1/2	M10	
	3/4	3/4	3/4	3/4	M12	

## Screw threads

Both U.N.F. and Metric threads to ISO standards are used.

Damaged threads must always be discarded.

Cleaning up threads with a die or tap impairs the strength and closeness of fit of the threads and is not recommended.

Castellated nuts must not be slackened back to accept a split-pin, except in those recommended cases when this forms part of an adjustment.

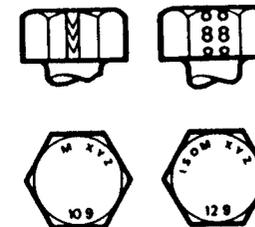
Do not allow oil or grease to enter blind threaded holes. The hydraulic action on screwing in the bolt or stud could split the housing.

Always tighten a nut or bolt to the recommended torque figure. Damaged or corroded threads can affect the torque reading.

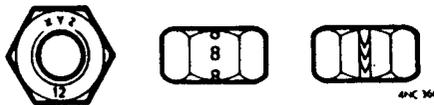
To check or re-tighten a bolt or screw to a specified torque, first slacken a quarter of a turn, then re-tighten to the correct torque figure.

## Bolt identification

An ISO metric bolt or screw made of steel and larger than 6 mm in diameter can be identified by either the symbols ISO M or M embossed or indented on top of the head.



grade, e.g., 8.8; 10.9; 12.9; 14.9. As an alternative, some bolts and screws have the M and strength grade symbols on the flats of the hexagon.



Strength Grade 6

Strength Grade 8



Strength Grade 12    Strength Grade 14  
Nut identification

#### Nut identification

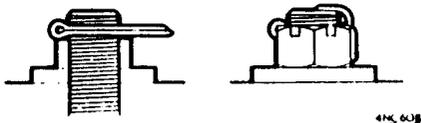
A nut with an ISO metric thread is marked on one face or on one of the flats of the hexagon with the strength grade symbol 8, 12, 14. Some nuts with a strength grade 4, 5 or 6 are also marked and some have the metric symbol M on the flat opposite the strength grade marking.

A clock face system is used as an alternative method of indicating the strength grade. The external chamfers or a face of the nut is marked in a position relative to the appropriate hour mark on a clock face to indicate the strength grade.

A dot is used to locate the 12 o'clock position and a dash to indicate the strength grade. If the grade is above 12, two dots identify the 12 o'clock position.

#### Locking devices

Always release locking tabs and fit new locking washers, do not re-use locking tabs.



#### Fitting a split pin

##### Fitting a split pin

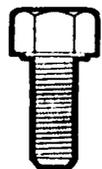
Always fit new split-pins of the correct size for the hole in the bolt or stud.

Always fit new roll pins of an interference fit in the hole.

Always fit new circlips of the correct size for the groove.

Self locking nuts can be re-used, providing resistance can be felt when the locking portion passes over the thread of the bolt or stud.

DO NOT re-use self-locking nuts in critical locations, e.g. engine bearings. Always use the correct replacement self-locking nut.



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#### Encapsulated bolt

An encapsulated bolt can be identified by a coloured section of thread which is treated with a locking agent. This

can either be nylon, which covers approximately 180° of thread or an adhesive which is applied around the full 360°.

Unless a specified repair procedure states otherwise, encapsulated bolts can be reused provided the threads are undamaged.

Prior to refitment remove loose adhesive from the bolt and housing threads. Prior to use of an approved adhesive, ensure threads are clean and free of oil and grease.

Where specified, fit a new encapsulated bolt, or if not available a bolt of equivalent specification treated with an approved adhesive.

#### Oil seals

Always renew oil seals which have been removed from their working location either as an individual component or as part of an assembly.

Ensure the surface on which the new seal is to be run is free of burrs or scratches. Renew the component if the original sealing surface cannot be completely restored.

Protect the seal from any surface which could cause damage over which it has to pass when being fitted. Use a protective sleeve or tape to cover the relevant surface.

Lubricate the sealing lips with a recommended lubricant before use to prevent damage in initial use. On dual lipped seals, smear the area between the lips with grease.

Use the recommended service tool to fit an oil seal.

If the correct service tool is not available, use a suitable drift or press approximately 0.4 mm (0.015 in) smaller than the outside diameter of the seal.

Press or drift the seal in to the depth of its housing, with the sealing lip facing the lubricant to be retained if the housing is shouldered, or flush with the face of the housing where no shoulder is provided.

#### Service tools and garage equipment

Special service tools have been developed to facilitate removal, dismantling and assembly of mechanical components in a cost effective and practical manner without causing damage. Some operations in this Repair Manual cannot be carried out without the aid of the relevant service tools. Where a service tool is called for it must be used only for its designated application.

A range of 'Fast Check' testers have been developed to provide a means of fast effective diagnosis of faults on electronic systems currently fitted to the Austin Rover range of vehicles.

It is essential that operators familiarise themselves with the components of the system to be checked and the instructions for the relevant fast check tester before commencing diagnosis.

Where specific garage equipment is required for diagnosis and repair, reference will be made in this Manual to the Service Tools and Equipment Programme where details of the equipment recommended by Austin Rover may be found.

#### Body repairs

Any damage found, that would affect the corrosion resistance of the vehicle during the Warranty period must be rectified by an authorised Austin Rover Dealer to the standards, and by the methods, detailed in the Body Sealing and Preservation Manual, SMD 8563.

## Replacement panels

Panels are supplied coated in cathodic electrocoat primer.

## FUEL HANDLING PRECAUTIONS

### General

The following information provides basic precautions which must be preserved if petrol (gasoline) is to be handled safely. It also outlines other areas of risk which must not be ignored. This information is issued for guidance only, and if in doubt appropriate enquiries should be made of your local Fire Officer.

### Petrol - Gasoline

Petrol/gasoline vapour is highly flammable and in confined spaces is also explosive and toxic.

When petrol/gasoline evaporates it produces 150 times its own volume in vapour which when diluted with air becomes a readily ignitable mixture. The vapour is heavier than air and will always fall to the lowest level. It can readily be distributed throughout a workshop by air currents; consequently, even a small spillage of petrol/gasoline is potentially very dangerous.

Always have a fire extinguisher containing FOAM, CO<sub>2</sub>, GAS or POWDER close at hand when handling or draining fuel or when dismantling fuel systems and in other areas where fuel containers are stored.

Always disconnect the vehicle battery before carrying out dismantling or drainage work on a fuel system.

Whenever petrol/gasoline is being handled, drained or stored or when fuel systems are being dismantled, all forms of ignition must be extinguished or removed; any leadlamps must be

flameproof and kept clear of spillage.

**WARNING:** *No one should be permitted to repair components associated with petrol/gasoline without first having specialist training.*

### Fuel tank draining

**WARNING:** *Petrol/gasoline must not be extracted or drained from any vehicle whilst it is still standing over a pit.*

**Draining or extraction of petrol/gasoline from a vehicle fuel tank must be carried out in a well ventilated area.**

**The receptacle used to contain the petrol/gasoline must be more than adequate for the full amount of fuel to be extracted or drained. The receptacle should be clearly marked with its contents, and placed in a safe storage area which meets the requirements of local authority regulations.**

**CAUTION:** *When petrol/gasoline has been extracted or drained from a fuel tank the precautions governing naked lights and ignition sources should be maintained.*

### Fuel tank removal

When the fuel line is secured to the fuel tank outlet by a spring steel clip, the clip must be released before the fuel line is disconnected or the fuel tank removed. This procedure will avoid the possibility of residual petrol fumes in the fuel tank being ignited when the clip is released.

As an added precaution fuel tanks should have a 'PETROL (GASOLINE) VAPOUR' warning label attached to them as soon as they are removed from the vehicle.

### Fuel tank repairs

Under no circumstances should a repair to any fuel tank involving heat treatment be carried out without first rendering the tank SAFE, by using one of the following methods:

a. STEAMING: With the filler cap and tank unit removed, empty the tank. Steam the tank for at least two hours with low pressure steam. Position the tank so that condensation can drain away freely, ensuring that any sediment and sludge not volatilized by the steam is washed out during the steaming process.

b. BOILING: With the filler cap and tank unit removed, empty the tank. Immerse the tank completely in boiling water containing an effective alkaline degreasing agent or a detergent, with the water filling and also surrounding the tank for at least two hours.

After steaming or boiling, a signed and dated label to this effect should be attached to the tank.

### Body and chassis repairs

When body or chassis repairs involve the use of heat, all fuel pipes which run in the vicinity of the repair area must be removed, and the tank outlet plugged, BEFORE HEAT IS APPLIED. If the repair is in the vicinity of the fuel tank, the tank must be removed.

Plastic fuel pipes are particularly susceptible to heat, even at relatively low temperature, and can be melted by heat conducted from some distance away.

Fuel lines or tanks must not be removed whilst the vehicle is over an inspection pit.

## ELECTRICAL PRECAUTIONS

The following guidelines are intended to ensure the safety of the operator whilst preventing damage to the electrical and electronic components fitted to the vehicle. Where necessary specific precautions are detailed in the relevant sections of this Manual which should be referred to prior to commencing repair operations.

Equipment - Prior to commencing any test procedure on the vehicle ensure that the relevant test equipment is working correctly and any harness or connectors are in good condition, this particularly applies to mains lead and plugs.

**WARNING:** *Before commencing work on an ignition system all high tension terminals, adaptors and diagnostic equipment for testing should be inspected to ensure that they are adequately insulated and shielded to prevent accidental personal contacts and minimize the risk of shock. Wearers of surgically implanted pacemaker devices should not be in close proximity to ignition circuits or diagnostic equipment.*

Polarity - Never reverse connect the vehicle battery and always observe the correct polarity when connecting test equipment.

High Voltage Circuits - Whenever disconnecting live h.t. circuits always use insulated pliers and never allow the open end of the h.t. lead to come into contact with other components particularly E.C.U's. Exercise caution when measuring the voltage on the coil terminals while the engine is running. High voltage spikes can occur on these terminals.

Connectors and Harness - The engine compartment of a vehicle is a particularly hostile environment for elect-

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ical components and connectors. Always ensure these items are dry and oil free before disconnecting and connecting test equipment. Never force connections apart either by using tools or by pulling on the wiring harness. Always ensure locking tabs are disengaged before removal and note orientation to enable correct reconnection. Ensure that any protective covers and substances are replaced if disturbed.

Having confirmed a component to be faulty switch off the ignition and disconnect the battery. Remove the component and support the disconnected harness. When replacing the component keep oily hands away from electrical connection areas and push connectors home until any locking tabs fully engage.

#### **Battery disconnecting**

Before disconnecting the battery, switch off all electrical equipment.

**CAUTION:** To prevent damage to electrical components ALWAYS disconnect the battery when working on the vehicle electrical system. The earth lead must be disconnected first and reconnected last.

*Always ensure that battery leads are routed correctly and are not close to any potential chafing points.*

#### **Battery charging**

Recharge the battery out of the vehicle and keep the top well ventilated. While being charged or discharged, and for approximately fifteen minutes afterwards, batteries emit hydrogen gas. This gas is flammable.

Always ensure any battery charging area is well ventilated and that every precaution is taken to avoid naked flames and sparks.

#### **Disciplines**

Switch off ignition prior to making any connection or disconnection in the system as electrical surge caused by disconnecting 'live' connections can damage electrical components.

Ensure hands and work surfaces are clean and free of grease, swarf, etc. as grease collects dirt which can cause tracking or high-resistance contacts.

When handling printed circuit boards, treat them as you would a hi-fi record - hold by the edges only; note that some electronic components are susceptible to body static.

Connectors should never be subjected to forced removal or refit, especially inter-board connectors. Damaged contacts will cause short-circuit and open-circuit conditions.

Prior to commencing test, and periodically during test, touch a good earth, i.e. cigar lighter socket, to discharge body static as some electronic components are susceptible to static electricity.

#### **Grease for electrical connectors**

All under bonnet and under body connectors are protected against corrosion by the application of a special grease on production. Should connectors be disturbed in service or repaired or replaced, a grease of this type, available in 150 gm tubes under Part No. BAU 5811, should again be applied.

**Note:** The use of other greases must be avoided as they can migrate into relays, switches etc. contaminating the contacts and leading to intermittent operation or failure.



## SERVICE LUBRICANTS, FUEL AND FLUIDS - CAPACITIES

### Lubrication

The engine and transmission are filled with high performance oil.

**CAUTION:** You should always use a high quality oil of the correct viscosity range in the engine and gearbox during maintenance and when topping-up. The use of oil not to the correct specification can lead to high oil and fuel consumption and ultimately to damaged components.

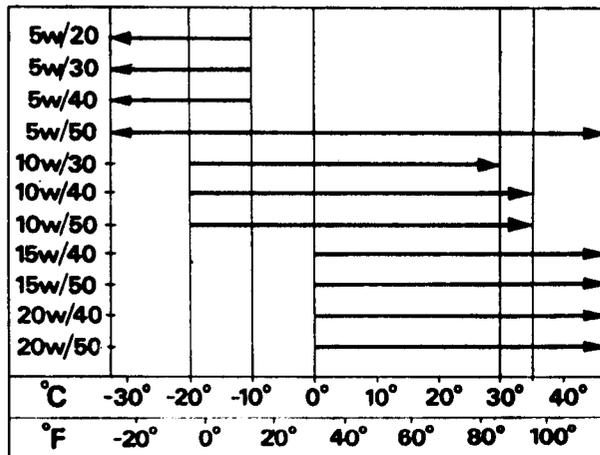
Oil of the correct specification contains additives which disperse the corrosive acids formed by combustion and prevent the formation of sludge which can block the oilways. Additional oil additives should not be used. Always adhere to the recommended servicing intervals.

### Engine/gearbox - Non Turbo Manual and Automatic

Use oils meeting specification BLS.22.OL.07 or the requirements of CCMC G3 and having a viscosity band recommended for the temperature range of your locality. Where oils to these BL and European specifications are not available, well known brands of oil meeting API SF or SF/CD quality should be used. In no circumstances must any additive be introduced into the lubricants recommended for the automatic gearbox.

### Engine/gearbox - Turbo models

Only synthetic oil must be used in this engine. We recommend the use of Castrol Syntrol X. Where this oil is not available, use well known brands of synthetic oil meeting API SG or SG/CD.



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### Steering rack

Using BP Energrease FGL Fluid Grease; a total quantity of 100 cm<sup>3</sup> is required to fill a rack from the dry condition. This lubricant is available from BP agents.

### Grease points

Use Multipurpose Lithium Grease N.L.G.I., consistency No. 2.

### Fuel

Fuel recommendations are given on each page of 'ENGINE TUNING DATA.'

**CAUTION:** Serious damage to the engine may occur fuel of the incorrect grade or type is used.

### Brake and Clutch fluid

For topping-up, use AP New Premium Super DOT 4 brake fluid or Castrol Girling Universal DOT 4 brake/clutch fluid.

### Anti-freeze solutions

Use Unipart Universal anti-freeze to protect the cooling system.

If Unipart Universal is not available use an ethylene glycol based anti-freeze containing no methanol with non-phosphate corrosion inhibitors suitable for use in mixed metal engines.

**CAUTION:** No other 'universal' anti-freeze should be used with Unipart Universal Anti-freeze.

After filling with anti-freeze solution, attach a warning label to a prominent position on the car stating the type of anti-freeze contained in the cooling system to ensure that the correct type is used for topping up.

The recommended quantities of anti-freeze for different degrees of frost protection are:

Solution	Amount of anti-freeze		Commences freezing		Frozen solid	
	%	Litres	Pts	°C	°F	°C
33 1/3	1.2	2	-19	-2	-36	-33
50	1.8	3 1/4	-36	-33	-48	-53

The overall anti-freeze concentration should not fall below 30% by volume, to ensure that the anti-corrosion properties of the coolant are maintained.

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## Capacities (approx.)

### Fuel tank:

850 .....	5½ gallons (25 litres, 6.6 U.S. gal)
1000 .....	5½ gallons (25 litres, 6.6 U.S. gal)
Clubman .....	5½ gallons (25 litres, 6.6 U.S. gal)
850 - After VIN 691249 .....	7½ gallons (34 litres, 9 U.S. gal)
1000 - After VIN 701402 .....	7½ gallons (34 litres, 9 U.S. gal)
Clubman - After VIN 689970 .....	7½ gallons (34 litres, 9 U.S. gal)
Clubman (export only) .....	7½ gallons (34 litres, 9 U.S. gal)
Van .....	6 gallons (27.3 litres, 7.2 U.S. gal)
Pick-up .....	6 gallons (27.3 litres, 7.2 U.S. gal)
Estate .....	6 gallons (27.3 litres, 7.2 U.S. gal)
1275 GT .....	7½ gallons (34 litres, 9 U.S. gal)
Turbo .....	7½ gallons (34 litres, 9 U.S. gal)

### Cooling system:

With heater - Not Turbo .....	6¼ pints (3.55 litres, 7.5 U.S. pints)
With heater - Turbo only .....	8½ pints (4.83 litres, 10.2 U.S. pints)
Without heater .....	5¼ pints (3 litres, 6.3 U.S. pints)
Engine and manual gearbox:	
Refill with filter change .....	8½ pints (4.83 litres, 10.2 U.S. pints)
Engine and automatic gearbox (including filter):	
Total capacity .....	13 pints (7.38 litres, 16 U.S. pints)
Refill capacity (approx.) .....	9 pints, 11 U.S. pints)

# SERVICE/MAINTENANCE CHECK SHEET

APPLICABLE TO ALL VEHICLES  
SOLD ON OR AFTER 1st JAN. 1988

ALWAYS REFER TO MAINTENANCE MANUAL AND CARRY OUT ALL OPERATIONS APPLICABLE TO THE MODEL BEING INSPECTED.

## SERVICE INTERVALS

- 1 = 1,000 MILES OR 1 MONTH (WHERE APPLICABLE)  
 6 = THE FIRST 6,000 MILES OR 6 MONTHS  
 12 = THE FIRST 12,000 MILES OR 12 MONTHS  
 18 = THE FIRST 18,000 MILES OR 18 MONTHS AND THEREAFTER AT INTERVALS OF 12,000 MILES OR 12 MONTH  
 24 = THE FIRST 24,000 MILES OR 24 MONTHS AND THEREAFTER AT INTERVALS OF 24,000 MILES OR 24 MONTH  
 36 = THE FIRST 36,000 MILES OR 36 MONTHS AND THEREAFTER AT INTERVALS OF 36,000 MILES OR 36 MONTH

IMPORTANT: Any additional work found necessary as a result of a check is subject to extra cost.

## ACTION

A = ADJUST      L = LUBRICATE      R = RENEW      C = CHECK  
(CLEAN, ADJUST OR RENEW AS NECESSARY)

- † THEREAFTER EVERY 24,000 MILES OR 24 MONTH INTERVAL  
 †† RENEW EVERY 48,000 MILES

CORRECT  INCORRECT

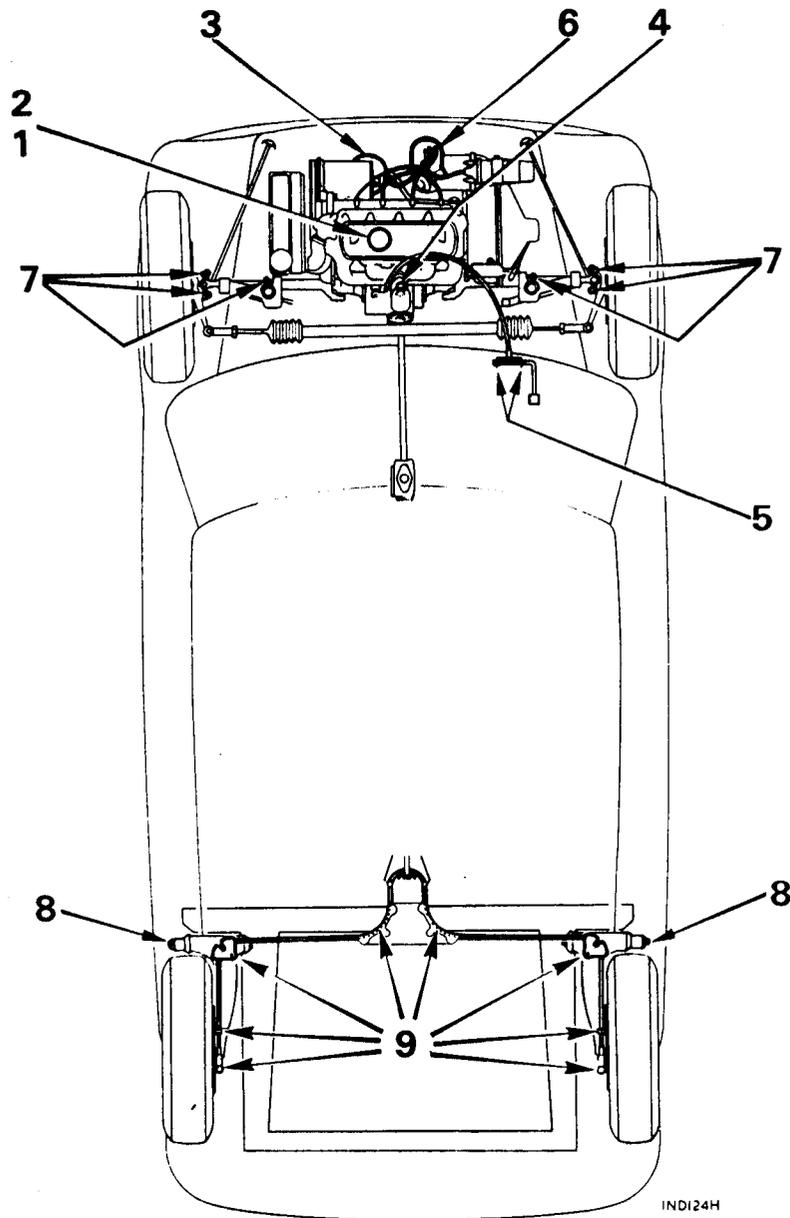
	FIT CAR PROTECTION KIT AND WING COVERS BEFORE COMMENCING ANY OPERATIONS AND REMOVE ON COMPLETION	FIRST SERVICES					
		1	6	12	18	24	36
	<b>INSIDE - OUTSIDE CAR</b>						
1	Lamps, horns and warning indicators			C	C	C	C
2	Hazard warning flashers			C		C	C
3	Screen & headlamp washers			C		C	C
4	Screen wipers and blades			C	C	C	C
5	Footbrake	C		C	C	C	C
6	Handbrake	A		C		C	C
7	Interior panels - Vans			C		C	C
8	Trim height - Metro	C		C		C	C
9	Locks, hinges and latch mechanisms (not steering lock)			L		L	L
10	Exterior paint work and body panels			C		C	C
11	Road wheel fastenings			C		C	C
	<b>WHEEL FREE AT CONVENIENT HEIGHT</b>						
12	Road wheels			C		C	C
13	Tyre pressures & condition	C		C	C	C	C
14	Brake pads (visual check) - Mini only		C		C		
15	Front brake - hydraulics, pads, discs and calipers - All models			C		C	C
16	Rear brakes - Mini & Metro			A		A	A
17	Rear brake linings (visual check)			C			
18	Rear brake - hydraulics, cylinders/calipers, linings, discs & drums					C	C
19	Brake & clutch - master cylinders, hoses, pipes & valves			C		C	C
20	Fuel & evaporative loss hoses, pipes, unions & fuel tank			C		C	C
21	Brake fluid						
	<b>ON LIFT FULLY RAISED</b>						
22	Gearbox oil - Manual			C			C
23	Gearbox oil - Except Maestro 1.3, 1.6, Montego 1.3 & pre 1989 1.6 - Manual					R	
24	Gearbox final drive oil - 1.6 Maestro & Montego - Auto			C		C	C
25	Suspension dampers, ball joints, fixings and gaiters			C		C	C

CORRECT  INCORRECT

	FIT CAR PROTECTION KIT AND WING COVERS BEFORE COMMENCING ANY OPERATIONS AND REMOVE ON COMPLETION	FIRST SERVICES					
		1	6	12	18	24	36
26	Load - Conscious valve - Maestro Van			A		A	A
27	Steering column, rack, joints & gaiters			C		C	C
28	Drive shaft gaiters			C		C	C
29	Gear change linkage - Maestro 1.3, 1.6, Montego 1.3 & pre 1989 1.6 - Manual	L		L	L	L	L
30	Inspect engine & transmission for oil leaks	C		C	C	C	C
31	Exhaust system & catalyst heat shield			C		C	C
32	Grease points	L		L	L	L	L
33	Front fender drains - Metro			C		C	C
34	Scuttle joints - Mini			C		C	C
35	Underbody sealer			C		C	C
36	Engine oil and filter - Rover 800 V6, 213 and Turbo models - Petrol	C	R	R	R	R	R
37	Engine oil and filter - All other models - Petrol & Diesel van	C	R	C	R	C	C
38	Engine oil - Turbo Diesel models	R					
39	Engine oil and filter - Turbo Diesel models		R	C	R	C	C
	<b>UNDER BONNET</b>						
40	Spark plugs			R		R	R
41	Rocker shaft and cyl head nuts - 'A' series engines	A					
42	Valve clearance - 'A' series engine	A		A		A	A
43	Valve clearance - Rover 213			A		A	A
44	Valve clearances - 1.6 Petrol & 2.0 Diesel models					C	
45	Valve clearances - 2.0 models except Rover 820 (M16) & diesel					A	
46	Carburettor piston damper	C		C	C	C	C
47	Vacuum pipe - Turbo			C	C	C	C
48	Fuel filter - Metro Turbo & Diesel models			R		R	R
49	Fuel filter - Maestro, Montego & Rover 216 Efi models						
50	Fuel filter - Rover 213, 820 (M16) and V6 models					R	
51	Fuel filter drain sediment - Diesel models	C				C	
52	Glow plugs - Diesel models						

CHECK EVERY 48,000 MILES





INDI24H

## LUBRICATION

Ensure that the vehicle is standing on a level surface when checking oil levels.

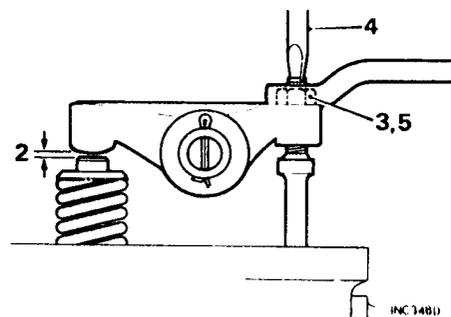
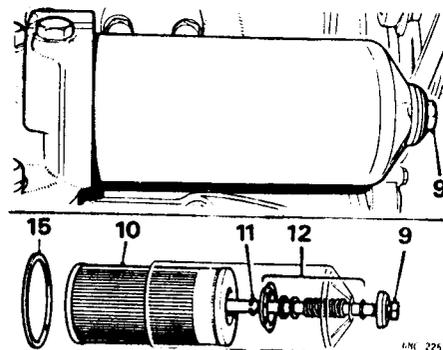
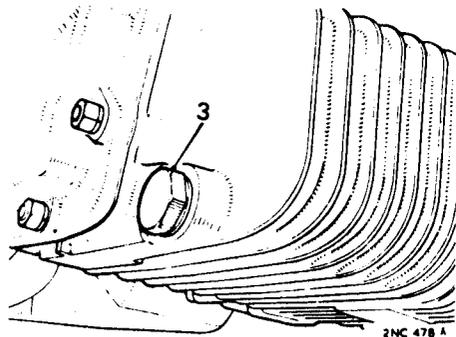
### Optional Intermediate Service at 3,000 miles (5000 km) or 3 months

- (1) **Engine/gearbox.** Check the oil level with the dipstick, and top up if necessary. After switching off the engine always allow the same period of time to elapse before checking the engine oil level.

### Every 6,000 miles (10000 km) or 6 months

- (2) **Engine/gearbox.** Drain off the old oil and refill with new.
- (3) **Oil filter.** Fit a new oil filter cartridge, or element - Automatic.
- (4) **Carburettor.** Top up the piston damper.
- (5) **Accelerator.** Lubricate accelerator control linkage and pedal fulcrum.
- (6) **Distributor.** Lubricate the cam, contact breaker pivot, weights and centre spindle. **Do not oil the cam wiping pad.**
- (7) **Steering joints** Lubricate as detailed in 'MAINTENANCE'.
- (8) **Rear suspension radius arms** Lubricate as detailed in 'MAINTENANCE'.
- (9) **Hand brake.** Lubricate the sector pivots and cable linkages.
- (10) **Locks and hinges.** Lubricate the bonnet release and safety catch, and all door locks and hinges. **Do not oil the steering-column lock.**

Service oils and greases are give in 09



## ENGINE AND TRANSMISSION

Ensure that the vehicle is standing on a level surface.

### Checking engine oil level

1. Engine/Manual gearbox  
Maintain the level between the 'MIN' and 'MAX' marks on the dipstick; the difference in quantity between the 'MIN' and 'MAX' marks is approximately 1 pint (0.6 litre).
2. Engine/Automatic gearbox  
Start the engine and run it for 1 - 2 minutes. Stop the engine and wait for one minute, then check the oil level with the dipstick. Maintain the oil level between the 'MIN' and 'MAX' marks on the dipstick; the difference in quantity between the 'MIN' and 'MAX' marks is approximately 1 pint (0.6 litre)

### Draining and refilling the engine oil

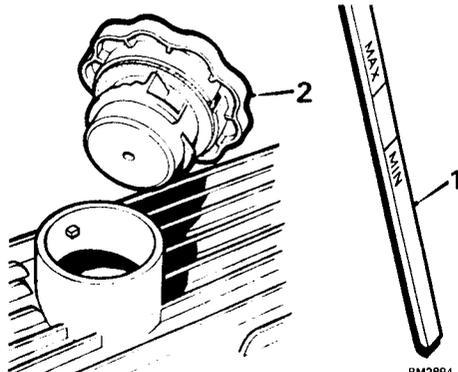
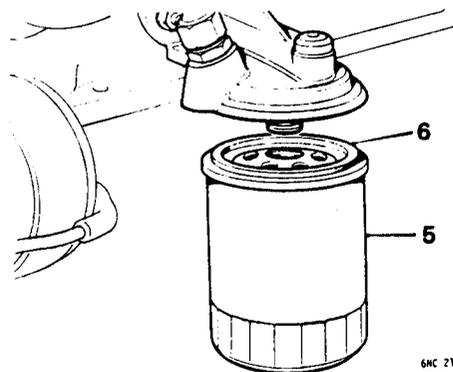
3. Drain the oil while the engine is warm; clean the magnetic drain plug, and fit a new sealing washer if necessary. Tighten the plug to the correct torque figure, see 'TORQUE WRENCH SETTINGS'.
4. Refill with the correct quantity and grade of oil, see 'SERVICE LUBRICANTS'.

### Oil filter change - Manual gearbox

5. Unscrew the filter cartridge from the filter head and discard the used filter cartridge and seal.
6. Lubricate the seal on the new cartridge with engine oil and screw the cartridge onto the filter head. **TIGHTEN BY HAND FORCE ONLY; DO NOT OVERTIGHTEN.**
7. Check for oil leakage immediately the engine is started.

### Oil filter element change - Automatic gearbox

8. Mini 1000 only; Remove the front grille (16 screws) and place a container beneath the filter bowl. On 'Clubman' models sufficient clearance exists for filter bowl removal.
9. Unscrew the filter bowl securing bolt and remove the filter assembly.
10. Discard the used element.
11. Remove the circlip from the centre bolt.
12. Withdraw the centre bolt and remove the pressure plate, rubber and steel washers, and the spring.
13. Thoroughly wash the casing and components in a cleaning fluid.
14. Examine the sealing washers, and replace if necessary.
15. Extract the sealing ring from the filter head recess and fit a replacement.
16. Reassemble the filter bowl components and fit a new element.
17. Refit the filter assembly; rotate the bowl while tightening to ensure that it is correctly located on the sealing ring. Tighten the retaining bolt to the correct torque figure, see 'TORQUE WRENCH SETTINGS'.
18. Check for oil leakage immediately the engine is started.
19. Refit the grille (Mini 1000 only)

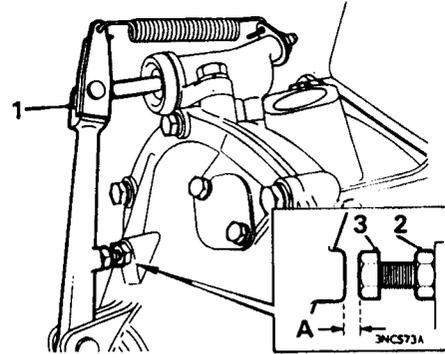


### Engine ventilation filter

1. An air intake filter is incorporated with the oil filler cap and must be renewed as a complete assembly.

### Valve rocker adjustment

1. Remove the rocker cover.
2. Check the clearance between the valve rocker arms and valve stems with a feeler gauge.  
**Clearance - Not Turbo** 0.012 in (0.30 mm)  
**Clearance - Turbo only**  
Inlet 0.012 to 0.014 in ( 0.30 to 0.35 mm)  
Exhaust 0.014 to 0.016 in (0.35 to 0.40 mm)  
The gauge should be a sliding fit when the engine is cold.  
Check the clearance of each valve in the following order:  
Check No. 1 valve with No. 8 fully open  
Check No. 3 valve with No. 6 fully open  
Check No. 5 valve with No. 4 fully open  
Check No. 2 valve with No. 7 fully open  
Check No. 8 valve with No. 1 fully open  
Check No. 6 valve with No. 3 fully open  
Check No. 4 valve with No. 5 fully open  
Check No. 7 valve with No. 2 fully open
3. Slacken the locknut.
4. Rotate the screw, clockwise to decrease or anti-clockwise to increase the clearance.
5. Retighten the locknut when the clearance is correct, holding the screw against rotation.



### CLUTCH

#### Release lever clearances

A clearance of 0.020 in (0.5 mm) must be maintained between the clutch release lever and its return stop. Use a feeler gauge to check the clearance.

#### Checking

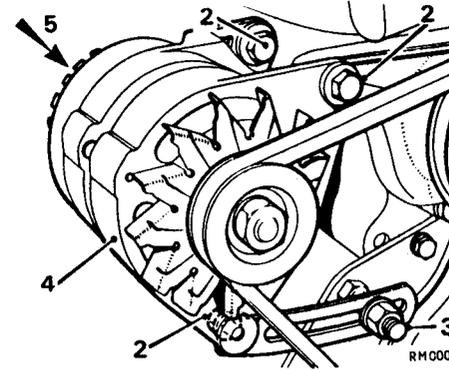
1. Pull the release lever outwards until all movement is taken up and check the clearance 'A'.

#### Adjusting

2. Slacken the locknut.
3. Turn the stop until the correct clearance is obtained, and retighten the locknut.

#### Master cylinder reservoir

Refer to 'BRAKE AND CLUTCH RESERVOIRS'.



### DRIVE BELT TENSION

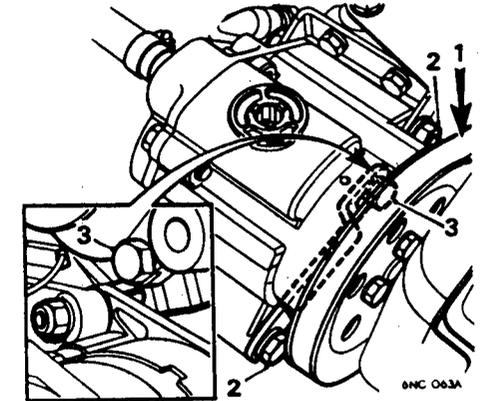
When correctly tensioned, a total deflection of 0.5 in (13 mm) under moderate hand pressure should be possible at the midway point of the belt run between the pulleys.

#### Adjusting

##### Alternator

1. Remove the ignition shield (if fitted) and check the belt tension using one of the following methods:
  - a Use a torque spanner and apply a load of 11.0 to 11.5 lbf ft (1.5 to 1.6 kgf m) in a clockwise direction to the alternator pulley retaining nut. If the belt tension is correct the belt will slip at this torque loading.
  - b Apply a load of 7.5 to 8.2 lbf (3.3 to 3.6 kgf) at right angles to the belt midway between pulleys. The belt should deflect 0.25 in (6 mm).
2. Slacken the alternator securing bolts.
3. Slacken the adjusting link nut.

4. Move the alternator to the required position; apply any leverage necessary to the drive-end bracket and not to any other part of the alternator. The lever used should preferably be of wood or soft metal.  
**DO NOT** overtension.
5. Keep the slots in the plastic cover clean.
6. Tighten the securing nuts and bolts.
7. Fit the ignition shield.



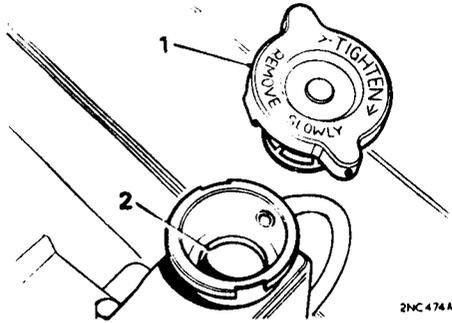
### AIR PUMP

1. Check the belt tension.
2. Slacken the securing bolt.
3. Slacken the two adjusting link bolts and move the air pump to the required position.
4. Tighten the bolts and re-check the belt tension.  
**DO NOT** overtension.

## COOLING SYSTEM

The cooling system is under pressure while the engine is hot. Allow the system to cool before removing the filler cap.

**WARNING:** If it is essential to remove the filler cap while the engine is HOT, take great care to protect the hands and arms from scalding by the escaping steam, and turn the cap to the safety stop to release pressure.



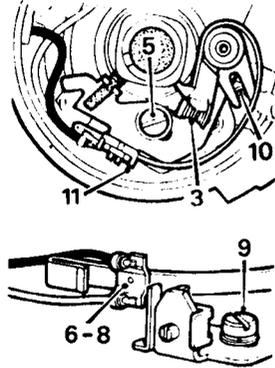
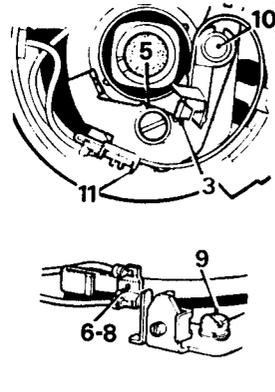
1. Remove the radiator filler cap.
2. Top up with sufficient coolant to bring the level up to the bottom of the filler neck.  
The system contains anti-freeze, ensure that the specific gravity of the coolant is maintained.

## IGNITION

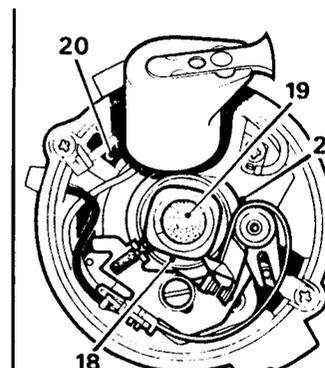
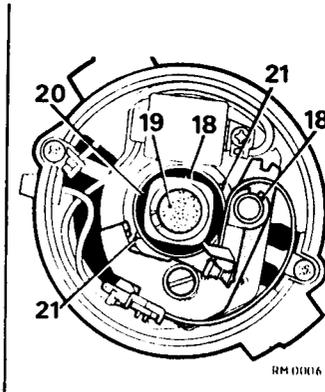
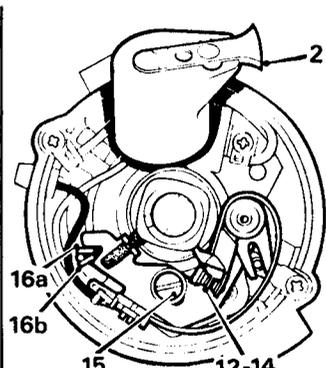
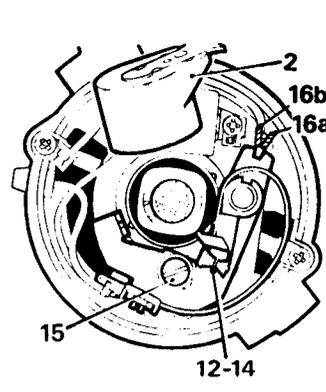
### Spark plugs

#### Servicing

1. Remove the spark plugs and clean them, preferably with an air blast service unit.
2. Clean the exterior insulators.



3. Check and reset the points gap to 0.025 in (0.65 mm). Use a plug gauge setting tool and move the side electrode to obtain the correct setting.
4. Replacement: When fitting new plugs ensure that only the recommended type is used, see 'ENGINE TUNING DATA'. Check the gap setting before installation. Tighten to the torque figure given in 'TORQUE WRENCH SETTINGS'.



## DISTRIBUTOR - Lucas - Not Turbo

### Cleaning the points

1. Remove the ignition shield (Clubman and 1275 GT).
2. Release the spring clip, detach the cap and pull the rotor arm from the cam spindle.
3. Clean the points (7) with a fine emery cloth or carborundum stone and wipe clean.
4. Renew the contact set if the points are pitted or worn.

### Renewing the contact set

5. Unscrew the securing screw and lift the contact set from the moving plate.
6. Press the contact set spring and release the terminal plate from the spring.
7. Wipe the new points clean with fuel or denatured alcohol (methylated spirit).
8. Connect the terminal plate (BLACK wire uppermost) into the end of the contact spring.
9. Place the securing screw with its spring and flat washer in the contact set slot.
10. Non-sliding contacts: Locate the base-plate peg and lightly tighten the securing screw.  
Sliding contacts: Locate the baseplate peg in the fork, press the pivot post into the plate and lightly tighten the securing screw.
11. Check that the contact spring is located in the insulation shoe.
12. Adjust the points gap.  
**Note:** Re-check the gap after the first 500 miles, 800 km.

### Adjusting the points gap

13. Clean the area around each spark plug, disconnect the leads and remove the spark plugs. Ensure that the gear lever is in neutral or gear selector is in 'N' and with the hand-brake still applied, use a spanner to turn the crankshaft pulley nut clockwise.
14. Insert a 0.35 to 0.40 mm (0.014 to 0.016 in) feeler gauge between the points - the gauge should be a sliding fit.
15. If adjustment is necessary, slacken the securing screw.
16. Adjust the gap by inserting a screwdriver between the 'V' shaped notch and the pip as illustrated.  
a. Increase gap.

b Decrease gap.

17. Refit the spark plugs, see 'IGNITION'.

#### Lubrication

18. Lightly smear the cam with grease. **Do not oil the cam wiping pad.** Non-sliding points: Lightly grease the pivot post.
19. Add a few drops of oil to the pad in the top of the cam spindle.
20. Add one or two drops of oil through the gap in the plate to lubricate the advance mechanism.
21. Every 24,000 miles (40 000 km) add a drop of oil to the moving plate bearing groove.

**CAUTION:** Do not over lubricate. Wipe away surplus lubricant. The contact set points must be clean and dry.

#### Refitting the rotor arm and cap

22. Align the cam slot and rotor peg, then press the rotor arm onto the spindle.
23. Wipe the inside of the cap clean and dry. Locate the cap on the distributor and secure. Check the dwell angle and adjust if necessary - see 'ENGINE TUNING DATA'.

### DISTRIBUTOR - Ducellier - Not Turbo

1. Remove the distributor cover and lift off the rotor arm.

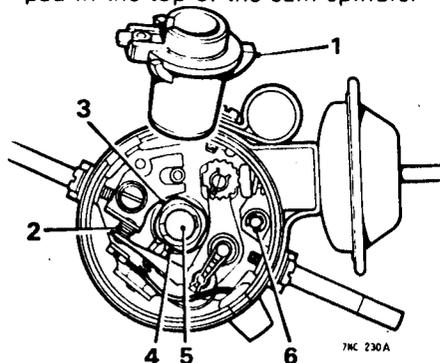
#### Contact breaker set

2. Inspect the contact breaker points; if burnt or worn, they should be renewed, see 86.35.26.

#### Lubrication

3. Very lightly smear the cam with grease.
4. Lubricate the pressure pad with grease.

5. Add a few drops of oil to the felt pad in the top of the cam spindle.



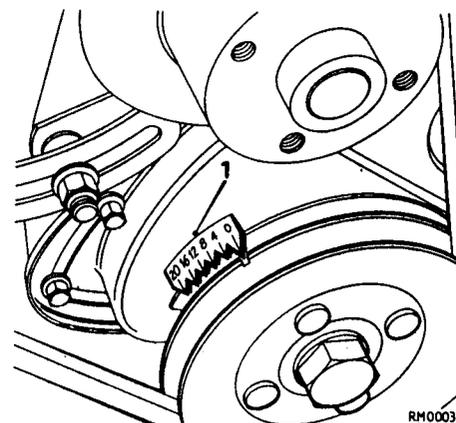
6. Turn the crankshaft until the distributor centrifugal weight pivot post is visible through the cut-out in the base-plate and lubricate the pivot post with a drop of oil; repeat for the opposite pivot post.
7. Carefully wipe away all surplus lubricants and see that the contact breaker points are perfectly clean and dry.
8. Refit the rotor arm, engage the slot in the spindle and push down firmly.
9. Wipe the inside and outside of the distributor cover clean, particularly between the electrodes, and refit the cover.

### IGNITION TIMING

#### Check and adjust

The ignition timing must be set dynamically, using a stroboscopic light.

1. Paint **WHITE** the appropriate timing pointer and the timing mark on the crankshaft pulley.
2. Connect the stroboscopic light and tachometer, select 4-cylinder.
3. Disconnect the vacuum pipe from the distributor.



4. Start the engine. Slacken the distributor clamp bolts and rotate the distributor to obtain the specified ignition timing at the given engine speed, see 'ENGINE TUNING DATA' - 05.
5. Tighten the distributor clamp bolts.
6. Check centrifugal advance at specified speed.
7. Re-connect the vacuum pipe and check vacuum advance.

### FUEL SYSTEM

#### Accelerator mechanism lubrication

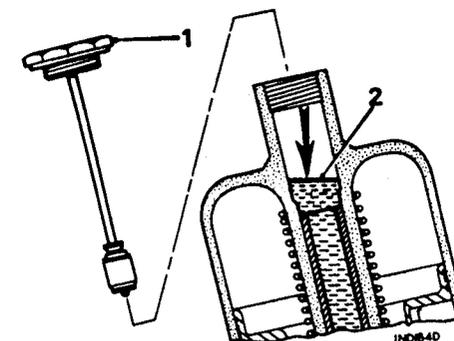
1. Lubricate the accelerator control linkage.
2. Lubricate the accelerator pedal pivots.
3. Check operation of the accelerator and that the throttle opens fully.

#### Carburettor piston damper - Not Turbo

Top up the carburettor piston damper reservoir, using an approved engine oil. Under no circumstances should a heavy-bodied lubricant be used.

1. Unscrew the oil cap and withdraw the damper.

2. Top up with oil to bring the level 0.5 in (13 mm) above the top of the hollow piston rod.
3. Refit the damper assembly



#### Carburettor piston damper - Turbo only

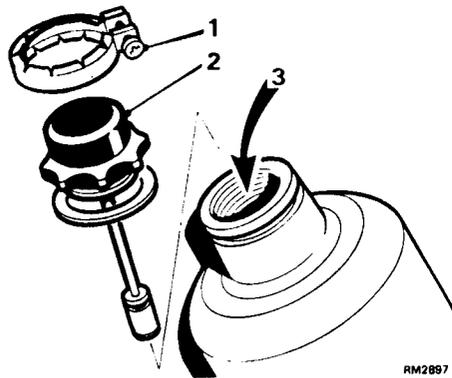
Top up the carburettor piston damper using an approved engine oil. Under no circumstances should a heavy bodied lubricant be used.

4. Slacken the screw securing the damper retaining clip.
5. Unscrew the cap and withdraw the damper.
6. Top up with oil to bring the level 0.5 in (13 mm) above the top of the hollow piston rod.
7. Refit the damper, tighten the damper retaining clip screw.

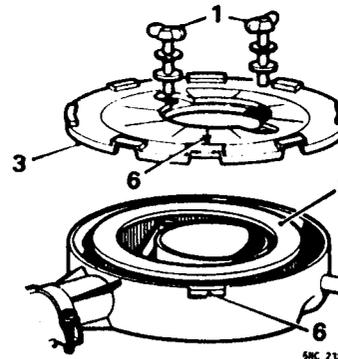
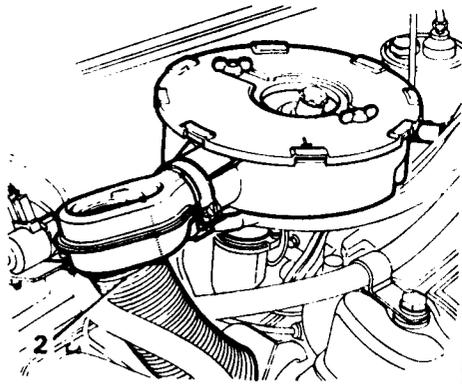
#### Carburettor settings check and adjust

**Note: Turbo Models:-** For details of carburettor settings and adjustment, refer to the tuning chart which follows the **ENGINE TUNING DATA** section, Group 05.

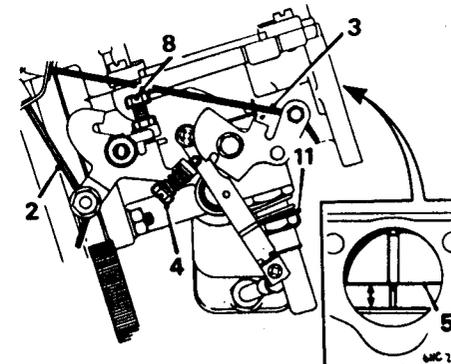
It is essential that the ignition timing, tappet clearance, distributor contact breaker (not Turbo models) and plug gaps are checked and adjusted before tuning the carburettor. Carburettor tuning must be confined to setting the idle



RM2897



5MC 232



5MC 174

and fast speeds and mixture at idle speed. A reliable tachometer should be used.

**Note:**

- a Where a vehicle must conform to exhaust emission regulations, adjustments should only be carried out if an accurate tachometer and an approved exhaust gas analyser (CO meter) are used.
- b When adjustment is required on a carburettor with sealed idling and/or mixture adjusters, the seals must be removed and discarded. New seals must be fitted after tuning adjustments where regulations require this to be done; the seals are colour coded as follows:  
**BLACK** and/or **BLUE** : Fitted by manufacturer. **RED** : Fitted after adjustments in service.

Refer to 'ENGINE TUNING DATA' for carburettor settings.

On vehicles fitted with automatic gear-box select 'N' on the gear quadrant and apply the hand brake.

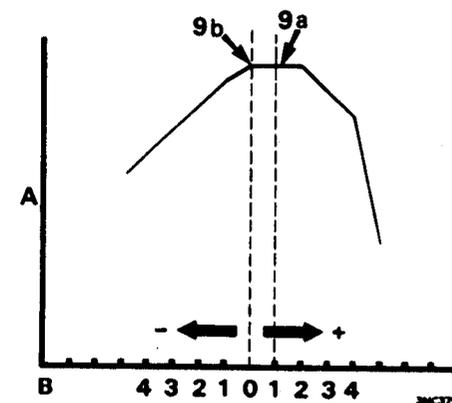
1. Top up the carburettor piston damper if necessary.
2. Check that the throttle functions correctly.
3. Ensure that the mixture control (choke) will return fully, and that the cable has a  $\frac{1}{16}$  in (2 mm) free play before it starts to pull on the lever.
4. Check that a small clearance exists between the fast idling screw and the cam.
5. Remove the air cleaner, then raise and lower the piston with a finger, checking that it can move smoothly without any tendency to stick or bind. If it fails to move freely, refer to 19.12.28. Refit the air cleaner.
6. Connect up a tachometer. Start the engine and run it at a fast idle speed until it attains normal running temperature, and continue for a further five minutes.

7. Before making any adjustments increase the engine speed to 2,500 rev/min and maintain the speed for 30 seconds to clear the intake manifold of excess fuel. Repeat this procedure at three-minute intervals if these adjustments cannot be completed within this period of time.

8. Check the idling speed with the tachometer and adjust as necessary by turning the idling screw. If the engine will not run smoothly at the correct idling speed, adjust the mixture setting as follows:

**Mixture - adjust - Not Turbo**

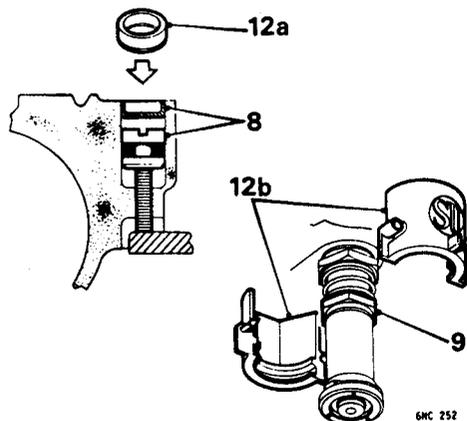
9. Screw the mixture adjusting nut one flat at a time, up to weaken or down to enrich the mixture, until the fastest idling speed (a) is achieved consistent with smooth running. Now screw the nut up slowly (weakening) until the speed just starts to fall (b).
10. Re-adjust the idling screw (8) as necessary to obtain the specified idling speed.



11. EMISSION CONTROL. Using the exhaust gas analyser, check that the reading is within the limits given in 'ENGINE TUNING DATA' if the reading falls outside the limits given, reset the mixture adjusting nut by the minimum amount necessary to bring the reading just within the limits.

If more than half a turn of the nut (or 5 flats of the nut on sealed adjustment carburetter) is required to achieve this, the carburetter must be removed and serviced.

12. Fit new seals to the adjustment points where this is mandatory.
  - a Press a new seal into the bore above the idle adjustment screw.
  - b Fit the halves of a new seal around the mixture adjusting nut and snap them together.
13. Check and adjust the fast idling speed (see 'ENGINE TUNING DATA') as follows: Pull out the mixture control knob until the linkage is about to move the jet, and lock the knob in this position.

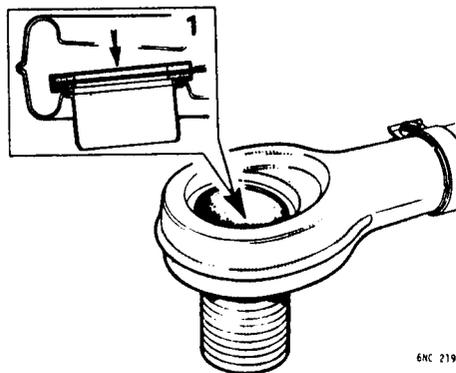


14. Turn the fast idling screw (4) until the correct fast idling speed is obtained; see 'ENGINE TUNING DATA'. Return the control knob fully and check that a clearance exists between the fast idling screw and its cam.
15. Stop the engine and disconnect the tachometer.

#### Air cleaner element - Not Turbo

In dusty conditions the element may require renewing more frequently than at the normal service intervals.

16. Unscrew the two wing nuts securing the air cleaner to the carburetter and air manifold.
17. Pull the connector pipe from the air temperature control valve flange and remove the air cleaner assembly.
18. Remove the top cover by prising it off with a screwdriver placed beneath the slots on the underside of the cover.
19. Discard the element and thoroughly clean the casings.
20. Fit a new element.
21. Ensure that the rubber 'O' ring is correctly positioned in the groove on the underside of the top cover, refit the top cover aligning the arrow on the cover with the location lug of the casing.
22. Refit the assembly.



#### Air temperature control valve - Not Turbo

23. Note the position of the valve when the engine is cold.

24. Depress the valve and release it. The valve should return to its original position. Inspect the valve seat for signs of damage or deterioration.

#### Air cleaner element - Turbo only

**CAUTION:** A clogged air cleaner element will affect turbocharger performance and fuel consumption; in dusty conditions therefore, the element may require renewing more frequently than at the normal servicing intervals.

25. Remove the air cleaner assembly, see 19.10.01.
26. Thoroughly clean the exterior of the air cleaner.
27. Release the clips and remove the element.
28. Thoroughly clean inside the air cleaner cover and casing.
29. Fit the new element ensuring that the word 'UP' faces towards the top of the casing and is facing towards the cover.
30. Fit the cover ensuring that it is correctly located and fasten the clips.
31. Fit the air cleaner, see 19.10.01.

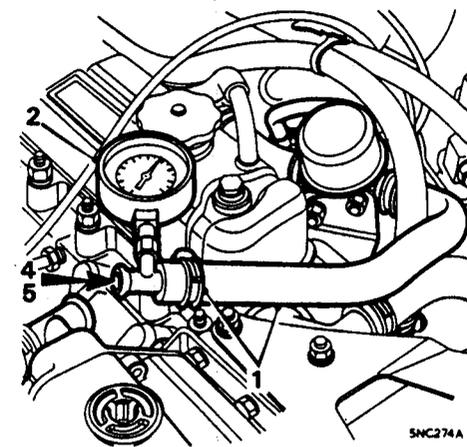
#### EMISSION CONTROL

##### Gulp valve - testing

1. Slacken the clip and disconnect the gulp valve air supply hose at the air pump.
2. Connect a vacuum gauge, with a 'T' (tee) adaptor to the gulp valve hose.
3. Start the engine and run it at idle speed.
4. The engine must remain at idle during this test. Seal the end of the 'T' (tee) adaptor and check that the gauge reads zero for approximately 15 seconds.

If a vacuum is registered, renew the gulp valve.

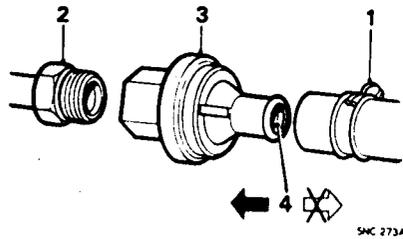
5. Seal the end of the 'T' (tee) adaptor and open the throttle rapidly; the gauge should register a vacuum. Unseal the adaptor. Repeat the test several times. If a vacuum is not registered, renew the gulp valve.



6. Reconnect the supply hose and tighten the hose clips securely.

##### Check valve - testing

7. Release the clip securing the hose to the check valve. Move the clip along the hose and free the hose on the valve adaptor.
8. Hold the air manifold union to prevent it twisting and unscrew the check valve.
9. Pull the check valve from the hose.



SNC 273A

#### Check valve - testing

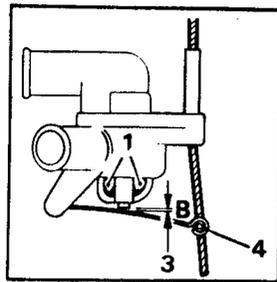
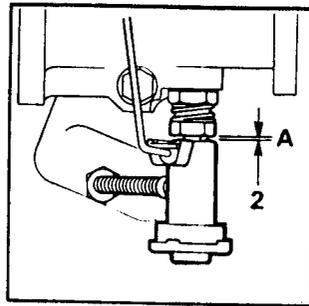
7. Release the clip securing the hose to the check valve. Move the clip along the hose and free the hose on the valve adaptor.
8. Hold the air manifold union to prevent it twisting and unscrew the check valve.
9. Pull the check valve from the hose.
10. Using the mouth; blow into the valve from each end in turn. Air should only pass through the valve from the air supply end. If air passes through from the air manifold end, renew the check valve.
11. Reverse the procedure in 1 to 3 to refit the valve.

**CAUTION: DO NOT APPLY AIR LINE PRESSURE TO THE VALVE.**

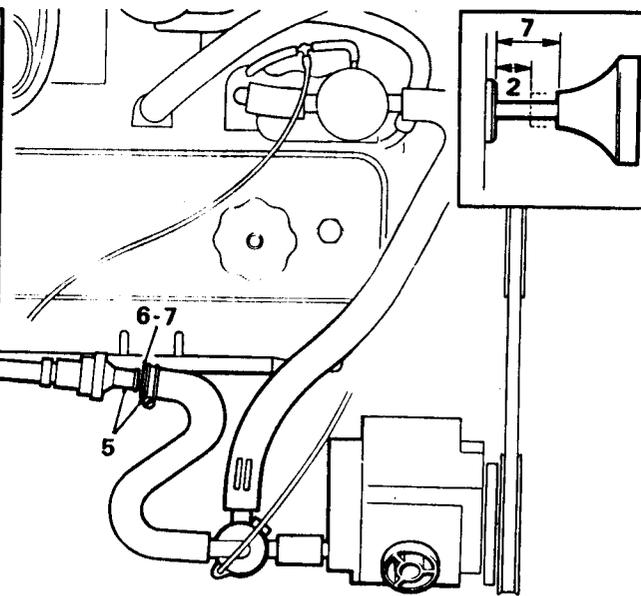
#### DIVERTER VALVE

##### Check and adjust

1. Check the general condition of the diverter valve and ensure the air silencer is in place.
2. Operate the mixture control knob and obtain the given clearance between the jet housing and the adjusting nut.  
Lock the control knob.  
'A' = 0.25 to 0.38 mm (0.010 to 0.015 in).



3. Check the clearance between the operating lever and the valve stem.  
'B' = 0.04 to 0.08 mm ( 0.0015 to 0.003 in).
4. Adjustment; Slacken the trunnion, position the operating lever and tighten the trunnion.
5. Disconnect the hose from the check valve.
6. Start the engine and run it at idle speed.  
Air pressure should be felt at the hose end.
7. Operate the mixture control (choke), air supply cut off completely.  
If air pressure is felt at the hose, renew the diverter valve.



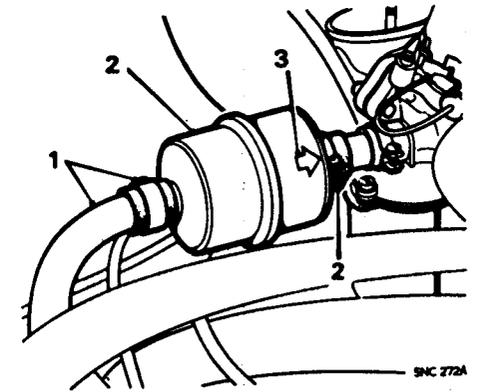
SNC779

#### Fuel line filter - renew (Emission engine)

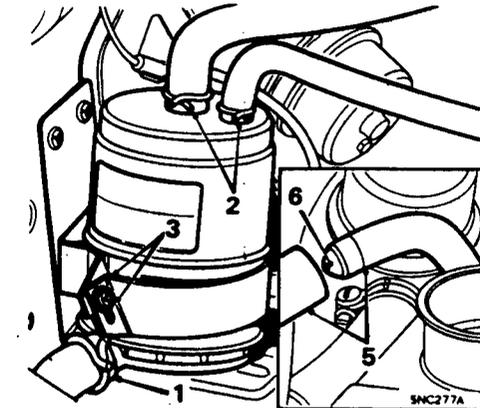
8. Slacken the clip and disconnect the inlet hose.
9. Slacken the clip and pull the fuel filter from the inlet hose.
10. Ensure that the new filter is fitted with its flow arrow towards the carburetter.

#### Adsorption canister - renew

11. Disconnect the air vent hose from the bottom of the canister.
12. Disconnect the vapour and purge hoses from the top of the canister.
13. Remove the retaining screw, open the bracket sufficiently to withdraw the canister.
14. Reverse the procedure in 1 to 3 to fit the new canister.



SNC 272A



SNC277A

15. Disconnect the purge hose from the rocker cover elbow.
16. Examine the restrictor orifice, clear any dirt or deposits using a length of soft wire.
17. Reconnect the purge hose.

#### Fuel line filter - Turbo only

18. Disconnect the battery.
19. Position a suitable container to collect any spilled fuel.
20. Slacken the hose clips.

21. Disconnect the hoses and withdraw the filter.
22. Insert the new filter into the hoses and tighten the clips.

**CAUTION:** There is an arrow etched on the fuel filter body, ensure that the arrow faces in the direction of flow i.e. towards the carburettor.

## STEERING

### Checking

1. Examine the steering system for signs of leakage and general condition of gaiters and hoses.
2. Check steering and suspension ball joint for excessive free movement.

### Checking front wheel alignment

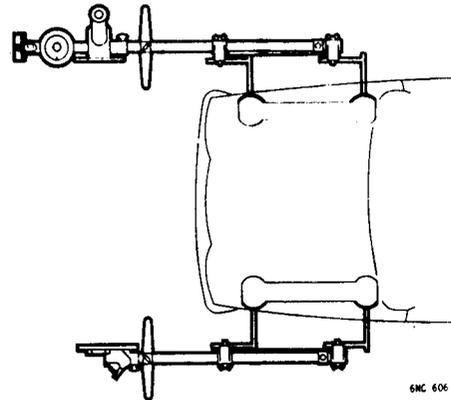
When checking the front wheel alignment the following points must always be observed, see **DATA** for alignment setting figure.

3. Position the vehicle on a level surface loaded to kerbside unladen trim with the tyre inflated to the recommended pressures. Position the wheels in the straight-ahead position. Rock the vehicle from side to side and roll it backwards and forwards at least a vehicle's length.
4. Remove the grommet from the toe board, unscrew the plastic plug from the steering rack and centralize the rack by inserting a  $\frac{1}{4}$  in (6 mm) diameter dowel (e.g. drill shank) through the rack casing to engage the mating hole in the rack.

5. Using an optical gauge, take two readings on the front tyres at wheel centre height at the centre of the sidewall, then check the average of these two readings against the front wheel alignment figure given in **DATA**.

### Adjusting

6. Slacken the locknut on both tie-rods.
7. Slacken the clip securing the rubber gaiter to the tie-rod.



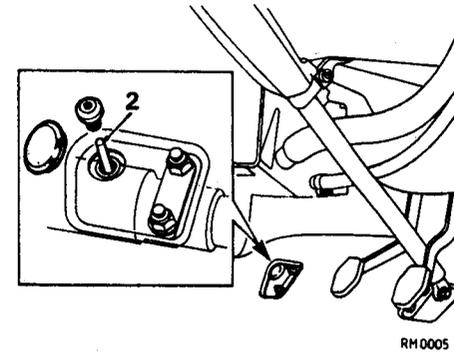
GMC 606

8. Rotate each tie-rod (both are right-hand thread) in the required direction by an equal amount to correct the misalignment. **CAUTION:** It is important that the tie-rods are adjusted to exactly equal length.
9. Tighten the tie-rod locknuts, see **'TORQUE WRENCH SETTINGS'**.
10. Tighten the gaiter clips.
11. Re-check the wheel alignment.

## FRONT SUSPENSION

### Swivel hub ball joints

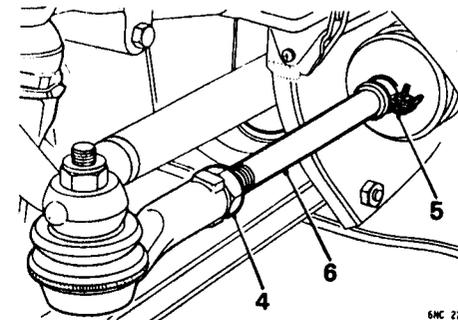
1. Use one of the recommended greases shown in the **'SERVICE LUBRICANTS'** chart and charge the two nipples on each hub with grease; if the joints are already filled with grease, no further grease can usually be forced in.



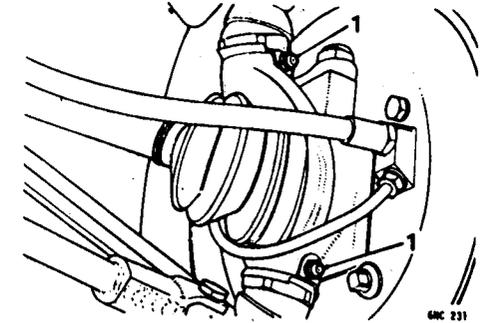
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### Upper support arm inner pivot

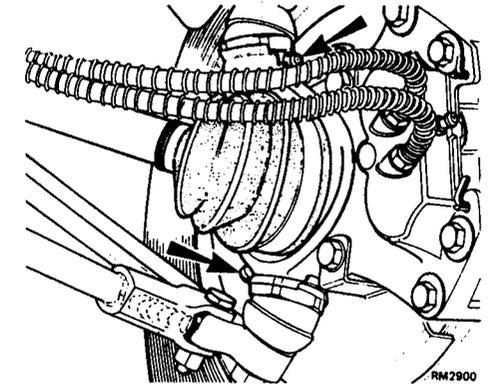
2. Apply grease to the lubricating nipple on each unit on both sides of the vehicle.



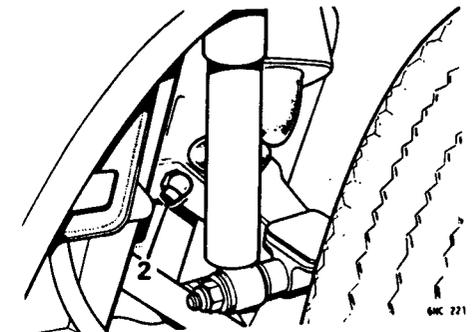
GMC 224



GMC 231



RM2900

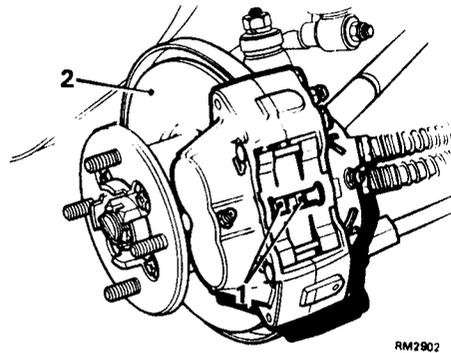
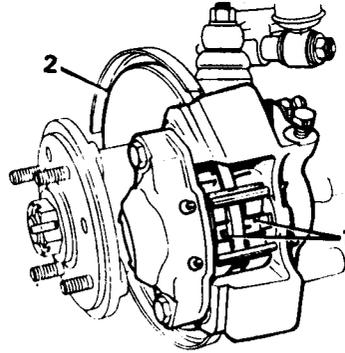
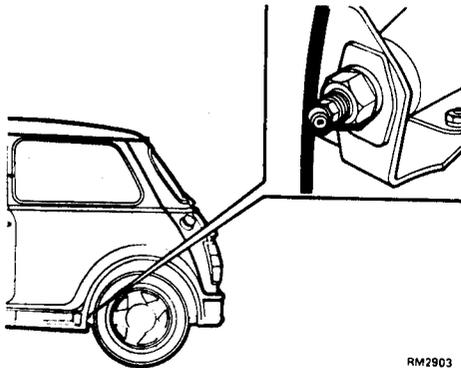
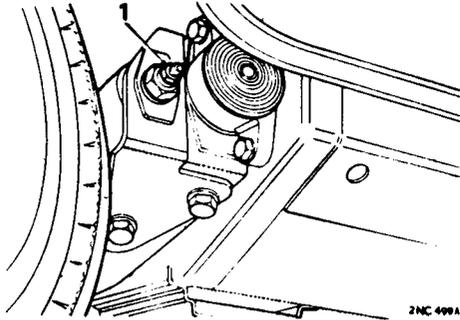


GMC 221

## REAR SUSPENSION

### Radius arms

1. Using the same recommended grease as used for front suspension lubrication, charge the nipple on each unit with grease until excess grease appears from the inner bush on the opposite end of the radius arm.



## BRAKES AND MASTER CYLINDERS

### Brake and clutch hoses and pipes

Check visually all hoses, pipes and unions for chafing, leaks and corrosion. It is most important that hoses are not subjected to stress and are not positioned near to other components so that chafing can occur.

Rectify any leaks and replace hoses and pipes showing signs of damage or deterioration-additional work.

### Preventive maintenance

In addition to the recommended 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 Maintenance Summary.
2. Brake fluid should be changed completely every 18 months or 18,000 miles (30,000 km) whichever is the sooner.
- 3.
4. All fluid seals in the hydraulic system should be renewed and all flexible hoses should be examined and renewed if necessary 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.

Care must be taken always to observe the following points:

1. At all times use the recommended brake fluid.
2. Never leave fluid in unsealed containers. It absorbs moisture quickly and can be dangerous if used in the braking system in this condition.
3. Fluid drained from the system is best discarded.
4. The necessity for absolute cleanliness throughout cannot be over-emphasized.

### Inspecting front brake pads and discs

1. Road wheel removed. Check the thickness of the pads, and renew them before the lining material has worn down to  $\frac{1}{16}$  in (1.6 mm). Ensure that sufficient pad material remains to allow the car to run until the next check. Change the pads over if wear is not even - additional work see 70.40.02.

**WARNING: Do not use an airline to blow lining dust, asbestos dust can be a serious health hazard if inhaled. Use methylated spirit or denatured alcohol to wash dust from components. Do not use any petroleum-based fluids.**

2. Examine the disc for cracking or scoring.

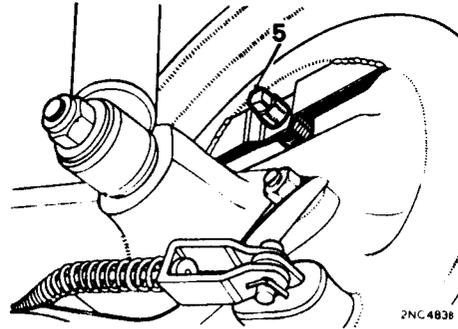
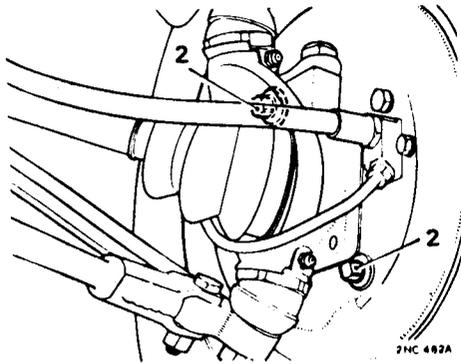
### Inspecting brake linings

1. Jack up the vehicle and place supports under the sub-frame.
2. Back off the brake adjusters and release the hand brake when dealing with the rear brakes.
3. Remove the brake-drum securing screws and pull off the drums.
4. Examine the linings for wear or contamination. Wash out accumulated dust from the backplate assembly and the drum with methylated spirits (denatured alcohol) and allow to dry. Examine the drum for cracking and scoring.  
**WARNING: Do not use an airline to blow dust from the brake assemblies - asbestos dust can be dangerous to health if inhaled.**
5. Inspect the linings for wear; if the lining material has worn down to the minimum permissible thickness of  $\frac{1}{16}$  in (1.6 mm) on bonded-type shoes, or close to the rivets, or will have done so before the next check is called for, the brake-shoes must be renewed. Refer to 70.40.02.

### Adjustment

1. Jack up the vehicle and place supports under the sub-frames. Deal with one adjuster at a time.

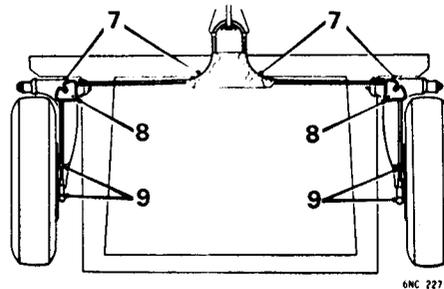
**Note:** On cars fitted with disc brakes on the front wheels, the disc brakes are self adjusting.



6. Repeat the above operation on the other wheel.

### Hand brake - lubricate and adjust

7. Smear grease around the cable guide channels.
8. Lubricate the swivel sector pivots with oil.



### FRONT - CARS FITTED WITH DRUM BRAKES

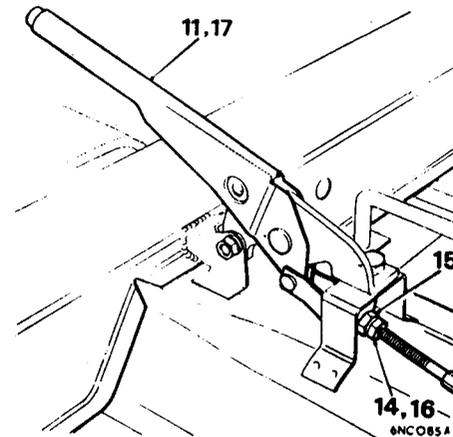
2. Turn the adjuster in the same direction as the forward rotation of the road wheel until the wheel is locked. Back off the adjuster the minimum amount necessary to allow the wheel to revolve freely.
3. Spin the wheel, apply the foot brake hard to centralize the brake shoes, and re-check the adjustment.
4. Repeat this procedure with each adjuster and repeat the same operation on the other front wheel.

### REAR - ALL CARS

5. Turn the single squared adjuster in a clockwise direction (when viewed from under the centre of the vehicle) until the wheel is locked. Back off the adjuster the minimum amount necessary to allow the wheel to revolve freely.

9. Smear grease around the operating lever clevis pin and the cable adjacent to the spring anchor brackets.
10. Adjust the brake shoes as detailed in operations 5 and 6.
11. Pull the handbrake lever on until the third tooth on the ratchet is heard to engage.

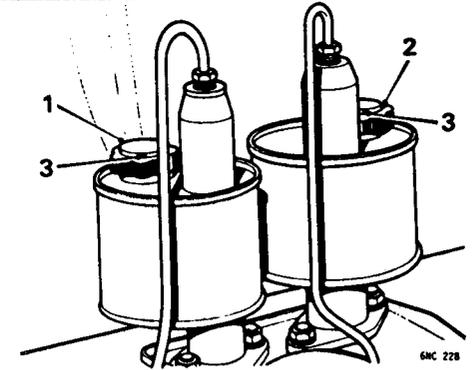
12. Check for braking effect on the rear wheels: the adjustment is correct if each wheel can only just be rotated by heavy hand pressure.
13. If adjustment is required, tilt the front seats forward and pull back the floor covering.
14. **Turbo only:** Remove the control console, see 76.25.01. Slacken the cable locknut.



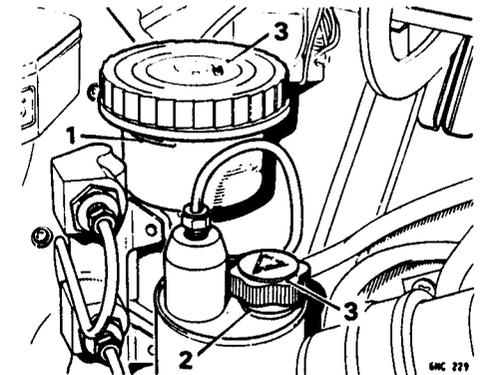
15. Turn the adjusting nut in the required direction until the correct tension is achieved.
16. Tighten the locknut.
17. Check the handbrake operation, release the handbrake to the OFF position and check that both rear road wheels rotate freely.
18. Replace the floor covering.  
**Turbo only:** Fit the centre console, see 76.25.01.

### Brake and clutch master cylinder fluid level

Use only the recommended grade of brake fluid to top up the master cylinders, refer to 'SERVICE LUBRICANTS'.

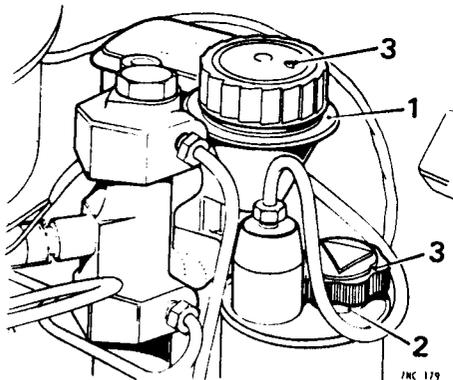


The need for frequent topping-up is indicative of a leak in the hydraulic system which must be found and rectified immediately.

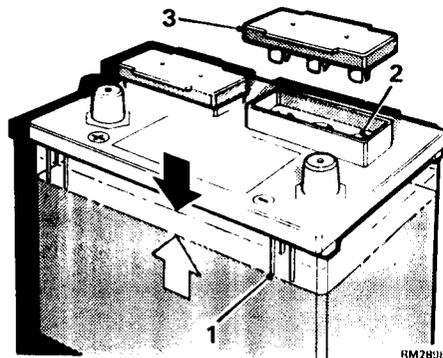


**CAUTION:** Ensure that brake fluid does not contact paint finished surfaces as it can have a detrimental effect.

1. **BRAKE:** Check the fluid level in the reservoir; the fluid must be maintained up to the bottom of the filler neck, or to the level mark on the translucent reservoir (indicated) of the tandem brake master cylinder.



2. CLUTCH: Remove the filler cap and check the fluid level in the reservoir, the fluid level must be maintained to the bottom of the filler neck.
3. Check that the breather holes in the caps are clear.



## ELECTRICAL

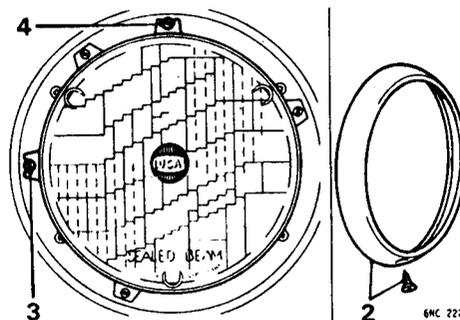
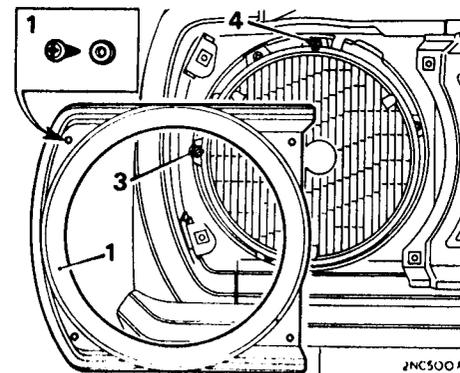
### Battery

#### Checking

1. Check the electrolyte levels through the side of the translucent battery case, or by fully raising the vent cover and tilting it to one side. The electrolyte level should be maintained at the maximum level mark on the battery case or so that the separator plates are just covered.

#### Topping-up

2. Raise the vent cover and pour distilled or de-ionized water into the trough until electrolyte is to the correct level.
3. Press the cover firmly into position, the correct quantity of distilled or de-ionized water will be distributed to each cell.



5. Wipe the battery top clean and dry. Smear the terminal posts with petroleum jelly and ensure the terminals are tight. Clean off any corrosion from the battery and fittings; use diluted ammonia, and then paint affected areas with ant-sulphuric paint. **Note:** Specific gravity check and battery charging off the vehicle is additional work.

### Headlamp beam adjustment

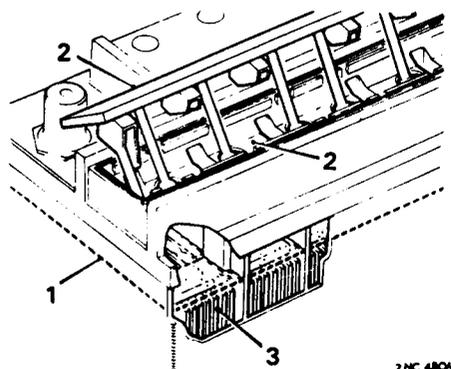
#### Checking

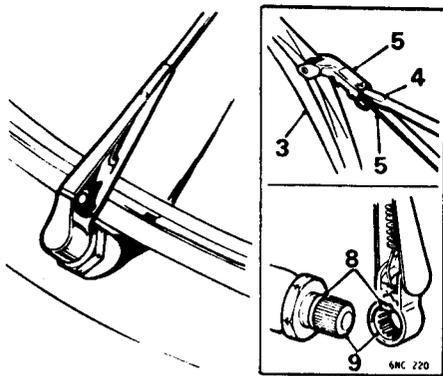
1. Ensure that the tyre pressures are correct.
2. Clean each lamp lens and check that the lamp functions correctly.
3. Check the beam setting of each lamp using a beam tester.

#### Adjusting

The main beams should be  $\frac{1}{2}^\circ \pm \frac{1}{4}^\circ$  below horizontal and parallel with each other in the straight-ahead position, or in accordance with regulations governing the setting and use of headlamps.

1. Clubman and 1275 GT models: To obtain access to the beam adjusting screws, remove the front grille extensions (four screws each).
  2. All other models: Remove the rim retaining screw, pull the rim forwards and upwards to release it from the lamp retaining lugs.
  3. Turn the screw on the side of the lamp unit for horizontal adjustment.
  4. Turn the top screw for vertical adjustment.
  5. Refit the headlamp rims or the grille extensions as applicable to the model.
4. In freezing conditions run the engine immediately after topping-up to mix the electrolyte. **CAUTION:** The vent cover must be kept closed at all times, except when topping-up. The electrolyte will flood if the cover is raised while charging the battery. The battery could also flood if it is topped-up within half an hour of having it charged other than by the car charging system.

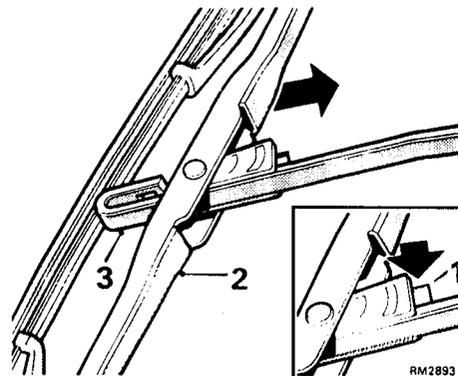




8. Hold the spring retaining clip clear of the groove in the drive spindle.
9. Pull the wiper arm assembly off the splined spindle, reposition it and push it hard down until secured by the retaining clip.

**Wiper blade - Rear  
Renew**

10. Depress the spring clip.
11. Pull the wiper blade holder rearwards until the holder is disengaged from the end of the arm.
12. Disengage the arm from the holder.
13. Insert the new wiper blade and holder into the end of the arm and push the holder forwards until the clip engages with the cut out in the arm.



**WINDSCREEN WASHER AND WIPERS**

**Washer**

1. The jets should spray towards the top of the windscreen.
2. Top up the washer bottle; use **UNIPART Screen Wash** or in freezing conditions use **UNIPART 'Four Seasons' Screen Wash**. Do not use radiator anti-freeze.

**Wiper blades - front**

3. Examine the lip of the blades; if defective renew the blade assembly.
4. Pull the wiper arm away from the windscreen, insert a small screwdriver between the arm and the blade, then withdraw the blade from the arm.
5. Insert the end of the arm into the holder of the new blade and lower the wiper onto the windscreen.
6. Operate the washer and check the wipers for effective wipe at each speed - reposition the blades if necessary.
7. Check the parking position of the arms and reposition as detailed in 8 and 9 if necessary.

**EXHAUST, FUEL AND CLUTCH PIPES**

1. Check visually fuel hoses, pipes and unions for chafing, leaks and corrosion. Rectify and renew parts as necessary - additional work.
2. Check the exhaust system for leakage and security.

**BODY**

1. Lubricate the bonnet safety catch and release mechanism.
2. Lubricate the moving joints of all hinges.
3. Lubricate all door locks - use **UNIPART Lockspray**. Do not oil the steering lock.
4. Check condition and security of the seat bolts.
5. Check security of seats and locking mechanisms.
6. Check rear view mirrors for cracks and crazing.

**WHEELS AND TYRES**

1. Check that the tyres comply with specification  
145-10 radial-ply  
520-10 cross-ply  
145/70SR-12 radial-ply  
155/65SF-310 'DENOVO'  
**Turbo only:** 165/60 MR13 Stool belted, radial ply.
2. Check depth of tread
3. Check visually for cuts in tyre fabric, exposure of ply or cord structure, lumps or bulges.
4. Check and adjust tyre pressures, including the spare.
5. Check tightness of the road wheel nuts, see **TORQUE WRENCH SETTINGS**.

---

## DATA

### Tyre pressures

#### 145-10

radial-ply:

All conditions:

Front	.....28 lbf/in <sup>2</sup>	2.0 kgf cm <sup>2</sup>	1.93 bar
Rear	.....26 lbf/in <sup>2</sup>	1.8 kgf cm <sup>2</sup>	1.79 bar

520-10 cross-ply:

Normal driving:

Front	.....24 lbf/in <sup>2</sup>	1.7 kgf cm <sup>2</sup>	1.66 bar
Rear	.....22 lbf/in <sup>2</sup>	1.5 kgf cm <sup>2</sup>	1.52 bar

Fully laden:

Front	.....24 lbf/in <sup>2</sup>	1.7 kgf cm <sup>2</sup>	1.66 bar
Rear	.....24 lbf/in <sup>2</sup>	1.7 kgf cm <sup>2</sup>	1.66 bar

#### 145/70SR-12

radial-ply:

All conditions:

Front	.....28 lbf/in <sup>2</sup>	2.0 kgf cm <sup>2</sup>	1.93 bar
Rear	.....28 lbf/in <sup>2</sup>	2.0 kgf cm <sup>2</sup>	1.93 bar

#### 155/65F-310

'DENOVO':

All conditions:

Front	.....26 lbf/in <sup>2</sup>	1.8 kgf cm <sup>2</sup>	1.79 bar
Rear	.....24 lbf/in <sup>2</sup>	1.7 kgf cm <sup>2</sup>	1.66 bar

**Turbo only:**

Road Wheels -

165/60 R13

Spare Wheel -

145/70 SR12

Steel belted,

radial ply.

All conditions:

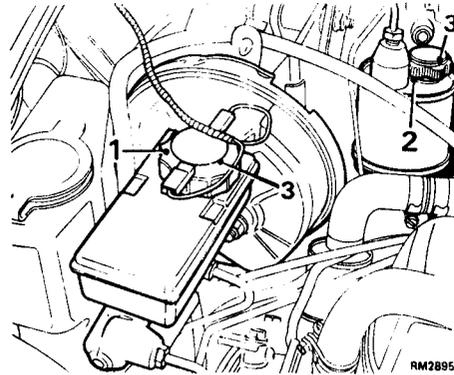
Front	.....28 lbf/in <sup>2</sup>	1.97 kgf/cm <sup>2</sup>	2.0 bar
Rear	.....28 lbf/in <sup>2</sup>	1.97 kgf/cm <sup>2</sup>	2.0 bar

## GENERAL

Road or roller test the vehicle.

1. Check that all the instruments function correctly.
2. Check brake pedal effort required to apply brakes, brakes for pulling to one side, binding. Check hand-brake operation.
3. Check clutch pedal effort; clutch for disengagement, slipping or judder.
4. Check for gear selection.
5. Test operation of inertia type seat belts: With the belts being used; drive the car at 5 m.p.h. (8 km.h) and brake sharply; the automatic locking device should operate and lock the reel.

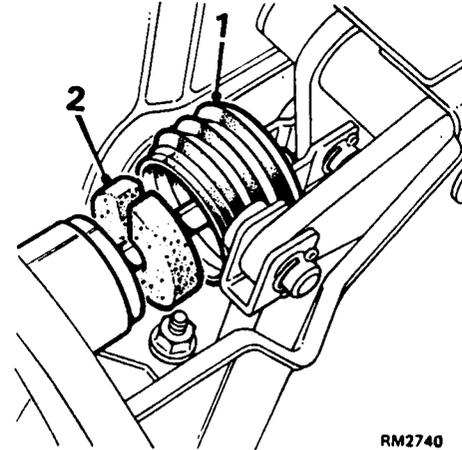
**CAUTION:** When checking the tightness of nuts and bolts great care must be taken not to overtighten them. A torque should be used where possible - see 'TORQUE WRENCH SETTINGS'.



### BRAKE AND CLUTCH MASTER CYLINDERS FLUID LEVEL - 1989

Model Year on

1. Check the fluid level in the reservoir; the fluid must be maintained up to the 'MAX' mark on the reservoir.
2. If necessary, remove the filler cap and add fluid until it reaches the correct level. Refit the filler cap.



### BRAKE SERVO AIR FILTER - 1989

Model Year on

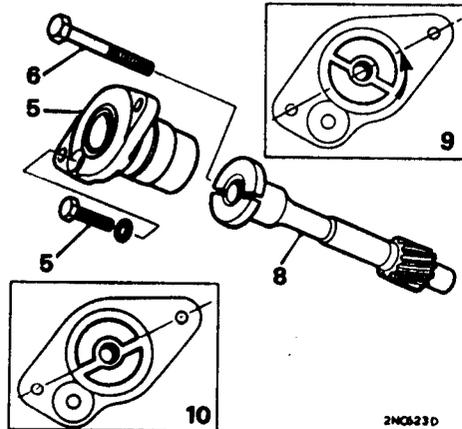
Renew

1. Release the rubber boot from the servo body and slide it rearwards along the brake pedal push rod.
2. Withdraw the filter pad from inside the servo body.
3. Using a sharp knife, cut a slot in the replacement filter pad from the centre of the pad to its outer edge.
4. Locate the filter pad on the brake pedal push rod and position the pad in the servo body.
5. Refit the rubber boot.



*Note: Certain engine operations applicable to Mini Turbo Models only are covered in the next section; These operations are as follows:*

1. Crankshaft pulley - Remove and refit - 12.21.01
2. Cylinder head gasket - Remove and refit - 12.29.02
3. Engine and Gearbox - Remove and refit - 12.37.01
4. Engine Mountings - Align - 12.45.40
5. Flywheel Housing - Remove and refit - 12.53.01
6. Oil Cooler - Remove and refit - 12.60.68
7. Oil Cooler Feed Hose - Remove and refit - 12.60.74
8. Oil Cooler Return Hose - Remove and refit - 12.60.76



## DISTRIBUTOR DRIVE SHAFT

**Remove and refit** 12.10.22

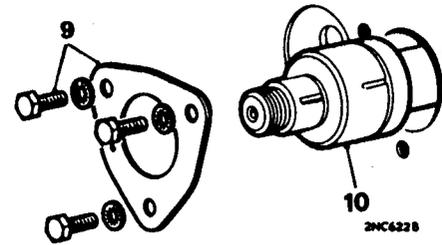
### Removing

1. Slacken the securing screws on the flywheel/converter housing timing mark cover-plate and turn the plate.
2. Turn the crankshaft until the '1/4' timing mark ('O' on the automatic converter) is adjacent to the timing mark pointer on the housing. Turbo only:- Remove the grille assembly, see 76.55.03
3. Remove the distributor cover and check that the rotor is adjacent to the No. 1 h.t. lead on the cover.
4. Remove the distributor, see 86.35.20.
5. Remove the securing bolt and withdraw the distributor housing.
6. Screw a 5/16 in U.N.F. bolt approximately 3.50 in (90 mm) long into the threaded end of the distributor drive shaft.
7. Note the fitted position of the shaft.
8. Pull out the distributor drive shaft, using the bolt; the shaft will rotate approximately a quarter of a turn.

### Refitting

9. Enter the drive shaft with the driving slot in the position shown with the large slot uppermost.
10. The gear will rotate anti-clockwise into engagement and the final position of the driving slot should be as shown, with the top edge of the slot in line with the centre line of the distributor mounting holes.
11. Remove the bolt used to refit the gear.
12. Examine the 'O' ring on the housing, and renew if necessary.
13. Refit the distributor see 86.35.20.
14. Refit the distributor cap.

15. Refit the timing mark cover-plate on the flywheel/converter housing. Turbo only:- Refit the grille assembly, see 76.55.03



## CAMSHAFT

**Remove and refit - 850 and 1000** 12.13.02

### Removing

1. a Remove the engine/gearbox, see 12.37.01.  
b Remove the engine/automatic gearbox, see 12.37.01.
2. Remove the rocker shaft, see 12.29.54.
3. Remove the distributor drive shaft, see 12.10.22.
4. Remove the fuel pump, see 19.45.08.
5. Remove the timing chain and gears, see 12.65.12.
6. Remove the pushrods.
7. Remove the two screws securing the side covers.
8. Remove the side covers and then withdraw the tappets.
9. Remove the three securing screws and lift off the camshaft locating plate.
10. Withdraw the camshaft.

### Refitting

11. Reverse the procedure in 1 to 10, noting:  
Check the camshaft end float is within the tolerance given in **GENERAL SPECIFICATION DATA**. Renew the end plate if the end-float is excessive.  
Torque tighten nuts and bolts where applicable, see 'TORQUE WRENCH SETTINGS'.

## CAMSHAFT

**Remove and refit - 1275 and Turbo** 12.13.02

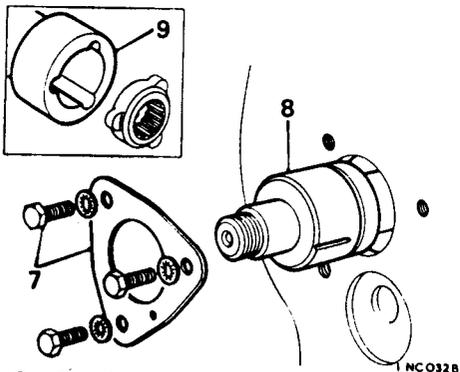
### Removing

1. Remove the engine/gearbox, see 12.37.01.
2. Remove the rocker shaft, see 12.29.54.
3. Remove the distributor drive shaft, see 12.10.22
4. Remove the fuel pump - Not Turbo Models, see 19.45.08.
5. Remove the timing chain and gears, see 12.65.12.
6. Lay the engine on its side to prevent the tappets falling into the transmission when the camshaft is removed.
7. Remove the three securing screws and lift off the camshaft locating plate.
8. Withdraw the camshaft.  
*Note: Take care when removing the camshaft as the oil pump drive coupling may stick by oil adhesion to the camshaft and possibly fall into the transmission.*

### Refitting

9. Check that the oil pump drive coupling is located on the splined oil pump spindle.
10. Refit the camshaft and retaining plate; tighten the retaining bolts.

- Stand the engine upright and check that the tappets and push-rods are correctly located.



- Check that the camshaft end-float is within the tolerance of the figures given in **GENERAL SPECIFICATION DATA**. Renew the retaining plate if the end-float is excessive.
- Refit the timing chain and gears, see 12.65.12.
- Refit the fuel pump - Not Turbo Models, see 19.45.08.
- Refit the distributor drive shaft, see 12.10.22.
- Refit the rocker shaft, see 12.29.54
- Refit the engine/gearbox, see 12.37.01.

## CAMSHAFT BEARINGS

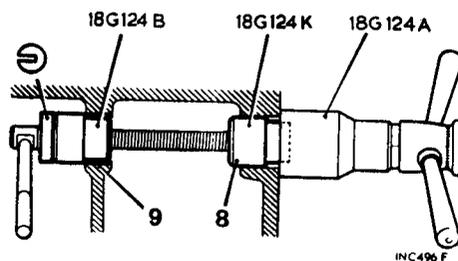
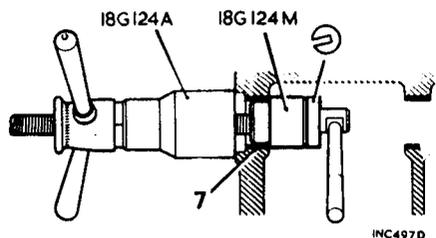
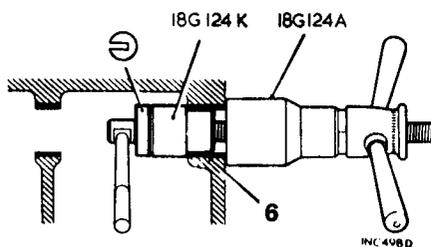
**Remove and refit** 12.13.13

**Service tool:** 18G 124 A, 18G 124 B, 18G 124 K, 18G 124 M

### Removing

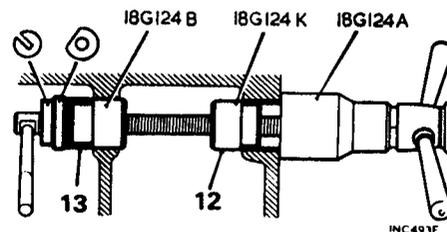
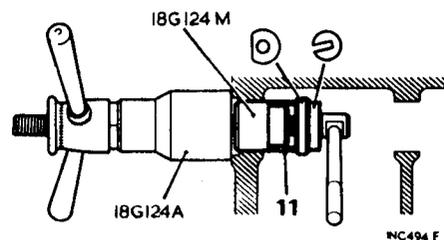
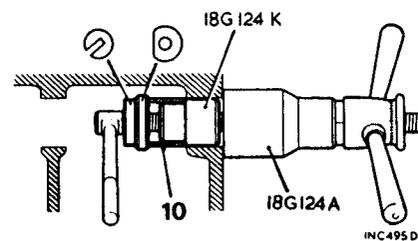
- Remove the engine/gearbox, see 12.37.01.
  - Remove the engine/automatic gearbox assembly, see 12.37.01.
- Remove the cylinder head, see 12.29.11.

- Remove the crankshaft, see 12.21.33.
- Remove the connecting rods and pistons, see 12.17.01.
- Remove the tappets, see 12.59.57.



### 1275 and Turbo only

- Remove the camshaft front bearing liner, using 18G 124 A with the slotted washer and adaptor 18G 124 K.



- Remove the camshaft rear bearing liner, using 18G 124 A with the slotted washer and adaptor 18G 124 M.
- Insert adaptor 18G 124 K into the camshaft front bearing liner bore.
- Remove the camshaft centre bearing liner, using 18G 124 A with the slotted washer and adaptor 18G 124 B.

### Refitting

**CAUTION:** It is essential that the oil holes in the new bearing liners are aligned with the lubrication holes in the cylinder block, and remain in this position during the whole operation of refitting. Also, when fitting the front and centre bearing liner, the cut-away portion of the 'C' washer, used with 18G 124 A, must be turned away from the butt joint of the bearing liner.

- Fit a new camshaft front bearing liner, using 18G 124 A with the large 'C' washer, the slotted washer and adaptor 18G 124 K.
- Fit a new camshaft rear bearing liner, using 18G 124 A with the slotted washer and adaptor 18G 124 M.
- CAUTION:** Do not use the large 'C' washer to fit the rear bearing liner.
- Insert pilot adaptor 18G 124 K into the camshaft front bearing liner.

13. Fit a new camshaft centre bearing liner, using 18G 124 A with the large 'C' washer, the slotted washer and adaptor 18G 124 B.

**All Models**

14. Refit the tappets, see 12.29.57.
15. Refit the connecting rods and pistons, see 12.17.01.
16. Refit the crankshaft, see 12.21.33.
17. Refit the cylinder head, see 12.29.11.
18. a Refit the engine/gearbox, see 12.37.10.  
b Refit the engine/automatic gearbox assembly, see 12.37.01.

**CONNECTING RODS AND PISTONS**

**Remove and refit**  
- 850, 100 and 1100

12.17.01

**Service tool:** 18G 55 A

**Removing**

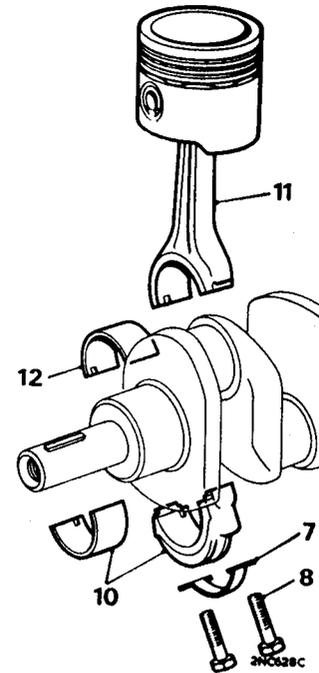
1. a Remove the engine/gearbox assembly, see 12.37.01.  
b Remove the engine/automatic gearbox assembly, see 12.37.01.
2. a Remove the gearbox from the engine, see 37.20.01.  
b Remove the automatic gearbox from the engine, see 44.20.01.
3. Remove the rocker shaft, see 12.29.54.

4. Remove the cylinder head, see 12.29.02.
5. Withdraw the engine dipstick.
6. Check the identification marks on the connecting rods and big-end caps; mark each rod and cap as a pair in sequence '1' to '4' starting at the front if they are not marked.
7. Tap back the lock washer tabs on the bearing cap securing bolts.
8. Remove the cap securing bolts.
9. Tap the side of each bearing cap with a hammer to release the caps from the connecting rods.
10. Remove each cap in turn with its bearing shell and retain the two together to ensure correct reassembly.
11. Push the piston and connecting rod assemblies upwards and withdraw them from the top of the cylinder block.
12. Remove the top half bearing shells from the connecting rods if a new set is to be fitted, otherwise retain each one with its respective rod.

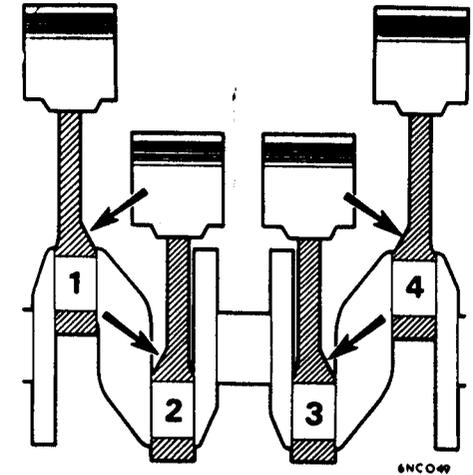
**Refitting**

13. Fit the bearing shells to the connecting rods and caps if renewing the bearings.
14. Lubricate the pistons with graphite oil (Acheson's Colloids 'Oildag') and space out the piston ring gaps at equal distances around the non-thrust side of the piston.

15. Fit tool 18G 55 A over each piston in turn to compress the rings.



17. Lubricate the bearings and refit the bit-end caps with new locking-plates; tighten the big-end bolts to the correct torque figure, see 'TORQUE WRENCH SETTINGS'; tap over the locking plate tabs.



16. Fit each piston and connecting rod assembly to its original bore noting the following:
  - a The word 'FRONT' on the piston crown faces the front of the engine.
  - b The offset of the bearings on No. 1 and No. 3 connecting rods is towards the rear of the engine.
  - c The offset of the bearings on No. 2 and No. 4 connecting rods is towards the front of the engine.

18. Refit the cylinder head, see 12.29.02.
19. Refit the rocker shaft, see 12.29.54.
20. a Refit the gearbox to the engine, see 37.20.01.  
b Refit the automatic gearbox to the engine, see 44.20.01.
21. Refit the engine dipstick
22. a Refit the engine/gearbox assembly, see 12.37.01.  
b Refit the engine/automatic gearbox assembly, see 12.37.01.

## CONNECTING RODS AND PISTONS

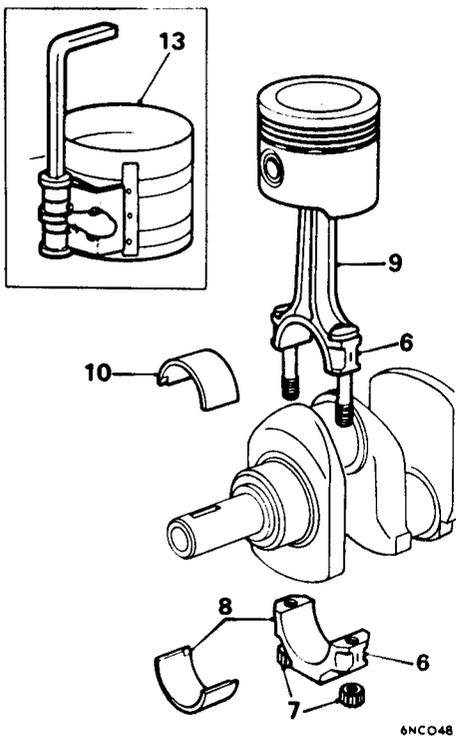
Remove and refit - 1275 and Turbo

12.17.01

Service tool: 18G 55 A

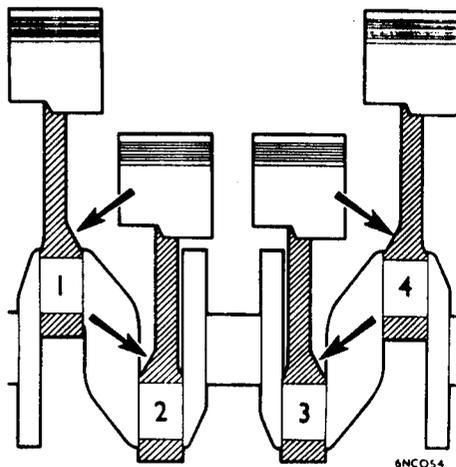
### Removing

1. Remove the engine/gearbox assembly, see 12.37.01.
2. Remove the gearbox from the engine, see 37.20.01.
3. Remove the rocker shaft, see 12.29.54.



4. Remove the cylinder head, see 12.29.02.

5. Withdraw the engine dipstick.
6. Check the identification marks on the connecting rods and big-end caps; mark each rod and cap as a pair in sequence '1' to '4' starting at the front if they are not marked.
7. Remove the multi-sided nuts securing the big-end caps.
8. Withdraw the big-end caps and bottom half bearing shells; retain each shell with its respective cap.
9. Push the piston and connecting rod assemblies upwards and withdraw them from the top of the cylinder block.

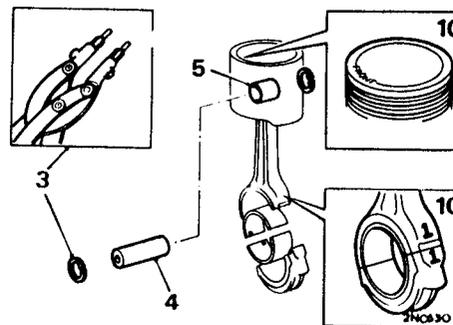


10. Remove the top half bearing shells from the connecting rods if a new set is to be fitted, otherwise retain each one with its respective rod.

### Refitting

11. Fit the bearing shells to the connecting rods and caps if renewing the bearings.

12. Lubricate the pistons with graphite oil (Acheson's Colloids 'Oildag') and space out the ring gaps equally on the non-thrust side of the piston.
13. Fit tool 18G 55 A over each piston to compress the rings.
14. Refit each piston and connecting rod assembly to its original bore, noting the following:
  - a The mark 'FRONT' or 'A' etched on the piston crown faces the front of the engine.
  - b The offset of the bearings on Nos. 1 and 3 connecting rods is towards the rear of the engine.
  - c The offset of the bearings on Nos. 2 and 4 connecting rods is towards the front of the engine.
15. Lubricate the bearings and refit the big-end caps; tighten the nuts to the correct torque figure, see 'TORQUE WRENCH SETTINGS'.
16. Refit the cylinder head, see 12.29.02.
17. Refit the rocker shaft, see 12.29.54.
18. Refit the gearbox to the engine, see 37.20.01.
19. Refit the engine dipstick.
20. Refit the engine/gearbox assembly, see 12.37.01.



## CONNECTING RODS AND PISTONS

Overhaul - 850, 100 and 1100 12.17.10

Gudgeon pin bush 1 and 3 to 10 12.17.13

Service tool: 18G 1004

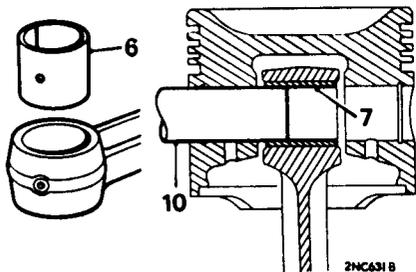
### Dismantling

1. Remove the connecting rods and pistons, see 12.17.01.
2. Remove the piston rings over the crown of the piston.
3. Remove the gudgeon pin retaining circlips, using tool 18G 1004.
4. Press out the gudgeon pin.
5. Check the bush in the connecting rod, press out if worn.

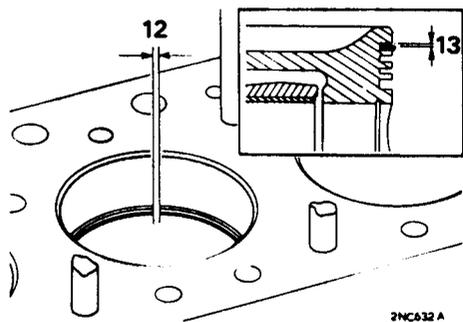
### Reassembling

6. Press the new bush into the connecting rod, aligning the oil holes. The split in the bush must be on the camshaft side of the engine.
7. Ream the bush to the dimensions given in DATA.
8. Check the connecting rod alignment.
9. Lubricate the gudgeon pin bores of the connecting rod and piston with graphited oil (Acheson's Colloids 'Oildag').
10. Press in the gudgeon pin and refer to **GENERAL SPECIFICATION DATA** for the selective fit.
 

**CAUTION:** The gudgeon pin bore is offset towards the camshaft side of the engine. It is essential that the piston is correctly fitted to the connecting rod, the word 'FRONT' on the piston crown faces the front of the engine. The number stamped on the connecting rod and cap faces the camshaft side of the engine.
11. Refit the gudgeon pin retaining circlips, using tool 18G 1004.

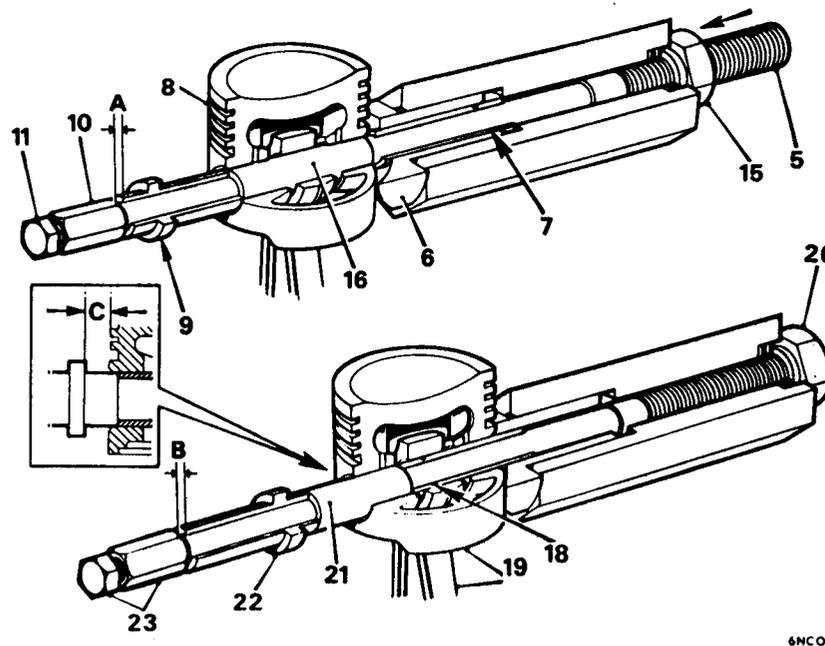


12. Insert each piston ring in turn squarely into its bore and check that the ring gap is within the tolerance figures given in **GENERAL SPECIFICATION DATA**.
13. Fit each ring into its groove on the piston and check the groove clearance is within the tolerance figures given in **GENERAL**

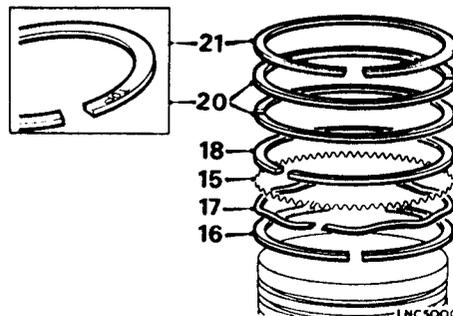


#### SPECIFICATION DATA

14. Assemble the piston rings onto each piston, commencing with the oil control ring expander.
15. Fit the expander into the bottom groove with the lugs butted together (not crossed) and inserted into one of the holes on the non-thrust side of the piston.
16. Fit the bottom rail of the assembly to the bottom of the groove.
17. Fit the side spring



18. Fit the top rail into the top of the bottom groove.



19. Stagger the gaps of the two rails and the side springs on the non-thrust side of the piston.

20. Fit the third and second taper compression rings with the faces marked 'TOP' towards the top of the piston.
21. Fit the chrome-plated compression ring to the top groove with the face marked 'TOP' towards the top of the piston.  
*Note: Position the compression ring gaps at 90 degrees to each other and away from the thrust side of the piston.*
22. Refit the connecting rods and pistons, see 12.17.01.

## CONNECTING RODS AND PISTONS

Overhaul - 1275 and Turbo 12.17.10

Service tool: 18G 1150, 18G 1150 A

### Dismantling

1. Remove the connecting rods and pistons, see 12.17.01.
2. Remove the piston rings over the crown of the piston.
3. Retain the hexagon body of tool 18G 1150 in a vice.
4. Screw the large nut back until it is flush with the end of the centre screw.
5. Push the screw forward until the nut contacts the thrust race.
6. Fit the large adaptor 18G 1150 A onto the centre screw.
7. Slide the parallel sleeve, groove end first, onto the centre screw and smear the outside diameter with oil.
8. Fit the piston onto the centre screw.
9. Fit the remover/replacer bush on the centre screw, with the flanged end away from the gudgeon pin.
10. Screw the stop nut onto the centre screw and adjust it until approximately 0.032 in (0.8 mm) end-play 'A' exists on the assembly.
11. Lock the stop nut securely with the lock screw.
12. Check that the remover/replacer bush and the parallel sleeve are correctly positioned in the bore on both sides of the piston.
13. Check that the curved face of the adaptor is clean.
14. Slide the piston on the tool so that it fits into the curved face of the adaptor.
15. Screw the large nut up to the thrust race.

16. Hold the lock screw, and turn the large nut until the gudgeon pin is withdrawn from the piston.

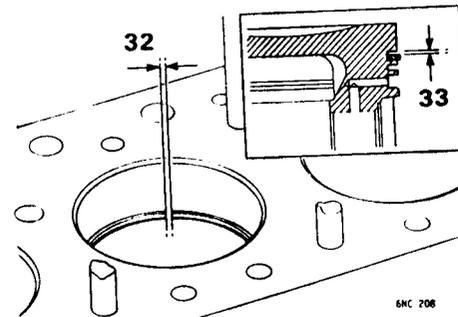
**Reassembling**

17. Remove the large nut of 18G 1150 and pull the centre screw out of the body a few inches.  
**CAUTION:** Ensure that the threads of the large nut and screw are lubricated and the piston support adaptor is in place.
18. Slide the parallel sleeve, groove end last, onto the centre screw and up to the shoulder.
19. Lubricate the gudgeon pin and bores of the connecting rod and piston with graphited oil (Acheson's Colloids 'Oildag').
20. Fit the connecting rod and piston to the tool with the connecting rod entered on the sleeve up to the groove.
21. Fit the gudgeon pin into the piston bore up to the connecting rod.
22. Fit the remover/replacer bush, with the flanged end towards the gudgeon pin.
23. Screw the stop nut onto the centre screw; adjust the nut to give a 0.032 in (0.8 mm) end-play 'B' and lock the nut securely with the lock screw.
24. Check that the curved face of the adaptor is clean.
25. Position the piston on the tool so that it fits into the curved face of the adaptor.
26. Screw the large nut up to the thrust race.
27. Set the torque wrench to 16 lbf ft (2.2 kgf m). This represents the minimum load for an acceptable fit.
28. Using the torque wrench on the large nut, and holding the lock screw, pull the gudgeon pin in until the flange of the

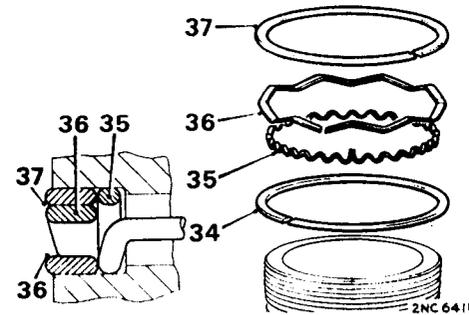
remover/replacer bush is 0.032 in (0.8 mm) 'C' from the piston skirt. Under no circumstances must the flange be allowed to contact the piston.

**CAUTION:** If the torque wrench has not broken throughout the pull, the fit of the gudgeon pin to the connecting rod is not acceptable and necessitates the renewal of components. The large nut and centre screw of the tool must be kept well oiled.

29. Remove the tool.
30. Check that the piston pivots freely on the pin, and is free to slide sideways. If stiffness exists, wash the assembly in fuel or paraffin (kerosene), lubricate the gudgeon pin with Acheson's Colloids 'Oildag' and re-check. If stiffness persists, dismantle and re-check for ingrained dirt or damage.
31. Check the piston and connecting rod for alignment.
32. Check the piston ring gaps in the cylinder bore, and adjust if necessary to the figures given in **GENERAL SPECIFICATION DATA**.



33. Check the compression ring to groove clearance, see **GENERAL SPECIFICATION DATA**.
34. Fit one of the rails to the piston and position it below the bottom groove.

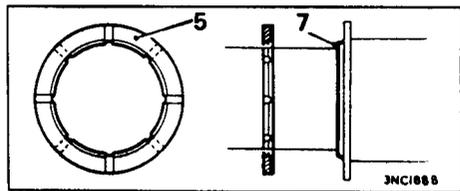
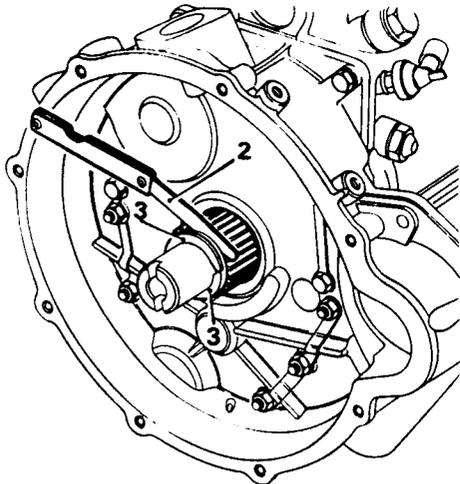


38. Fit the chrome-plated compression ring to the top groove.  
**Note:** Position the ring gaps at 90 degrees to each other on the non-thrust side of the piston.

35. Fit the oil control expander into the bottom groove, and move the rail previously positioned into this groove.
36. Fit the other rail into the bottom groove and check that the ends of the expander are butting together but not overlapping when both rails have been lightly squeezed together.
37. Set the gaps of the rails and the expander at not less than 90 degrees to each other on the non-thrust side of the piston. Fit the second and third compression rings, with the face marked 'TOP' towards the top of the piston.

**DATA**

Crankshaft primary gear end-float	0.0035 to 0.0065 in (0.089 to 0.165 mm)
Adjustment	Selective thrust washers
Thrust washer sizes available	0.110 to 0.112 in (2.80 to 2.85 mm)
	0.112 to 0.114 in (2.85 to 2.90 mm)
	0.114 to 0.116 in (2.90 to 2.95 mm)
	0.116 to 0.118 in (2.95 to 3.00 mm)
	0.118 to 0.120 in (3.00 to 3.05 mm)



## CRANKSHAFT PRIMARY GEAR END-FLOAT

**Check and adjust** 12.21.28

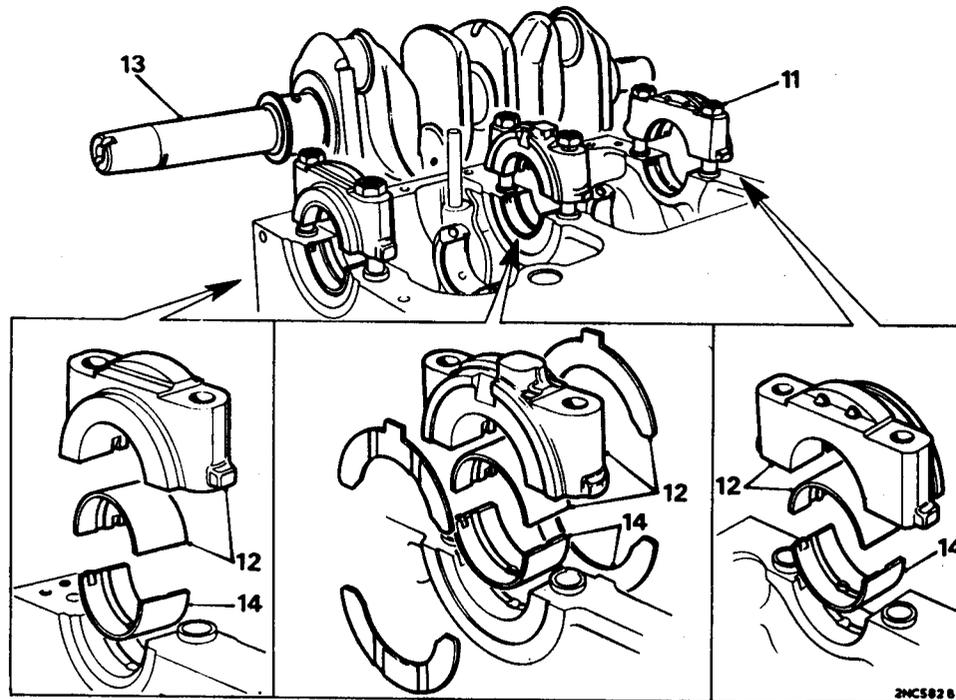
**Service tool:** 18G 1043, 18G 1068 B

### Checking

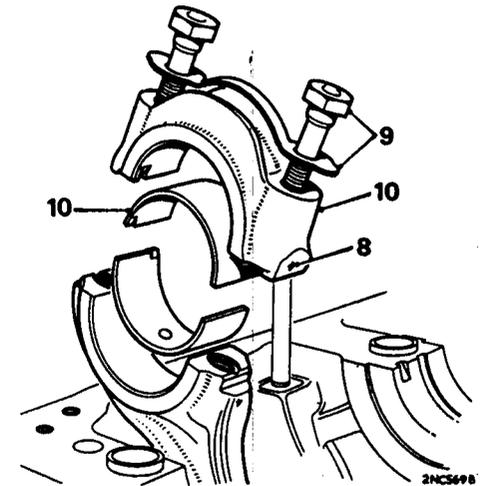
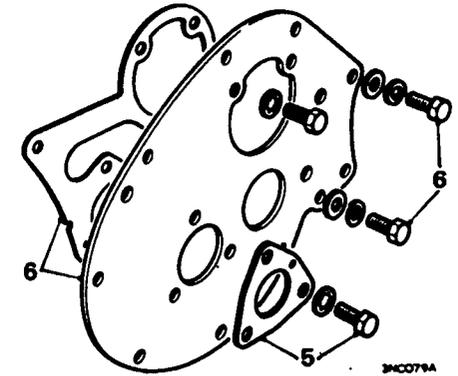
1. Remove the clutch/flywheel assembly, see 33.10.01.
2. Check the primary gear end-float with feeler gauges between the backing ring and the gear. The end-float figure is given in DATA.

### Adjusting

3. Remove the primary gear backing ring and the 'C' shaped rear thrust washer.



4. Remove the flywheel housing oil seal (includes removing the primary gear), see 12.53.02.
5. Remove the primary gear front thrust washer and measure its thickness.
6. Select a thrust washer (see DATA for sizes) which will set the primary gear end-float to the dimension given in DATA.
7. Smear the selected washer with grease and fit it with the chamfered side against the crankshaft register.
8. Refit the primary gear, backing ring, and the 'C' shaped rear thrust washer.
9. Re-check that the end-float is now within the tolerance given in DATA.
10. Remove the rear thrust washer, backing ring, and the primary gear.
11. Refit the flywheel housing oil seal (and primary gear), see 12.53.02.
12. Refit clutch/flywheel assembly, see 33.10.01.



## CRANKSHAFT

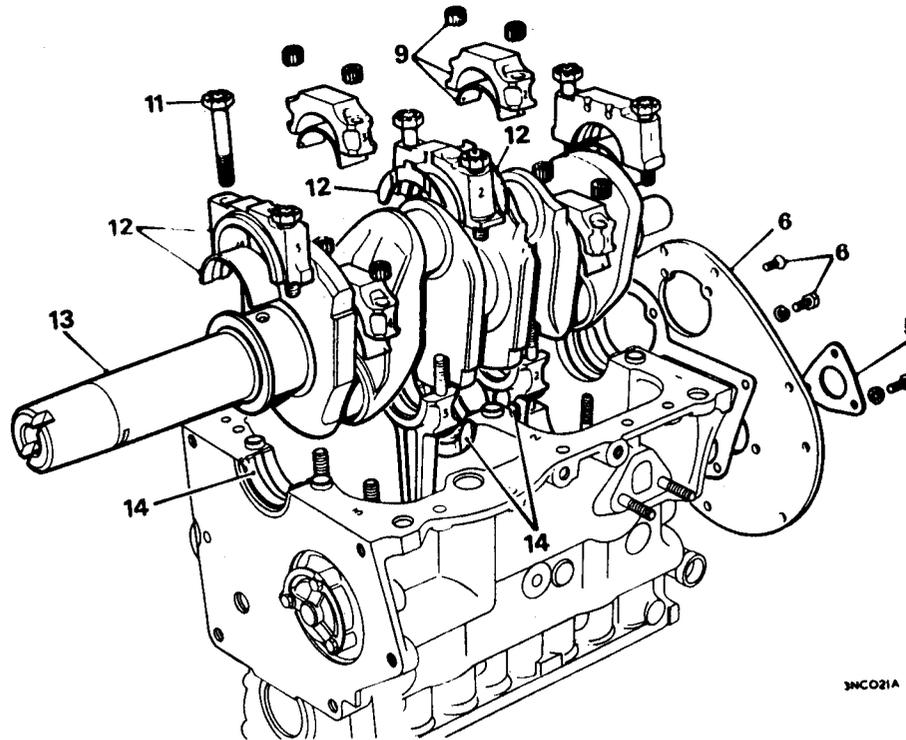
**Remove and refit - 850, and 1000**

12.21.33

### Removing

1.
  - a Remove the engine/gearbox assembly, see 12.37.01.
  - b Remove the engine/automatic gearbox assembly, see 12.37.01.

2. a Remove the gearbox from the engine, see 37.20.01.  
b Remove the automatic gearbox from the engine, see 44.20.01.
  3. Remove the timing chain and gears, see 12.65.12
  4. Remove the alternator adjusting link bracket.
  5. Remove the three securing screws and lift off the camshaft locating plate.
  6. Remove the retaining screws and lift off the cylinder block front plate and joint washer.
  7. Remove the crankshaft primary gear rear thrust washer and backing ring, pull off the primary gear and front thrust washer.
  8. Check the identification marks on the connecting rods and big-end caps; mark each rod and cap as a pair in sequence '1' to '4' starting at the front if they are not marked.
  9. Tap back the lock washer taps on the bearing cap securing bolts, remove the bolts and lift off the caps and bearing shells.
  10. Disconnect the connecting rods and bottom half bearing shells from the crankshaft.
  11. Remove the main bearing cap retaining bolts.
  12. Remove the main bearing caps with their bearing shells together with the thrust washer halves from the centre main bearing.
  13. Lift out the crankshaft.
  14. Remove the main bearing top half shells and the remaining halves of the thrust washers from the centre main bearing.
- Note:** Ensure that the bearing shells are retained with their respective caps for correct assembly.
- Refitting**
15. Thoroughly clean out all the crankshaft oilways.



16. Fit the top half main bearing shells into their respective locations in the cylinder block and lubricate with engine oil.
17. Fit the crankshaft into the bearings.
18. Fit the thrust washers with their oilways facing away from the bearings, with the tab on the washer locating in the slot on the centre main bearing cap.
19. Ensure that the bearing shells are correctly located in the caps, and refit the caps.
20. Check the crankshaft end-float, see **GENERAL SPECIFICATION DATA**. Rectify if necessary by selecting and fitting the required washers.
21. Tighten the main bearing cap retaining bolts to the correct torque figure, see '**TORQUE WRENCH SETTINGS**'.
22. Lubricate the connecting rod big-end bearings, refit the caps with new locking plates and tighten the retaining bolts, see '**TORQUE WRENCH SETTINGS**'. Tap over the locking plate tabs.

23. Refit the cylinder block front plate with a new joint washer and tighten the securing screws.
24. Refit the camshaft locating plate and tighten the securing screws.
25. Refit the camshaft primary gear, thrust washers and backing ring, checking and adjusting the primary gear end-float as described in 12.21.28.
26. Refit the timing chain and gears, see 12.65.12.
27. a Refit the gearbox to the engine, see 37.20.01.  
b Refit the automatic gearbox to the engine, see 44.20.01.
28. Refit the alternator adjusting link and adjust the driving belt.
29. a Refit the engine/gearbox assembly, see 12.37.01.  
b Refit the engine/automatic gearbox assembly, see 12.37.01
30. Refill the engine/gearbox with the correct quantity of oil, see '**SERVICE LUBRICANTS**'.

## CRANKSHAFT

Remove and refit - 1275 and Turbo

12.21.33

### Removing

1. Remove the engine/gearbox assembly, see 12.37.01
2. Remove the gearbox from the engine, see 37.20.01.
3. Remove the timing chain and gears, see 12.65.12.
4. Remove the alternator adjusting link bracket.
5. Remove the three securing screws and lift off the camshaft locating plate.
6. Remove the retaining screws and lift off the cylinder block front plate and joint washer.

7. Remove the crankshaft primary gear rear thrust washer and backing ring, pull off the primary gear and front thrust washer.
8. Check the identification marks on the connecting rods and big-end caps; mark each rod and cap as a pair in sequence '1' to '4' starting at the front if they are not marked.
9. Remove the multi-sided nuts retaining the big-end caps and detach the caps and bearing shells from the crankshaft.
10. Release the connecting rods and retain each bearing shell with its respective rod.
11. Remove the main bearing cap retaining bolts.
12. Remove the main bearing caps with their bearing shells together with the thrust washer halves from the centre main bearing.
13. Lift out the crankshaft.
14. Remove the main bearing top half shells and the remaining halves of the thrust washers from the centre main bearing.

**Note:** Ensure that the bearing shells are retained with their respective caps for correct assembly.

#### Refitting

15. Thoroughly clean out all the crankshaft oilways.
16. Fit the top half main bearing shells into their respective locations in the cylinder block and lubricate with engine oil.
17. Fit the crankshaft into the bearings.
18. Fit the thrust washers with their oilways facing away from the bearings, with the tab on the washer locating in the slot on the centre main bearing cap.
19. Ensure that the bearing shells are correctly located in the caps, and refit the caps.

20. Check the crankshaft end-float, see **GENERAL SPECIFICATION DATA**. Rectify if necessary by selecting and fitting the required thrust washers.
21. Tighten the main bearing cap retaining bolts, see **'TORQUE WRENCH SETTINGS'**.
22. Lubricate the connecting rod big-end bearings, refit the caps and tighten the retaining nuts, see **'TORQUE WRENCH SETTINGS'**.
23. Refit the cylinder block front plate with a new joint washer and tighten the securing screws.
24. Refit the camshaft locating plate and tighten the securing screws.
25. Refit the crankshaft primary gear, thrust washers and backing ring, checking and adjusting the primary gear end-float as described in 12.21.28.
26. Refit the timing chain and gears, see 12.65.12.
27. Refit the gearbox to the engine, see 37.20.01.
28. Refit the alternator adjusting link and adjust the driving belt.
29. Refit the engine/gearbox assembly, see 12.37.01.
30. Refill the engine/gearbox with the correct quantity of oil, see **'SERVICE LUBRICANTS'**.

### CYLINDER BLOCK LINERS

Remove and refit 12.25.26

Liners not previously fitted 1 to 7, and 11 to 18

Liners already fitted 1 to 10, and 12 to 18

**Note:** Should the condition of the cylinders bores be such that they cannot be cleaned up to accept oversize pistons, dry cylinder liners can be fitted.

#### Removing

1. a Remove the engine/gearbox assembly, see 12.37.01.  
b Remove the engine/automatic gearbox assembly, see 12.37.01.
2. a Remove the gearbox from the engine, see 37.20.01.  
b Remove the automatic gearbox from the engine, see 44.20.01.
3. Remove the cylinder head, see 12.19.02.
4. Remove the crankshaft, see 12.21.33.
5. Remove the connecting rods and pistons, 12.17.01.
6. Remove the tappets, see 12.29.57.
7. Remove the cylinder head studs.
8. Place the cylinder block on the bed of a press supported on wooden blocks, with the cylinder head face upwards.
9. Screw the pilot extension into the pressing-out pilot, and insert the pressing-out pilot into the top of the cylinder liner.
10. Press the worn liner out of the cylinder block bore, using a power press capable of 5 to 8 tons (5080 to 8128 kg) pressure.

#### Refitting

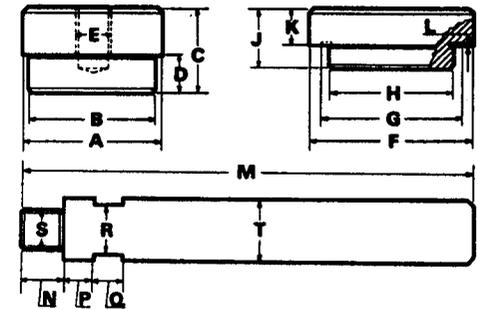
11. Machine and hone the cylinder block bores to the dimension given in DATA.
12. Place the cylinder block on the head of the press, supported on wooden blocks, with the cylinder head face upwards.
13. Position the new liner with the chamfered end leading, in the top of the cylinder block bore.
14. Insert the pressing-in pilot in the top of the liner.
15. Check that the liner is square with the top of the cylinder block, and the press is over the centre of the bore.

16. Press the liner into the cylinder block, using a press capable of 3 tons (3048 kg) pressure.
17. Machine and hone the bores of the cylinder liners to the 'standard' bore size given in DATA.
18. Reverse the procedure in 1 to 7.

#### Pilots

Pilots should be made to the dimensions given from case-hardening steel and case-hardened.

The pilot extension should be made from 55-ton hardening and tempering steel, hardened in oil and then tempered at 550°C (1020°F).



SNC 481A

## DATA

Cylinder liners	850	1000 and 1100	1275 and Turbo		850	1000 and 1100	1275 and Turbo
Outside diameter	2.606 to 2.60675 in (66.19 to 66.21 mm)	2.64325 to 2.6440 in (67.1385 to 67.1576 mm)	2.8775 to 2.87825 in (73.09 to 73.106 mm)	Pressing-out pilot	A. 2.578 + 0.005 in - 0.000 in (65.48 + 1.127 mm - 0.000 mm)	2.625 + 0.005 in - 0.000 in (66.67 + 1.127 mm - 0.000 mm)	2.778 + 0.005 in - 0.000 in (70.55 + 1.127 mm - 0.000 mm)
Interference fit in cylinder block	0.002 to 0.00325 in (0.05 to 0.08 mm)	0.002 to 0.00325 in (0.05 to 0.08 mm)	0.002 to 0.00325 in (0.05 to 0.08 mm)		B. 2.465 + 0.000 in - 0.005 in (62.61 + 0.000 mm - 0.127 mm)	2.537 + 0.000 in - 0.005 in (64.44 + 0.000 mm - 0.127 mm)	2.859 + 0.000 in - 0.005 in (72.63 + 0.000 mm - 0.127 mm)
Bore of cylinder block - machined before fitting					C. 1.75 in (44.45 mm)	1.75 in (44.45 mm)	1.75 in (44.45 mm)
liner	2.6035 to 2.604 in (66.128 to 66.14 mm)	2.64075 to 2.644 in (67.0579 to 67.1576 mm)	2.8750 to 2.8755 in (73.02 to 73.04 mm)		D. 0.75 in (19 mm)	0.75 in (19 mm)	0.75 in (19 mm)
Bore of liner - machined after fitting ('standard')	2.477 to 2.4785 in (62.915 to 62.954 mm)	2.5420 to 2.5435 in (64.566 to 64.605 mm)	2.779 to 2.7805 in (70.59 to 70.62 mm)	Pressing-in pilot	E. $\frac{3}{4}$ in B.S.W. thread	$\frac{3}{4}$ in B.S.W. thread	$\frac{3}{4}$ in B.S.W. thread
					F. 3.00 in (76.20 mm)	3.062 in (77.78 mm)	3.312 in (84.14 mm)
					G. 2.625 in (66.68 mm)	2.687 in (68.26 mm)	2.906 in (73.8 mm)
					H. 2.455 + 0.000 in - 0.005 (62.35 + 0.000 mm - 0.127)	2.515 + 0.000 in - 0.005 (63.88 + 0.000 mm - 0.127)	2.753 + 0.000 in - 0.005 (69.85 + 0.000 mm - 0.127)
					J. 1.25 in (31.75 mm)	1.25 in (31.75 mm)	1.25 in (31.75 mm)
					K. 0.75 in (19 mm)	1.25 in (19 mm)	0.75 in (19 mm)
					L. 0.015 in (0.38 mm)	0.015 in (0.38 mm)	0.015 in (0.38 mm)
				Pilot extension	M. 10.50 in (26.67 cm)	10.50 in (26.67 cm)	10.50 in (26.67 cm)
					N. 0.875 in (22.22 mm)	0.875 in (22.22 mm)	10.50 in (22.22 mm)
					P. 0.625 in (15.87 mm)	0.625 in (15.87 mm)	0.625 in (15.87 mm)
					Q. 0.625 in (15.87 mm)	0.625 in (15.87 mm)	0.625 in (15.87 mm)
					R. Two flats 1 in (25.4 mm) across	Two flats 1 in (25.4 mm) across	Two flats 1 in (25.4 mm) across
					S. $\frac{3}{4}$ in B.S.W. thread	$\frac{3}{4}$ in B.S.W. thread	$\frac{3}{4}$ in B.S.W. thread
					T. 1.25 in (31.75 mm)	1.25 in (31.75 mm)	1.25 in (31.75 mm)

## CYLINDER HEAD GASKET

Remove and refit - Not Turbo 12.29.02

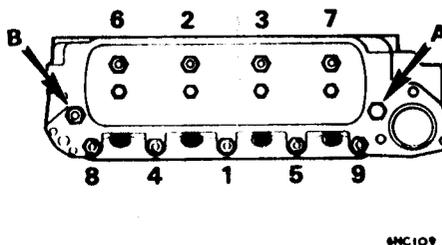
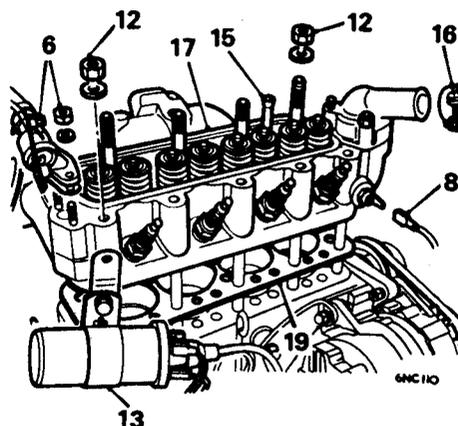
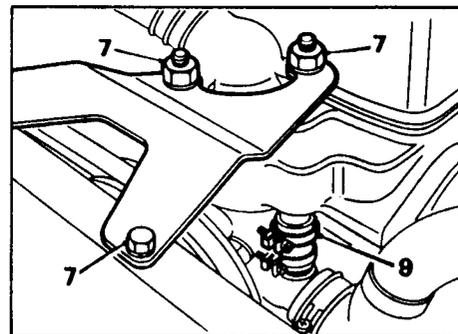
### Removing

1. Remove the cylinder block drain plug and drain the coolant into a clean container.
2. Remove the carburetter air cleaner.
3. Disconnect the distributor vacuum pipe, fuel hose and engine breather pipe from the carburetter.
4. Remove the securing nuts, detach the carburetter and place it to one side.
5. Slacken the exhaust pipe/manifold flange clamp bolts and release the exhaust pipe.
6. Remove the securing nuts, detach the heater water valve and place it to one side.
7. Remove the nuts and bolts securing the radiator upper support bracket and remove the bracket.
8. Disconnect the h.t. leads and the electrical connection from the temperature gauge transmitter.
9. Slacken the clip securing the bypass hose to the cylinder head.
10. Remove the rocker cover, see 12.49.42.
11. 1275 GT: Remove the securing bolt 'A' and nut 'B' shown in the illustration from the cylinder head.
12. Remove the cylinder head and rocker pedestal nuts.
13. Remove the ignition coil and place to one side.
14. Remove the rocker shaft assembly.
15. Withdraw the push-rods, keeping them in their installed order.
16. Disconnect the top hose from the thermostat housing.
17. Lift off the cylinder head complete with the exhaust manifold.
18. Remove the exhaust manifold from the cylinder head if necessary.

19. Remove the cylinder head gasket.

### Refitting

20. Clean the underside of the cylinder head and the mating face on the cylinder block.  
**WARNING: Do not use an airline to blow gasket dust, asbestos dust can be a serious health hazard if inhaled. Use methylated spirit or denatured alcohol to wash dust from components. Do not use any petroleum-based fluids.**
21. Fit a new cylinder head gasket with the side marked 'TOP' uppermost and the end marked 'FRONT' to the front of the engine.
22. Fit a new exhaust manifold gasket and refit the manifold to the cylinder head (if removed).
23. Refit the cylinder head.
24. The remainder is a reversal of the removing procedure in 2 to 16.
25. Tighten the cylinder head nuts gradually in the sequence shown (followed by bolt 'A' and nut 'B' - 1275 GT only) to 50% of the full torque value, then tighten in the same sequence to the full torque of 68 Nm, 6.9 kgf m, 50 lbf ft.
26. Tighten the rocker shaft bracket nuts to a torque of 32 Nm, 3.2 kgf m, 24 lbf ft.
27. Check the valve clearances and adjust if necessary, see 12.29.48.
28. Refill the cooling system, see 26.10.02.
29. Run the engine at fast idle speed for at least 15 minutes or road test for 5 miles (8 km), then allow the engine to cool.
30. In the sequence shown, slacken and tighten each cylinder head nut individually; slackening a half-turn then re-tightening to the full torque.
31. Check the valve clearances, and adjust if necessary, see 12.29.48.



## CYLINDER HEAD GASKET

Remove and refit - emission control engine 12.29.02

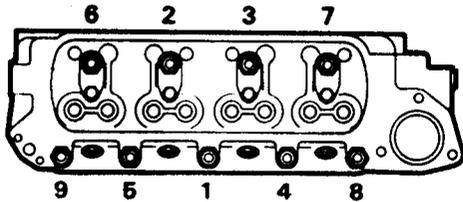
### Removing

1. Drain the cooling system and refit the cylinder block drain plug.
2. Remove the air cleaner and air temperature control valve assembly.
3. Disconnect the hose at the check valve and air pump.
4. Disconnect the hose at the gulp valve and place the diverter valve to one side.
5. Disconnect the leads from the spark plugs.
6. Remove the No.1 spark plug.
7. Slacken the bolt, alternator pivot and air pump adjusting link.
8. Remove the screw securing the adjusting bracket to the air pump.
9. Remove the air pump pivot bolt, release the drive belt and remove the air pump.
10. Slacken the top hose clips, remove the two screws securing the radiator to the top mounting bracket and remove the top hose.
11. Remove the rocker cover nuts. Position the heater hoses clear.
12. Pull the purge pipe from the rocker cover pipe and remove the rocker cover and gasket.
13. Release the heater water control valve from the cylinder head and position it clear.
14. Disconnect the lead from the manifold heater.
15. Remove the two nuts securing the carburetter to the manifold. Withdraw the carburetter assembly, induction heater and mounting bracket from the studs and position them clear.
16. Remove the hot air duct.
17. Remove the exhaust manifold pipe clamp.

18. Progressively slacken the cylinder head and rocker shaft nuts in the reverse order of the tightening sequence.
19. Remove the rocker assembly.
20. Remove the push-rods, **keeping them in their installed order**.
21. Remove the coil and position it clear.
22. Slacken the clip securing the bypass hose to the cylinder head.
23. Remove the four remaining nuts and lift the cylinder head assembly squarely off the studs. Lift the gasket from the studs.  
*Note: If the head will not release from the gasket, tap each side of the head with a soft faced mallet.*

#### Refitting

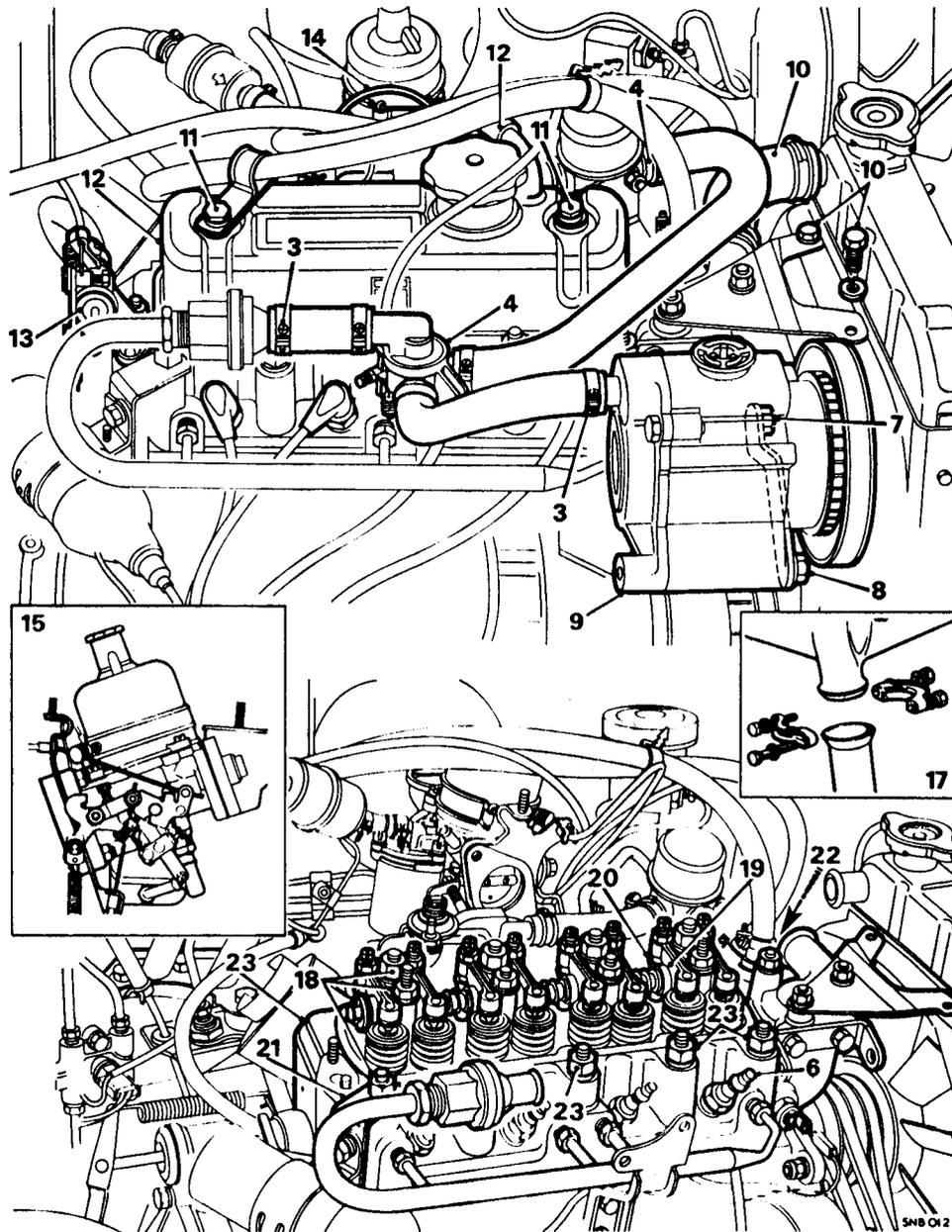
24. Reverse the procedure in 1 to 23, noting:
  - a Thoroughly clean the joint faces of the cylinder block and head.



SNC 335A

**WARNING:** Do not use an airline to blow gasket dust, asbestos dust can be a serious health hazard if inhaled. Use methylated spirit or denatured alcohol to wash dust from components. Do not use any petroleum-based fluids.

- b Fit a new gasket dry, with the end marked 'FRONT' to the water pump and the face marked 'TOP' upwards.



- c Tighten the cylinder head nuts gradually in the sequence shown to 50% of the full torque value, then tighten in the same sequence to the full torque of 54 Nm, 5.5 kgf m, 40 lbf ft. Tighten the rocker shaft bracket nuts to a torque of 32Nm, 3.2 kgf m, 24 lbf ft.
  - d Check the carburettor throttle damper, see 19.20.08.
  - e Check and adjust the valve rocker clearances, see 'MAINTENANCE'.
  - f Refill the cooling system.
  - g Check and adjust the carburettor setting., see 'MAINTENANCE'.
  - h Adjust the tension of the drive belts, see 'MAINTENANCE'.
25. Run the engine at a fast idle speed for at least 15 minutes or road test it for 5 miles (8 km), then allow it to cool.
  26. In the sequence shown, slacken and tighten each cylinder head nut individually; slackening a half-turn and then re-tightening to the full torque.
  27. Check the valve clearances and adjust if necessary, see 'MAINTENANCE'.

## CYLINDER HEAD

Overhaul 12.29.19

*Service tool: 18G 29, 18G 45, and either 18G 27, 18G 167, 18G 167 A, 18G 167 B, 18G 167 C, 18G 167 D or MS 76, MS 113 R, MS 120-7, MS 150-7, MS 204.*

#### Dismantling

1. Remove the cylinder head, see 12.29.11.
2. Remove the manifold.
3. Remove the spark plugs.

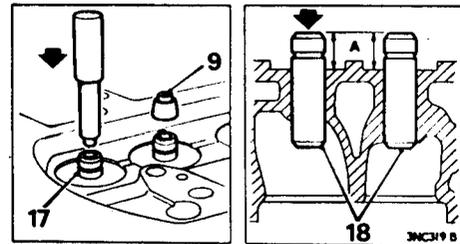
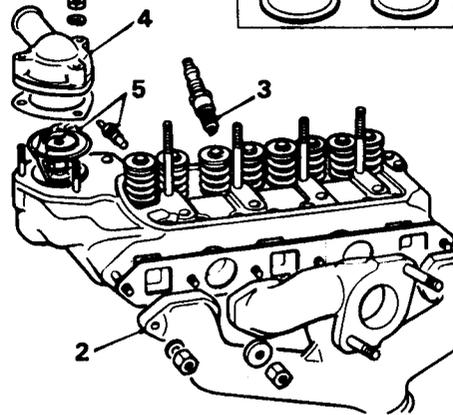
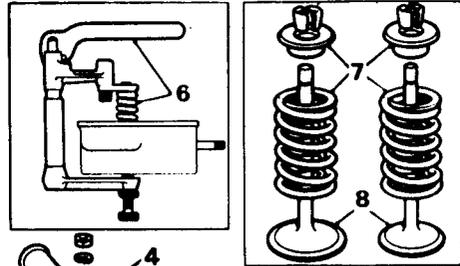
4. Remove the water outlet elbow and thermostat housing.
5. Remove the thermostat and temperature gauge transmitter.
6. Use tool 18G 45 to compress the valve spring.
7. Remove the cotters, spring cup and spring.
8. Remove the valve.
9. 1275 GT and Turbo: Remove the oil seals from the inlet valve guides.
10. Repeat the procedure in 6 to 8 to remove the other valves; retain them in their installation order.
11. Decarbonize the cylinder head and valves, taking care not to damage the valve seats and faces.

#### Inspecting

12. Check each valve face for damage, severe pitting or burning and renew valves which cannot be satisfactorily refaced (see the procedure in 19 to 22).
13. Check each valve stem for undue wear, and renew as necessary.
14. Insert each valve into its respective guide and check by hand feel the stem to guide clearance; if the head of the valve can be rocked excessively (with the maximum length of stem in the guide), renew the guides as detailed in procedures 17 and 18.
15. Examine the combustion chamber valve seats for cracks, severe pitting or burning. If a valve seat cannot be restored by refacing, a valve seat insert should be fitted; this is additional work and is covered by the procedure in 23 to 25.
16. Check the condition of all valve springs; renew as necessary.

#### Valve guides

17. Press out worn guides downwards into the combustion space (in the direction of the arrow).



18. Press in new valve guides from the top of the cylinder head (in the direction of the arrow) until the top of the guide is 'A' 0.540 in (13.72 mm) above the machined face of the valve spring seating.

#### Valve seat reconditioning

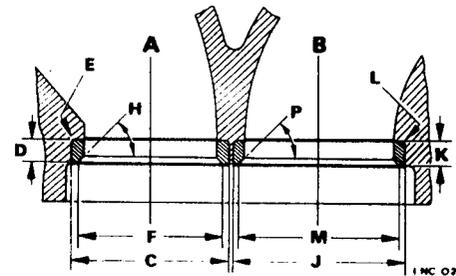
**Note:** Adjustable cutter MS 204 and expandable pilot MS 150-7 are for 1275 GT and Turbo only.

19. Remove the inlet and exhaust valve seat glazing, using tools 18G 27, 18G 167 A, and 18G 167 D.
20. Re-cut the inlet and exhaust valve seats, removing the minimum amount of metal necessary to correct the seat, using tools 18G 27, 18G 167 and 18G 167 D.
21. Narrow the inlet and exhaust valve seats, using tools 18G 27, 18G 167 B, 18G 167 C and 18G 167 D.
22. Lap the valves to the seats with fine grinding paste, using tool 18G 29.

#### Valve seat inserts

If valve seat inserts cannot be restored by the cutting procedure in 19 to 22, seat inserts are available for fitting.

23. Machine the cylinder head to accept the inserts to the dimensions given.
24. Press in the inserts.
25. Cut the seats in the inserts as in 19 to 22 to the dimensions given, ensuring that the throats of the inserts blend to those of the cylinder head.



#### 850 and 1000

##### EXHAUST (A)

- C. 1.124 to 1.125 in (28.55 to 28.58 mm).
- D. 0.186 to 0.188 in (4.72 to 4.77 mm)
- E. Maximum radius 0.015 in (0.38 mm).
- F. 1.0235 to 1.0435 in (25.99 to 26.50 mm)
- H. 45°

##### INLET (B)

- J. 1.187 to 1.188 in (30.16 to 30.17 mm)
- K. 0.186 to 0.188 in (4.72 to 4.77 mm)
- L. Maximum radius 0.015 in (0.38 mm)
- M. 1.0855 to 1.1055 in (27.58 to 28.07 mm)
- N. 45°

#### 1100

##### EXHAUST (A)

- C. 1.124 to 1.125 in (28.55 to 28.58 mm)
- D. 0.186 to 0.188 in (4.72 to 4.77 mm)
- E. Maximum radius 0.015 in (0.38 mm)
- F. 1.0235 to 1.0435 in (25.99 to 26.50 mm)
- H. 45°

##### INLET (B)

- J. 1.3075 to 1.3085 in (33.18 to 33.20 mm)
- K. 0.186 to 0.188 in (4.72 to 4.77 mm)
- L. Maximum radius 0.015 in (0.38 mm)
- M. 1.1435 to 1.1635 in (29.05 to 29.55 mm)
- P. 45°

## 1275 GT and Turbo

### EXHAUST (A)

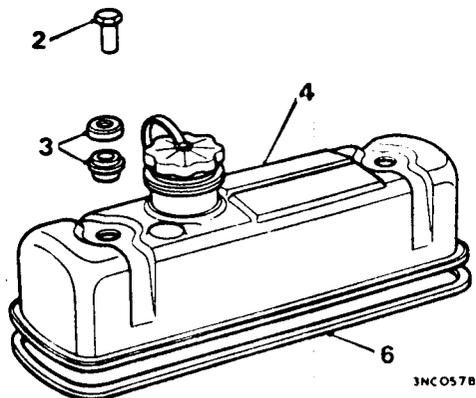
- C. 1.2505 to 1.2515 in (31.76 to 31.78 mm)
- D. 0.186 to 0.188 in (4.72 to 4.77 mm)
- E. Maximum radius 0.015 in (0.38 mm)
- F. 1.144 to 1.164 in (29.06 to 29.56 mm)
- H. 45°

### INLET (B)

- J. 1.3805 to 1.3815 in (33.063 to 35.088 mm)
- K. 0.186 to 0.188 in (4.72 to 4.77 mm)
- L. Maximum radius 0.015 in (0.38 mm)
- M. 1.2995 to 1.3195 in (33.10 to 33.52 mm)
- P. 45°

### Reassembling

26. Reverse the procedure in 2 to 10, noting the following:
  - a. Lubricate the inlet valve stem oil seals with engine oil and fit them onto the inlet valve guides.
  - b. Test that the thermostat is in good working order, see 26.45.09.
  - c. Fit new joint washers when refitting the exhaust manifold and water outlet elbow.
  - d. Apply a suitable sealant to the threads of the water transmitter.
27. Refit the cylinder head, see 12.29.11.



### ROCKER COVER

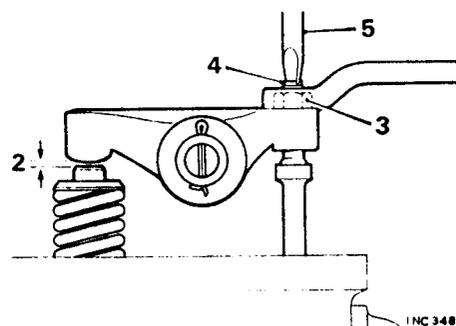
Remove and refit 12.29.42

#### Removing

1. Clubman/1275 GT and Turbo: Release the three clips and remove the ignition shield.
2. Remove the two nuts retaining the rocker cover.
3. Remove the cup washers and seals.
4. Lift off the rocker cover.
5. Remove all traces of the old joint washer from the cover and cylinder head joint faces.

#### Refitting

6. Smear the joint face of the rocker cover with Hylomar jointing compound or similar equivalent and fit a new joint washer to the cover face.
7. Refit the cover, seals and cup washers: tighten the retaining nuts evenly.



### VALVE CLEARANCE

Check and adjust 12.29.48

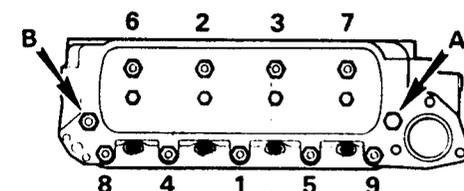
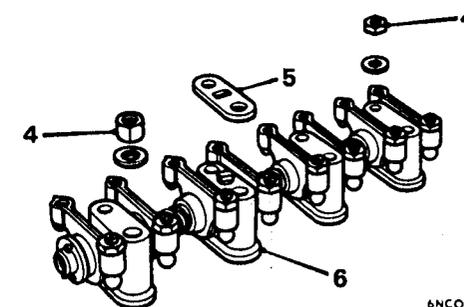
#### Checking

1. Remove the rocker cover, see 12.29.42.
2. Check the clearance between the valve rocker arms and valve stems using the correct size of feeler gauge. The gauge should be a sliding fit when the engine is cold. Check the clearance of each valve in the following order.

Check No. 1 valve with No. 8 fully open  
Check No. 3 valve with No. 6 fully open  
Check No. 5 valve with No. 4 fully open  
Check No. 2 valve with No. 7 fully open  
Check No. 8 valve with No. 1 fully open  
Check No. 6 valve with No. 3 fully open  
Check No. 4 valve with No. 5 fully open  
Check No. 7 valve with No. 2 fully open

#### Adjusting

3. Slacken the locknut.
4. Rotate the screw, clockwise to decrease or anti-clockwise to increase the clearance.
5. Retighten the locknut when the clearance is correct, holding the screw against rotation.
6. Refit the rocker cover, see 12.29.42.



### ROCKER SHAFT ASSEMBLY

Remove and refit 12.29.54

#### Removing

1. Remove the cylinder block drain plug and drain the coolant into a clean container, see 26.10.01.
2. Detach the distributor vacuum pipe from the carburetter.
3. Remove the rocker cover, see 12.29.42.
4. Slacken evenly and remove the eight nuts retaining the rocker shaft brackets to the cylinder head.
5. Remove the locking plate from No. 2 rocker shaft bracket.
6. Remove the rocker shaft assembly.

### Refitting

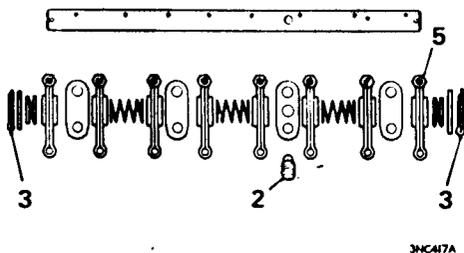
- Reverse the procedure in 1 to 6 noting:
  - 850, 1000 and 1100: Torque tighten the cylinder head nuts in the sequence shown, see 'TORQUE WRENCH SETTINGS'.
  - Emission control engine: Torque tighten the cylinder head nuts in the sequence shown, see 'TORQUE WRENCH SETTINGS'.
  - 1275 GT and Turbo: Tighten the bolt 'A' and nut 'B' to the correct torque figure, see 'TORQUE WRENCH SETTINGS'.
- Refill the cooling system, see 26.10.01.
- Adjust the valve clearances, see 12.29.48.

## ROCKER SHAFT ASSEMBLY

Overhaul - 850, 100 and 1100 12.29.55

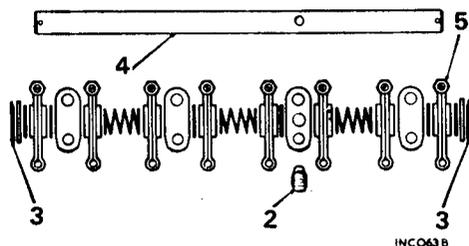
### Dismantling

- Remove the rocker shaft, see 12.29.54.
- Remove the rocker shaft locating screw from No. 2 rocker shaft bracket.
- Remove the split pins from each end of the rocker shaft.
- Slide the components off the rocker shaft.
- Remove the adjuster screws.



### Inspecting

- Clean the oilways of the rocker shaft.
- Examine the rocker to valve contact face for wear and renew if necessary.
- Renew the rocker adjusting screws if they show signs of uneven wear.
- Reverse the procedure in 1 to 5, noting that the double coil spring washers are fitted at either end of the rocker shaft.



## ROCKER SHAFT ASSEMBLY

Overhaul - 1275 GT and Turbo 12.29.55

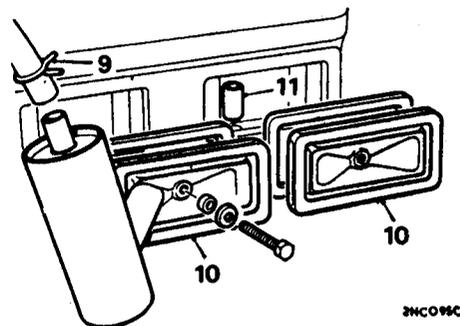
### Dismantling

- Remove the rocker shaft, see 12.29.54.
- Remove the rocker shaft locating screw from No. 2 rocker shaft bracket.
- Remove the split pins from each end of the rocker shaft.
- Slide the components off the rocker shaft.
- Remove the adjuster screw.

### Inspecting

- Clean the oilways of the rocker shaft.
- Examine the rocker to valve contact face for wear, and renew if necessary.
- Renew the rocker adjusting screws if they show signs of uneven wear.

- Reverse the procedure in 1 to 5, noting:
  - Shims are fitted either side of No. 1 and No. 8 rocker.
  - That a shim is fitted behind No. 2 rocker shaft bracket.
  - That a shim is fitted in front of No. 3 rocker shaft bracket.



## TAPPETS

Remove and refit - 850, 1000 and 1100

12.29.57

### Removing

- Remove the bonnet, see 76.16.01.
- Clubman: Remove the ignition shield.
- Remove the carburetter air cleaner.
- Remove the rocker cover.
- Remove the rocker shaft assembly, see 12.29.54.
- Withdraw the push rods and retain them in their installation order.
- Remove the bolt retaining the tie-rod to the rear end of the cylinder block, slacken the nut and bolt securing the other end of the tie-rod and swing the rod away from the engine.
- Remove the manifold, see 30.15.01.

- Release the retaining clip and pull the purge pipe off the crankcase breather oil separator.
- Remove the retaining screws and withdraw the tappet side covers and joint washers.
- Withdraw the tappets from their locations in the tappet chamber, use a pair of pointed nose pliers for those which are difficult to remove with the fingers. Retain the tappets in their installation order.

### Inspecting

- Examine the operating surfaces of the tappets for pitting or wear, and renew where necessary.

### Refitting

- Lubricate and refit the tappets in their installation order except where renewal is required.
- Reverse the procedure in 2 to 10 fitting new joint washers. Tighten the side cover retaining bolts, see 'TORQUE WRENCH SETTINGS'.
- Torque tighten the cylinder head and rocker shaft assembly, see 12.29.54.
- Adjust the valve clearances, see 12.29.48.
- Refit the bonnet, see 76.16.01.

## TAPPETS

Remove and refit - 1275 GT and Turbo

12.29.57

### Removing

- Remove the engine/gearbox assembly, see 12.37.01.
- Remove the gearbox from the engine, see 37.20.01.
- Remove the rocker shaft assembly, see 12.29.54.
- Withdraw the push-rods and retain them in their installation order.

5. Remove the timing chain and gear, see 12.65.12
6. Remove the distributor, see 86.35.20.
7. Remove the distributor drive shaft, see 12.20.22.
8. Remove the fuel pump - not Turbo, see 19.45.08.
9. Remove the camshaft, see 12.13.01.
10. Withdraw the tappets downwards through the bottom of their bores, keeping them in their installed order.

#### Inspecting

11. Examine the operating faces of the tappets for pitting or wear, and renew where necessary.

#### Refitting

12. Refit the tappets in their original bores; where replacements are fitted, ensure that they slide freely in their bores.
13. Reverse the procedure in 1 to 9.
14. Adjust the valve clearances, see 12.29.48.

## ENGINE AND AUTOMATIC GEARBOX ASSEMBLY

### Remove and refit 12.37.01

#### Removing

1. Remove the bonnet, see 76.10.01.
2. Disconnect the battery.
3. Remove the carburetter air cleaner.
4. Disconnect the petrol feed hose, vacuum advance pipe and the breather hose from the carburetter.
5. Disconnect the kickdown control rod.
6. Remove the retaining nuts, detach the carburetter from the manifold and place it to one side.
7. Disconnect the inlet hose from the fuel pump.

8. Remove the cylinder block drain plug and drain the coolant
9. Remove the heater water control valve from the cylinder head and move it aside.
10. Disconnect the exhaust down pipe from the exhaust manifold flange.
11. 1000: Disconnect and remove the horn.
12. From beneath the R.H. front wing, release the flexible pipe from the air intake.
13. Remove the intake from the wing valance.
14. Disconnect the starter cable connection, remove the starter solenoid retaining screws and place the solenoid through the intake hold in the wing valance.
15. Clubman: Remove the ignition shield and its retaining brackets off the rocker cover.
16. Disconnect all electrical connections from the engine ancillary units and the engine earth strap(s) from the engine.
17. 1000: Pull the h.t. leads off the spark plugs and coil and remove the distributor cap and rotor arm.
18. Release the engine tie rod from the rear of the cylinder block, slacken the bolt and nut securing the other end of the rod and swing it clear of the power unit.
19. 1000: Disconnect the oil gauge hose from the pipe at the rear of the cylinder block.
20. Disconnect the heater hose from the bottom water hose connection (adjacent to the water pump).
21. Remove the rocker cover and fit the engine lifting attachment bracket.
22. Raise the front of the car and support both sides, the road wheels must be free to rotate.

23. Disconnect the exhaust pipe from the steady bracket and remove the bracket from the final drive housing.
24. Depending on the type of joint fitted, either remove the nuts retaining the drive shaft universal joints to the final drive flanges or carry out item 28 in operation 12.37.01 for the manual gearbox.
25. Remove the gear change cable cover retaining screws and detach the cover.
26. Disconnect and release the gear change cable from the gearbox.
27. Remove the nuts and screws retaining the engine mountings to the sub-frame.
28. Attach the engine lifting equipment.
29. Raise the power unit sufficiently to release the drive shafts from the driving flanges and disconnect the speedometer cable from the drive pinion.
30. Lift the power unit out of the car.

#### Refitting

31. Reverse the procedure in 1 to 30 noting the following:
  - a Lower the power unit into the engine compartment to a position where the drive shafts can be engaged onto the drive flanges and screw the nuts on loosely, tighten the nuts when the power unit is lowered into position.
  - b Connect the speedometer cable and lower the power unit into position.
  - c Adjust the gear selector cable, see 44.30.04.
  - d Check and adjust if necessary the kickdown control linkage, see 44.30.02.

32. Refill the cooling system and check the engine/gearbox oil level, see 'MAINTENANCE'.

## ENGINE AND GEARBOX ASSEMBLY

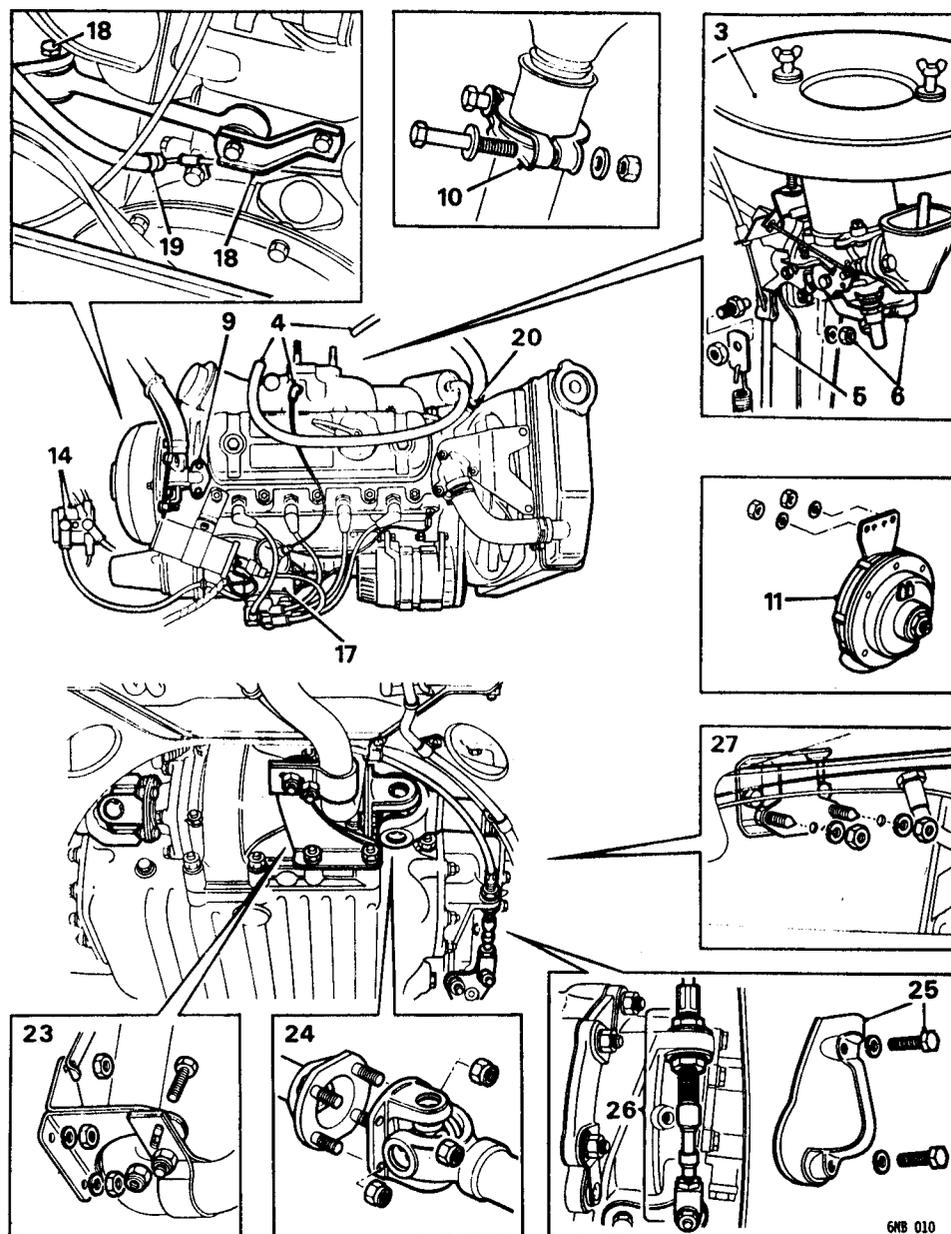
### Remove and refit - Manual - Not Turbo 12.37.01.

*Service tool: 18G 1063, 18G 1243*

#### Removing

1. Remove the bonnet, see 76.10.01.
2. Disconnect the battery.
3. Remove the carburetter air cleaner.
4. Disconnect the petrol feed hose, vacuum advance pipe and the breather hose from the carburetter.
5. Remove the carburetter and place it aside.
6. Disconnect the inlet hose from the fuel pump
7. Remove the cylinder block drain plug and drain the coolant.
8. Disconnect the heater hose from the radiator bottom hose connection.
9. Remove the heater water control valve from the cylinder head and move it aside.
10. Disconnect the exhaust down pipe from the exhaust manifold flange.
11. 850 and 1000: Disconnect and remove the horn.
12. From beneath the R.H. front wing, release the flexible pipe from the air intake.
13. Remove the air intake from the wing valance.
14. Disconnect the starter cable connection, remove the starter solenoid retaining screws and place the solenoid through the intake hole in the wing valance.
15. Clubman and 1275 GT: Remove the ignition shield.

16. Disconnect all electrical connections from the engine ancillary units and the engine earth strap(s) from the engine.
17. 850 and 1000: Pull the h.t. leads off the spark plugs and coil and remove the distributor cap and rotor arm.
18. Disconnect the clutch operating lever return spring, remove the slave cylinder securing bolts and place the unit aside.
19. Release the engine tie-rod from the rear of the cylinder block, slacken the bolt and nut securing the other end of the rod and swing it clear of the power unit.
20. Clubman and 1275 GT: Remove the ignition shield brackets from the rocker cover.
21. Remove the rocker cover and fit the engine lifting attachment.
22. Remove the screw retaining the suspension upper arm rebound rubber and place a solid wedge of the same thickness in its place.
23. Remove the wheel trim and slacken the front road wheel nuts.
24. Jack up the vehicle, place supports under the sub-frame side members and remove the road wheels.
25. Remove the nut retaining the steering tie-rod ball joint and release the joint from the steering lever using tool 18G 1063.
26. Remove the upper swivel hub ball pin retaining nut and washer. Release the joint using tool 18G 1063 and refit the nut loosely.
27. Repeat the procedure in 25 and 26 on the opposite side of the vehicle.
28. Assemble tool 18G 1243 to the drive shaft with the tool hard against the inboard joint before inserting the taper pin. Insert the 'U'

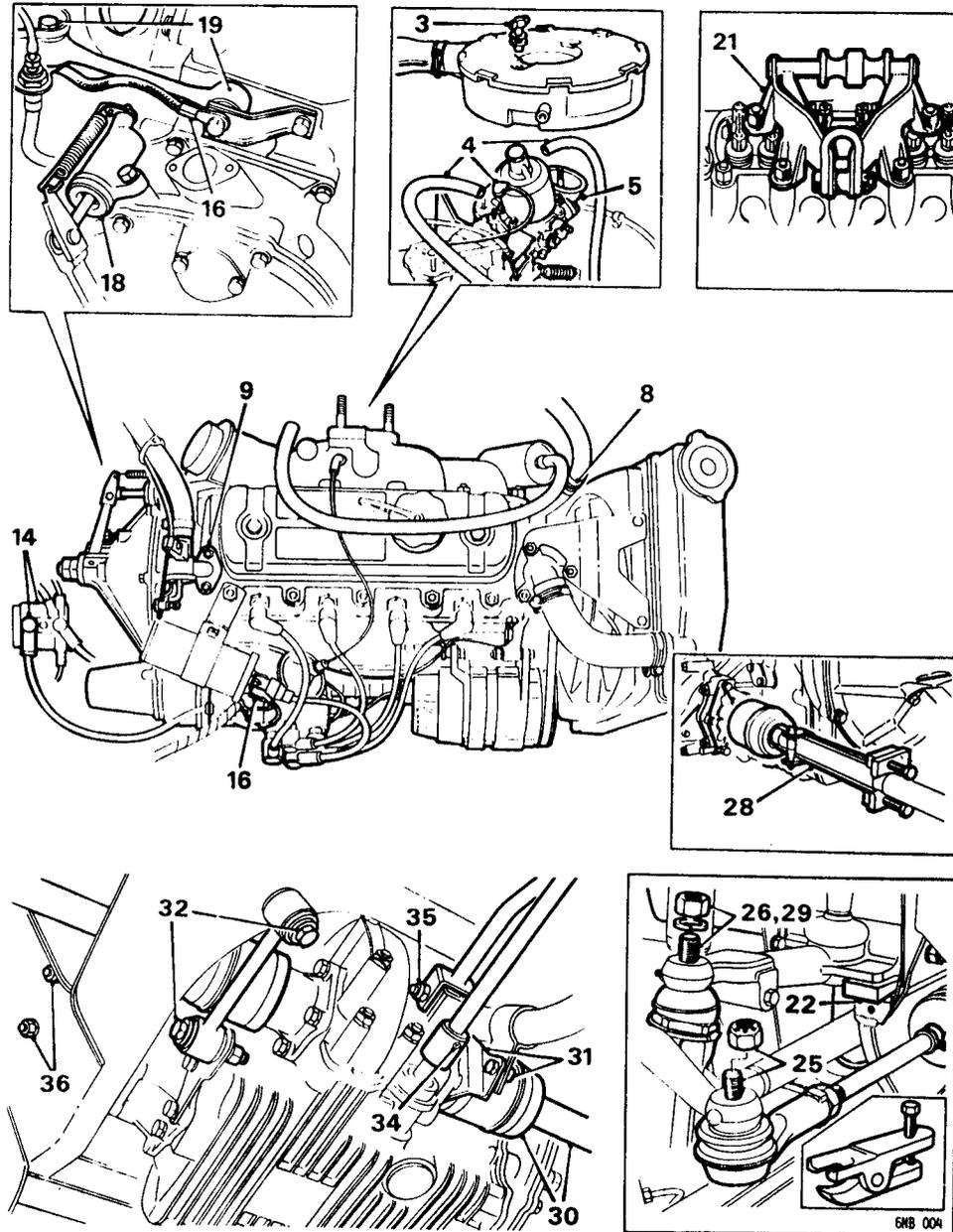
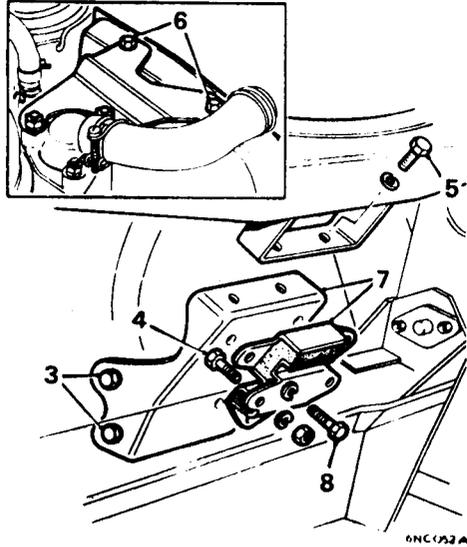


shaped part of the tool into the groove on the shaft, tighten the two bolts evenly until the drive shaft is released from the inboard joint. Remove the tool.

29. Remove the nut and disconnect the swivel hub ball pin from the suspension upper arm.  
**WARNING: Take care not to stretch the brake hose.**
30. Retain the position of the inboard joint boot and at the same time withdraw the shaft out of the inboard joint. Repeat this procedure on the other shaft.
31. Disconnect the exhaust pipe from the steady bracket and remove the bracket from the final drive cover.
32. Release the lower engine tie-rod from the rear of the gearbox casing. Slacken the bolt retaining the other end and swing it clear of the power unit.
33. Select reverse gear with the gear lever.
34. Drift out the roll-pin securing the remote control extension rod to the selector shaft.
35. Remove the retaining bolt from the remote control steady fork on the final drive housing and release the fork.
36. Remove the bolts and nuts securing the engine mountings to the sub-frame.
37. Attach lifting equipment to the front lifting eye of the attachment to give an angled lift.
38. Partially raise the power unit then disconnect the speedometer cable from the speedometer drive housing, lift the power unit out of the vehicle.

### Refitting

39. Lower the power unit partly into the engine compartment and connect up the speedometer cable, lower the unit into position and refit the engine mounting securing bolts.



40. The remainder is a reversal of the procedure in 1 to 35.  
41. Tighten the cylinder head nuts to the torque figure given in 'TORQUE WRENCH SETTINGS' according to model application.  
42. Refill the cooling system, see 'MAINTENANCE'.

### ENGINE MOUNTING

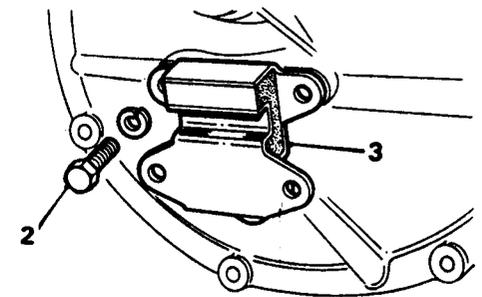
Remove and refit - left hand 12.45.11

#### Removing

1. Remove the radiator assembly, see 26.40.04.
2. Support the engine on a hydraulic jack.
3. Turbo only: Remove the left hand underpanel, see 76.10.42
4. Remove the two bolts retaining the mounting bracket to the gearbox.
5. Remove the two nuts and bolts retaining the mounting to the subframe.
6. 850 and 1000: Remove the bolts retaining the radiator cowl to the mounting bracket.
7. 850 and 1000: Remove the bolts to release the radiator cowl from the radiator upper support bracket and remove the cowl from the vehicle.
8. Remove the mounting bracket assembly.
9. Remove the bolts retaining the mounting to the mounting bracket and remove the left-hand engine mounting.

#### Refitting

10. Reverse the procedure in 1 to 9 as applicable to model.



6NC 051

## ENGINE MOUNTING

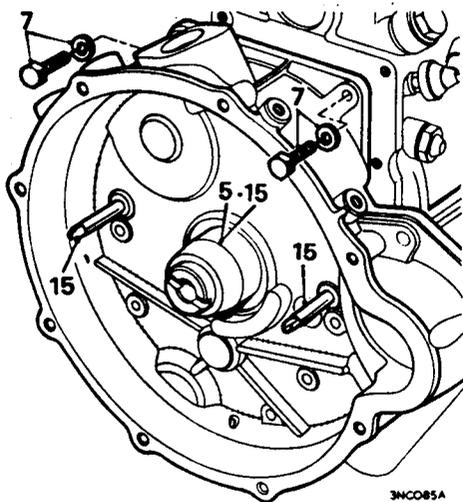
Remove and refit - right hand 12.45.12.

### Removing

1. Remove the clutch cover, see 33.10.01.
2. Remove the set screws retaining the mounting to the clutch cover.
3. Remove the right-hand engine mounting.

### Refitting

4. Reverse the procedure in 1 to 3.



## FLYWHEEL HOUSING

Remove and refit - Not Turbo 12.53.01

Service tool: 18G 134, 18G 134 BC, 18G 1043

### Removing

1. Remove the clutch/flywheel as individual items, see 33.10.01.
2. Drain the engine/gearbox oil.
3. 1275 GT: Remove the bolts retaining the engine breather to the flywheel housing.

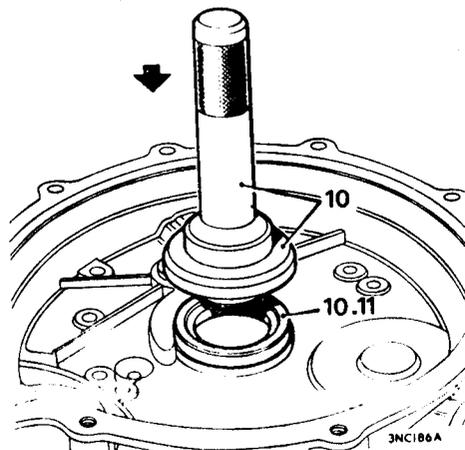
4. Release the clutch slave cylinder from the flywheel housing and place to one side.
5. Position tool 18G 1043 over the clutch splines of the crankshaft primary gear.

6. Knock back the locking plate tabs of the flywheel housing securing bolts and nuts.
7. Remove the securing bolts and nuts and withdraw the housing off the power unit.

**Note:** The housing is also located to the gearbox by two dowels.

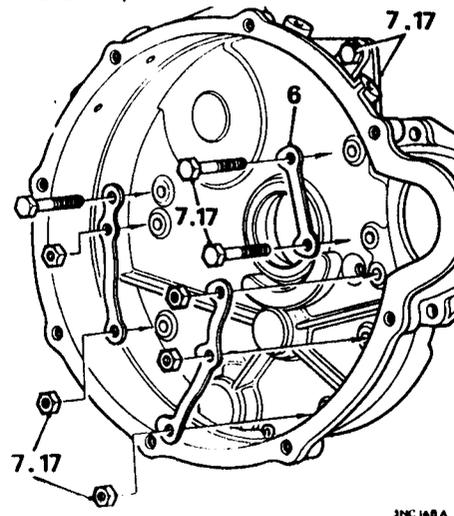
8. Remove the housing joint washer.
9. Extract the primary gear oil seal from the housing.

**Note:** The oil seal can be renewed with the power unit in situ and without removing the flywheel housing. This operation is covered by the procedure given in 12.53.02.



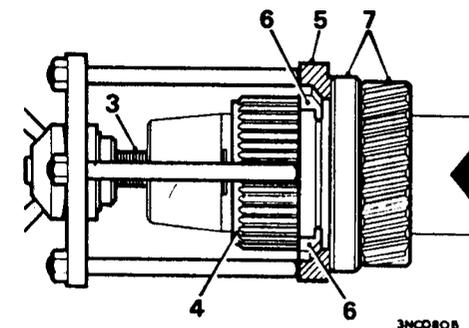
### Refitting

10. Lubricate a new primary gear oil seal with engine oil and locate it onto tools 18G 134 and 18G 134 BC. Smear Castrol LM grease on the clutch housing seal recess.
11. Support the underside of the housing beneath the seal aperture and drift the new seal into the housing.
12. Check and adjust the idler gear end-float if necessary, see 37.20.10.
13. Check and adjust the crankshaft primary gear end-float if necessary, see 12.21.28.
14. Fit a new housing joint-washer and ensure that both locating dowels are fully in their holes.



15. Ensure that tool 18G 1043 is located over the primary gear and screw in the two guides (part of 18G 1043) into the two bottom holes of the crankcase.
16. Refit the flywheel housing and remove tool 18G 1043.

17. Use new locking plates and tighten the securing bolts and nuts, see 'TORQUE WRENCH SETTINGS'; tap over the locking plate tabs.
18. Engage the release lever push rod and refit the clutch slave cylinder.
19. Refit the starter solenoid switch.
20. Refit the clutch/flywheel assembly, see 33.10.01.
21. Refill the engine/gearbox with oil, see 'MAINTENANCE'.



## FLYWHEEL HOUSING OIL SEAL

Remove and refit 12.53.02.

Service tool: 18G 1043, 18G 1068 B

### Removing - engine in vehicle

1. Remove the clutch/flywheel as individual items, see 33.10.01.
2. Remove the 'C' shaped thrust washer and backing ring securing the primary gear to the crankshaft.
3. Screw the centre bolt of tool 18G 1068 B securely into the crankshaft.
4. Pull the primary gear outwards as far as possible.
5. Pull the body of tool 18G 1068 B over the centre bolt until the groove in the primary gear is visible inside the tool body.

6. Fit the two half collets of the tool into the groove in the gear.
7. Turn the winged nut anti-clockwise to withdraw the primary gear and oil seal clear of the housing.

#### Refitting

8. To ensure that the oil sealing lip will bed-in, restore the surface condition on the primary gear as follows:
  - a. Mount the gear in a lathe so that it will rotate anti-clockwise viewed from the splined end.
  - b. Lightly burnish the sealing surface with fine emery cloth under a flat wooden support by moving from the spline to gear end. Do not move the cloth towards the splines whilst in contact with the surface.
  - c. Fit the primary gear to the crankshaft.
9. Fit tool 18 G 1043 over the primary gear.
10. Liberally lubricate the new oil seal with engine oil and fit it over the protector sleeve onto the primary gear.
11. Smear the primary gear front thrust washer with grease and refit it (with its chamfered inner edge against the shoulder on the crankshaft).
12. Locate the primary gear onto the crankshaft until the gear teeth are starting to engage with those of the idler gear, and with the oil seal contacting the housing bore whilst still seated on the sealing surface of the gear.

13. Pass the body of tool 18G 1068 B over the crankshaft and screw the winged nut in a clockwise direction down the centre bolt to press the seal into the housing. The seal is correctly fitted when the base of the tool contacts the lip of the housing bore.
14. Refit the backing ring and 'C' shaped thrust washer (with the back of the 'C' washer adjacent to the timing marks on the flywheel).
15. Refit the clutch/flywheel assembly, see 33.10.01.

#### FLYWHEEL

Remove and refit 1, 2, 7 and 8 12.53.07

Starter ring gear 12.53.19

#### Removing - engine in the car

1. Remove the clutch/flywheel as individual items, see 33.10.01.
2. Split the starter ring gear and remove it from the flywheel.

#### Refitting

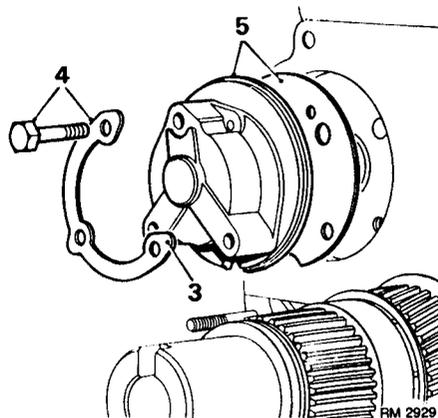
3. Check the mating surfaces of the flywheel flange and remove any burrs.
4. Heat the new starter ring gear to a temperature of 300 to 400 °C (572 to 752°F) - indicated by a light blue surface colour.
5. Fit the new starter ring gear with the lead of the teeth facing the clutch.
6. Refit the clutch/flywheel assembly, see 33.10.01.

#### OIL PUMP

Remove and refit - 850, 1000 and 1100  
12.60.26

#### Removing

1. a. Remove the clutch and flywheel, see 33.10.01.
- b. Remove the converter assembly, see 44.17.07.
2. a. Remove the flywheel housing, see 12.53.01.
- b. Remove the converter housing, see 44.17.01.

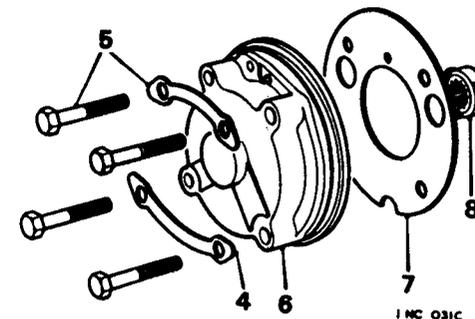


3. Knock back the locking plate tabs.
4. Remove the oil pump retaining bolts and locking plate.
5. Withdraw the oil pump and joint washer.

#### Refitting

6. Fit a new joint washer to the pump, ensuring that all holes and cut-aways are aligned with those on the pump.
7. Refit the oil pump with the driving spindle engaging with the camshaft.

8. Fit a new locking plate and tighten the retaining bolts, see 'TORQUE WRENCH SETTINGS'. Tap over the locking plate tabs.
9. a. Refit the flywheel housing, see 12.53.01.
- b. Refit the converter housing, see 44.17.01.
10. a. Refit the clutch and flywheel, see 33.10.01.
- b. Refit the converter assembly, see 44.17.07.



#### OIL PUMP

Remove and refit - 1275 GT and Turbo  
12.60.26

#### Removing

1. Remove the engine and gearbox assembly - see 12.37.01, not Turbo.
2. Remove the clutch and flywheel, see 33.10.01.
3. Remove the flywheel housing, see 12.53.01.
4. Knock back the locking plate tabs.
5. Remove the oil pump retaining bolts and locking plate.
6. Withdraw the oil pump.
7. Remove the gasket.
8. Remove the oil pump drive coupling.

### Refitting

- Assemble the oil pump drive coupling to the oil pump spindle.
- Refit the oil pump with a new gasket; ensure that the coupling engages with the camshaft and the mounting bolt holes are aligned.
- Fit new locking plates and tighten the pump securing bolts, see 'TORQUE WRENCH SETTINGS', tap over the locking plate tabs.
- Refit the flywheel housing, see 12.53.01.
- Refit the clutch and flywheel, see 33.10.01.
- Refit the engine and gearbox assembly - see 12.37.01, not Turbo.

## OIL PUMP

Overhaul - 850, 1000 and 1100 12.60.32

### Dismantling

- Remove the oil pump, see 12.60.26.
- Remove the screw retaining the pump cover and remove the cover which is located by two dowels.
- Remove the rotors from the pump body.

## DATA

### Oil pump

Outer ring end-float	0.005 in (0.127 mm)
Inner rotor end-float	0.005 in (0.127 mm)
Outer ring to pump body diametrical clearance	0.010 in (0.254 mm)
Rotor lobe clearance	0.006 in (0.152 mm)

### Inspecting

- Clean all components.
- Install the rotors in the pump body, ensuring the chamfered edge of the outer ring enters the pump body first.
- Check the end-float of the inner rotor and outer ring.
- Check the outer ring to pump body diametrical clearance.
- Check the rotor lobe clearances.
- Renew the pump assembly if the clearances or end-float measured in procedure 5 to 7 exceed the figures given in DATA.

### Reassembling

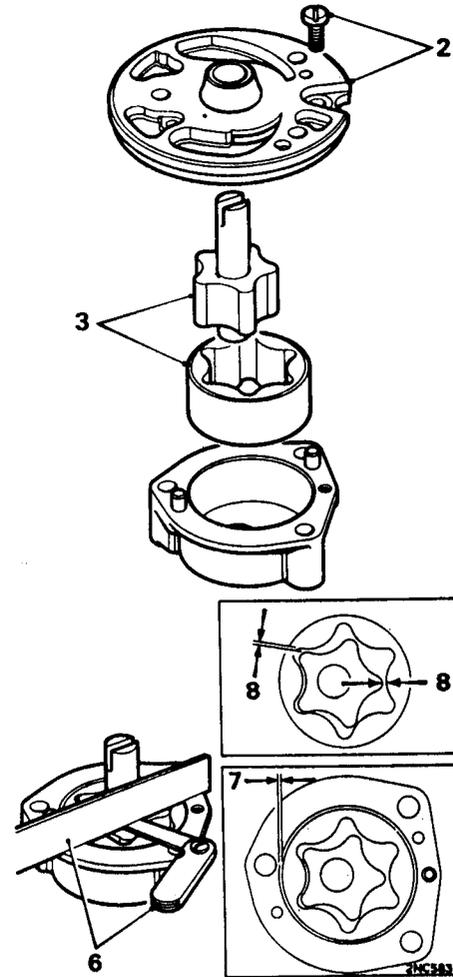
- Lubricate all parts in clean engine oil before assembling.
- Reverse the procedure in 2 and 3.
- Check the pump for freedom of action.
- Refit the oil pump, see 12.60.26.

## OIL PUMP

Overhaul - 1275 GT and Turbo 12.60.32

### Dismantling

- Remove the oil pump, see 12.60.26.
- Remove the pump cover from the pump body.  
**CAUTION:** The pump cover is located on the pump body by two dowels.



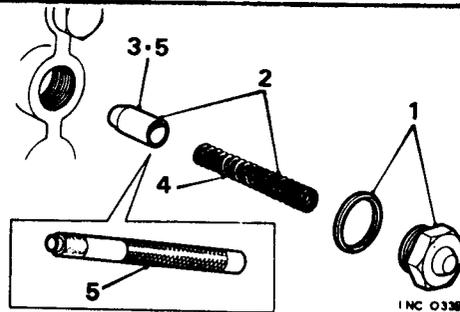
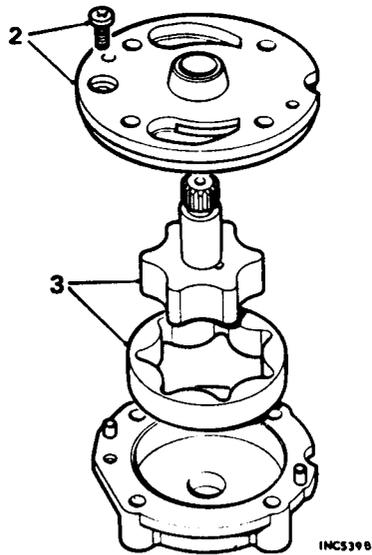
- Remove the rotors from the pump body.

### Inspecting

- Clean all components.
- Install the rotors in the pump body, ensuring the chamfered edge of the outer ring enters the pump body first.
- Check the end-float of the inner rotor and outer ring.
- Check the outer ring to pump body diametrical clearances.
- Check the rotor lobe clearances.
- Renew the pump assembly if the clearances or end-floats measured in procedure 5 to 7 exceed the figures given in DATA.

### Reassembling

- Lubricate all parts in clean engine oil before assembling.
- Reverse the procedure in 2 and 3.
- Check the pump for freedom of action.
- Refit the oil pump, see 12.60.26.



### OIL PRESSURE RELIEF VALVE

Remove and refit 12.60.56

Service tool: 18G 69

#### Removing

**Note:** On Turbo Models it will be necessary to remove the grille assembly, see 76.55.03

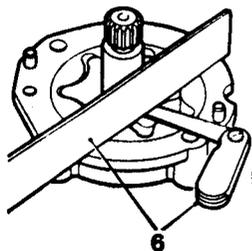
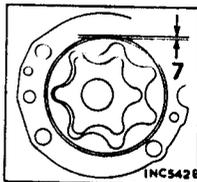
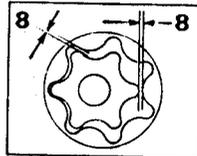
1. Remove the valve cap and washer
2. Remove the spring and relief valve.

#### Inspecting

3. Check that the face of the valve is not badly pitted, and that the valve is seating correctly, renew if necessary.
4. Check the length of the spring, see DATA, and renew if necessary.

#### Refitting

5. If the valve is only lightly pitted, lap the valve onto its seating using tool 18G 69.



### DATA

#### Lubrication

Oil pressure relief valve .....	60 lbf/in <sup>2</sup> (4.2 kgf/cm <sup>2</sup> )
Relief valve spring:	
Free length .....	2.86 in (72.64 mm)
Fitted length .....	2.156 in (54.77 mm)
Load at fitted length .....	13 to 14 lbf (5.90 to 6.35 kgf)

6. Reverse the procedure in 1 and 2.
7. Turbo Models: Fit the grille assembly, see 76.55.03

### TIMING GEAR COVER OIL SEAL

Remove and refit 12.65.05

Timing gear cover 1 to 10 and 16 to 19  
12.65.01

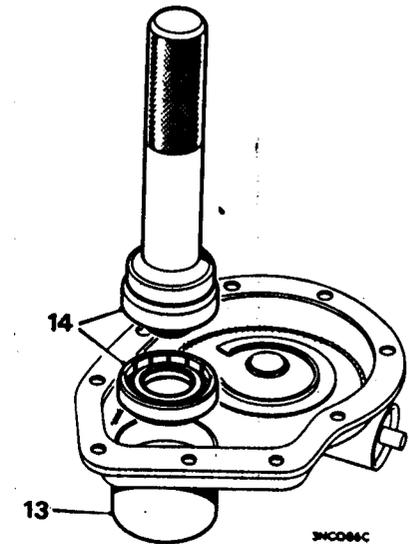
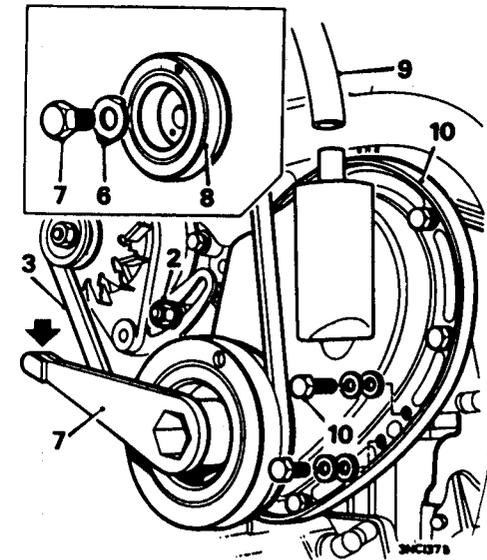
Service tool: 18G 98A, 18G 134, 18G 135 BD, 18G 1044

#### Removing

1. Remove the radiator assembly, see 26.40.04.
2. Slacken the alternator securing bolts.
3. Remove the alternator driving belt.
4. Remove the four bolts retaining the fan blades.
5. Remove the fan blades and water pump pulley.
6. Knock back the locking tab of the crankshaft retaining bolt lock washer.
7. Remove the crankshaft pulley retaining bolt, using tool 18G 98 A.
8. Withdraw the pulley from the crankshaft.
9. 1275 GT: Release the engine breather hose from the timing cover.
10. Remove the securing screws and lift off the timing gear cover and joint washer.
11. Extract the oil seal from the timing gear cover.

#### Refitting

12. Lubricate the new seal with engine oil before fitting.
13. Place the support (tool 18G 134 BD) onto a firm surface with the timing gear cover held onto the support.
14. Position the oil seal onto tools 18G 134 and 18G 134 BD with the lips of the seal facing the tool.



15. Hold the cover onto the support and drift the seal into the timing gear cover.
16. Clean all joint faces and fit a new joint washer.
17. Refit the timing gear cover and centralize the oil seal over the crankshaft by fitting centralizer tool 18G 1044.
18. Tighten the cover retaining bolts and remove the centralizer tool.
19. Reverse the procedure in 1 to 9, noting the following:
  - a. Lubricate the hub of the crankshaft pulley with oil before refitting.
  - b. Fit a new crankshaft pulley bolt lock washer; tighten the retaining bolt, see 'TORQUE WRENCH SETTINGS'.
  - c. Adjust the alternator drive belt tension and tighten the retaining bolt, see 'MAINTENANCE'.

## TIMING CHAIN AND GEARS

**Remove and refit** 12.65.12

**Service tool:** 18G 98 A

### Removing

1. Remove the bonnet, see 76.16.01.
2. Remove the radiator, see 26.40.04.
3. Remove the timing gear cover, see 12.65.01.
4. Remove the oil thrower; note that the face marked 'F' faces outwards.
5. Tap back the lock washer tab on the camshaft gear retaining nut.
6. Remove the camshaft gear retaining nut using tool 18G 98 A; pull off the lock washer.
7. Remove the two retaining screws and detach the timing chain tensioner.

8. Rotate the crankshaft until the two timing marks on the gears are opposite each other.
9. Use suitable levers or two large screw-drivers and lever behind each side of the camshaft gear to withdraw it from the camshaft. When it has moved a short distance, apply the leverage to the crankshaft gear, repeat this procedure equally on both gears in turn until the gears and chain can be withdrawn as an assembly.

### Refitting

10. Checking the valve timing:
  - a. Rotate the crankshaft if necessary so that its keyway is at T.D.C.
  - b. Rotate the camshaft if necessary so that its key is in the two o'clock position.
11. Refit the crankshaft and camshaft gears without the chain.
12. Check the alignment of the gears with a straight-edge; use feeler gauges to determine the thickness of adjustment shims required.
13. Remove the gears and the crankshaft driving key.
14. Select and fit the required thickness of shims to obtain the correct alignment. The shims are one size only - 0.0006 in (0.152 mm).
15. Refit the driving key into the crankshaft.
16. Assemble the timing chain and gear wheels with the timing mark on each gear opposite each other.
17. Reverse the procedure in 5 to 7 using a new lock washer.
18. Refit the timing gear cover, see 12.65.01.
19. Refit the radiator, see 26.40.04.
20. Refit the bonnet, see 76.16.01.

## FRONT MAIN BEARING CAP OIL SEAL

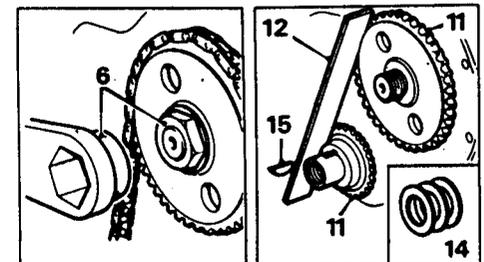
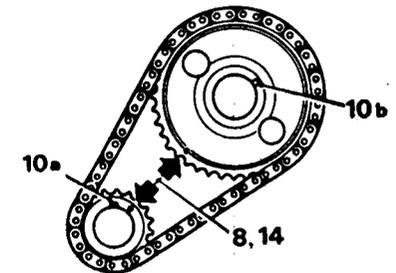
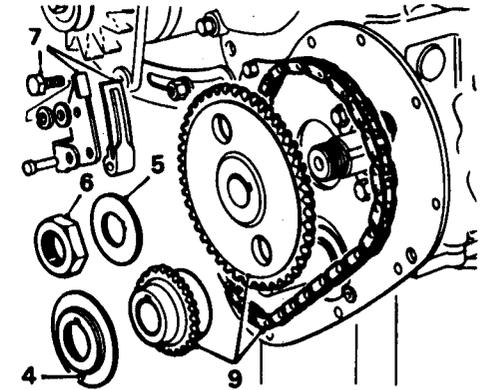
**Remove and refit** 12.21.38

### Removing

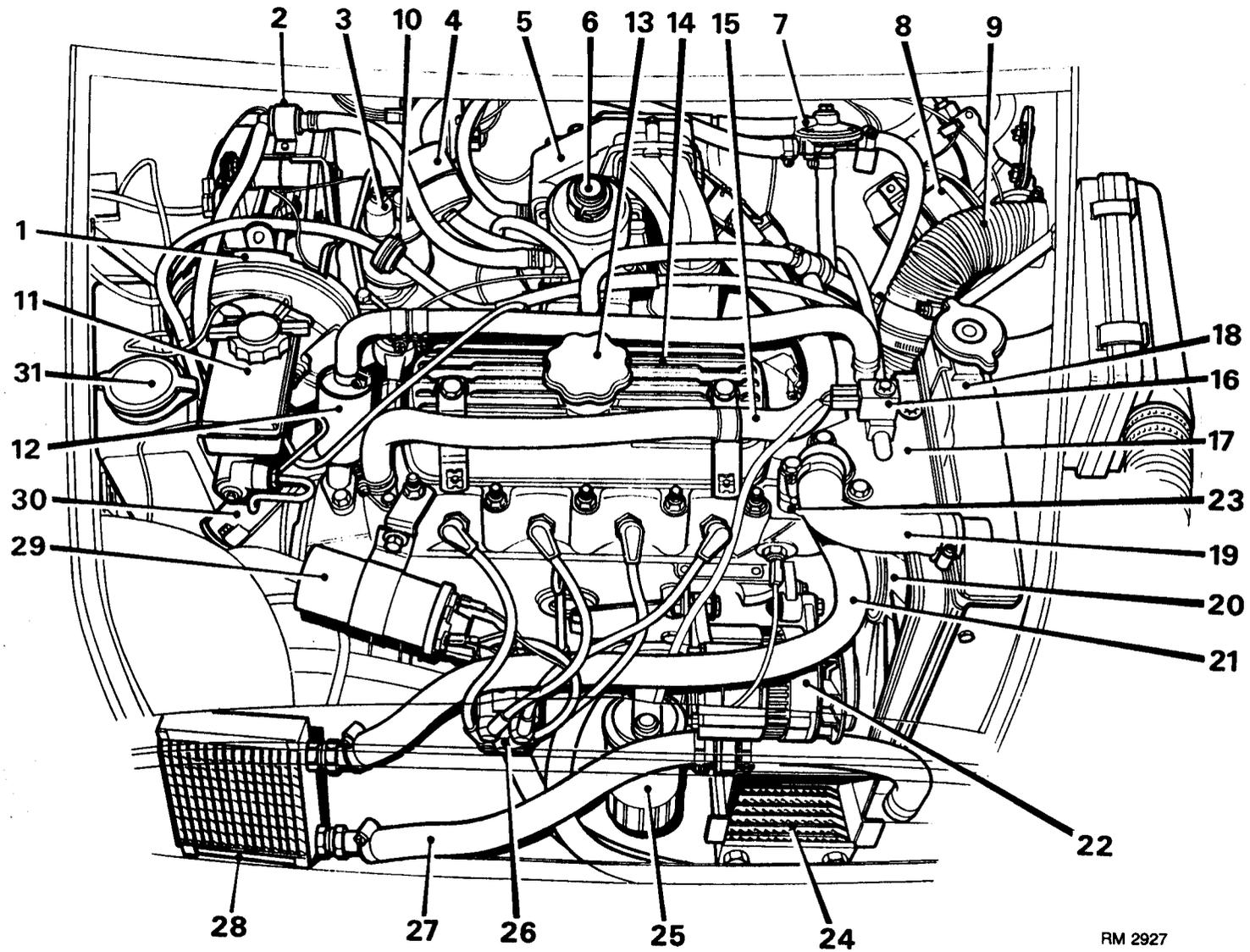
1. Remove the timing chain and gears, see 12.65.12.
2. Remove the camshaft locating plate and engine front plate.
3. Remove the seal from the front main bearing -cap recess.

### Refitting

4. Thoroughly clean the front main bearing-cap recess and the front face of the cylinder block and gearbox.
5. Coat the ends of the seal with RTV compound Part No. GCH 111 and lubricate the seal with engine oil.
6. Fit the seal into the main bearing-cap recess by first inserting the top edges and then working the seal into position until the face of the seal is flush with the cylinder-block face.
7. Fit the engine front plate, using a new gasket, and fit the camshaft locating plate.
8. Fit the timing chain and gears, see 12.65.12.



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## **TURBO ENGINE COMPARTMENT**

1. Brake servo
2. Anti run-on valve
3. Clutch master cylinder
4. In-line fuel filter
5. Plenum chamber
6. Carburetter
7. Pressure regulator valve
8. Windscreen wiper motor
9. Turbocharger air inlet hose
10. Non-return valve - brake servo
11. Brake master cylinder
12. Vapour separator
13. Oil filler cap
14. Rocker cover
15. Heater hose
16. Boost control solenoid valve
17. Radiator top mounting bracket
18. Radiator
19. Radiator top hose
20. Cooling fan
21. Remote radiator hose
22. Alternator
23. Thermostat housing
24. Oil cooler
25. Oil filter
26. Distributor
27. Auxiliary radiator hose
28. Auxiliary radiator
29. Coil
30. Clutch slave cylinder
31. Windscreen washer reservoir

**Note:** : Certain operations applicable to the Mini Turbo Engine are covered in the preceding engine section. These operations are listed on the following pages and reference should, therefore, be made to the preceding section where necessary.

## DESCRIPTION - TURBO ONLY

The engine/transmission unit is supported transversely on three rubber mountings in a front sub-frame.

Bolted directly on top of the gearbox, the four-cylinder overhead valve engine has a chain-driven camshaft which drives the distributor and oil pump, the oil pump being mounted at the rear end of the camshaft. The connecting rods have horizontally split big-ends and are connected to the pistons by gudgeon pins which are a press fit in the small-ends.

Drive is transmitted to the gearbox by a train of helical gears and through the differential mounted on the rear of the gearbox to the front wheels by drive shafts and constant velocity joints. **Distributor Drive Shaft - Remove and refit - Refer to operation 12.10.22**

**Camshaft - Remove and refit - Refer to operation 12.13.02 - 1275 and Turbo.**

**Connecting Rods and Pistons - Remove and refit - Refer to operation 12.17.01 - 1275 and Turbo.**

**Connecting Rods and Pistons - Overhaul - Refer to operation 12.17.10 - 1275 and Turbo.**

## CRANKSHAFT PULLEY - TURBO ONLY

Remove and refit

12.21.01

Removing

**Service tool: 18G 98A**

1. Disconnect the battery.
2. Remove the radiator, see 26.40.04.
3. Restrain the water pump pulley and remove the bolts securing the cooling fan: remove the fan and water pump pulley.
4. Slacken the alternator securing bolts and remove the drive belt.
5. Remove the bolts securing the radiator bottom mounting bracket: withdraw the bracket.
6. Remove the starter motor, see 86.60.01.
7. Bend back the locking tab securing the crankshaft pulley bolt.
8. Lock the flywheel to prevent it from turning.
9. Using 18G 98A, remove the crankshaft pulley bolt; withdraw the pulley and recover the Woodruff key.

Refitting

10. Lubricate the timing cover oil seal and the oil seal running surface of the crankshaft pulley with clean engine oil.
11. Locate the Woodruff key in the crankshaft and fit the pulley.
12. Fit a new tabwasher ensuring that it is located correctly.
13. Fit and tighten the pulley securing bolt, see 'TORQUE WRENCH SETTINGS' Bend over the locking tab on the tabwasher.
14. Remove the flywheel locking tool: fit the starter motor, see 86.60.01.
15. Fit the radiator bottom mounting bracket.

16. Fit the water pump pulley, drive belt and cooling fan. Tension the drive belt, see 'MAINTENANCE'

17. Fit the radiator, see 26.40.04.

18. Connect the battery.

**Crankshaft Primary Gear End-Float - Check and adjust - Refer to operation 12.21.28**

**Crankshaft - Remove and refit - Refer to operation 12.21.33 - 1275 and Turbo**

**Front Main Bearing Cap Oil Seal - Remove and refit - Refer to operation 12.21.38**

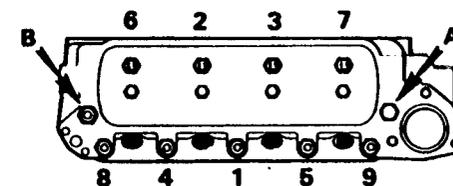
## CYLINDER HEAD GASKET - TURBO ONLY

Remove and refit

12.29.02

Removing

1. Disconnect the battery and remove the ignition shield.
2. Raise the front of the vehicle and support it on stands.
3. Remove the inlet and exhaust manifolds, see 30.15.15.
4. Drain the coolant.
5. Remove the rocker cover, discard the gasket.
6. Disconnect the H.T. lead and the electrical connection from the thermal transmitter.
7. Disconnect the heater hose, radiator top hose and auxiliary radiator hose.
8. Remove the securing bolt 'A' and nut 'B' shown in the illustration from the cylinder head.
9. Remove the bolt securing the coil bracket; move the coil and bracket aside.
10. Remove the cylinder head and rocker pedestal securing nuts noting the fitted position of the lock plate on the rocker pedestal.
11. Lift off the rocker shaft assembly.

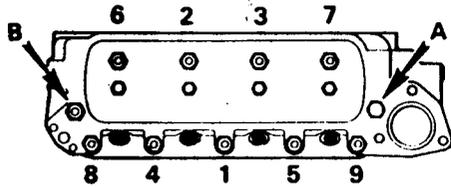


12. Withdraw the push rods, keep them in their fitted order.
13. Lift off the cylinder head, remove and discard the gasket.

Refitting

14. Clean the underside of the cylinder head and the mating face of the cylinder block.  
**WARNING: Do not use an airline to blow gasket dust, asbestos dust can be a serious health hazard if inhaled. Use methylated spirit or denatured alcohol to wash dust from components. Do not use any petroleum based fluids.**
15. Fit a new cylinder head gasket with the 'TOP' and 'FRONT' marks correctly positioned.  
**CAUTION: The gasket must be fitted dry, do not use jointing compound or grease.**
16. Fit the cylinder head and push rods.
17. Fit the rocker shaft assembly, ensure that the lock plate is positioned on the rocker pedestal and the tappet screws are located in the push rods.
18. Fit the cylinder head nuts and bolt.

19. Tighten the cylinder head nuts gradually in the sequence shown (followed by bolt 'A' and nut 'B') to 50% of the full torque value then tighten in the same sequence to the final torque figure, see **'TORQUE WRENCH SETTINGS:**



\*\*\* 11.9

20. Tighten the rocker shaft pedestal nuts to the figure given in **'TORQUE WRENCH SETTINGS:**
21. Check/adjust the valve clearances, see 12.29.48.
22. Fit the coil bracket.
23. Connect the heater hose, remote radiator hose and radiator top hose.
24. Connect the H.T. leads and thermal transmitter cable.
25. Fit the rocker cover; use a new gasket.
26. Fit the inlet and exhaust manifolds, see 30.15.15.
27. Fill the cooling system, lower the vehicle to the ground and connect the battery.
28. Run the engine at a fast idle speed for at least 15 minutes or road test for 5 miles (8Km), allow engine to cool.

29. Working in the sequence shown, slacken then tighten each cylinder head nut in turn followed by bolt 'A' and nut 'B'; slackening each a half-turn and then re-tightening to the full torque.
30. Check/adjust the valve clearances if necessary.
31. Fit the ignition shield.

**Cylinder Head - Overhaul - Refer to operation 12.29.19**

**Rocker Cover - Remove and refit - Refer to operation 12.29.42.**

**Valve Clearance - Check and adjust - Refer to operation 12.29.48**

**Rocker Shaft Assembly - Remove and refit - Refer to operation 12.29.54**

**Rocker Shaft - Overhaul - Refer to operation 12.29.55 - 1275 and Turbo**

## ENGINE AND GEARBOX - TURBO ONLY

**Remove and refit 12.37.01**

### Removing

**Service tool: 18G 1063, 18G 1240**

1. Disconnect the battery. Raise the front of the vehicle and position it on axle stands.
2. Remove the bonnet, see 76.16.01
3. Remove the ignition shield.
4. Remove the brake master cylinder, see 70.30.08 (1989 Model Year).
5. Remove the windscreen washer reservoir, see 84.10.01.
6. Remove the brake servo, see 70.50.01 (1989 Model Year)
7. Disconnect the brake pipes from the three and four way unions; plug broken connections to prevent the ingress of dirt.
8. Remove the horn, see 86.30.10.
9. Release the fresh air intake hose and duct.

10. Remove the bolts securing the clutch slave cylinder to the clutch housing; move the slave cylinder aside.
11. Remove the carburetter, see 19.15.09.
12. Remove the bolts securing the engine top steady bar; withdraw the bar. Position a suitable size block of wood between the engine and the bulkhead.
13. Remove the exhaust pipe clamp and 'U' bolt.
14. Remove the bolts securing the exhaust pipe clamp bracket; withdraw the bracket.
15. Select reverse gear.
16. Using a suitable size punch, drive out the gear change rod roll pin and disconnect the rod from the gearbox.
17. Select neutral on the gearbox.
18. Drain the engine oil.
19. Disconnect the turbocharger top inlet hose from the air cleaner.
20. Remove the top inlet hose.
21. Disconnect the turbocharger bottom inlet hose at the connector.
22. Drain the cooling system.
23. Remove the grille assembly, see 76.55.03.
24. Disconnect the heater hoses.
25. Remove the alternator, see 86.10.02.
26. Disconnect the H.T. leads from the coil and spark plugs.
27. Release the screws and remove the distributor cap and rotor arm.
28. Disconnect the harness Lucar from the coolant temperature transmitter.
29. Disconnect the harness Lucar from the boost control solenoid valve.
30. Release the bolt securing the solenoid harness clip to the thermostat housing.
31. Remove the starter motor, see 86.60.01.
32. Remove the bolt securing the starter motor lead clip to the clutch housing.
33. Disconnect the harness Lucar from the oil pressure switch.
34. Remove the oil cooler, see 12.60.68.
35. Release the drive shafts from the transmission using 18G 1240.
36. Remove both front road wheels.
37. Using a trolley jack, raise the suspension until it is clear of the rebound rubbers.
38. Remove the rebound rubbers and position a thin, solid wedge in place of each rubber.
39. Lower the suspension until it is resting on the wedges.
40. Remove the nuts securing the left and right hand track rod end ball joints and release the joints using 18G 1063.
41. Remove the nuts securing the front hub top swivel joints and release the joints using 18G 1063.  
**WARNING: Support the hubs to avoid straining the brake hoses.**
42. Withdraw the drive shafts as far as possible until they are clear of the engine.
43. Fit suitable lifting hooks and chains and support the weight of the engine/transmission.
44. Remove engine mounting bolts.
45. Raise the engine/transmission until access to the speedometer cable is obtained; disconnect the speedometer cable.
46. Lift the engine/transmission clear of the engine compartment.

### Refitting

47. Reverse the procedures given in 4 to 46.
48. Bleed the braking system, see 70.25.02 - Turbo Models.
49. Connect the battery.

50. Disconnect the H.T. lead from the coil. Crank the engine until the low oil pressure warning light is extinguished. Connect the H.T.lead.
51. Fit the ignition shield.
52. Fit the bonnet, see 76.16.01.
53. Run the engine and check for oil and coolant leaks.
54. Road test the car, check the brakes for correct operation.

**Engine Mounting - Remove and refit - left hand - Refer to operation 12.45.11**

**Engine Mounting - Remove and refit - right hand - Refer to operation 12.45.12**

## ENGINE MOUNTINGS - TURBO ONLY

**Align 12.45.40**

1. Position the vehicle on a four post lift. Apply the handbrake, select neutral and chock the wheels.
2. Remove the underpanels.
3. Slacken but do not remove the engine mounting and tie bar bolts.
4. Start the engine and allow it to idle for two minutes.
5. Switch off the engine.
6. Tighten the engine mounting bracket and tie bar bolts - see 'TORQUE WRENCH SETTINGS'
7. Reverse operations 1 and 2.

## FLYWHEEL HOUSING - TURBO ONLY

**Remove and refit 12.53.01**

### Removing

1. Remove the bonnet, see 76.16.01.
2. Remove the radiator, see 26.40.04 and radiator mounting bracket.
3. Remove the clutch/flywheel, see 33.10.01.
4. Drain the engine/gearbox oil.

5. Remove the exhaust down pipe clamp 'U' bolt.
6. Bend back the locking tabs of the lock plates and remove the securing bolts and nuts from the outside and inside of the flywheel housing; note the fitted position of different length bolts.
7. Separate the housing from the cylinder block, pull the engine forwards and withdraw the housing.
8. Remove and discard the gasket.

### Refitting

**Service tool: 18G 1043, 18G 1068B**

9. Clean all traces of sealant from the securing bolts, cylinder block face and flywheel housing.
10. Remove and discard the primary gear oil seal from the housing.  
*Note: The oil seal can be renewed with the engine in-situ and without removing the flywheel housing, see 12.53.02.*
11. Lubricate a new primary gear oil seal with engine oil, apply Castrol LM grease or equivalent to the seal recess and fit the seal using 18G 1068B.
12. Check and adjust the primary gear end-float if necessary, see 12.21.28.
13. Check and adjust the idler gear end-float if necessary, see 37.20.10.
14. Lubricate gears, thrust washers, bushes and bearing with clean engine oil.
15. Position a new gasket on the flywheel housing, retain the gasket with Castrol LM grease or equivalent.
16. Locate tool 18G 1403 over the primary gear and screw the two guides (part of 18G 1043) into the two bottom holes of the crankcase.

17. Pull the engine forwards and manoeuvre the flywheel housing into position. Remove tool 18G 1403.
18. Apply suitable sealant to the threads of the retaining bolts and studs.
19. Use new lock plates, fit the retaining bolts and nuts and tighten them to the correct torque, see 'TORQUE WRENCH SETTINGS'. Bend over the tabs of the lock plates.
20. The remainder is a reversal of the procedures given in 1 to 5.

**Flywheel Housing Oil Seal - Remove and refit - Refer to Operation 12.53.02**

**Oil Pump - Remove and refit - Refer to operation 12.60.26 - 1275 and Turbo**

**Oil Pump -Overhaul - Refer to operation 12.60.32 - 1275 and Turbo**

**Oil Pressure Relief Valve - Remove and refit - Refer to operation 12.60.56**

## OIL COOLER - TURBO ONLY

**Remove and Refit 12.60.68**

### Removing

1. Disconnect the battery.
2. Release the clips and remove the ignition shield.
3. Remove the front grille, see 76.55.03
4. Position a suitable container beneath the oil cooler.
5. Disconnect the hose unions at the oil cooler, plug the hose ends to prevent ingress of dirt.
6. Allow the surplus oil to drain from the cooler and plug the connections to the cooler.
7. Remove the nut securing the oil cooler mounting bracket to the front valance.
8. Remove the nut securing the oil cooler to the side valance bracket.

9. Release the oil cooler from the front valance; withdraw the oil cooler.

### Refitting

10. Reverse the procedure given in 1 to 9.
11. Top-up the engine oil.
12. Run the engine and check for leaks.
13. Switch off the engine, check and top-up the engine oil if necessary.

## OIL COOLER FEED HOSE - TURBO ONLY

**Remove and refit 12.60.74**

### Removing

1. Disconnect the battery.
2. Remove the front grille, see 76.55.03.
3. Release the clips and remove the ignition shield.
4. Remove the bolt securing the coil to the mounting bracket.
5. Position suitable containers beneath the hose connections to cylinder block and the oil cooler.
6. Disconnect the feed hose from the oil cooler, plug the inlet connection in the oil cooler to prevent ingress of dirt.
7. Disconnect the feed hose from the cylinder block, collect the sealing washers.
8. Remove the hose.

### Refitting

9. Reverse the procedure given in 4 to 8. Use new sealing washers.
10. Connect the battery.
11. Top-up the engine oil.
12. Run the engine and check for oil leaks.
13. Switch off the engine, check and top-up the engine oil if necessary
14. Fit the ignition shield.
15. Fit the front grille, see 76.55.03

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## **OIL COOLER RETURN HOSE - TURBO ONLY**

**Remove and refit** 12.60.76

### **Removing**

1. Disconnect the battery.
2. Remove the front grille, see 76.55.03
3. Release the clips and remove the ignition shield.
4. Position suitable containers beneath the oil cooler and oil filter.
5. Disconnect the oil return hose from the oil cooler, plug the outlet connection in the oil cooler to prevent ingress of dirt.
6. Disconnect the oil return hose from the oil filter head, collect the sealing washers.
7. Withdraw the hose.

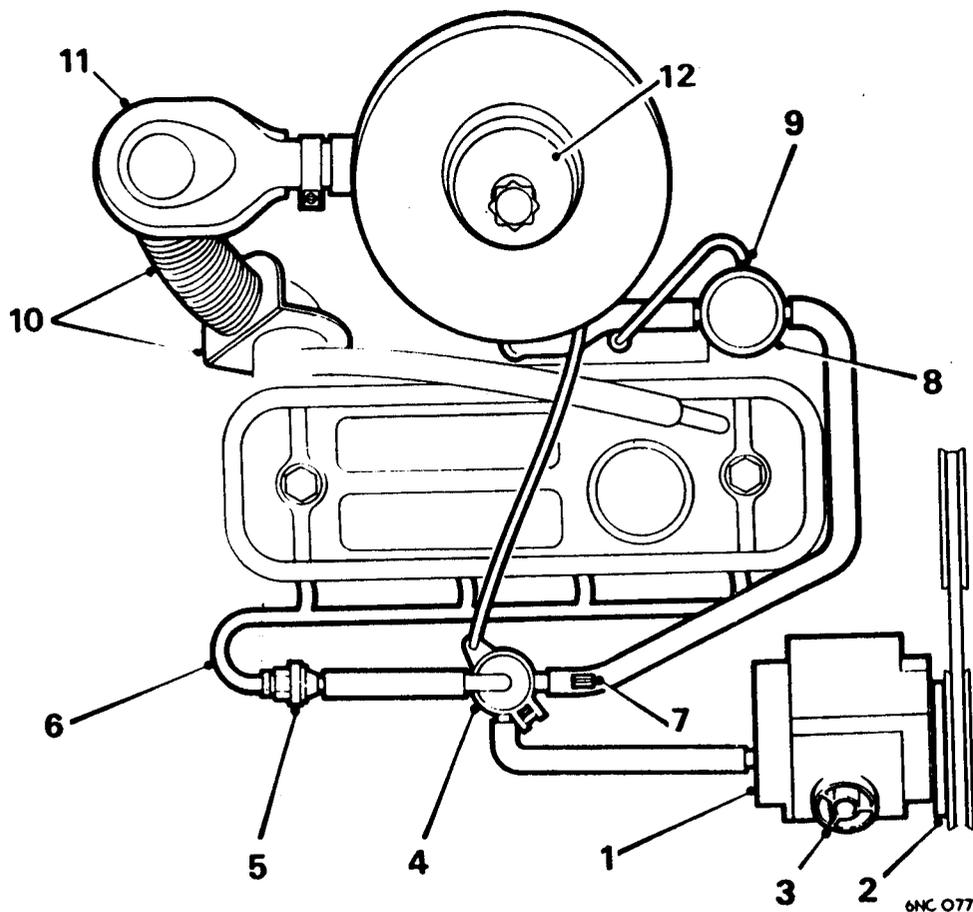
### **Refitting**

8. Reverse the procedure given in 4 to 7; use new sealing washers. Connect the battery.
9. Top-up the engine oil.
10. Run the engine and check for oil leaks.
11. Switch off the engine, check and top-up the oil level if necessary.
12. Fit the ignition shield.
13. Fit the front grille, see 76.55.03

**Timing Gear Cover Oil Seal - Remove and refit - Refer to operation 12.65.05**

**Timing Chain and Gears - Remove and refit - Refer to operation 12.65.12.**





## THE EMISSION CONTROL COMPONENTS

- |                          |                               |
|--------------------------|-------------------------------|
| 1. Air pump              | 7. Restrictor-gulp valve line |
| 2. Air pump filter       | 8. Gulp valve                 |
| 3. Air pump relief valve | 9. Gulp valve signal pipe     |
| 4. Air diverter valve    | 10. Hot air duct and shroud   |
| 5. Check valve           | 11. Air temperature control   |
| 6. Air manifold          | 12. Carburetter               |

## EXHAUST EMISSION CONTROL

### General description 17.01.01

Air is pressure-fed from an air pump via an injection manifold to the cylinder head exhaust port of each cylinder. A check valve in the air delivery pipe prevents blow-back from high pressure exhaust gases. The pump also supplies air through a gulp valve to the inlet manifold to provide air during conditions of deceleration and engine over-run.

**IMPORTANT** The efficient operation of the system is dependent on the engine being correctly tuned. The ignition and spark plug settings, valve clearances, and carburetter adjustments given for a particular engine (see 'ENGINE TUNING DATA') must be strictly adhered to at all times.

### Air pump

The rotary vane type air pump is mounted on the front of the cylinder head and is belt-driven from the water pump pulley. Provision is made for tensioning the belt.

Air is drawn into the pump through radial intakes around the pulley. A relief valve in the pump discharge port allows excessive air pressure at high engine speeds to discharge to the atmosphere.

### Diverter valve

The diverter valve, fitted between the pump and the check valve, is actuated by a cable from the mixture control (choke). During choke operation the air injection is cut off and air pressure is diverted to atmosphere.

### Check valve

The check valve, fitted in the pump discharge line to the injection manifold, protects the pump from the back-flow of exhaust gases.

The valve shuts if the air pressure ceases while the engine is running; for example, if the pump drive belt should break.

**Gulp valve** The gulp valve, fitted in the pump discharge line to the inlet manifold, controls the flow of air for leaning-off the rich air/fuel mixture present in the inlet manifold immediately following throttle closure after running at full throttle opening (i.e. engine over-run).

A sensing pipe connected between the inlet manifold and the gulp valve maintains manifold depression directly to the underside of the diaphragm and through a bleed hole to the upper side. Sudden increases in manifold depression which occur immediately following throttle closure act on the underside of the diaphragm which opens the valve and admits air to the inlet manifold. The bleed hole allows the differences in depression acting on the diaphragm to equalize and the valve closes.

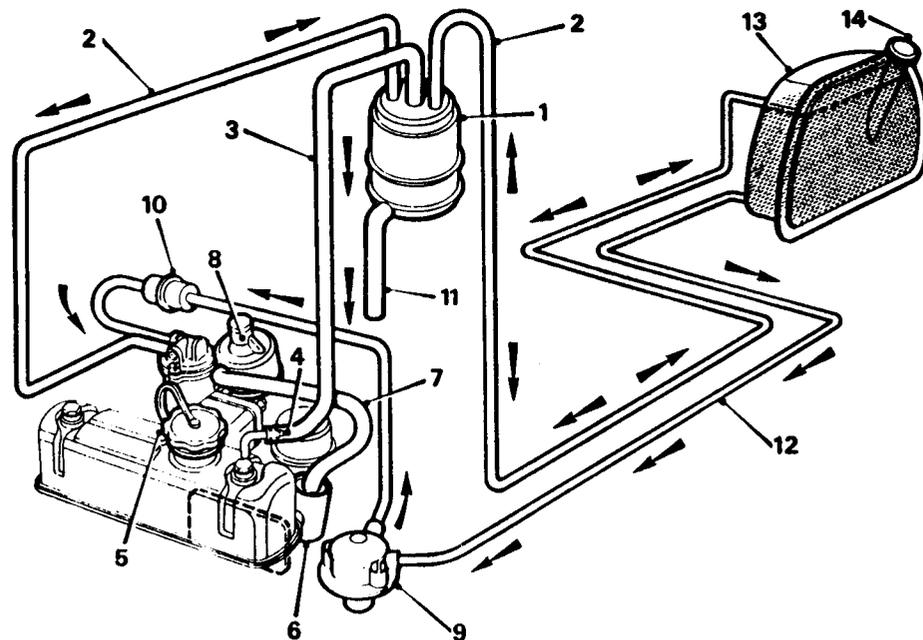
A restrictor is fitted to the air pump discharge connection to the gulp valve, to prevent surging when the gulp valve is operating.

### Carburetter

The carburetter is manufactured to a special exhaust emission control specification and is tuned to give optimum engine performance with maximum emission control.

The metering needle is arranged in such a manner that it is always lightly spring-loaded against the side of the jet to ensure consistency of fuel metering.

The throttle by-pass valve limits the inlet manifold depression and ensures that during conditions of engine overrun the air/fuel mixture enters the engine cylinders in a burnable condition consistent with low emission levels.



### THE FUEL EVAPORATIVE LOSS AND CRANKCASE EMISSION CONTROL SYSTEMS

- |  |                            |
|--|----------------------------|
| 1. Charcoal adsorption canister        | 9. Fuel pump               |
| 2. Vapour lines                        | 10. Fuel filter            |
| 3. Purge line                          | 11. Air vent hose          |
| 4. Restricted connection               | 12. Fuel pipe              |
| 5. Sealed oil filler cap               | 13. Fuel tank              |
| 6. Oil separator/flame trap (arrester) | 14. Sealed fuel filler cap |
| 7. Crankcase purge pipe                |                            |
| 8. Carburettor                         |                            |

### CRANKCASE EMISSION AND FUEL EVAPORATIVE LOSS CONTROL

General description

17.01.02

#### Crankcase emission control

The engine crankcase breather outlet incorporates an oil separator flame-trap (arrester) attached to the cylinder block side cover which is connected by a hose to the controlled depression chamber between the piston and the throttle disc of the carburettor. Piston blow-by fumes are drawn into the depression chamber of the carburettor from the side cover and are joined by purged air from the charcoal canister of the fuel evaporative loss system. These fumes combine with the inlet charge for combustion in the normal way.

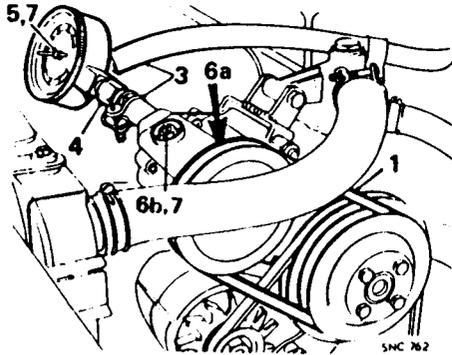
#### Fuel evaporative loss control

To prevent air pollution by vapours from the fuel tank, the control equipment stores the vapour in a charcoal-filled canister while the engine is stopped and disposes of it via the engine crankcase emission control system when the engine is running.

The fuel tank venting is designed to ensure that no liquid fuel is carried to the storage canister with the vapours and that vapours are vented through the control system.

The capacity of the fuel tank is limited by the position of the filler tube which ensures sufficient volume is available after filling to accommodate fuel which would otherwise be displaced as a result of a high temperature rise.

68B 115A



## AIR PUMP

Test 17.25.01

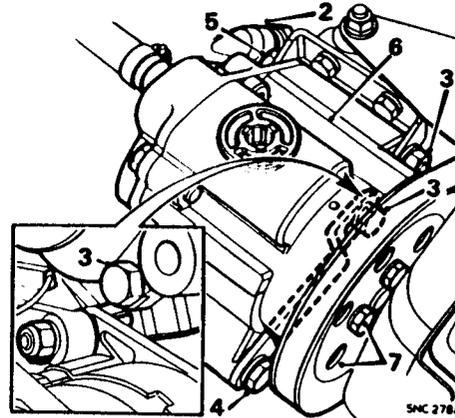
Faulty operation of the air pump is generally indicated by excessive noise from the pump. If a noisy air pump is suspected, remove the drive belt and run the engine. If this check shows that the pump is noisy, test as follows:

### Testing

1. Check the pump drive belt for correct tension, see 'MAINTENANCE'
2. Connect a tachometer to the engine in accordance with the instrument maker's instructions.
3. Slacken the clip and disconnect the air supply hose at the diverter valve.
4. Connect a 0 to 1.0 kgf/cm. (0 to 15 lbf/in.) pressure gauge to the hose.
5. Run the engine at 900 rev/min. A gauge reading of not less than 0.2 kgf/cm. (3 lbf/in.) should be registered.
6. If the specified pressure is not obtained:
  - a Check that the fan intakes are clear.
  - b Blank off the relief valve and test again.
 Pressure obtained; fit a new relief valve, see 17.25.11.

No pressure: fit a new air pump, see 17.25.07.

7. Start the engine and slowly increase the speed until air flow from the relief valve is detected. The pressure gauge should read 0.3 to 0.5 kgf/cm. (4 to 7 lbf/in.) at relief valve blow-off.
8. If the relief valve fails to operate correctly, fit a new relief valve, see 17.25.11.



## AIR PUMP

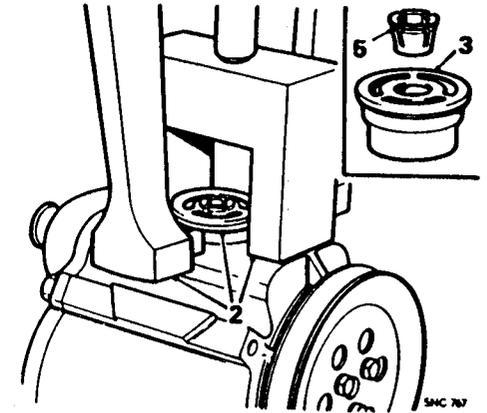
Remove and refit 17.25.07

### Removing

1. Disconnect the outlet hoses from the pump adaptor.
2. Remove the No. 1 cylinder spark plug.
3. Slacken the pump adjusting bracket and the alternator pivot bolt securing the pump.
4. Remove the screw securing the adjusting bracket to the pump.
5. Remove the pump pivot bolt.
6. Release the drive belt and remove the pump assembly.
7. Remove the pump pulley.

### Refitting

8. Reverse the procedure in 1 to 7.
9. Adjust the drive belt tension; total deflection of . in (13 mm) under thumb pressure at mid-point between pulleys.



## AIR PUMP RELIEF VALVE

Remove and refit 17.25.11

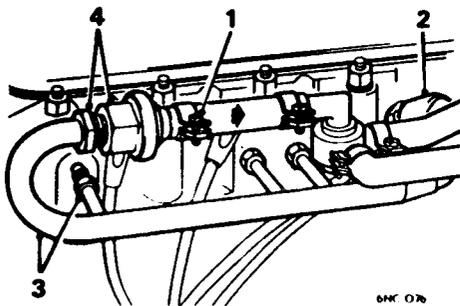
### Removing

1. Remove the air pump assembly, see 17.25.07.
2. Withdraw the relief valve from the pump body, using a gear puller and a fabricated bridge.

**DO NOT HOLD THE PUMP BY CLAMPING IT IN A VICE.**

### Refitting

3. Enter the new relief valve into the pump body.
4. Hold a protective plate over the valve and carefully drive the valve into the pump until the flange lightly contacts the pump body.
5. Insert the pressure setting plug into the relief valve and using a suitable tool press the centre of the plug to engage the locking legs.
6. Refit the air pump.
7. Test the air pump, see 17.25.01.



SNC 076

## AIR MANIFOLD

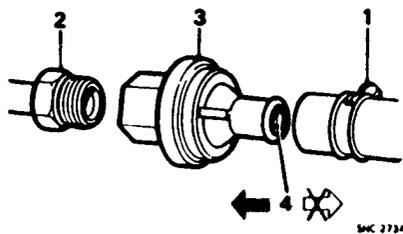
Remove and refit 17.25.17

### Removing

1. Release the clip securing the hose to the check valve and move the clip along the hose.
2. Disconnect the lead from No. 1 spark plug.
3. Unscrew the four unions from the cylinder head, pull the check valve from the hose and remove the air manifold assembly.
4. Hold the air manifold union and unscrew the check valve.

### Refitting

5. Reverse the procedure in 1 to 4.



SNC 273A

## CHECK VALVE

Remove and refit 17.25.21.

### Removing

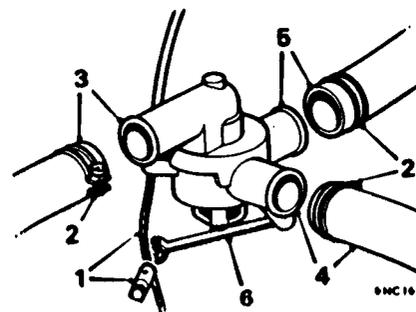
1. Release the clip securing the hose to the check valve. Move the clip along the hose and free the hose on the valve adaptor.
2. Hold the air manifold union to prevent it twisting, and unscrew the check valve.
3. Pull the check valve from the hose.

### Testing

4. Using the mouth, blow into the valve from each end in turn. Air should only pass through the valve from the air supply end. If air passes through from the air manifold end, renew the check valve.  
**CAUTION: DO NOT APPLY AIR LINE PRESSURE TO THE VALVE.**

### Refitting

5. Reverse the procedure in 1 to 3.



SNC 102

## DIVERTER VALVE

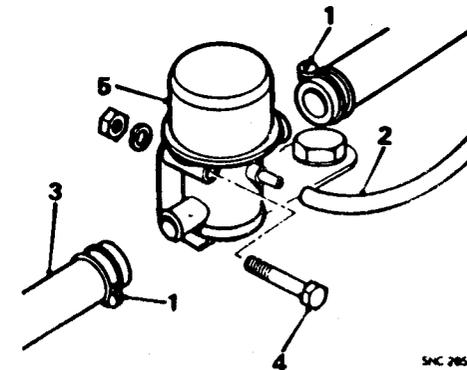
Remove and refit 17.25.25

### Removing

1. Slacken the trunnion and disconnect the cable from the operating lever.
2. Slacken the hose clips at the diverter valve.
3. Disconnect the check valve hose.
4. Disconnect the diverter valve from the pump hose.
5. Pull the diverter valve from the gulp valve hose.

### Refitting

6. Fit a new operating lever if necessary.
7. Reverse the procedure in 1 to 5.
8. Set the mixture control (choke) and adjust the operating lever and valve stem clearance, see 'MAINTENANCE'.



SNC 265B

## GULP VALVE

Remove and refit 17.25.30.

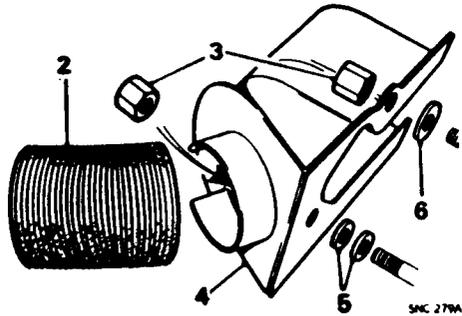
Test, see 'MAINTENANCE'

### Removing

1. Slacken all the hose to valve clips.
2. Pull the vacuum hose from the valve adaptor.
3. Pull the pump hose from the valve.
4. Remove the two bolts securing the valve to the bracket.
5. Pull the gulp valve from the manifold hose.

### Refitting

6. Reverse the procedure in 1 to 5.



## HOT AIR DUCT

Remove and refit 17.30.30.

Air temperature control valve, 1, 7 and 8

17.30.03

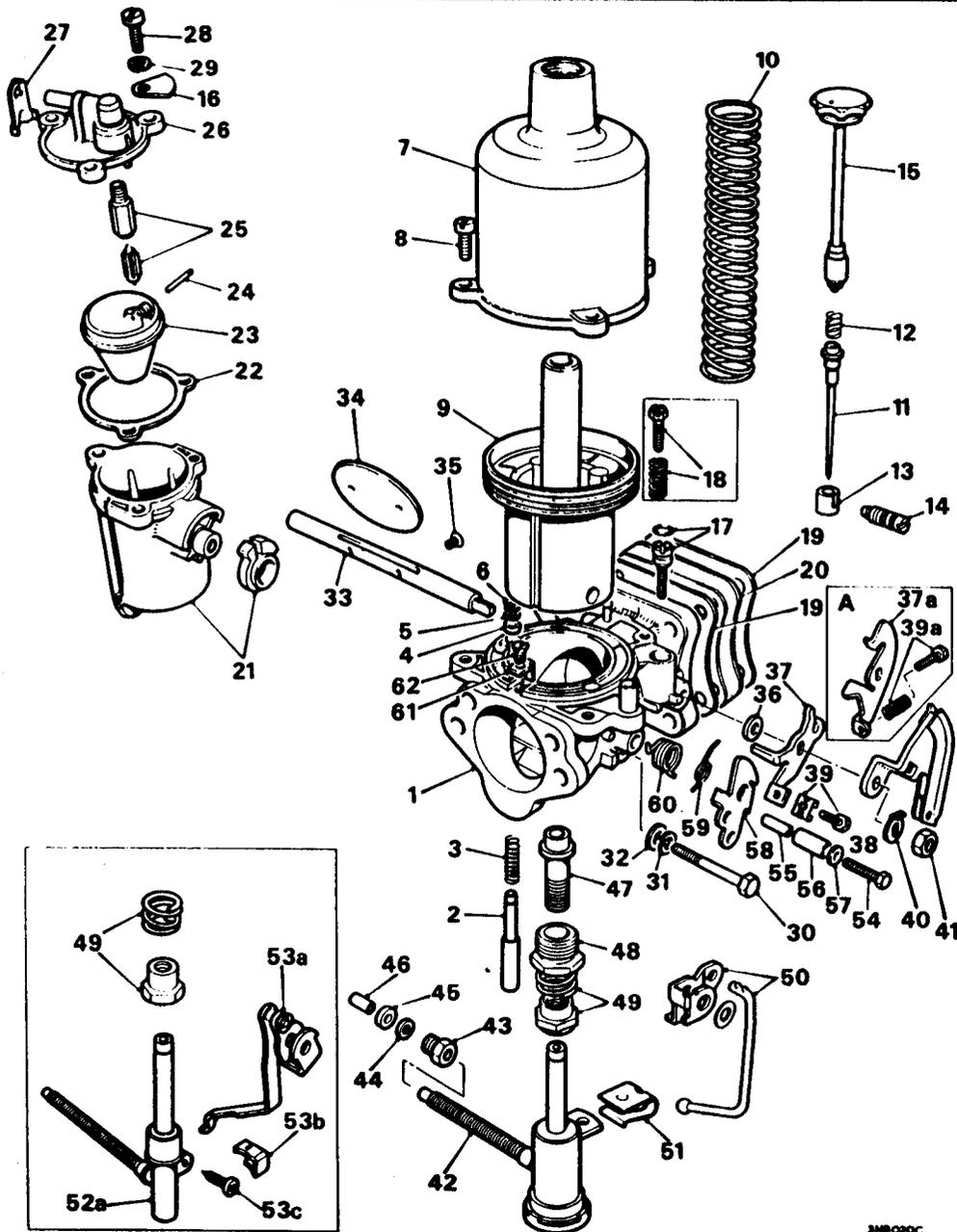
### Removing

1. Remove the air temperature control valve assembly.
2. Remove the flexible tube from the hot air duct.
3. Remove the two nuts securing the duct to the manifold.
4. Extract the hot air duct.

### Refitting

5. Ensure the two plain washers are on the outside stud.
6. Ensure the large washer bridging the manifold flanges is in place.
7. Reverse the procedure in 1 to 4.
8. Check the air temperature control valve, see 'MAINTENANCE'.



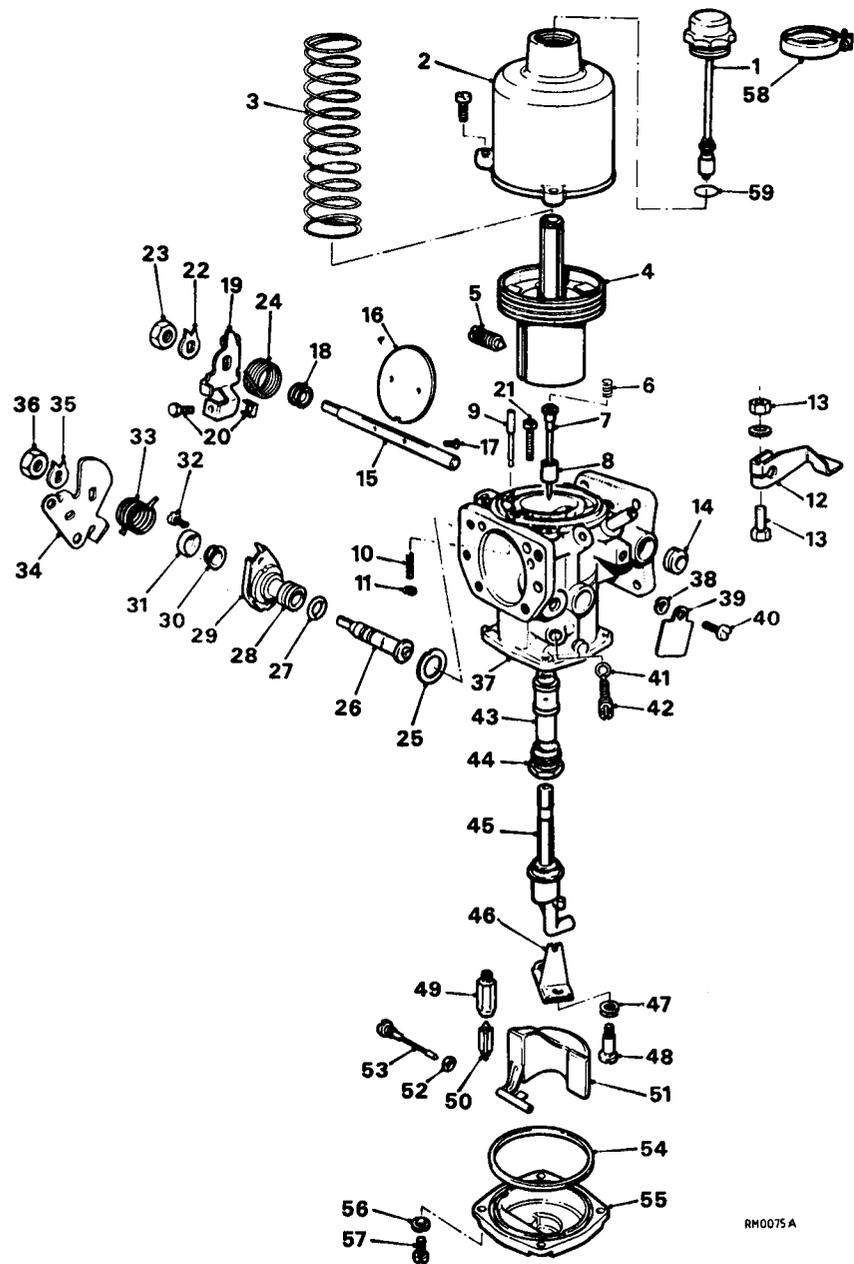


## KEY TO THE CARBURETTER COMPONENTS

- |  |  |
|--|--|
| 1. Body                                    | 34. Throttle disc                      |
| 2. Piston lifting pin                      | 35. Screw - securing disc assembly     |
| 3. Spring for pin                          | 36. Washer - throttle spindle          |
| 4. Sealing washer                          | 37. Throttle return lever*             |
| 5. Plain washer                            | 37a. Throttle return lever             |
| 6. Circlip                                 | 38. Progressive throttle (snail cam)   |
| 7. Piston chamber                          | 39. Fast idle screw*                   |
| 8. Screw - piston chamber                  | 39a. Fast idle screw and spring        |
| 9. Piston                                  | 40. Lock washer - throttle spindle nut |
| 10. Spring                                 | 41. Nut - throttle spindle             |
| 11. Needle                                 | 42. Jet assembly - CAPSTAT             |
| 12. Spring - needle                        | 43. Sleeve nut - jet flexible pipe     |
| 13. Support guide - needle                 | 44. Washer                             |
| 14. Locking screw - needle support guide   | 45. Gland                              |
| 15. Piston damper                          | 46. Ferrule                            |
| 16. Identification tag                     | 47. Jet bearing                        |
| 17. Throttle adjusting screw and 'O' ring* | 48. Jet locating nut                   |
| 18. Throttle adjusting screw and spring    | 49. Jet adjustment nut and spring      |
| 19. Joint washers                          | 50. Rod link and pick-up lever         |
| 20. Insulator block                        | 51. Spring clip                        |
| 21. Float-chamber and spacer               | 52a. Jet assembly - NON CAPSTAT        |
| 22. Joint washer - chamber                 | 53a. Pick-up lever - NON CAPSTAT       |
| 23. Float                                  | 53b. Link - NON CAPSTAT                |
| 24. Hinge pin - float                      | 53c. Screw - NON CAPSTAT               |
| 25. Needle and seat                        | 54. Pivot bolt                         |
| 26. Lid - float-chamber                    | 55. Pivot bolt tube - inner            |
| 27. Baffle plate                           | 56. Pivot bolt tube - outer            |
| 28. Screw - float-chamber lid              | 57. Distance washer                    |
| 29. Spring washer                          | 58. Cam lever                          |
| 30. Bolt - securing float chamber          | 59. Spring - cam lever                 |
| 31. Spring washer                          | 60. Spring - pick-up lever             |
| 32. Plain washer                           | 61. Guide - suction chamber piston     |
| 33. Throttle spindle                       | 62. Screw - securing guide             |

\*Used with sealed adjustment carburetters

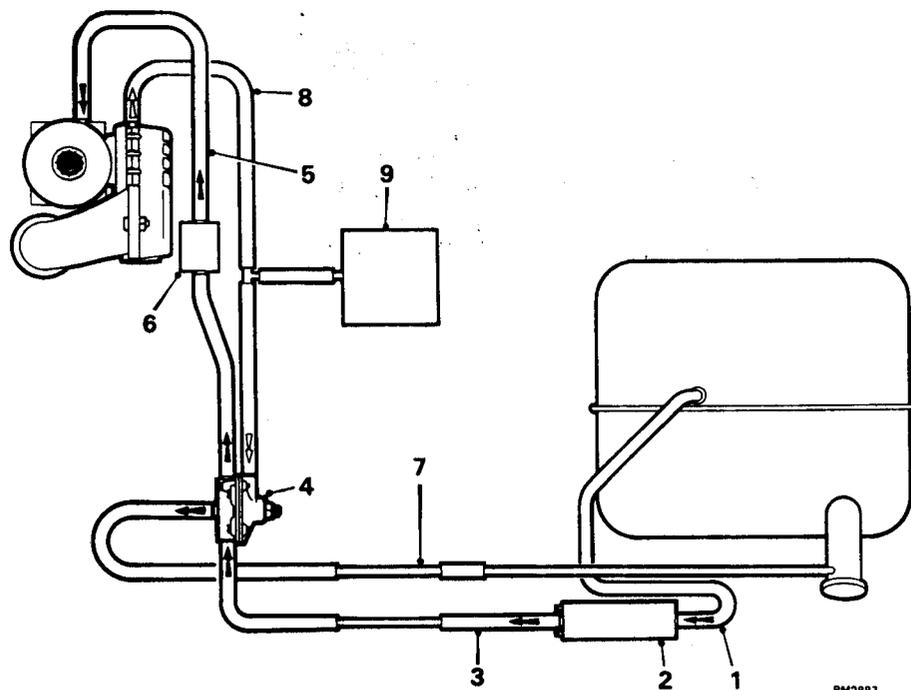
348020C



## KEY TO THE CARBURETTER COMPONENTS - TURBO ONLY

1. Piston damper
2. Suction chamber
3. Piston Spring
4. Piston
5. Needle retaining screw
6. Needle spring
7. Jet needle
8. Needle guide
9. Lifting pin
10. Lifting pin spring
11. Circlip
12. Throttle damper Operating lever
13. Clamp bolt and nut
14. Throttle spindle seal
15. Throttle spindle
16. Throttle disc
17. Throttle disc screw
18. Throttle spindle seal
19. Throttle lever
20. Fast idle adjustment screw
21. Throttle adjustment screw - idle
22. Tab washer
23. Retaining nut
24. Throttle spring
25. Cold start seal
26. Cold start spindle
27. 'O' ring
28. Cold start body
29. Retaining plate
30. Spindle seat
31. End cover
32. Retaining screw
33. Cold start spring
34. Fast idle cam
35. Tab washer
36. Retaining nut
37. Body
38. Spring washer
39. Identification tab
40. Retaining screw
41. Adjusting screw
42. Adjusting screw seal
43. Jet adjusting screw - mixture
44. Jet bearing
45. Jet bearing nut
46. Jet assembly
47. Bi-metal jet lever
48. Jet spring
49. Jet retaining screw
50. Float needle seat
51. Float needle
52. Float
53. Pivot seal
54. Float pivot
55. Float chamber cover seal
56. Float chamber cover
57. Spring washer
58. Cover screw
59. Piston damper retaining clip
60. Spring ring

RH0075A



## FUEL SUPPLY COMPONENTS - TURBO ONLY

1. Inlet hose and pipe-fuel pump
2. Fuel pump
3. Feed to fuel pressure regulator
4. Fuel pressure regulator
5. Inlet to carburetter
6. Fuel filter - in line
7. Excess fuel line and pipe - fuel tank
8. Air pressure sensing valve hose
9. E.C.U.

## TURBOCHARGER

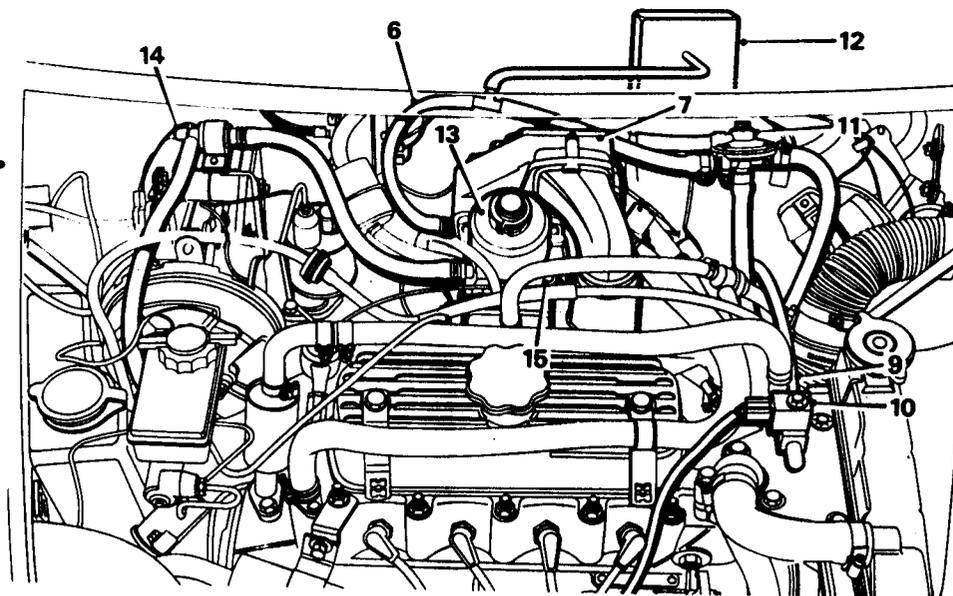
### Description

The turbocharger unit comprises three housings: exhaust, centre and compressor. The exhaust housing is bolted to the exhaust manifold and encloses the turbine wheel and wastegate. The centre housing carries the turbine/compressor shaft with its seals and fully floating bearings. Ports in the centre housing connect to the engine lubrication system from which a high volume flow of oil for bearing lubrication and turbine cooling is obtained. Temperatures as high as 950°C (1750°F) are generated in the turbine housing and oil prevents the transfer of heat to the compressor housing. The compressor housing connects to the engine induction system and incorporates a dump valve and pressure sensing connections.

### Operation

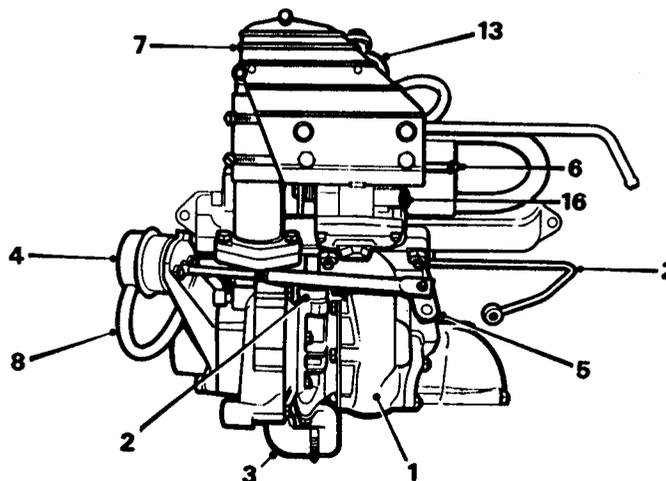
The turbocharger and its control system are shown in the illustration. The function of the Turbocharger is to provide, at moderate to high engine revolutions, air at between 4 to 7 lbf in<sup>2</sup> which increases engine volumetric efficiency and performance. Exhaust gas flow causes the turbine and compressor to rotate at speeds up to 130000 rev/min. The compressor draws air in and the compressed air is delivered through the carburettor to the inlet manifold and cylinders. A sensing line from the compressor housing actuates the wastegate diaphragm at a predetermined pressure and opens the wastegate valve, thus reducing exhaust gas flow to the turbine and thereby controlling compressor delivery. A sensing line from the plenum chamber connects to the E.C.U. and the fuel pressure regulating valve. At high en-

gine revolutions the boost pressure is increased by an electronically controlled solenoid valve that vents air from the sensing line. This reduces the pressure to the actuator diaphragm and the turbine pressure is allowed to increase to a maximum, controlled by the dump valve. The fuel regulating valve increases the fuel pressure in proportion to the compressor pressure.



## TURBOCHARGER SYSTEM

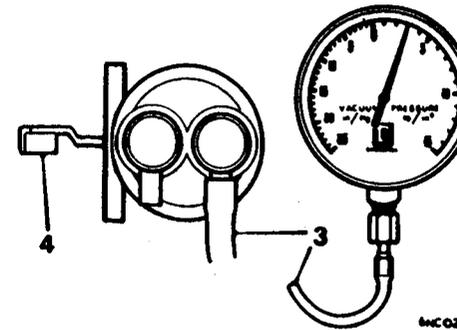
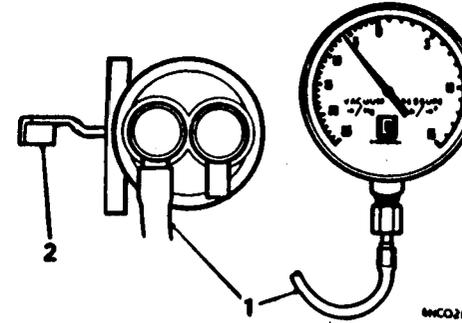
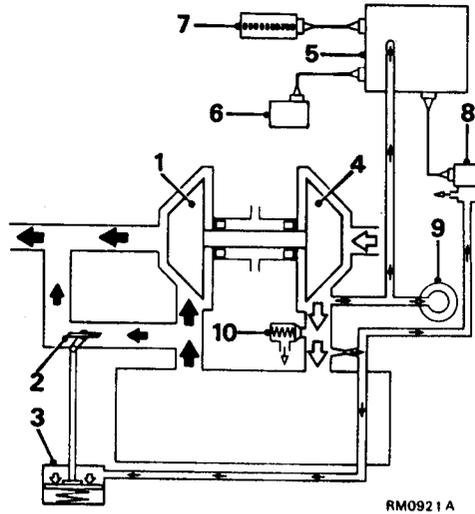
1. Turbocharger unit
2. Oil inlet pipe
3. Oil drain hose
4. Wastegate actuator - pressure diaphragm
5. Wastegate lever
6. Air pressure sensing hose to E.C.U. and fuel regulator
7. Compressor exit adaptor, plenum chamber and dump valve
8. Air pressure hose to actuator
9. Air pressure hose to pressure reducing valve
10. Solenoid
11. Fuel pressure regulator
12. E.C.U.
13. HIF 44 Carburetter
14. Anti run-on valve
15. Idling speed adjustment screw
16. Mixture adjustment screw



RM 2028

## TURBOCHARGER CONTROL SYSTEM

1. Turbine
2. Wastegate - exhaust pressure
3. Wastegate actuator - pressure diaphragm
4. Compressor
5. Electronic control unit E.C.U.
6. Ignition amplifier
7. Boost gauge - electronic
8. Pressure reducing valve and solenoid
9. Fuel pressure regulating valve
10. Dump valve



## FUEL PUMP - AUF 800 TYPE

### Testing

19.01.01

*Service tool: 18G 1116*

### Testing on the bench

Dry test a suspected pump

#### Suction

1. Connect the gauge, tool 18G 1116, to the inlet nozzle.

2. Operate the rocker lever through three full strokes; the minimum vacuum reading must not drop more than 2 in (50 mm) Hg in 15 seconds.

#### Delivery

3. Connect the gauge to the outlet nozzle.
4. Operate the rocker lever through two full strokes; the pressure reading must not drop more than 0.5 lbf/in<sup>2</sup> (0.04 kgf/cm<sup>2</sup>) in 15 seconds.

#### Testing without a gauge

A reasonable indication of pump condition can be obtained using the following procedure:

#### Suction

5. Hold a finger over the inlet nozzle and operate the rocker lever through full strokes.
6. Release the finger; a noise caused by suction should be heard.

#### Delivery

7. Hold a finger over the outlet nozzle and depress the rocker arm fully. Pressure should hold for up 15 seconds.

## DATA

Fuel pump:

Suction (min.) ..... 6 in (152 mm) Hg

Pressure (max.) ..... 4 lbf/in<sup>2</sup> (0.28 kgf/cm<sup>2</sup>)

## AIR CLEANER ASSEMBLY -TURBO ONLY

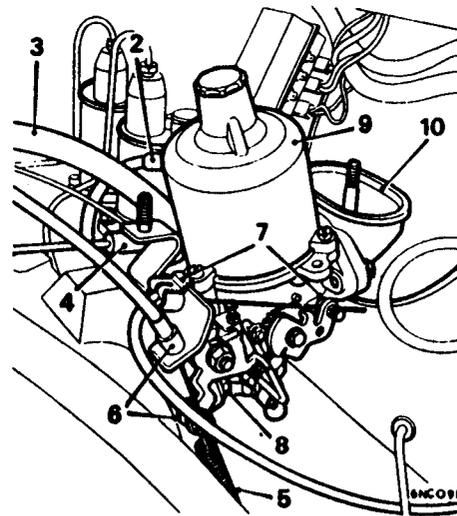
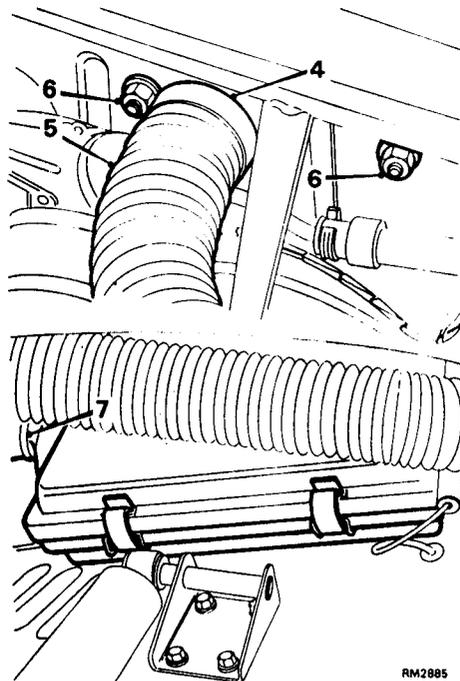
Remove and refit 19.10.01

### Removing

1. Raise the front of the vehicle and support it on stands.
2. Remove the left hand front road wheel.
3. Disconnect the fresh air intake duct.
4. Slacken the turbocharger air intake hose clip.
5. Disconnect the air intake hose from the air cleaner.
6. Remove the nuts and washers securing the air cleaner backplate to the inner wing.
7. Withdraw the air cleaner, slacken the air intake hose clip and disconnect the hose.

### Refitting

8. Reverse the procedure given in 1 to 7.



## CARBURETTER

Remove and refit 19.15.09

### Removing

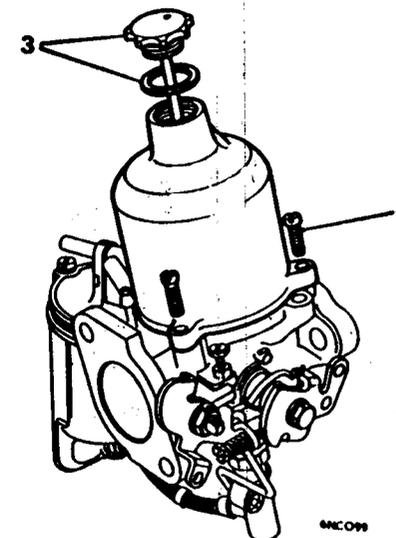
1. Remove the air cleaner assembly, see 'MAINTENANCE'.
2. Release the fuel hose from the float-chamber.
3. Disconnect the engine breather hose.
4. Disconnect the vacuum advance pipe at the carburetter adaptor.
5. Disconnect the throttle return spring.
6. Disconnect the throttle cable.
7. Disconnect the mixture control (choke) cable.
8. Remove the nuts and spring washers securing the carburetter to the manifold.
9. Remove the carburetter assembly.
10. Remove the air cleaner intake adaptor.

### Refitting

11. Fit new joint washers to the inlet manifold, intake adaptor, abutment bracket, and carburetter.

12. Reverse the procedure in 1 to 10, noting:

- a Check that the mixture control has  $\frac{1}{16}$  in (2 mm) free movement before the cable starts to pull on the lever.
- b Check that the throttle pedal has approximately  $\frac{1}{8}$  in (4 mm) of free movement before the throttle starts to open.
- c Check idle and mixture settings, see 'MAINTENANCE'.



## CARBURETTER

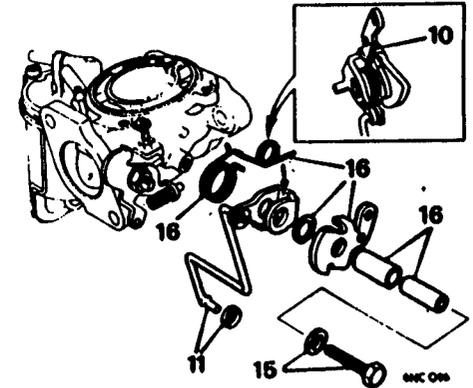
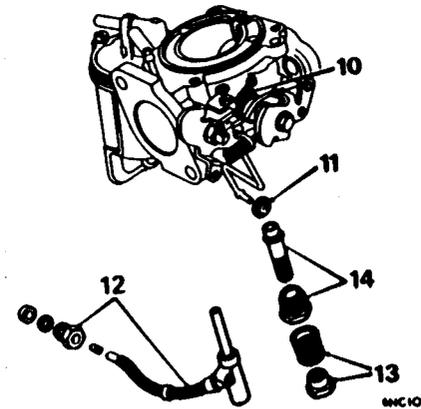
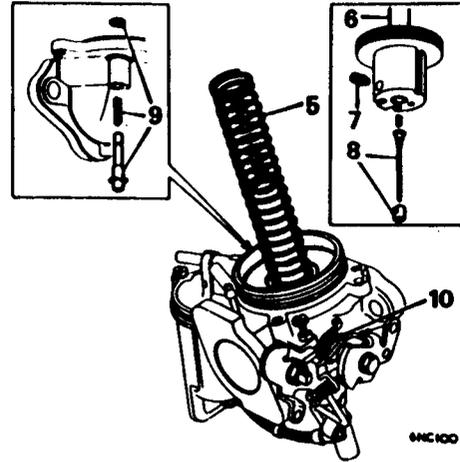
Overhaul and adjust 19.15.17

### Dismantling

1. Remove the carburetter assembly, see 19.15.09.
2. Thoroughly clean the outside of the carburetter.
3. Remove the damper assembly.

4. Unscrew the suction chamber securing screws and lift off the chamber.
5. Remove the piston spring.
6. Carefully lift out the piston assembly and empty the oil from the piston rod.
7. Remove the guide locking screw and withdraw the needle assembly.
8. Withdraw the needle from the guide and remove the spring from the needle.
9. Push the piston lifting pin upwards, detach its securing circlip 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 clip retaining the jet pick-up link.
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 carburettor flange.
23. Release the lock washer tabs securing the spindle nut and remove the nut and lock washer. Note the location of the lever arm in relation to the spindle and carburettor body and remove the lever arm and washer.

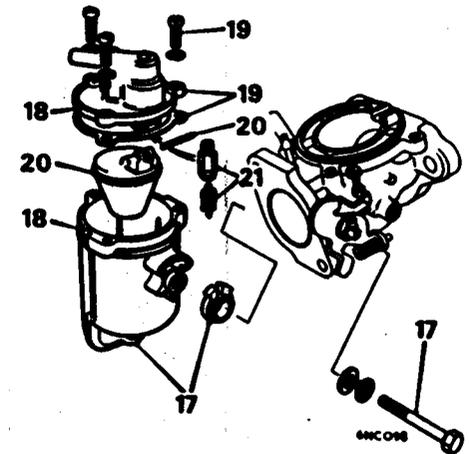
24. Press the split ends of the disc retaining screw together and remove the screws. Open the throttle and remove the disc from its slot in the throttle spindle. Remove the throttle spindle.

#### Inspecting

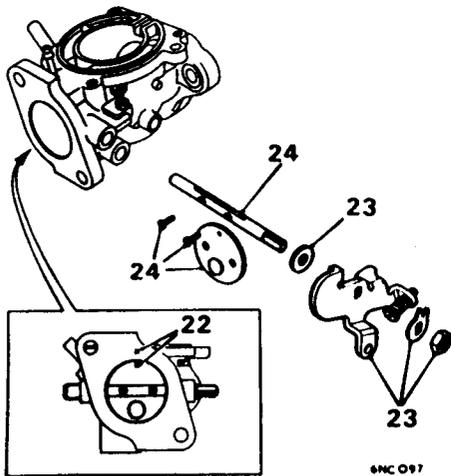
25. Examine the components as follows:
  - a Check the throttle spindle in the body for excessive play, and renew if necessary.
  - b Examine the float needle for wear, i.e. small ridges or grooves in the seat of the needle, and check that the spring-loaded plunger on the opposite end operates freely.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

#### Reassembling

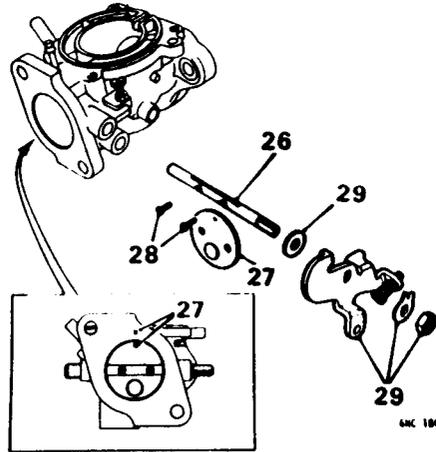
26. Refit the spindle to the body, with the countersunk holes in the spindle facing outwards.



27. 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 to centralize it in the bore of the carburettor.



INC097

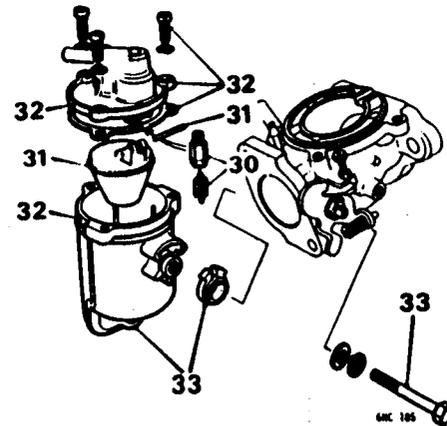


INC 104

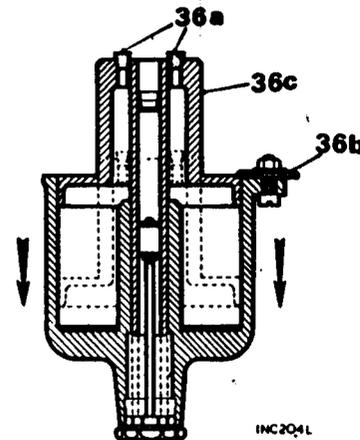
28. Fit new disc retaining screws but do not fully tighten, check that the disc closes fully and adjust its position as necessary. Tighten the screws fully and spread their split ends enough to prevent them turning.
29. Assemble the spacing washer, lever arm, lock washer and securing nut; ensure that 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.
30. Screw the seating into the float chamber; 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; ensure that the part number tag is in place and tighten the securing screws evenly.

33. Refit the float-chamber and spacer to the body and tighten the retaining bolt.
34. 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 is exceeded, check the piston

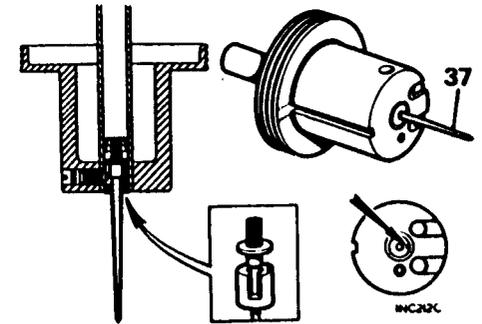
and chamber for cleanliness and mechanical damage. Renew the assembly if the time taken is still not within these limits.



INC 105



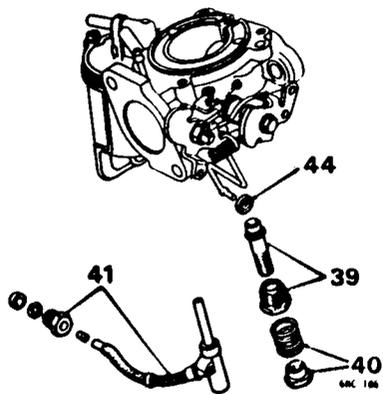
INC204L



INC20C

37. Fit the spring and guide to the needle and insert the assembly into the piston (with the guide fitted flush with the face of the piston) and the needle guide etch mark aligned correctly with the piston transfer holes. Fit a new guide locking screw.
- Note:** Check that the correct needle is fitted - refer to 'ENGINE TUNING DATA'.
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 (5 mm) beyond the gland. Tighten the sleeve nut until the gland is compressed; over-tightening can cause leakage.
  42. Refit the piston, spring and suction chamber to the body and tighten the securing screws evenly.

43. Reverse the procedure in 14 and 15.
44. Hold up the choke lever to relieve pressure on the jet pick-up link, support the end of the moulded jet and refit the securing clip.
45. Reset the jet adjusting nut to obtain the initial setting:
  - a sealed adjustment type: Screw the nut down three complete turns (18 flats).
  - b Non-sealed type: Screw the nut down two complete turns (12 flats).
46. Refit the carburetter, see 19.15.09.
47. Tune and adjust the carburetter, see 'MAINTENANCE'.



## CARBURETTER - TURBO ONLY

Remove and refit 19.15.09

### Removing

1. Disconnect the battery
2. Remove the plenum chamber, see 19.42.20.
3. Remove the bolts securing the turbocharger outlet pipe; discard the gasket.

4. Remove the carburetter heat shield
5. Disconnect the throttle cable and the choke cable.
6. Disconnect the vacuum pipe from the carburetter flange tapping.
7. Disconnect the fuel pipe from the float-chamber, plug the pipe to prevent the ingress of dirt.
8. Release the clip and disconnect the float-chamber vent pipe.
9. Remove the nuts securing the carburetter; withdraw the carburetter, throttle cable abutment bracket and spacer. Discard the gaskets.

### Refitting

**CAUTION:** All gaskets must be renewed and also the spacer if it is damaged. Mating surfaces must be scrupulously clean.

10. Fit new gaskets, spacer and abutment bracket.
11. Fit the carburetter and securing nuts. Tighten nuts progressively by diagonal selection to avoid distortion.
12. Connect the float chamber vent pipe and the fuel pipe.
13. Connect the throttle cable; ensure the cable has 1/8in (4mm) free movement.
14. Connect the choke cable; ensure the cable has 1/16in (2mm) free movement when the choke control knob is pushed fully in.
15. Connect the vacuum pipe.
16. Reverse the procedure given in 1 to 4; use a new gasket when fitting the turbocharger outlet pipe.

## CARBURETTER - TURBO ONLY

Overhaul and Pressure Test 19.15.17

### Dismantling

**WARNING:** The carburetter and other fuel system components are pressurised when the engine is running. All carburetter seals must, therefore, be renewed during reassembly and a carburetter pressure test carried out on completion.

1. Remove the carburetter, see 19.15.09.
2. Thoroughly clean all exterior surfaces of the carburetter.
3. Mark the bottom cover-plate and body for reassembly and remove the cover complete with sealing ring. Remove the jet adjusting screw and spring, and the jet adjusting lever retaining screw. Withdraw the jet complete with adjusting lever and disengage the lever. Remove the float pivot spindle, float, needle valve and valve seat.
4. Remove the piston damper assembly, remove the retaining screws and lift off the suction chamber and piston. Remove the spring clip from the top of the piston rod and withdraw the piston and spring. Drain the oil from the piston rod.

5. Unscrew the needle guide locking screw and withdraw the needle, guide and spring. Unscrew the jet bearing nut and withdraw the bearing.
6. Note the location of the ends of the fast idle cam lever return spring. Remove the cam lever retaining nut and locking washer, then, with the return spring held towards the carburetter body, prise off the cam lever and remove the return spring.
7. Remove the dust cap and the starter unit assembly and gasket. Remove the seal from the end of the starter unit spindle, withdraw the spindle and remove the 'O' ring.
8. Note the location of the ends of the throttle lever return spring and remove the spring. Remove the retaining nut, lock washer, plain washer, throttle lever and actuating lever. Remove the throttle damper operating lever and spring from the other end of the spindle.
9. Close the throttle, mark the position of the throttle disc in relation to the carburetter flange and remove the throttle disc retaining screws; open the throttle and carefully withdraw the disc from the throttle spindle. Withdraw the throttle spindle, noting the way it is fitted in relation to the carburetter body, and remove its seal.
10. Examine the throttle spindle and its bearings for excessive play, and the float needle and seating for excessive wear; renew if necessary.
11. Discard all seals, gaskets and 'O' rings.

12. Examine the carburettor body for cracks and damage and for security of the brass connections and the piston key. Clean the inside of the suction chamber and piston rod guide with fuel or denatured alcohol and wipe dry. Abrasives must not be used.

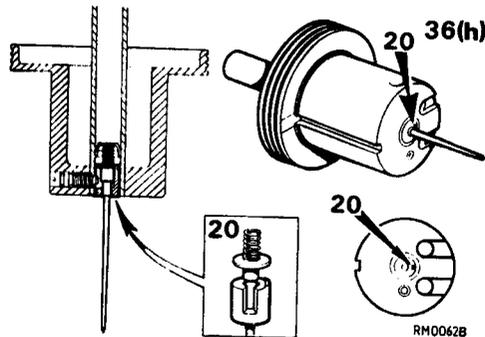
#### Reassembling

13. Fit the piston into the suction chamber, without the damper and spring, hold the assembly horizontally and spin the piston; the piston should spin freely in the suction chamber without any tendency to stick. If there is any tendency for the piston to stick, the suction chamber and piston must be replaced as an assembly.
14. Fit the throttle spindle to the carburettor body and insert the throttle disc into the spindle in its original position. New throttle disc retaining screws must be used when refitting the disc. Ensure that the throttle disc is correctly positioned and closes correctly before tightening the retaining screws. Spread the split ends of the screws sufficiently to prevent turning.
15. Position new throttle spindle end seals just below the spindle housing flange and fit the actuating lever throttle lever, washers, retaining nut and throttle lever return spring. Lock the retaining nut with the lock washer. Fit the spring and throttle operating lever to the other end of the spindle.
16. Fit the cold start spindle, use a new seal and 'O' ring.
17. Fit the unit with the cut-out towards the top retaining hole and the slotted flange of the retaining plate towards the throttle spindle. Fit cold start unit retaining screws,

spindle seat and dust cap, fast idle cam lever return spring, cam lever, lock washer and retaining nut. Lock the retaining nut with the lock washer.

18. Fit the jet bearing and nut. Fit the jet assembly to the bi-metal jet adjusting lever and ensure that the jet head moves freely in the slot.
19. Set the jet flush with bridge in the carburettor body.
20. Fit the correct size needle, see

**'ENGINE TUNING DATA' to the piston. Use a new retaining screw and ensure that the needle guide etch mark aligns correctly with the transfer holes and the needle guide is flush with the base of the piston.**



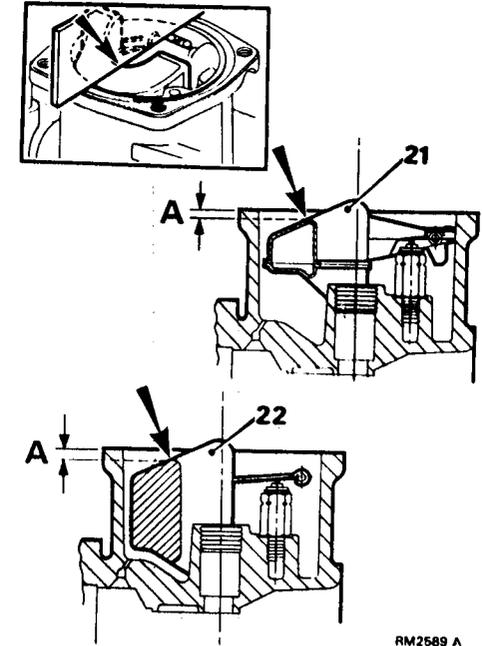
21. Fit the needle valve seat, needle valve, float, pivot spindle and washer.

22. Hold the carburettor inverted so that the weight of the float holds the needle valve closed and check that dimension 'A' is correct.  
*Note: Two types of float may be fitted; check that the dimension being checked is correct for the type of float fitted. Use a straight edge positioned across the face of the float chamber when checking the float height.*

Float - Type 1 - Dimension 'A' =  $0.040 \pm 0.020$ in ( $1.0 \pm 0.5$ mm) Float - Type 2 - Dimension 'A' =  $0.080 \pm 0.020$ in ( $2.0 \pm 0.5$ mm)

Adjust the float height if necessary by carefully bending the float arm. Check that the float pivots easily on the spindle.

23. To prevent the piston spring from being 'wound up' during assembly, temporarily fit the piston and suction chamber, less the piston spring, to the carburettor body and using a pencil, mark their positions relative to each other.
24. Remove the suction chamber, fit the piston spring.
25. Hold the suction chamber above the piston, align the pencil marks and carefully lower the chamber over the piston spindle. Fit the securing screws and tighten them evenly to prevent distortion. Lift the piston and fit the spring clip to the piston rod.
26. Using the piston lifting pin, raise the piston and check that the piston falls on to the bridge with a sharp 'click' when the pin is released.
27. Top up the piston damper and fit the cap.



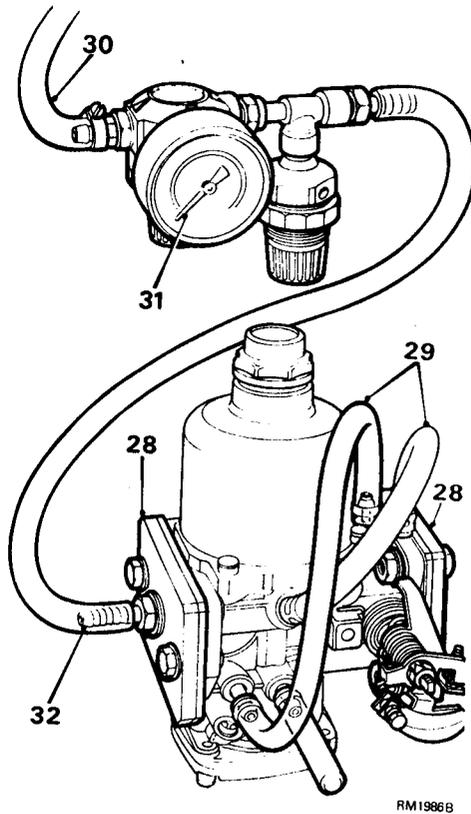
#### Pressure Test

Service tool: 18G 1462

#### Testing

28. Fit the blanking plates (part of 18G 1462) to the carburettor flanges; use new gaskets and ensure that the plates and flanges are clean.
29. Seal all open vents on the carburettor.

30. Connect the inlet side of the pressure gauge to a suitable compressed air supply  
**CAUTION:** Do not connect the outlet pipe of the pressure gauge to the carburettor until the delivery pressure has been correctly set
31. Turn on the compressed air supply and set the pressure gauge to 15 lbf/in<sup>2</sup> (1.0 kgf/cm<sup>2</sup>).  
**Note:** The relief valve is set to operate at 17 lbf/in<sup>2</sup> (1.1 kgf/cm<sup>2</sup>).
32. Connect the outlet pipe to the blanking plate; submerge the carburettor in water and check for air leaks.
33. Remove the carburettor from the water; blow all water from the carburettor before removing the test equipment.
34. Rectify any leaks as necessary.
35. Remove the test equipment.
36. Fit the carburettor to the engine, see 19.15.09.
37. Check/adjust carburettor, see tuning chart at rear of engine tuning data section.



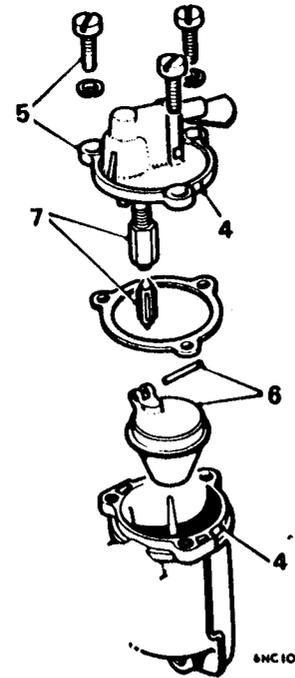
RM1986B

### FLOAT-CHAMBER NEEDLE AND SEAT

Remove and refit 19.15.24

#### Removing

1. Remove the air cleaner assembly.
2. Disconnect the engine breather hose at the carburettor adaptor.
3. Disconnect the fuel hose from the float chamber.
4. Mark the lid and float-chamber for assembly.
5. Remove the lid securing screws and detach the lid.



6NC101

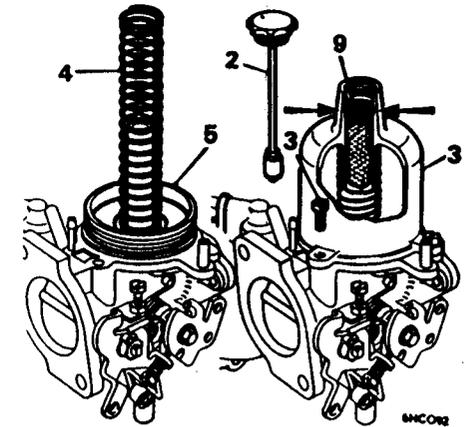
6. Hold the float hinge pin at its serrated end and withdraw the pin and float.
7. Extract the float needle from its seating.

#### Inspecting

8. 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

9. Clean any sediment from the float-chamber, and fit a new joint washer if required.
10. Reverse procedure 1 to 5 and ensure the specification number tag is fitted.



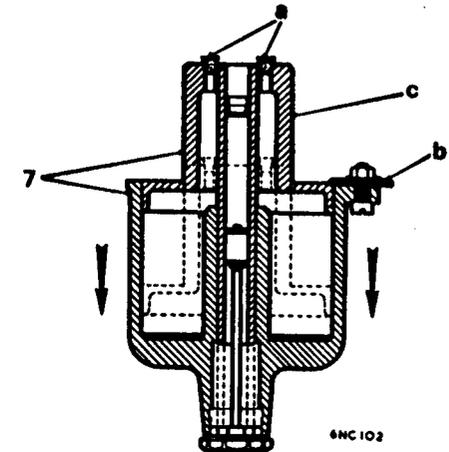
6NC02

### PISTON AND SUCTION CHAMBER

Clean and refit 19.15.28

#### Removing

1. Remove the air cleaner assembly, see 19.10.01.
2. Remove the damper assembly.



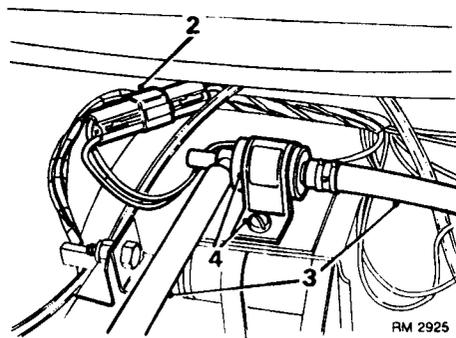
6NC102

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

#### Refitting

8. Refit the piston, spring and suction chamber to the carburetter 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 the piston damper.



### THROTTLE PEDAL

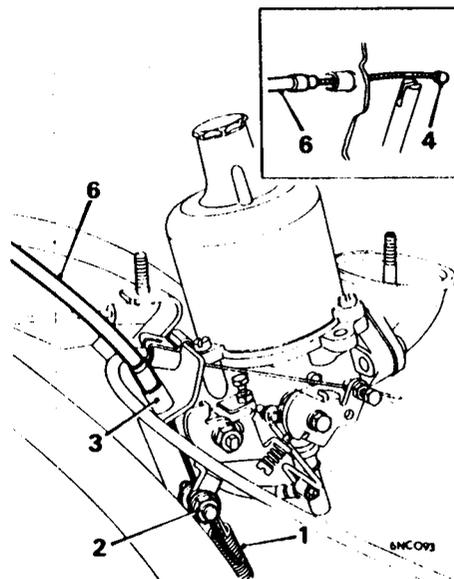
Remove and refit 19.20.01

#### Removing

1. Disconnect the throttle cable return spring.
2. Release the inner cable from the throttle pedal.
3. Remove the pedal bracket securing nuts and withdraw the pedal assembly.

#### Refitting

4. Reverse the procedure in 1 to 3.



### ANTI RUN-ON VALVE - TURBO ONLY

Remove and refit 19.15.73

#### Removing

1. Disconnect the battery
2. Disconnect the electrical leads at the multi-connector.
3. Disconnect the pipes from the anti-run on valve.
4. Remove the valve and mounting bracket from the servo mounting; release the valve from the mounting bracket.

#### Refitting

5. Reverse the procedure given in 1 to 4.

### THROTTLE CABLE

Remove and refit 19.20.06

#### Removing

1. Release the throttle return spring.
2. Slacken the throttle cable trunnion clamp nut.
3. Release the throttle cable from the abutment bracket.

4. Release the cable from the throttle pedal.
5. Remove the rubber clip retaining the throttle cable to the heater hose.
6. Pull the throttle cable through the bulkhead into the engine compartment.

#### Refitting

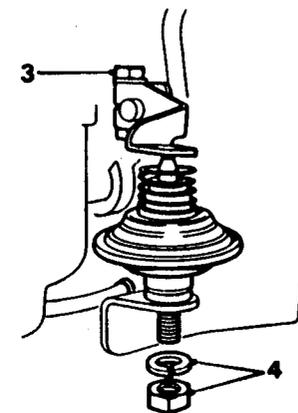
7. Reverse the procedure in 1 to 6 noting:  
Press down the throttle pedal and check that the pedal has approximately  $\frac{1}{8}$  in (4 mm) free movement before the throttle begins to open.

### THROTTLE DAMPER

Remove and refit 19.20.08

#### Removing

1. Remove the air cleaner and air temperature control valve assembly, see 'MAINTENANCE'.
2. Remove the hot air duct.
3. Slacken the bolt and nut securing the throttle damper operating lever to the carburetter spindle.
4. Remove the nut to release the throttle damper from its mounting.



### Refitting

5. Refit the damper to its mounting.
6. Set the damper operating lever as follows:
  - a Position a 0.080 in (2.03 mm) feeler gauge between the operating lever and the damper plunger.
  - b Press the operating lever downwards until the damper is fully compressed; hold the lever in this position and tighten the lever bolt and nut.
  - c Release the lever and remove the feeler gauge.
7. Refit the hot air duct.
8. Refit the air cleaner and the air temperature control valve.

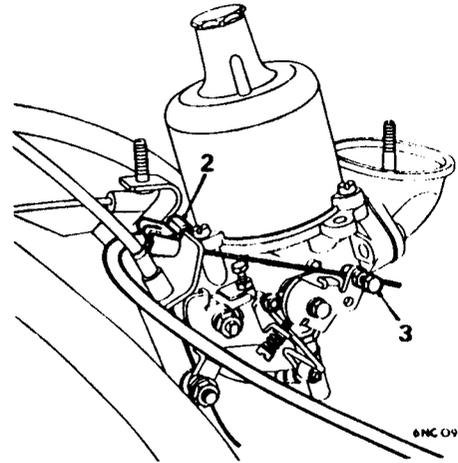
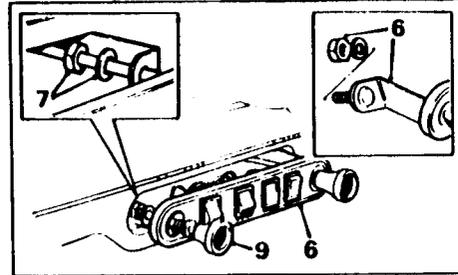
### MIXTURE CONTROL (CHOKE) CABLE ASSEMBLY

Remove and refit 19.20.13

#### Removing

If a console is fitted, remove the console retaining screws to enable the console to be moved as necessary.

1. Remove the air cleaner, see 'MAINTENANCE'.
2. Remove the clip securing the outer cable to the abutment bracket.
3. Slacken the inner cable trunnion screw on the carburettor lever and disconnect the cable.
4. Remove the heater retaining screws and lower the heater assembly.
5. Disconnect the heater switch wire from the switch.
6. Remove the switch panel retaining nuts and pull the panel forward from the dash.
7. Unscrew the cable securing nut, note the locking washer.



8. Pull the cable complete through the bulkhead grommet.
9. Pull the cable through the switch panel.

#### Refitting

10. Reverse the procedure in 1 to 9, noting:

Check that the mixture control cable has  $\frac{1}{16}$  in (2 mm) free movement before the cable starts to pull on the lever.

### MIXTURE CONTROL (CHOKE) CABLE - TURBO ONLY

Remove and refit

Removing 19.20.13

1. Disconnect the battery.
2. Disconnect the inner and outer choke cables from the carburettor.
3. Remove the centre console, see 76.25.01.
4. Remove the screws securing the clock and switch panel to the heater unit, move the panel aside.
5. Remove the heater distribution control knob and release the panel from the mounting bracket.
6. Noting their fitted position, disconnect the Lucar connectors from the heater blower motor switch.
7. Disconnect the demist tubes from the heater.
8. Slacken the nut retaining the rear of the heater and remove the screws securing the heater to the fascia rail.
9. Carefully lower the heater.
10. Remove the nuts securing the mixture control and cable to the switch panel.
11. Withdraw the cable through the bulkhead.

#### Refitting

12. Ensure that the cable grommet is correctly fitted.
13. Reverse the procedure given in 1 to 12.
14. Check that the cable has  $\frac{1}{16}$  in (2mm) free movement when the choke control is pushed fully in; adjust inner cable as necessary.

### TURBOCHARGER

Remove and refit

19.42.01

#### Removing

1. Remove the turbocharger lower intake hose, see 19.42.11.
2. Remove the carburettor, see 19.15.09.
3. Disconnect the oil drain hose from the turbocharger.
4. Remove the block fitted in operation 19.42.11.
5. Disconnect the crankcase breather hose, heater hoses and the brake servo hose from the inlet manifold. Plug the brake servo hose to prevent the ingress of dirt.
6. Remove the nuts and washers securing the inlet manifold; release the manifold from the studs and recover the ring dowels from the manifold/cylinder head.
7. Remove the coil and mounting bracket.
8. Disconnect the harness from the oil pressure switch and oil pressure transducer.
9. Remove the oil pressure transducer.
10. Remove the oil pressure switch adapter; collect the sealing washers.

11. Remove the bolts securing the vapour separator to the clutch housing; move the separator aside. Remove and discard the gasket.
12. Remove the bolt securing the engine steady rod to the bracket, move the engine steady rod aside.
13. Disconnect the hose and Lucar connectors from the boost control solenoid valve and remove the radiator top mounting bracket together with the valve.
14. Remove the bolt securing the turbo oil feed pipe clip to the cylinder block.
15. Remove the nuts and washers securing the exhaust manifold, pull the engine forwards and release the manifold and turbocharger from the mounting studs.
16. Note the fitted position of the oil feed pipe; remove the banjo bolt, release the pipe and recover the sealing washers. Plug the end of the pipe to prevent ingress of dirt.
17. Remove and discard the manifold gasket.
18. Remove the exhaust outlet elbow, discard the lock tabs and gasket.
19. Release the locking wire from the turbocharger securing nuts, release the lock tabs and remove the nuts. Discard the lock tabs.
20. Separate the turbocharger from the exhaust manifold, discard the gasket.  
*Note: If a new unit is being fitted, transfer the oil drain elbow to the new unit; use a new gasket. Fit blanking plugs to the old unit if it is to be returned.*  
**CAUTION:** Prior to refitting the turbocharger, inject 5 fluid ounces (140ml) of clean engine oil through the oil inlet hole in the turbocharger and rotate the shaft by hand to distribute the oil over the bearings.

### Refitting

21. Reverse the procedure given in 1 to 20. Use new gaskets, lock tabs and locking wire.
22. Top up the cooling system.
23. Top up engine oil level if necessary.
24. Disconnect the coil H.T. lead and crank the engine until the low oil pressure warning light is extinguished. Refit the H.T. lead.
25. Run the engine and check for oil and exhaust leaks.

## TURBOCHARGER

### Check

19.00.00

**Service tool:** 18G 1462; D.T.I. gauge

**CAUTION:** When a fault in the turbocharger is suspected, carry out the initial checking procedure detailed in the Fault Finding Manual before removing the turbocharger.

### Inspecting

1. Remove the turbocharger, see 19.42.01.
2. Clean the exterior of the turbocharger using a suitable solvent.  
**CAUTION:** Do not immerse the turbocharger in the solvent and do not allow solvent to enter the turbocharger.

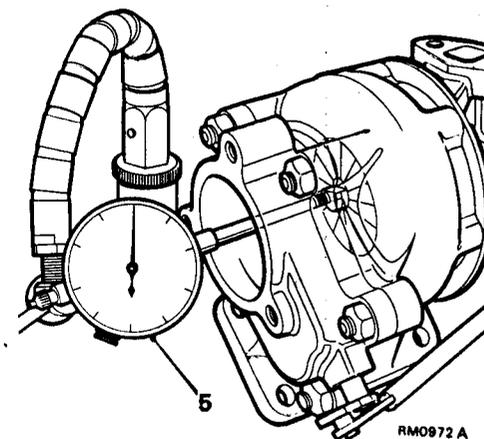
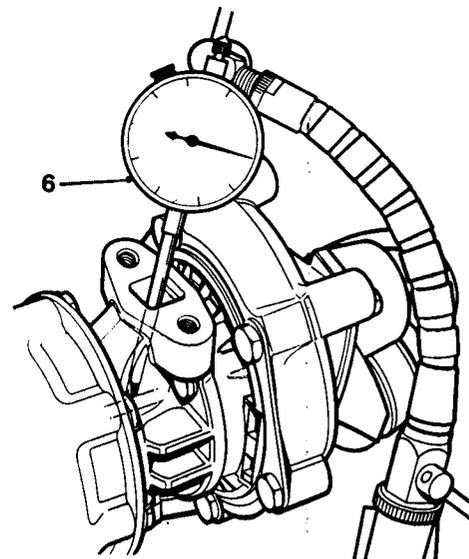
### Checking the compressor and turbine.

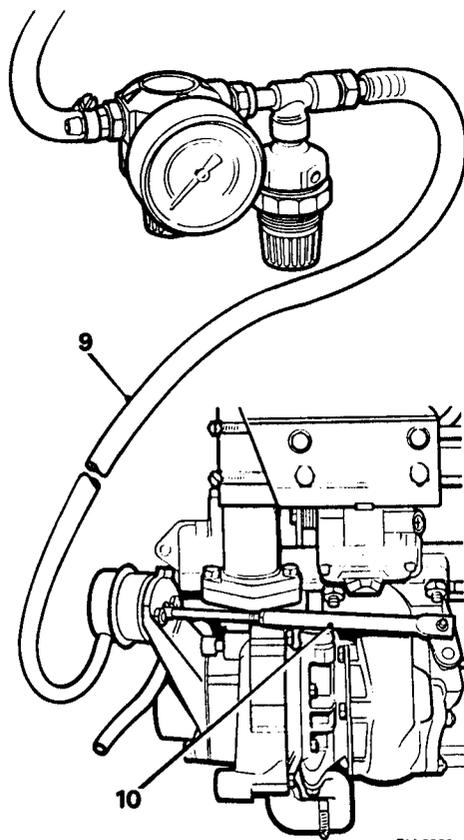
3. Check the turbine and compressor rotors for damage, heat discoloration and heat distortion.
4. Rotate the shaft and check for smooth operation. Move the shaft axially and radially and check for bearing roughness and rubbing of the rotor tips.

5. Mount the D.T.I. gauge against the end of the turbine shaft and zero the gauge. Push and pull the shaft and note the D.T.I. gauge reading. Correct end-float of shaft - 0.001 to 0.003 in (0.03 to 0.08 mm)
6. Position the D.T.I. gauge with the gauge stylus inserted through the oil drain hole and zero the gauge. Move the turbine shaft from side to side and note the D.T.I. gauge reading. Correct radial clearance - 0.003 to 0.006 in (0.08 to 0.015mm)

### Checking wastegate operation

7. Connect the inlet side of pressure test equipment 18G 1462 to a suitable compressed air supply.  
**CAUTION:** Do not connect the outlet pipe of the pressure gauge to the wastegate actuator until the delivery pressure has been correctly set.
8. Turn on the compressed air supply and set the pressure gauge to 4 lbf/in<sup>2</sup> (0.35 kgf/cm<sup>2</sup>).
9. Disconnect the air pressure hose from the wastegate actuator and connect the outlet pipe from the gauge in its place.
10. Check that the wastegate operates at the applied pressure of 4 lbf/in<sup>2</sup> (0.35 kgf/cm<sup>2</sup>).  
**Note:** It may be necessary to gently tap the turbine housing with a soft mallet to initiate movement of the actuator rod.
11. If the wastegate fails to operate, check the actuator by substituting a new actuator and repeating the test. If the wastegate still fails to operate, replace the turbocharger.  
**CAUTION:** No adjustment of the actuator rod is permitted.
12. Remove the test equipment, connect the air pressure hose to the actuator.
13. Fit the turbocharger to the engine, see 19.42.01.





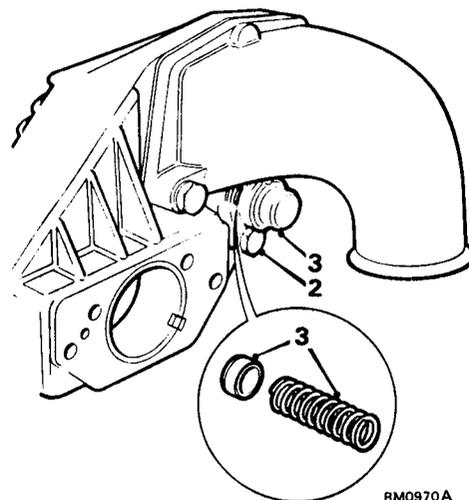
RM 2922

### Inspection

5. Carefully remove all traces of carbon from the valve, spring and valve bore.
6. Check the valve and bore for scoring; replace plenum chamber as necessary.
7. Check the spring for distortion; renew as necessary.

### Refitting

8. Reverse the procedure given in 1 to 4; use a new gasket (if fitted).



RM0970A

### TURBOCHARGER LOWER INTAKE HOSE

Remove and refit 19.42.11

### Removing

1. Disconnect the battery
2. Remove the bonnet, see 76.16.01.
3. Remove the underpanels.
4. Remove the bolts securing the left and right hand engine steady bars.
5. Remove the front exhaust bracket; 'U' bolt and clamp.
6. Disconnect the gear change steady rod from the gearbox.

7. Remove the bolt securing the top engine steady rod to the mounting bracket.
8. Pull the engine forwards and position a suitably sized wooden block between the engine and bulkhead to gain access to the lower intake hose.
9. Disconnect the turbocharger top intake hose from the air cleaner.
10. Release the clip securing the top intake hose to the connector.
11. Remove the top intake hose.
12. Release the clips securing the lower intake hose, withdraw the hose.

### Refitting

13. Reverse the procedure given in 1 to 12.

### TURBOCHARGER OIL DRAIN HOSE

Remove and refit 19.42.12

### Removing

Service tool: 18G1063, 18G1240

1. Disconnect the battery.
2. Remove the under panels.
3. Drain the engine oil.
4. Release the inboard joint from the differential using 18G 1240. Insert the tool between the joint and the final drive end cover and strike the flat face of the tool inwards towards the final drive housing.
5. Remove the left hand front road wheel; support the vehicle on a suitable stand.
6. Using a trolley jack, raise the suspension until it is clear of the rebound rubber.
7. Remove the rebound rubber and position a thin, solid wedge in its place.
8. Lower the suspension until it is resting on the wedge.

9. Remove the nut securing the left hand track rod end ball joint and release the ball joint using 18G 1063.
10. Remove the nut securing the front hub top swivel joint and release the joint using 18G 1063.  
**WARNING: Support the hub to avoid straining the brake hose.**
11. Withdraw the drive shaft inner joint as far as possible to gain access to the turbocharger oil drain hose.
12. Disconnect the drain hose from the cylinder block and turbocharger; withdraw the hose.

### Refitting

13. Reverse the procedure given in 4 to 12.
14. Refill the engine with the correct grade of oil.
15. Fit the underpanels.
16. Connect the battery.
17. Disconnect the H.T. lead from the coil and crank the engine until the oil pressure warning light is extinguished.
18. Connect the H.T. lead to the coil.
19. Run the engine and check for oil leaks.

### PLENUM CHAMBER - TURBO ONLY

Remove and refit 19.42.20

### Removing

1. Disconnect the battery.
2. Remove the underpanels.
3. Remove the bolt securing the lower engine steady bar.
4. Pull the engine forwards and position a suitably sized wooden block between the turbocharger exhaust outlet pipe and the bulkhead.
5. Disconnect the hose from the plenum chamber.
6. Remove the carburetter heat shield.

### DUMP VALVE

Remove and refit 19.42.03

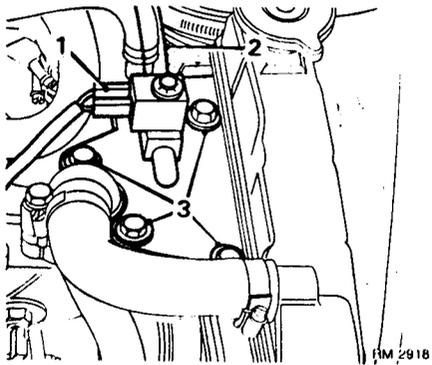
### Removing

1. Remove the plenum chamber, see 19.42.20.
2. Remove the bolts securing the dump valve assembly.
3. Remove the cover and withdraw the spring and piston.
4. Discard the gasket (if fitted).

- Remove the bolts securing the plenum chamber to the carburetter.
- Withdraw the plenum chamber slightly until access to the turbocharger pipe clip is obtained.
- Disconnect the pipe from the plenum chamber; withdraw the plenum chamber and discard the gasket.

#### Refitting

- Ensure that the mating surfaces of the plenum chamber and carburetter are scrupulously clean.
- Reverse the procedure given in 1 to 9; use a new gasket.
- Tighten the plenum chamber securing bolts evenly to prevent distortion and leakage.



#### BOOST CONTROL SOLENOID AND VALVE - TURBO ONLY

**Remove and refit** 19.42.30

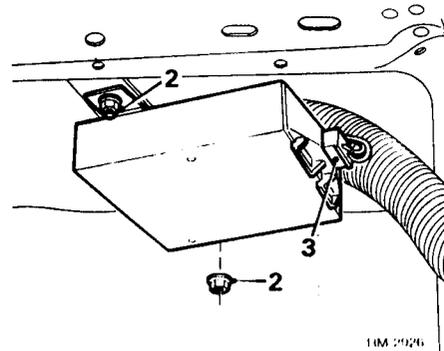
#### Removing

- Disconnect the Lucar connectors from the solenoid.
- Disconnect the hose.
- Remove the nuts and bolts securing the radiator steady bracket; lift the bracket clear of the studs.

- Remove the screws securing the valve to the bracket.
- To separate the valve from the solenoid, carefully prise the star washer off the retaining pin and withdraw the valve.

#### Refitting

- Reverse the procedure given in 1 to 5.



#### ELECTRONIC CONTROL UNIT (E.C.U.)

**Remove and refit** 19.42.31

- Disconnect the battery.
- Release the bolts securing the E.C.U. to the underside of the parcel shelf.
- Lower the E.C.U. slightly, disconnect the multi-plug, withdraw the E.C.U.

#### Refitting

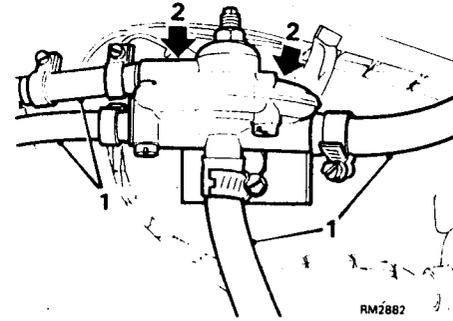
- Reverse the procedure in 1 to 3.

#### PRESSURE REGULATOR VALVE - TURBO ONLY

**Remove and refit** 19.45.06

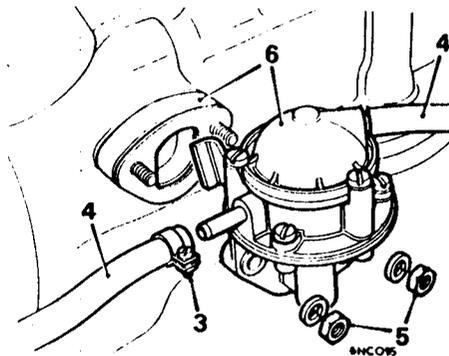
#### Removing

- Disconnect the hoses from the pressure regulator valve.
- Remove the bolts securing the valve to the mounting bracket; withdraw the valve.



#### Refitting

- Reverse the procedure given in 1 and 2.



#### FUEL PUMP - AUF 700 type

**Remove and refit** 19.45.08

#### Removing

- Remove the front cylinder block side cover bolt, remove the side cover and joint washer.
- 850 and 1000: Disconnect the speedometer cable from the speedometer drive housing.
- Slacken the petrol hose clips.
- Pull off the inlet and outlet hose from the pump nozzles.
- Remove the petrol pump securing nuts.

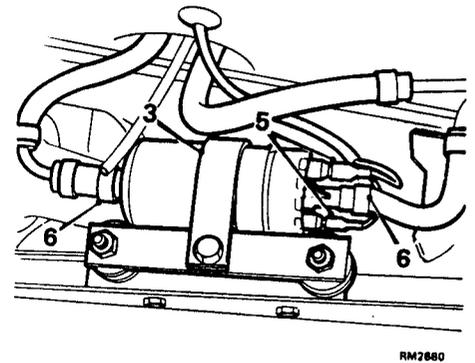
- Withdraw the pump and insulating block.

#### Refitting

**CAUTION:** When fitting an AZX 1818 fuel pump as a replacement, it will be necessary, on cars fitted with automatic transmission, to fit kickdown connecting rod part number DAM 8393.

- Reverse the procedure in 1 to 6 noting:

Fit new joint washers to the insulating block and cylinder block side cover.



#### FUEL PUMP - TURBO ONLY

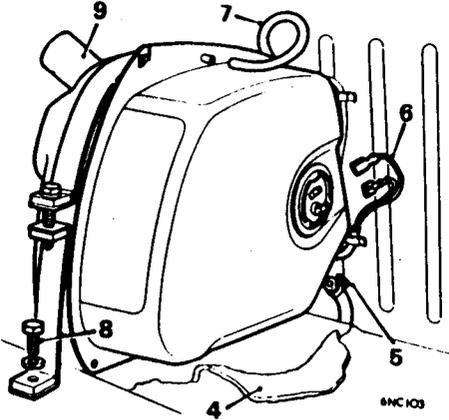
**Remove and refit** 19.45.08

#### Removing

- Disconnect the battery.
- Raise the rear of the vehicle and support it on stands.
- Remove the clip securing the fuel pump to the mounting bracket.
- Fit a suitable hose clamp to the fuel pump inlet hose to prevent loss of fuel.
- Disconnect the harness from the pump.
- Disconnect the inlet and outlet hoses from the pump; plug both hoses to prevent the ingress of dirt.

### Refitting

- Reverse the procedure given in 1 to 6.



### FUEL TANK

Remove and refit - Saloon 19.55.01

#### Removing

- Pump or siphon all fuel out of the tank.
- Remove the luggage compartment floor mat.
- Remove the spare wheel.
- 1275 GT: Fold back the underfelt around the fuel tank.
- Slacken the securing clip and disconnect the fuel hose from the fuel tank.
- Disconnect the fuel tank breather pipe.
- Remove the fuel tank securing strap bolt.
- Withdraw the fuel tank from the luggage compartment.
- Remove the fuel tank gauge unit, see 88.25.32.

#### Refitting

- Reverse the procedure in 1 to 10.

### FUEL TANK

Remove and refit - Estate 19.55.01

#### Removing

- Remove the fuel tank drain plug and drain the fuel tank.
- Unscrew and disconnect the main line fuel pipe from the fuel tank and release the pipe from the retaining clips.
- Remove the filler cap.
- Disconnect the wiring connection from the fuel tank gauge unit.
- Remove the tank securing screws, noting the plastic spacers, and lower the fuel tank.
- Remove the fuel tank gauge unit, see 88.25.32.

#### Refitting

- Reverse the procedure in 1 to 6.

### FUEL TANK - TURBO ONLY

Remove and refit 19.55.01

#### Removing

- Position the vehicle on a ramp.
- Disconnect the battery.
- Pump or siphon all fuel out of the tank.  
**WARNING: Take all due precautions when handling and draining the fuel tank.**
- Disconnect the fuel inlet hose from the fuel tank and the wires from the sender unit.
- Remove the spare wheel.
- Release the carpet from the vicinity of the fuel tank; remove the fuel tank cover.
- Disconnect the fuel delivery, fuel return and breather pipes from the tank.
- Remove the bolt securing the tank retaining strap; move the strap aside and lift out the tank.

#### Refitting

- Reverse the procedure given in 3 to 8. Secure the carpet with a suitable adhesive.
- Check for fuel leaks around all hose connections.
- Connect the battery.



## COOLANT

Drain and refill - Not Turbo 26.10.01

Cylinder block 1 to 3

### Draining

1. Remove the pressure relief cap from the radiator.  
**WARNING: Turn the cap slowly to release the pressure gradually if the system is hot.**
2. Position a container to collect the coolant.
3. Remove the cylinder block drain plug.
4. Slacken the clip and detach the bottom hose at the radiator.

### Refilling

5. Refit the drain plug and reconnect the hose.
6. Slowly fill the system up to the bottom of the filler neck of the radiator. For the coolant capacity and anti-freeze, see 'SERVICE LUBRICANTS'.
7. Refit the pressure relief cap. Ensure that the correct cap marked '15' is fitted.

## COOLANT

Drain and refill - Turbo only 26.10.01

### Draining

1. Remove the front grille, see 76.55.03  
**WARNING: If the cooling system is hot, protect the hands and remove the radiator pressure relief cap slowly to release the pressure from the cooling system**
2. Remove the pressure relief cap from the radiator.
3. Position a container to collect the coolant.

4. Slacken the clip and disconnect the auxiliary radiator hose from the radiator. Allow the coolant to drain.

### Refill

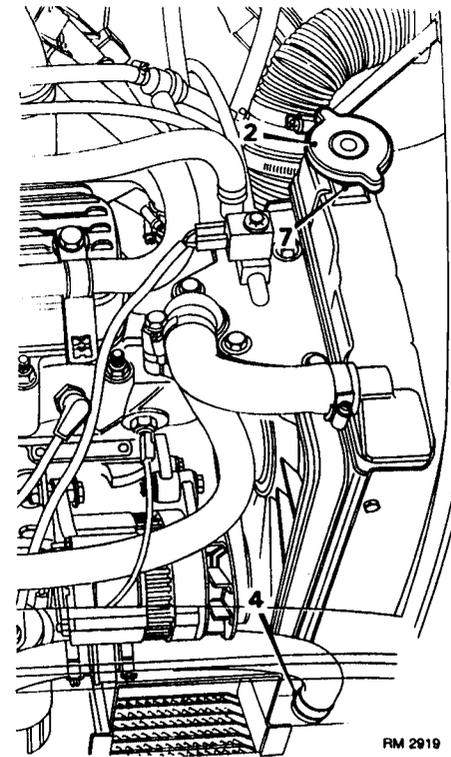
5. Connect the auxiliary radiator hose to the radiator.
6. Move the heater control to the 'HOT' position.
7. Slowly fill the system up to the bottom of the filler neck of the radiator. For the coolant capacity and anti-freeze, see 'SERVICE LUBRICANTS - TURBO MODELS'
8. Fit the pressure relief cap. Ensure that the correct cap marked '15' is fitted.
9. Run the engine for three minutes, remove the pressure relief cap and top-up the coolant if necessary.  
**WARNING: Protect the hands and remove the pressure relief cap slowly.**

## AUXILIARY RADIATOR

Remove and refit - Turbo only 26.15.01

### Removing

1. Remove the front grille, see 76.55.03.
2. Position a container to collect the coolant.  
**WARNING: If the cooling system is hot, protect the hands and remove the radiator pressure relief cap slowly to release the pressure from the cooling system.**
3. Remove the pressure relief cap from the radiator.
4. Disconnect the bottom hose from the auxiliary radiator and drain the coolant.
5. Disconnect the top hose from the auxiliary radiator.



### Refitting

8. Check that the rubber mounting and the bottom locating peg rubber sleeve are in good condition; renew as necessary.
9. Reverse the procedure given in 4 to 7.
10. Fit the front grille, see 76.55.03.
11. Fill the cooling system, see 76.10.01
12. After topping-up the cooling system, run the engine and check for coolant leaks

6. Remove the nut securing the rubber mounting to the auxiliary radiator bracket.
7. Slide the auxiliary radiator rearwards to disengage the rubber mounting and the bottom locating peg.

## DRIVE BELT

Remove and refit 26.20.07

### Removing

1. Clubman and Turbo: Release the three fasteners and remove the ignition shield from the engine.
2. Slacken the alternator securing bolts.
3. Press the alternator towards the engine and remove the belt from the pulleys by passing it over the fan blades.

### Refitting

4. Reverse the procedure in 1 to 3.
5. Adjust the drive belt tension, see 'MAINTENANCE'.

## FAN BLADES

Remove and refit 26.25.06

### Removing

1. Remove the radiator, see 26.40.04.
2. Remove the four bolts and remove the fan from the water pump.
3. Remove the fan spacer from the water pump pulley.

### Refitting

4. Reverse the procedure in 1 to 3.

## HOSES

Remove and refit

By-pass hose 26.30.46

Radiator bottom hose 26.30.07

Radiator top hose 26.30.01

## RADIATOR

Remove and refit - Not Turbo 26.40.04

### Removing

1. Remove the nuts to release the bonnet from its hinges.
2. Drain the cooling system, see 26.10.01.
3. Disconnect the top and bottom hose from the radiator.
4. Remove the two nuts and two bolts securing the radiator upper support bracket and remove the bracket.
5. Clubman and 1275 GT: Remove the bolt securing the lower support bracket to the engine mounting.
6. Pull off the overflow pipe.
7. 850 and 1000: Remove the four bolts securing the radiator cowl to the radiator.
8. Lift the radiator from the engine bay.
9. Clubman and 1275 GT: Remove the four bolts securing the cowl to the radiator.

### Refitting

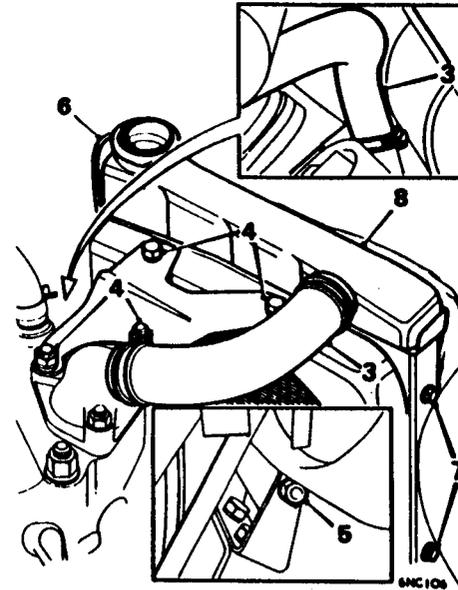
10. Reverse the procedure in 1 to 9 as applicable.
11. Refill the cooling system, see 26.10.01.

## RADIATOR

Remove and refit \_\_ Turbo only 26.40.04

### Removing

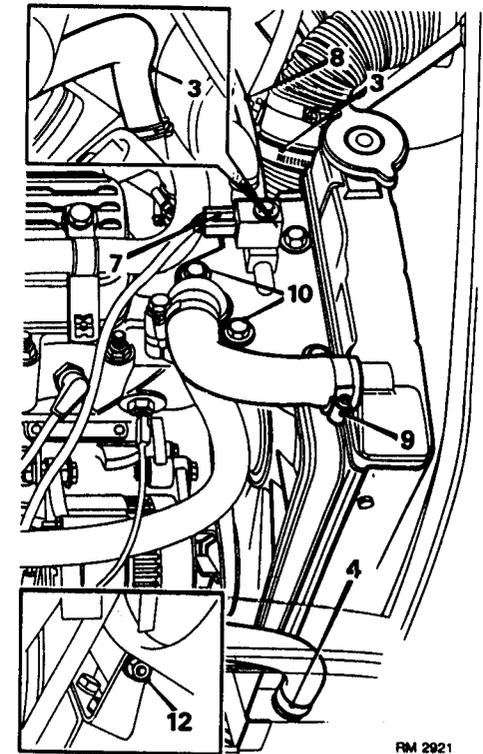
1. Place the vehicle on a suitable lift.
2. Disconnect the battery
3. Disconnect the air inlet bottom hose from the turbocharger and at the hose connector
4. Drain the coolant, see 26.10.01
5. Remove the front grille, see 76.55.03



6. Release the fasteners and remove the ignition shield.
7. Disconnect the Lucar connectors from the boost control solenoid.
8. Disconnect the hose from the boost control solenoid.
9. Disconnect the top hose from the radiator.
10. Remove the bolts securing the radiator steady bracket to the thermostat housing.
11. Disconnect the radiator bottom hose.
12. Remove the bolts securing the radiator to the bottom bracket.
13. Lift out the radiator and cowl assembly.

### Refitting

14. Reverse the procedure in 1 to 13.



## THERMOSTAT - Not Turbo

Remove and refit 26.45.01

### Removing

1. Remove the coolant drain plug from the rear of the cylinder block, partly drain, and refit the drain plug.
2. Disconnect the top hose at the thermostat housing.
3. Remove the bolts securing the upper radiator cowl support bracket to the upper radiator cowl.

4. Remove the nuts and plain washers securing the thermostat housing and the radiator cowl upper support bracket.
5. Remove the radiator cowl upper support bracket.
6. Remove the thermostat housing and joint washer.
7. Remove the thermostat from the cylinder head.

#### Refitting

8. Reverse the procedure in 1 to 7, noting:
  - a Clean the joint faces and renew the joint washer.
  - b The nominal temperature in degrees Centigrade at which the thermostat opens is stamped on the base of the thermostat bulb; ensure that the correct thermostat is fitted, see 'GENERAL DATA'.
9. Refill the cooling system, see 26.10.01.

## THERMOSTAT

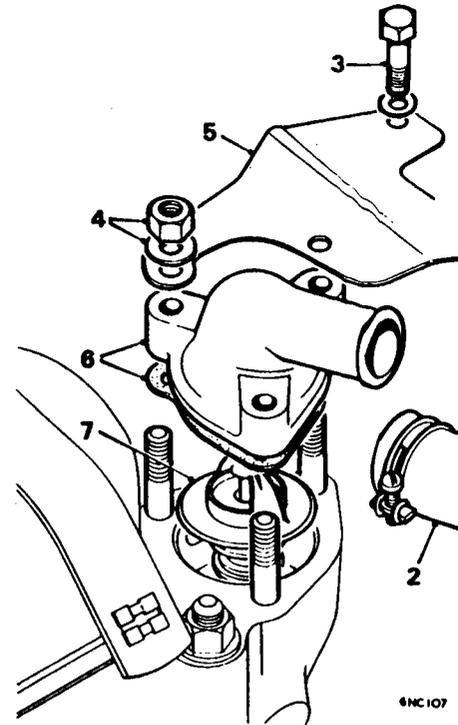
### Remove and refit - Turbo only 26.45.01

#### Removing

1. Remove the front grille, see 76.55.03
2. Position a container to collect the coolant.
3. Slacken the hose clip securing the auxiliary radiator bottom hose to the radiator and partially drain the cooling system.

**WARNING: Protect the hands if the cooling system is hot.**

4. Disconnect the radiator top hose and the auxiliary radiator top hose from the thermostat housing.
5. Disconnect the Lucar connectors from the boost control solenoid.



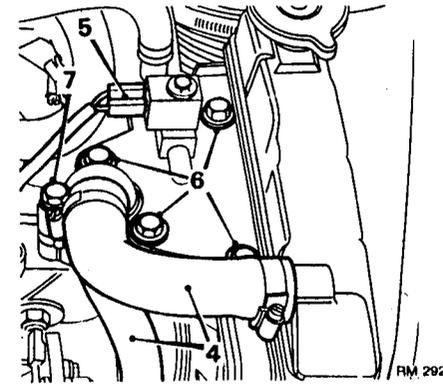
6. Remove the bolts securing the radiator steady bracket, move the bracket aside.
7. Remove the remaining thermostat housing retaining bolt; lift off the housing.
8. Remove the thermostat from the cylinder head; remove and discard the gasket.

#### Refitting

9. Remove all traces of the gasket from the thermostat housing and cylinder head.
10. Fit the thermostat ensuring that the opening temperature of the thermostat, stamped in degrees C on the thermostat bulb corresponds to figure given in 'GENERAL DATA'

11. Fit a new gasket.
  12. Reverse the procedure given in 3 to 7.
  13. Remove the radiator pressure relief cap and top-up the coolant to bottom of the radiator filler neck. Refit the pressure relief cap.
  14. Run the engine for three minutes, remove the pressure relief cap and top-up the coolant if necessary.
- WARNING: Protect the hands and remove the pressure relief cap slowly.**

3. Test the thermostat by placing it in a container of water and heating the water, noting the temperature at which the thermostat opens. The nominal opening temperature is marked in degrees Centigrade on the base of the thermostat bulb; for correct type, see 'GENERAL DATA'.
4. Refit the thermostat, see 26.45.01.



## THERMOSTAT

#### Test

26.45.09

1. Remove the thermostat, see 26.45.01.
2. Examine the thermostat; if it is stuck in the open position it is faulty and must be renewed.

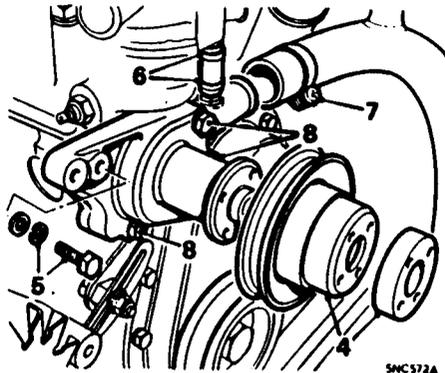
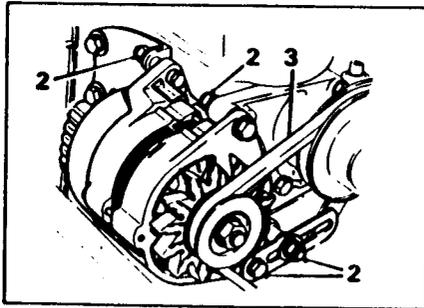
## WATER PUMP

### Remove and refit

26.50.01

#### Removing

1. Remove the radiator, see 26.40.04.
2. Slacken the alternator mounting bolts and press the alternator towards the engine.
3. Remove the fan belt from the pulleys.
4. Remove the fan, spacer and water pump pulley.
5. Remove the two bolts securing the top of the alternator to the water pump and the engine bracket and move the alternator aside.
6. Disconnect the by-pass hose from the water pump - Not Turbo.
7. Disconnect the radiator bottom hose from the water pump.
8. Remove the screws securing the water pump to the cylinder block and withdraw the water pump.
9. Remove the joint washer.



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#### Refitting

10. Reverse the procedure in 1 to 9, noting:
  - a Torque tighten the water pump securing screws, see 'TORQUE WRENCH SETTINGS'.
  - b Adjust the drive belt tension, see 'MAINTENANCE'.
11. Refill the cooling system, see 26.10.01.

## WATER PUMP

### Overhaul - Not Turbo

26.50.06

#### Service tool: 18G 2

#### Dismantling

1. Remove the water pump, see 26.50.01.
2. Pull the pulley hub off the spindle, using tool 18G 2.
3. Support the pump body and press the bearing spindle, impeller and water seal as an assembly out of the pump body.
4. Press the spindle with its bearing assembly out of the impeller.

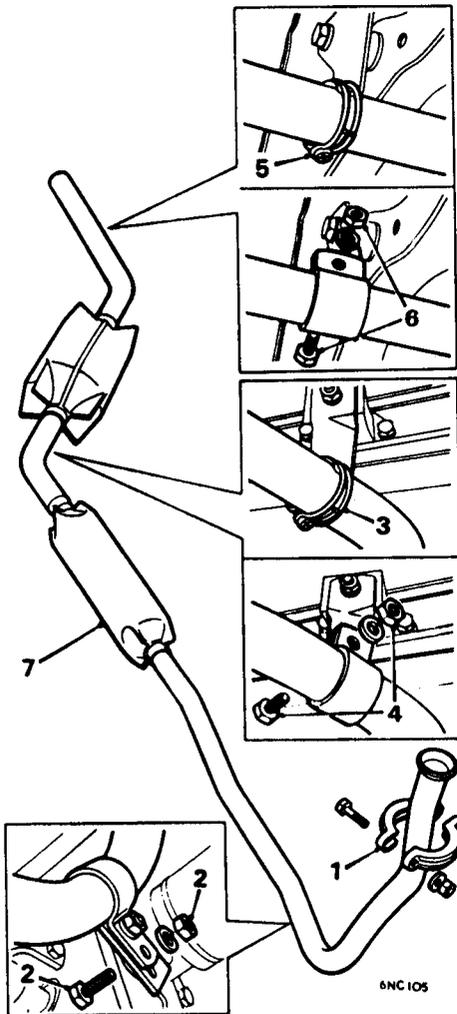
5. Withdraw the water seal from the spindle.

#### Reassembly

6. Check that the fit (see DATA) of the pulley hub and the impeller on the bearing spindle has not been destroyed.
7. Press the bearing assembly into the pump body so that the bearing assembly dimension is given in DATA.
8. Lubricate the impeller sealing face with a silicone based grease.
9. Press the impeller onto the bearing spindle so that the impeller vane to pump body clearance is given in DATA.
10. Press the pulley hub onto the bearing spindle so that the pulley hub assembly dimension is as given in DATA.
11. Refit the water pump, see 26.50.01.

## DATA

Spindle diameter .....	0.6262 to 0.6267 in (15.91 to 15.92 mm)
Impeller bore .....	0.6244 to 0.6252 in (15.86 to 15.88 mm)
Pulley hub bore .....	0.6230 to 0.6247 in (15.82 to 15.87 mm)
Bearing assembly dimension (measured from bearing outer race to water seal seating face in pump body) .....	0.533 to 0.543 in (13.54 to 13.79 mm)
Impeller vane to pump body clearance .....	0.020 to 0.030 in (0.51 to 0.76 mm)
Pulley hub assembly dimension (measured from the hub pulley face to the pump body joint face) .....	3.712 to 3.732 in (94.3 to 94.8 mm)



## EXHAUST SYSTEM

Remove and refit 30.10.01

### Removing

1. Remove the tail pipe and silencer, see 30.10.22 - Turbo only.
2. Remove the clamp to release the exhaust down-pipe from the exhaust manifold.
3. Remove the nut and bolt to release the front mounting from the transmission casing.
4. 1275 GI and Turbo: Remove the clip securing the centre mounting to the exhaust pipe.
5. Remove the bolt retaining the exhaust pipe clip to the centre mounting.
6. 1275 GT: Remove the clip securing the rear mounting to the exhaust pipe.
7. Remove the bolt retaining the exhaust pipe clip to the rear mounting.
8. Withdraw the exhaust system from beneath the vehicle.

### Refitting

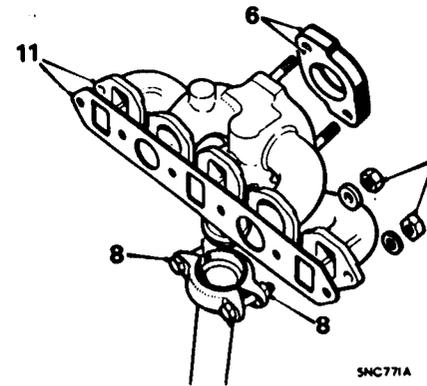
9. Reverse the procedure in 1 to 8 as applicable, noting:  
Tighten the exhaust pipe to manifold clamp bolts before tightening the front mounting to transmission casing bracket bolt.

## TAIL PIPE AND SILENCER

Remove and refit - Turbo only 30.10.22

### Removing

1. Raise the vehicle on a suitable lift.
2. Remove the bolt securing the tail pipe clamp to the body.
3. Release the clamp securing the silencer to the front pipe.
4. Withdraw the tail pipe and silencer.



### Refitting

5. Reverse the procedure given in 1 to 4. Ensure that the tail pipe and silencer are correctly aligned before tightening the clamps.

## MANIFOLD

Remove and refit - Not Turbo 30.15.01

### Removing

1. Remove the air cleaner assembly, see 'MAINTENANCE'.
2. Disconnect the crankcase breather hose from the carburetter.
3. Disconnect the distributor vacuum advance pipe from the carburetter.
4. Slacken the securing clip and disconnect the fuel hose from the carburetter.
5. Remove the two nuts to release the carburetter from the induction manifold.
6. Remove the carburetter, gaskets, cable abutment bracket and insulation block and place to one side.
7. Remove the bolt securing the front stay to the transmission casing.
8. Remove the clamp and release the exhaust pipe from the manifold.

9. Remove the six nuts and washers securing the exhaust manifold to the cylinder head.
10. Remove the hot air shroud and spacers.
11. Remove the manifold and joint washers.

**WARNING:** Do not use an airline to blow gasket dust, asbestos dust can be a serious health hazard if inhaled. Use methylated spirit or denatured alcohol to wash dust from components. Do not use any petroleum-based fluids.

### Refitting

12. Reverse the procedure in 1 to 11, using new joint washers.

## INLET AND EXHAUST MANIFOLDS

Remove and refit - Turbo only  
Inlet Manifold only, 1 to 4 and 8  
Inlet and Exhaust Manifold and gasket, 1 to 6 and 7 and 8 30.15.02

### Removing

1. Remove the carburetter, see 19.15.09
2. Drain the cooling system, see 26.10.01
3. Disconnect the crankcase breather hose, heater hose and the brake servo hose from the inlet manifold. Plug the brake servo hose to prevent the ingress of dirt.
4. Remove the nuts and washers securing the inlet manifold, release the manifold from the studs and recover the ring dowels from the manifold/cylinder head.
5. Remove the turbocharger, see 19.42.01 - 1 and 7 to 19.
6. Remove the gasket.

### Refitting

7. Fit the turbocharger (if applicable), see 19.42.01.

- 
- Reverse the procedure given in 1 to 4, use new locking washers and locking wire.

## **MOUNTINGS**

<b>Remove and refit</b>	<b>30.20.06</b>
<b>Front stay 1 to 3 and 12</b>	<b>30.20.16</b>
<b>Front mounting 4 to 7 and 12</b>	<b>30.20.02</b>
<b>Rear mounting 8 to 11 and 12</b>	<b>30.20.04</b>

### **Removing**

- Slacken the exhaust pipe clip clamp bolt.
- Remove the bolt securing the clip to the transmission casing bracket.
- Remove the three set screws and release the front stay from the transmission casing.
- 1275 GT: Slacken the clip to release the front mounting strap.
- Remove the bolt and release the clip from the front mounting strap.
- Remove the nut and spring washer to release the front strap from the rubber mounting.
- Remove the two set screws securing the front mounting rubber to the rear sub-frame.
- 1275 GT: Slacken the clip to release the rear mounting strap.
- Remove the bolt securing the rear strap to the exhaust tail pipe clip.
- Remove the nut and spring washer to release the rear strap from the rubber mounting.
- Remove the nut and spring washer securing the rear mounting rubber to the sub-frame.

### **Refitting**

- Reverse the procedure in 1 to 11 as applicable.

## CLUTCH ASSEMBLY

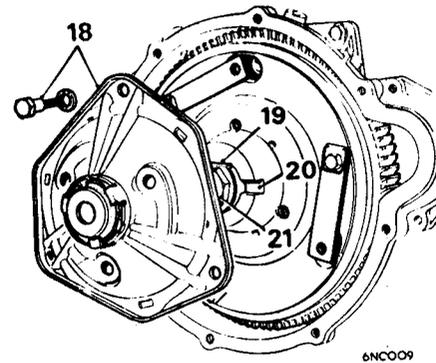
Remove and refit 33.10.01

Service tool: 18G 304, 18G 304N, 18G 587

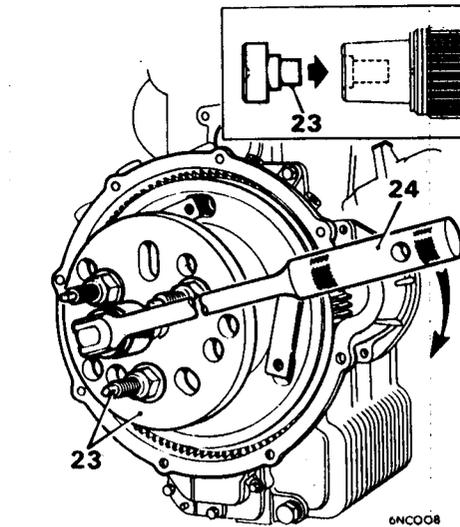
### Removing

1. Disconnect the battery
2. Remove the bonnet
3. Raise the front of the car and place supports beneath the sub-frame or suspension members.
4. Disconnect the exhaust pipe from the manifold flange.
5. Remove the nut and bolt securing the exhaust pipe clip to the transmission casing.
6. Support the power unit with a hydraulic jack under the transmission casing
7. Remove the bolts and nuts retaining the R.H. engine mounting to the sub-frame.
8. Clubman and 1275 GT: Remove the ignition shield.
9. Disconnect the cable terminal and remove the starter motor.
10. Disconnect and remove the starter solenoid unit from the wing valance.
11. Clubman and 1275 GT: Remove the two nuts and set screws and detach the radiator cowl support bracket.
12. 850 and 1000: Remove the horn and place it to one side.
13. 850 and 1000: Remove the cylinder head nut retaining the ignition coil bracket, move the coil and bracket to one side.
14. From under the front R.H. wing, pull the hose off the air intake then withdraw the intake into the engine compartment.
15. Disconnect the clutch release lever return spring.

16. Using the hydraulic jack placed under the transmission casing, raise the power unit sufficiently to allow the clutch cover retaining screws and the cover to be removed.
17. Remove the screws and lift off the clutch cover.
18. Progressively slacken and remove the three dowel bolts retaining the clutch diaphragm cover, remove the cover.



19. Knock back the flywheel retaining bolt lock washer tab.
20. Turn the crankshaft until the slot in the crankshaft and flywheel is horizontal.  
**CAUTION:** The crankshaft primary gear 'C' shaped thrust washer may fall out of position and cause severe damage and/or possibly make it impossible to remove the flywheel if the crankshaft is not correctly positioned.
21. Hold the flywheel from turning and use tool 18G 587 to remove the retaining bolt.
22. Remove the key plate locating the flywheel to the crankshaft.



23. Locate the thrust button of tool 18G 304 N into the end of the crankshaft, fit tool 18G 304 and 18G 304 N onto the flywheel.  
**CAUTION:** Ensure that when fitted, ends of adaptor bolts 18G 304 N do not protrude beyond the flywheel inner face. Failure to observe this precaution will result in damage to the clutch driven plate.
24. Hold the flywheel from turning, screw in the centre bolt of the tool to release the flywheel from the crankshaft taper.
25. Remove tools 18G 304 and 18G 304 N from the flywheel.
26. Remove the flywheel, clutch driven plate and pressure plate as individual items from the flywheel housing.  
**WARNING:** Do not use an airline to blow lining dust, asbestos dust can

be a serious health hazard if inhaled. Use methylated spirit or de-natured alcohol to wash dust from components. Do not use any petroleum-based fluids.

### Refitting

27. Note the following before carrying out the 'Refitting' procedure:
  - a Ensure that the crankshaft taper is clean and dry.
  - b The clutch pressure plate and diaphragm cover are stamped with a balance mark 'A' when assembling, these marks must be adjacent to each other and aligned with the timing markings on the flywheel.
28. Note the location of the balance mark 'A' and refit the pressure plate into the flywheel housing, see note 'b' above.
29. Fit the clutch driven plate (hub facing inwards) onto the primary gear splines and centralize the pressure plate onto the driven plate.
30. Refit the flywheel onto the crankshaft taper with the 1/4 timing marks aligned with the balance mark 'A' on the pressure plate.
31. Screw the three dowel bolts lightly into the pressure plate to align and pull the assembly together.
32. Align the offset slot in the end of the crankshaft and flywheel and refit the key plate.
33. Refit the flywheel retaining bolt with a new locking washer, hold the flywheel from turning and tighten the bolt using tool 18G 587, see **TORQUE WRENCH SETTINGS**.
34. Knock over the locking washer tab on the flywheel retaining bolt.
35. Remove the three dowel bolts.

36. Refit the clutch diaphragm cover with its balance mark 'A' adjacent to the 1/4 timing marks on the flywheel, refit and progressively tighten the dowel bolts ensuring that they pass squarely through each pair of driving straps. Finally tighten the bolts to the figure given in 'TORQUE WRENCH SETTINGS'.
37. The remainder is a reversal of the procedure in 1 to 17 as applicable to model.
38. Check the return stop adjustment, see 'MAINTENANCE'.

## CLUTCH ASSEMBLY

Overhaul 33.10.08

### Dismantling

1. Remove the clutch/flywheel assembly, see 33.10.01.
2. Knock back the locking plate tabs of the driving strap securing screws.
3. Remove the screws and detach each pair of driving straps, noting the spacer washer fitted between the straps and the flywheel.

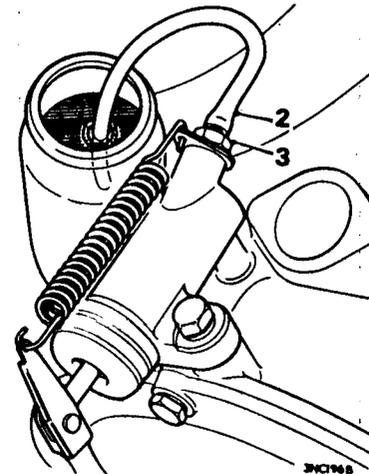
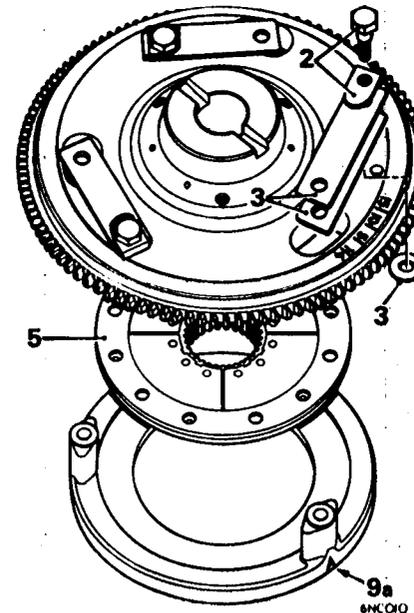
### Inspecting

4. Check the clutch unit and inspect as follows:
  - a. Check the pressure plate for scoring or damage.
  - b. Examine the diaphragm spring for wear and fractures.
  - c. Check the driving straps for elongate holes and the securing bolts for wear.
5. Inspect the driven plate as follows:
  - a. Check the linings for oil contamination and/or burning.
  - b. Examine the linings for uneven wear on each clutch face.

- c. Examine the control hub splines for wear.

### Reassembling

6. Check and if necessary adjust the crankshaft primary gear end-float, see 12.21.28.
7. Refit or fit new driving straps, fitting the spacer washers between the straps and the flywheel.
8. Fit new locking plates, screw in but do not tighten the strap securing screws.
9. Refit the clutch and flywheel assembly following the 'Refitting' procedure in 33.10.01, noting the following:
  - a. Fit the diaphragm with the 'A' mark in alignment with that on the pressure plate but do not tighten the retaining bolts.
  - b. Tighten the driving strap securing bolts (see 'TORQUE WRENCH SETTINGS') and secure with the lock washer tabs.
  - c. Tighten the diaphragm retaining bolts, see 'TORQUE WRENCH SETTINGS'.



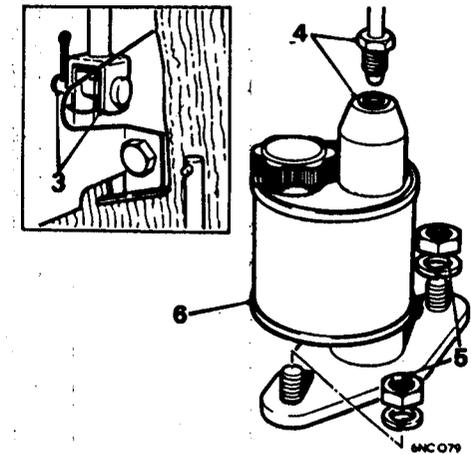
## HYDRAULIC SYSTEM

Bleeding 33.15.01

### Bleeding CAUTION:

- a. Never re-use fluid which has been bled from a system.
  - b. Brake fluid can have a detrimental effect on paintwork; ensure that the fluid is not allowed to contact painted surfaces.
1. Top up the clutch master cylinder with a recommended brake fluid, see 'SERVICE LUBRICANTS'.

Open the bleed screw three-quarters of a turn, depress the clutch pedal slowly and tighten the bleed screw, and then allow the pedal to return unassisted. Repeat this procedure with a slight pause before depressing the pedal, until the fluid is free of air bubbles. Do not allow the reservoir to become less than half full. Tighten the bleed screw. Top up the clutch master cylinder to the bottom of the filler neck.



## MASTER CYLINDER

Remove and refit 33.20.01

### Removing

1. Fit a bleed tube and open the bleed screw on the clutch slave cylinder. Remove the filler cap from the clutch master cylinder and pump the clutch pedal to drain the system.
  2. Disconnect the heater air intake flexible tube from the heater and the wheel arch.
2. Attach a bleed tube to the bleed screw on the clutch slave cylinder.

3. Remove the clevis pin securing the push-rod to the clutch pedal.
4. Disconnect the pipe union at the master cylinder and release the pipe from the cylinder. Remove the nuts and spring washers securing the master cylinder.
6. Remove the master cylinder.

#### Refitting

7. Reverse the procedure in 2 to 6.
8. Bleed the clutch hydraulic system, see 33.15.01.

## MASTER CYLINDER

Overhaul 33.20.07

#### Dismantling

1. Remove the clutch master cylinder, see 33.20.01.
2. Remove the filler cap and drain the fluid from the reservoir.
3. Detach the boot from the body and slide it off the push-rod.
4. Extract the circlip
5. Remove the push-rod complete with dished washer.
6. Withdraw the piston complete with the secondary cup, the piston washer, main cup, spring retainer and spring from the body.
7. Remove the secondary cup from the piston by carefully stretching it over the end of the piston.  
**CAUTION:** Care must be taken to avoid damaging the piston when removing the secondary cup.

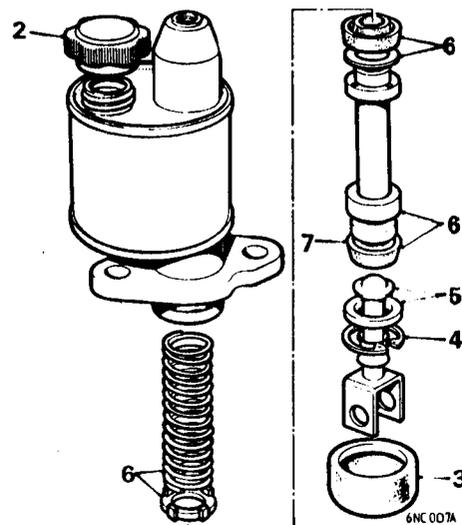
#### Inspecting

8. Clean the cylinder body in industrial methylated spirit. Wash all internal parts in clean brake fluid.
9. Examine the master cylinder piston bore; if the bore is not scored or ridged, new seals can be fitted. Renew the unit if the bores are ridged or scored.

10. Check that the inlet and outlet ports are free of obstructions.

#### Reassembling

11. Immerse all components in a recommended brake fluid and assemble when wet.
12. Stretch the secondary cup over the piston with the lip of the cup facing the head (drilled end) of the piston.
13. Fit the spring retainer into the small diameter end of the piston, and insert the spring into the body, large diameter first.
14. Fit the main cup and cup washer over the spring retainer.  
**CAUTION:** When fitting the cups, carefully enter the lip edge first.
15. Insert the piston assembly fully into the cylinder bore.



16. Refit the push-rod assembly and secure it with the circlip.
17. Refit the boot to the push-rod and attach it to the cylinder body.

18. Refit the clutch master cylinder see 33.20.01.
19. Bleed the clutch hydraulic system, see 33.15.01.

## CLUTCH RELEASE BEARING

Remove and refit 1 to 7 33.25.12

Throw-out stop - check and adjust 8 to 11 33.25.01

#### Removing

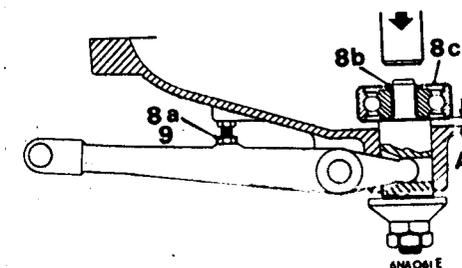
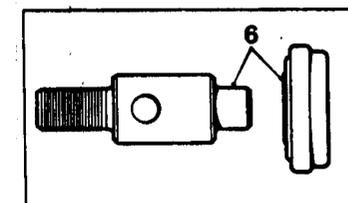
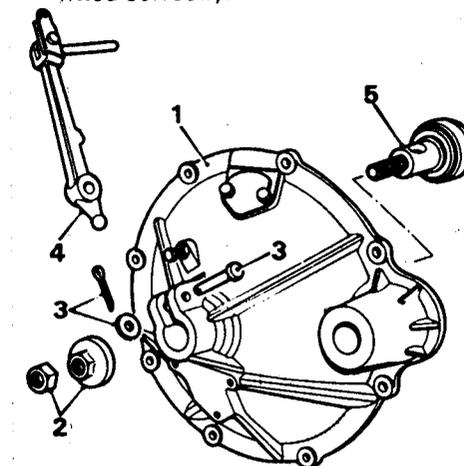
1. Remove the clutch cover following the procedure in 1 to 16, see 33.10.01.
2. Unscrew and remove the plunger stop and locknut.
3. Remove the split pin and washer and withdraw the clevis pin.
4. Pull the release lever out of the release bearing plunger.
5. Remove the release bearing and plunger assembly from the cover.
6. Drift or press the plunger through the release bearing.

#### Reassembling

7. Reverse the procedure in 1 to 6, noting the following:
  - a. Lubricate the operating surfaces of the release bearing plunger and the release lever ball-end with a graphite based grease.
  - b. When a self-aligning bearing is fitted follow the instructions in 8 and 9.
8. To fit the release bearing:
  - a. Adjust the return stop to bring the shoulder of the plunger 5 mm (3/16 in) 'A' above the face of the lever.
  - b. Fit the bearing onto the plunger and press a NEW self-locking ring over the plunger, using tool 18G 1325 and STEADY HAND PRESSURE.

Do not use the tool as a drift.

- c. Check that the ring has clamped the bearing.  
A force equivalent to 10 to 16 N, 3.6 to 5.4 kgf, 8 to 12 lbf, will be required to move the bearing radially when the locking ring is fitted correctly.



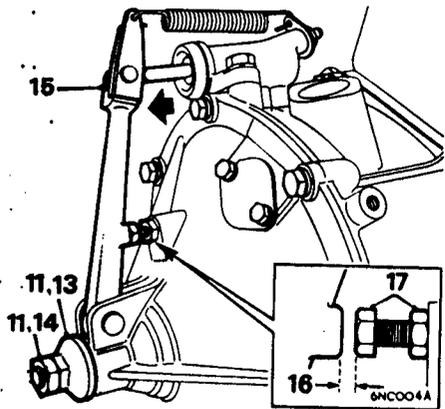
9. Do not disturb the return stop setting until the push-rod is inserted into the slave cylinder to ensure that any pressure applied to the release lever does not displace the self-locking ring.
10. Adjust the 'throw-out stop' and the 'return stop' see 11 to 16

#### Adjusting - Throw-out stop

11. Screw the plunger stop and locknut away from the housing to the limit of its travel.
12. Fully depress the clutch pedal. A second operator is required.
13. Screw the plunger stop up against the housing, release the clutch pedal and screw the stop in a further one flat of the stop, which is approximately 0.20 to 0.25 mm (0.007 to 0.010 in).
14. Hold the plunger stop and tighten the locknut.

#### Adjusting - Return stop

15. Pull the release lever outwards against spring pressure until all free movement is taken up.



16. Check the clearance between the stop and the release lever. The correct clearance is 0.5 mm (0.020 in).

17. To adjust the clearance, slacken the locknut and turn the stop to obtain the correct clearance. Tighten the locknut.

## CLUTCH PEDAL

Remove and refit 1 to 9, 11 and 12 **33.30.02**

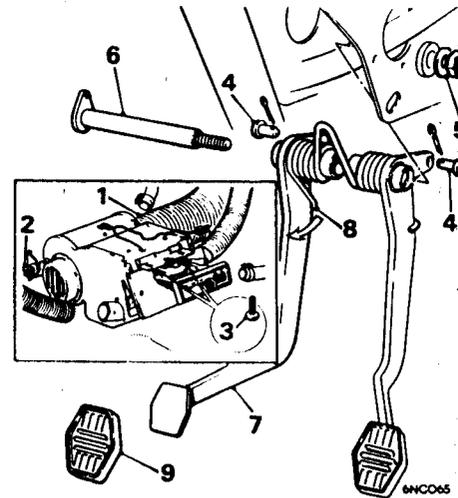
Overhaul 1 to 12 **33.30.06**

#### Removing

1. Disconnect and remove the heater air intake flexible tube from the heater and wheel arch.
2. Slacken the heater securing nut.
3. Remove the two screws retaining the heater unit to the parcel rail and lower the heater unit.
4. Remove the clevis pins from the clutch and brake push-rods.
5. Remove the pedal shaft retaining nut and washer.
6. Withdraw the pedal shaft.
7. Remove the clutch pedal from the pedal bracket.
8. Detach the clutch pedal return spring.
9. Remove the pedal rubber.

#### Refitting

10. Fit new pedal bearings if necessary.
  - a Press worn bearings from the tube.
  - b Press a new bearing into each end of the tube and slightly below the face.
  - c Check the shaft rotates freely in the tube.
11. Lightly lubricate the pedal shaft.
12. Reverse the procedure in 1 to 9.



## SLAVE CYLINDER

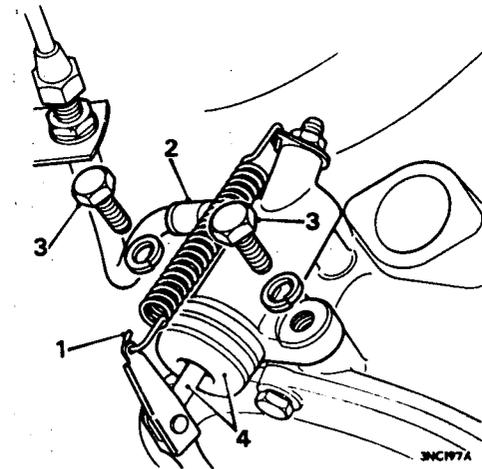
Remove and refit **33.35.01**

#### Removing

1. Disconnect the release lever return spring.
2. Slacken the hose connection at the slave cylinder.
3. Remove the two bolts securing the cylinder to the flywheel housing.
4. Pull the cylinder off the push-rod and unscrew the unit from the hose connection.

#### Refitting

5. Screw the slave cylinder fully onto the hose connection (tighten when the unit is secured on the flywheel housing).
6. Engage the push-rod into the cylinder and secure the unit to the flywheel housing.
7. Tighten the hose connection and connect up the release lever return spring.



8. Bleed the clutch hydraulic system, see 33.15.01.

## SLAVE CYLINDER

Overhaul **33.35.07**

#### Dismantling

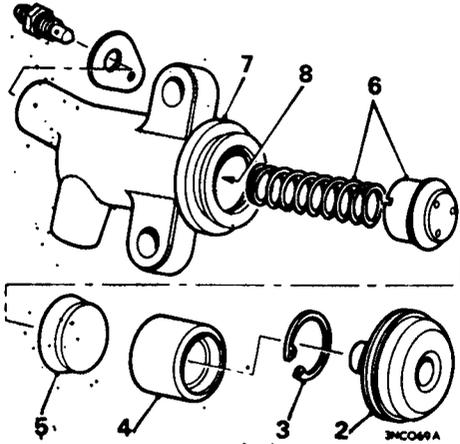
1. Remove the clutch slave cylinder, see 33.35.01.
2. Remove the dust cover from the body.
3. Remove the retaining circlip.
4. Extract the piston using an air pressure line.
5. Withdraw the cup seal.
6. Remove the cup filler and spring.

#### Inspecting

7. Wash the slave cylinder body in brake cleaning fluid or industrial alcohol. Clean internal parts in brake fluid.
8. Check the cylinder bore; if not scored or ridged, a new seal can be fitted. Renew the unit if the bore is scored or ridged.

### Assembling

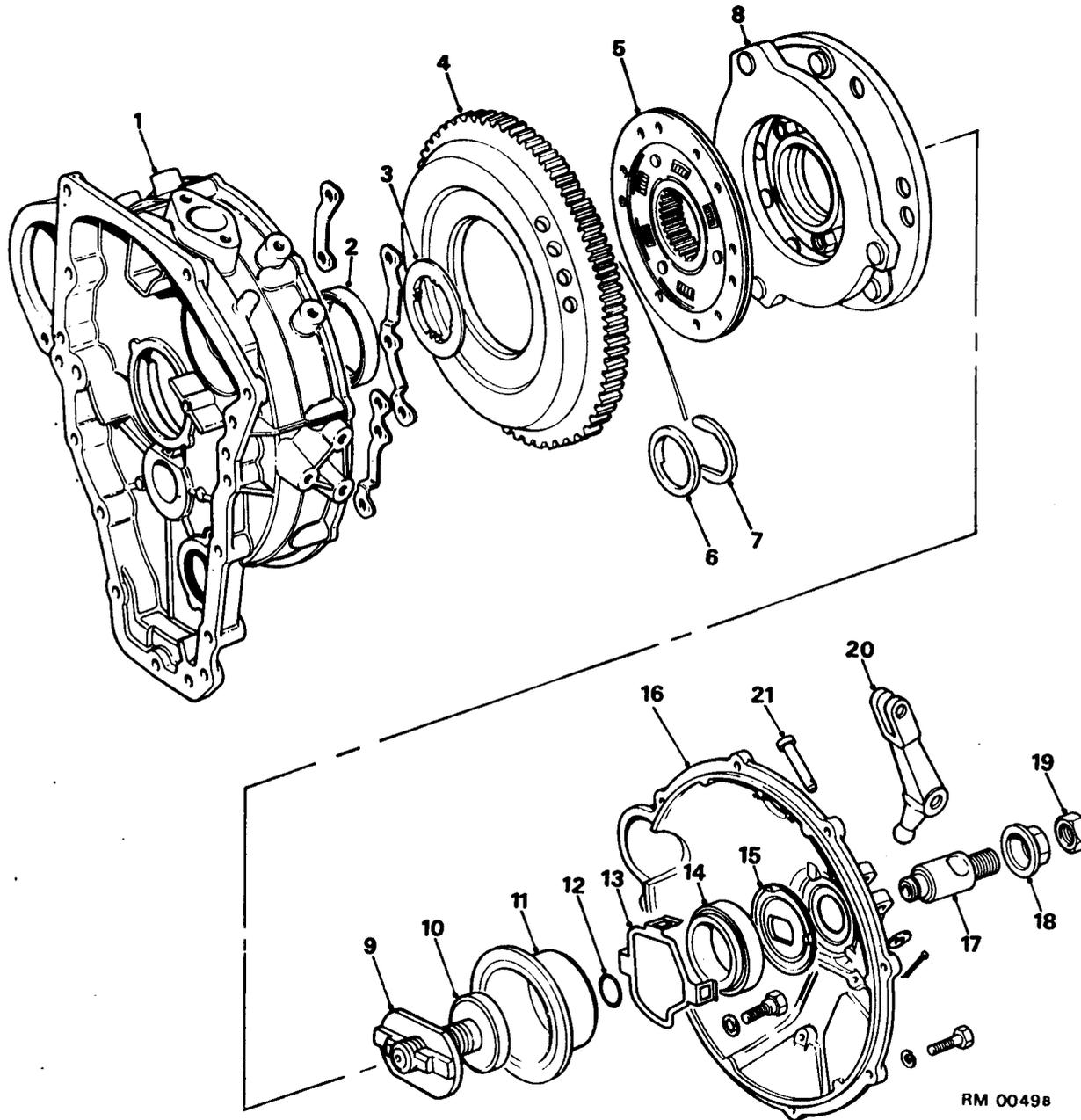
9. Immerse all internal parts in brake fluid and assemble when wet.
10. Fit the return spring, small end to piston.
11. Fit a new seal onto the piston, lip to the small land of the piston, and press the piston into the bore.
12. Refit the circlip.
13. Smear the sealing areas of the dust cover with rubber lubricant before fitting.
14. Refit the slave cylinder.
15. Bleed the clutch hydraulic system, see 33.15.01.



## CLUTCH COMPONENTS -

### Verto clutch

1. Flywheel housing
2. Primary gear oil seal
3. Dust shield
4. Flywheel
5. Driven plate
6. Crankshaft primary gear backing ring
7. 'C' shaped thrust washer
8. Pressure plate
9. Key plate
10. Flywheel retaining bolt
11. Thrust sleeve
12. 'O' ring
13. Spring clip
14. Release bearing
15. Bearing retainer plate
16. Clutch cover
17. Plunger
18. Plunger stop
19. Locknut
20. Release lever
21. Release lever pivot pin



RM 00498

## CLUTCH RELEASE BEARING - Verto clutch

Remove and refit 33.20.01

### Removing

1. Remove the clutch cover assembly.
2. Pull the release bearing assembly from the plunger and collect the 'O' ring. Prise the legs of the spring clip from the bearing retainer plate and remove the bearing.

### Refitting

3. Position the bearing on its retainer plate with the seal facing away from the plate. Fit the spring clip, then locate the bearing assembly on the plunger and fit the 'O' ring.
4. Fit the clutch cover assembly.
5. Adjust the throw-out stop.

## CLUTCH ADJUSTMENTS - Verto clutch

Throw-out stop - adjust 33.25.01

### Adjusting

1. Remove the windscreen washer reservoir.
2. Screw the plunger stop and locknut away from the clutch cover to the limit of the plunger thread.
3. Take up release bearing free play by pulling the release lever from the clutch cover until the release bearing makes light contact with the thrust sleeve.
4. Screw the plunger stop in until a gap of 6.5 mm (0.255 in) exists between the plunger stop and the face of the cover and tighten the locknut.

## CLUTCH ASSEMBLY - Verto clutch

Remove and refit 33.10.01

Overhaul 33.10.05

**Service tool:** 18G 684, 18G 1303, 18G 1381

1. Apply the handbrake. Disconnect the battery. Remove the bonnet.
2. Pull the wiring connectors from the starter solenoid, release the solenoid from the wing valance and position aside. Disconnect the starter motor.
3. Remove the exhaust pipe to manifold clamp. Release the clutch slave cylinder mounting plate from the flywheel housing, collect the spacer and position the clutch slave cylinder and mounting plate aside.
4. Protect the gearbox casing with a wood or rubber block and support the power unit under the gearbox casing with a hydraulic jack. Remove the bolts securing the right-hand engine mounting to the sub-frame and raise the flywheel end of the power unit to obtain access to the clutch cover bolts.
5. Release the clutch cover bolts, note the position of the carburettor drain tube and remove the clutch cover. Remove the thrust bearing sleeve from the clutch hub.
6. Prise the lock washer from the clutch hub slots. Position the crankshaft and clutch hub slots horizontally and lock the flywheel. Remove the flywheel retaining bolt, using tool 18G 1303. Remove the key plate from the crankshaft.
7. Release the flywheel from the crankshaft using tool 18G 1381, remove the tool and withdraw the flywheel and clutch as an assembly.

**CAUTION:** If the crankshaft is not positioned correctly the primary drive gear 'C'-shaped thrust washer may become displaced and make it impossible to remove the flywheel.

8. Remove the pressure plate bolts, lift off the pressure plate assembly and remove the driven plate from the flywheel.

### Overhaul

9. Renew the driven plate if the centre hub splines are worn, or if the linings are oil contaminated, burned or worn.
10. Check the diaphragm spring for wear and fractures. Renew the flywheel and pressure plate as an assembly if either component shows signs of wear or damage.

### Refitting

11. Check the crankshaft primary gear end-float, see Data.
12. Fit the driven plate with the hub boss facing the flywheel, fit the pressure plate assembly and lightly tighten the bolts. Using tool 18G 684, centralize the driven plate, then tighten the pressure plate bolts.
13. Fit the flywheel and clutch assembly onto the crankshaft, fit the key plate. Tighten the flywheel retaining bolt using tool 18G 1303, see 'Torque Wrench Settings'. Lock the flywheel retaining bolt by drifting the lockwasher into the slots in the clutch hub, then fit the thrust bearing sleeve.
14. Remove the flywheel locking tool and fit the starter motor. Fit the clutch cover, ensure that the carburettor drain tube is secured.

15. Lower the power unit and secure the R.H. engine mounting to the sub-frame. Insert the push-rod into the slave cylinder and fit the mounting plate to the flywheel housing.
16. Adjust the throw-out stop, refer to Clutch Adjustments.
17. Fit the exhaust pipe to manifold clamp. Fit the starter solenoid and the bonnet. Connect the battery.

## HYDRAULIC SYSTEM - 1989

### Model year on

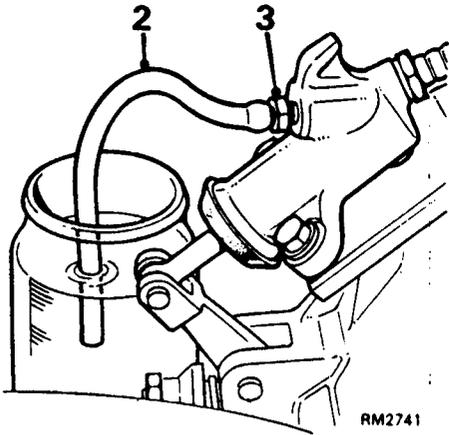
Bleeding 33.15.01

### Bleeding

#### CAUTION:

- a Never re-use fluid which has been bled from the system.
  - b Brake fluid has a detrimental effect on paintwork; ensure that the fluid is not allowed to contact painted surfaces.
- Top-up the master cylinder with the recommended fluid, see 'SERVICE LUBRICANTS'.
2. Attach a bleed tube to the bleed screw on the slave cylinder. Immerse the other end of the tube in a clean jar containing a quantity of fresh brake fluid.
  3. Open the bleed screw three quarters of a turn, depress the clutch pedal and allow it to return unassisted.
  4. Continue pumping the pedal until the fluid issuing from the tube is free of air bubbles. Tighten the bleed screw.
- CAUTION:** During the bleeding operation, check the level of fluid in the master cylinder at frequent intervals. Do not allow the level to fall too far or air will be drawn into the system.

5. Remove the bleed tube.
6. To-up the master cylinder to the correct level and fit the cap.



### SLAVE CYLINDER - 1989 Model year on

Remove and refit 33.35.01

#### Removing

1. Disconnect the multi-connector and the feed tube from the windscreen washer pump.
2. Remove the windscreen washer bottle.
3. Disconnect the master cylinder pipe from the hose at the body bracket; plug or tape the end of the hose to prevent the ingress of dirt.
4. Remove the locknut and washer and release the hose from the body bracket. Plug or tap the end of the hose.
5. Remove the two bolts and washers securing the slave cylinder the mounting bracket.
6. Slide the slave cylinder off the push rod.

7. With the slave cylinder held in a soft jawed vice, remove the banjo bolt; recover the two sealing washers. Plug or tape the end of the hose.

#### Refitting

8. With the slave cylinder held in a soft jawed vice, connect the hose to the cylinder; use new sealing washers if necessary.  
**CAUTION:** Ensure that the hose is aligned with the cylinder when the banjo bolt is tightened.
9. Lubricate the push rod with clean brake fluid and insert it into the slave cylinder.
10. Locate the slave cylinder on the mounting bracket; fit and tighten the securing bolts.
11. Connect the hose to the body bracket ensuring that it is not kinked or twisted and that it is still aligned with the cylinder.
12. Connect the master cylinder pipe to the hose.
13. Refit the windscreen washer bottle; connect the multi-plug and the washer pump feed tube.
14. Bleed the clutch hydraulic system, see 33.15.01.

### CLUTCH ASSEMBLY - VERTO CLUTCH - 1989 Model year on

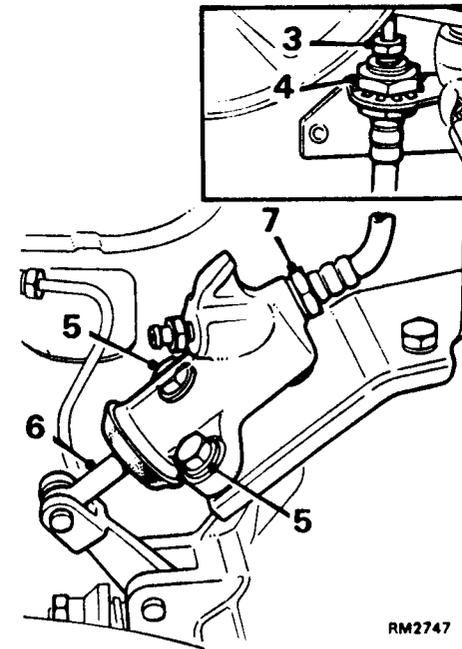
Remove and refit 33.10.01

Overhaul 33.10.05

**Service tool:** 18G 684, 18G 1303, 18G 1381

#### Removing

1. Disconnect the battery.
2. Disconnect the multi-connector and the feed tube from the windscreen washer pump.
3. Remove the windscreen washer bottle.



4. Release the turnbuckles and remove the ignition shield.
5. Remove the bolt and washer securing the coil bracket, move the coil and bracket aside.
6. Disconnect the Lucar connectors from the coil.
7. Remove the distributor cap together with the spark plug leads.
8. Remove the starter motor cable retaining strap.
9. Disconnect the air intake tube.
10. Disconnect the Lucar connectors from the horn.
11. Remove the horn.
12. Remove the air intake duct.
13. Remove the starter motor, see 86.10.01.
14. Remove the bolts and washers securing the slave cylinder to the mounting bracket, move the cylinder aside.

15. Remove the bolts and washers securing the slave cylinder mounting bracket; withdraw the bracket and collect the spacer.
16. Slide the slave cylinder off the push rod.
17. Support the engine on a jack, use a foam rubber pad or block of wood to protect the sump.
18. Remove the nuts and washers securing the rear engine mounting to the body.
19. Remove the bolts and washers securing the clutch cover, slacken the bolts securing the lower engine steady bracket, move the bracket aside. Note the fitted position of the carburettor drain tube and remove the clutch cover.
20. Remove the thrust bearing sleeve from the clutch hub.
21. Prise the lock washer from the clutch hub slots. Position the crankshaft and clutch hub slots horizontally and lock the flywheel.
22. Remove the flywheel retaining bolt using tool 18G 1303. Remove the key plate from the crankshaft.
23. Release the flywheel from the crankshaft using tool 18G 1381, remove the tool and withdraw the flywheel and clutch as an assembly.  
**CAUTION:** If the crankshaft is not positioned correctly, the primary drive 'C' shaped washer may become displaced and make it impossible to remove the flywheel.
24. Remove the pressure plate bolts, lift off the pressure plate assembly and remove the driven plate from the flywheel.

#### Overhaul

25. Renew the driven plate if the centre hub splines are worn or if the linings are oil contaminated, burned or worn.

- 
26. Check the diaphragm spring for wear and fractures. Renew the flywheel and pressure plate as an assembly if either component shows signs of wear or damage.

**Refitting**

27. Check the crankshaft primary gear end-float see 'DATA'.
28. Fit the driven plate with the hub boss facing the flywheel, fit the pressure plate assembly and lightly tighten the bolts. Using tool 18G 684, centralize the driven plate then tighten the pressure plate bolts.
29. Fit the flywheel and pressure plate assembly on to the crankshaft, fit the key plate. Tighten the flywheel retaining bolt using 18G 1303, see 'TORQUE WRENCH SETTINGS'. Lock the flywheel retaining bolt by drifting the lock washer into the slots in the clutch hub then fit the thrust bearing sleeve.
30. Remove the flywheel locking tool.
31. Reverse the procedure given in 1 to 19.
32. Adjust the throw-out stop, refer to 'CLUTCH ADJUSTMENTS - VERTO CLUTCH'.



## GEAR-CHANGE LEVER

Remove and refit - Not Turbo 37.16.04

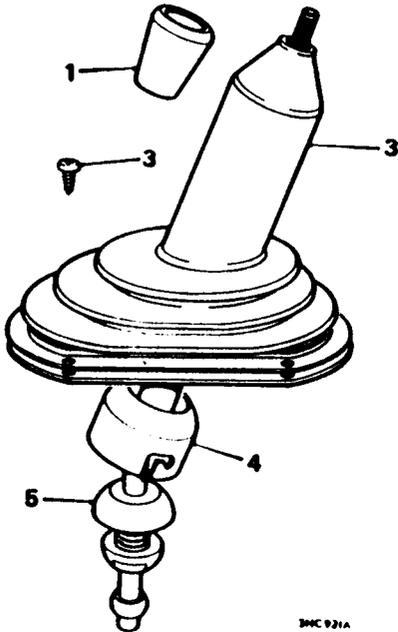
### Removing

If a console is fitted, remove the console retaining screws to enable the console to be moved as necessary.

1. Unscrew the knob from the gear-change lever.
2. Remove the front floor covering.
3. Remove the gaiter retaining ring screws and pull the gaiter up the lever.
4. Press down and turn the bayonet cap fixing to release the lever from the remote control assembly.
5. Remove the gear-change lever.

### Refitting

6. Smear the gear lever operating surfaces with Shell Alvania RA Grease or equivalent.
7. Reverse the procedure in 1 to 5.



## GEAR CHANGE LEVER

Remove and refit - Turbo only 37.16.04

### Removing

1. Remove the console, see 76.25.01
2. Remove the screws securing the draught excluder retaining plate; withdraw the draught excluder.
3. Lift off the foam insulation pad.
4. Press down and turn the bayonet cap fixing; release the cap and withdraw the gear lever.

### Refitting

5. Smear the gear lever operating surfaces with Shell Alvania RA Grease or equivalent.
6. Reverse the procedure given in 1 to 4.

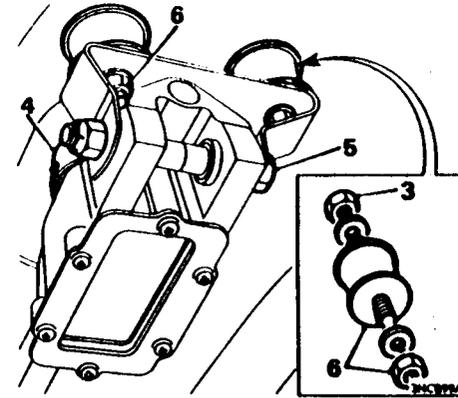
## GEAR-CHANGE REMOTE CONTROL ASSEMBLY

Remove and refit 37.16.19

Rubber mountings - remove and refit 37.16.25

### Removing

1. Turbo Models: Remove the console, see 76.25.01. Drift out the roll-pin retaining the extension rod to the selector rod at the final drive housing.
2. Remove the nut and bolt securing the remote control steady rod to the final drive housing on the gearbox.
3. Fold back the rear of the front carpet and remove the two nuts securing the remote control mounting rubbers to the floor.
4. Release the gear-change lever from the remote control from beneath the car.
5. Remove the one nut and bolt securing the remote control housing to the mounting bracket and remove the bracket.



6. Remove the nuts to release the mounting rubbers from the mounting bracket.

### Refitting

7. Reverse the procedure in 1 to 6.

## GEARBOX ASSEMBLY

Remove and refit 37.20.01

Service tool: 18G 1043

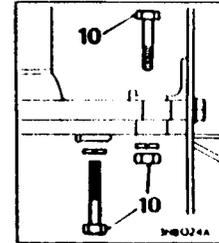
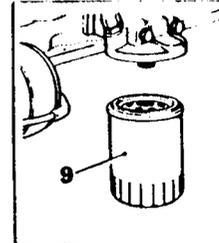
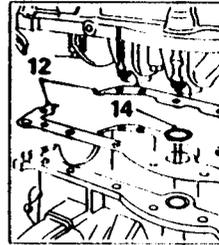
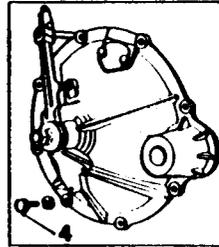
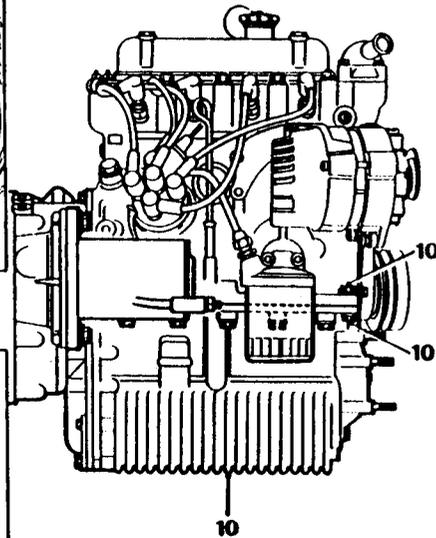
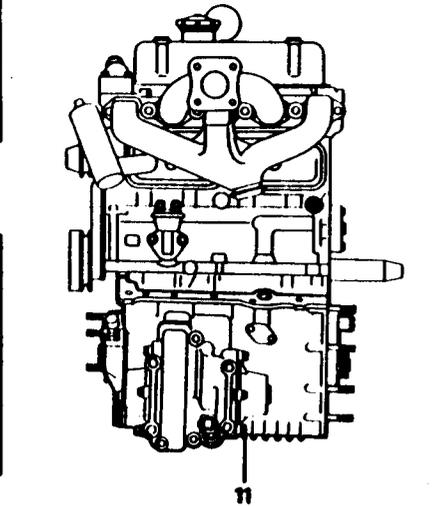
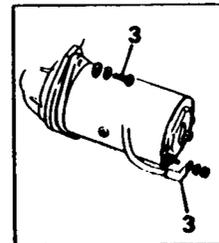
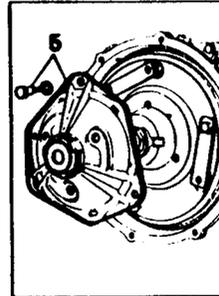
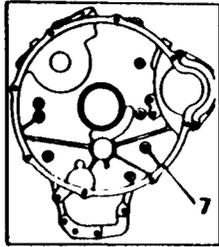
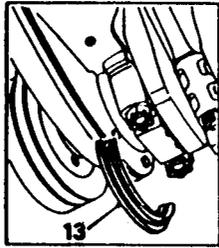
### Removing

1. Drain the engine/gearbox oil.
2. Remove the engine/gearbox assembly, see 12.37.01.
3. Remove the starter motor.
4. Remove the clutch cover securing screws and lift off the cover.
5. Remove the clutch and flywheel, see 33.10.01.
6. Fit tool 18G 1043 over the primary gear.
7. Tap back the locking plate tabs securing the flywheel housing securing nuts, remove the nuts and set screws and lift off the flywheel housing.
8. Remove the two bolts retaining the radiator to the left-hand engine mounting bracket.

9. Unscrew and remove the oil filter cartridge.
10. Remove all nuts, bolts and spring washers securing the gearbox to the engine.
11. Fit the engine lifting equipment and lift the engine away from the gearbox.
12. Remove the joint washers and ensure that the joint faces are clean and free from burrs.
13. Remove the front main bearing cap oil seal.
14. Check the oil feed 'O' ring seal, and fit a replacement if necessary.

### Refitting

15. Fit new joint washers to the transmission casing.
16. Lubricate and fit a new front main bearing cap oil seal to the engine.
17. Lower the engine onto the transmission unit and torque tighten the securing screws and nuts, see 'TORQUE WRENCH SETTINGS'.
18. Fit a new joint washer to the flywheel housing, refit the housing with new locking plates and torque tighten the securing nuts and set screws, see 'TORQUE WRENCH SETTINGS'.
19. Remove tool 18G 1043 from the primary gear.
20. Refit the clutch and flywheel, see 33.10.01.
21. Refit the clutch cover.
22. Refit the bolts securing the radiator to the left-hand engine mounting bracket.
23. Refit the starter motor.
24. Refit the oil filter cartridge.
25. Refit the engine/gearbox assembly, see 12.37.01.
26. Refill the engine/gearbox with oil up to the 'MAX' mark on the dipstick.



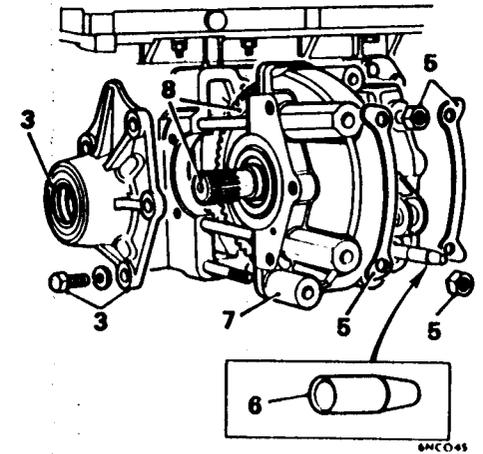
## GEARBOX ASSEMBLY

**Overhaul** 37.20.04

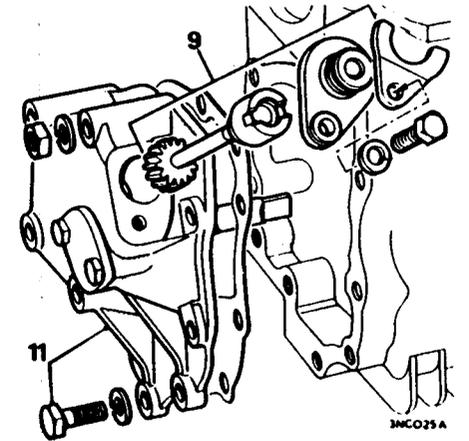
**Service tool:** 18G 134, 18G 134BC, 18G 257, 18G 284, 18G 284 B, 18G 569, 18G 579, 18G 581, 18G 587, 18G 617A, 18G 617C, (18G 617 A with collets 18G 617-X fitted), 18G 705, 18G 705 C, 18G 1004, 18G 1126, 18G 1127, 18G 1236, 18G 1288, 18G 1289, 18G 1338

### Dismantling

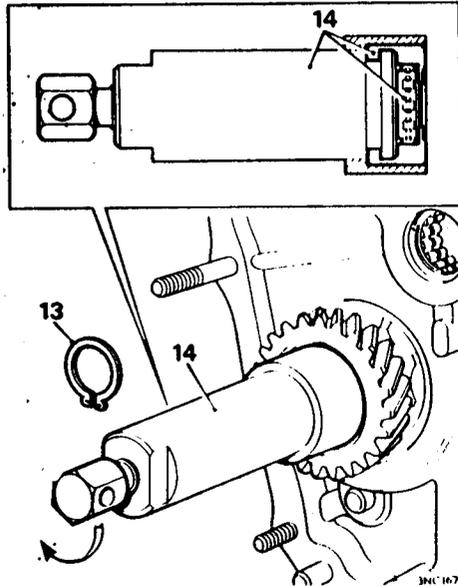
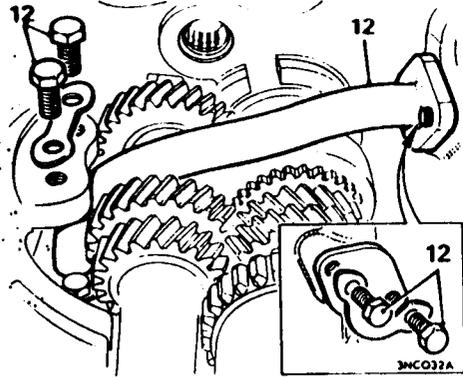
1. Remove the engine/gearbox assembly, see 12.37.01.
2. Remove the gearbox from the engine, see 37.20.01.
3. Remove the securing screws and detach the final drive end covers.
4. Extract the selector shaft detent spring, sleeve and ball.
5. Knock back the lock washer tabs from the final drive housing securing nuts; remove the nuts and lock washers.
6. Locate the oil seal protector sleeve (tool 18G 1236) over the selector shaft.
7. Remove the final drive housing; discard the oil seal and remove the nylon bush (if fitted) noting the type of bush fitted, i.e with or without an 'O' ring.
8. Remove the final drive gear assembly.
9. Remove the speedometer drive pinion, see 37.25.05.
10. Remove the engine mounting adaptor housing.
11. Remove the speedometer drive housing.
12. Tap back the lock washer tabs and remove the screws securing the oil suction pipe to the gearbox casing; pull out the pipe
13. Remove the circlip retaining the first motion shaft roller bearing, using tool 18G 1004.



14. Use tools 18G 705 and 18G 705 C to pull off the first motion shaft roller bearing.

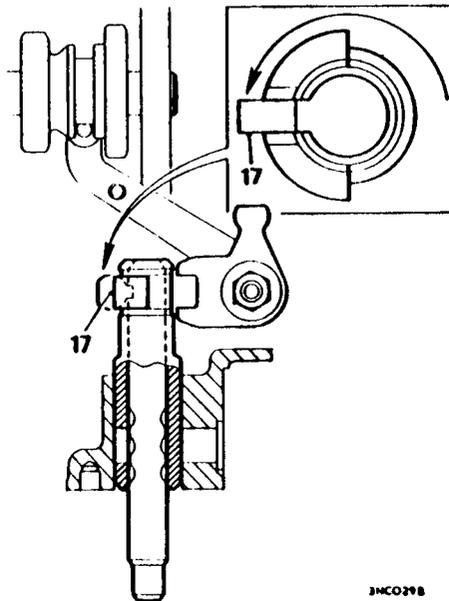


15. Knock back the lock washer tab from the first motion shaft securing nut.

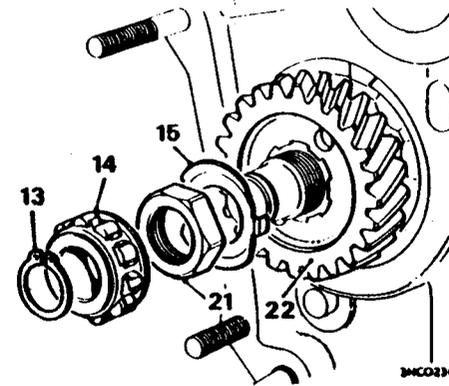
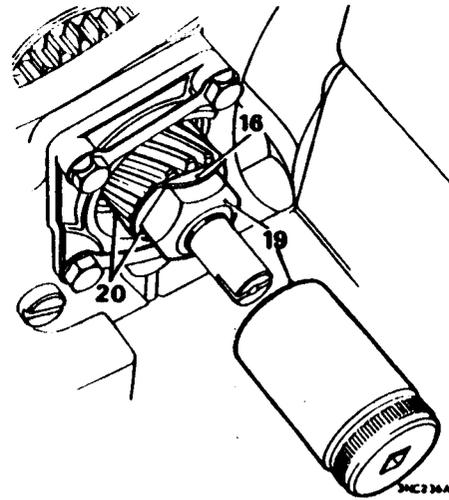


16. Knock back the lock washer tab from the third motion shaft final gear securing nut.

17. Rotate the selector shaft anti-clockwise to disengage the operating stub and the interlock spool from the bellcrank levers.
18. Engage first and fourth gears simultaneously to lock the gear train.
19. Use tool 18G 587 and remove the third motion shaft final drive gear nut.
20. Pull off the lock washer and final drive gear.
21. Remove the first motion shaft gear nut.
22. Pull off the lock washer and the first motion shaft gear.
23. Move first and fourth gears to neutral position.
24. Knock back the lock washer tabs on the third motion shaft bearing retainer bolts and remove the bolts.



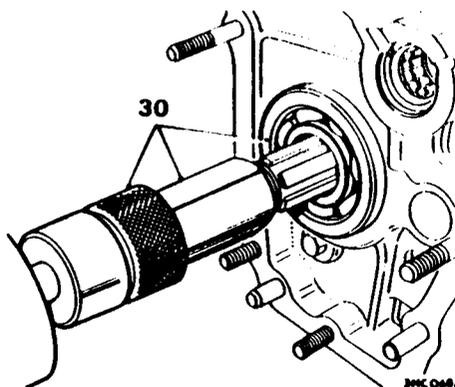
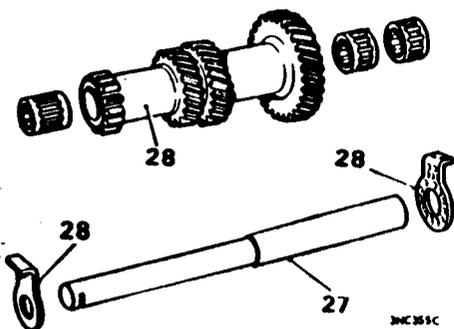
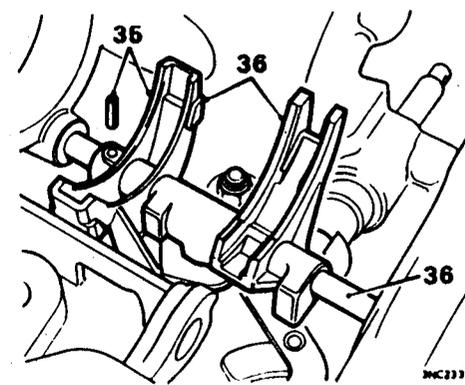
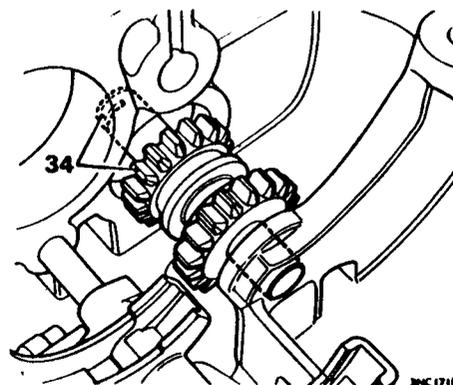
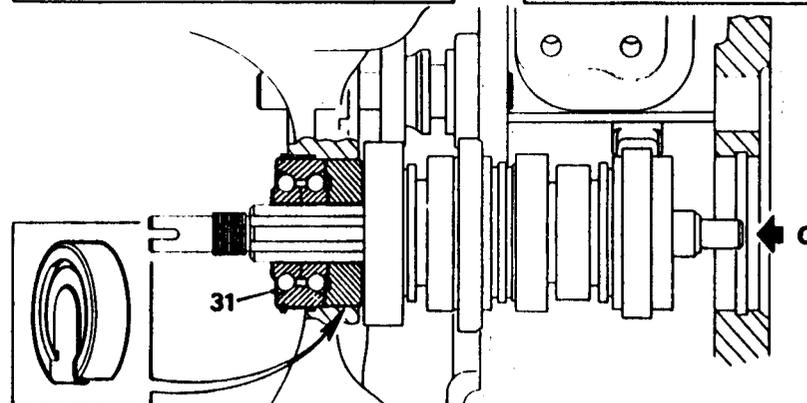
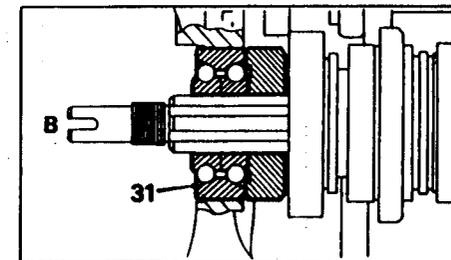
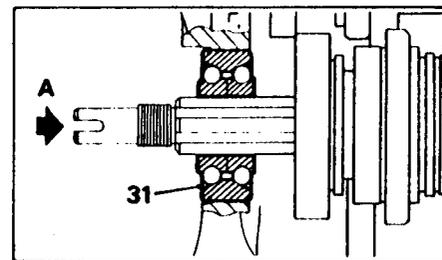
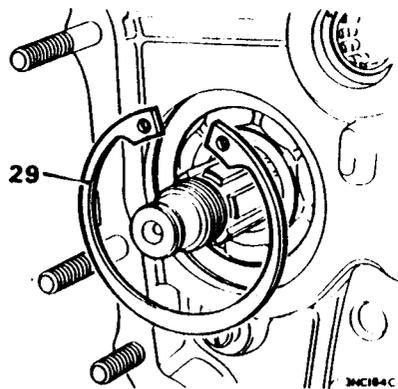
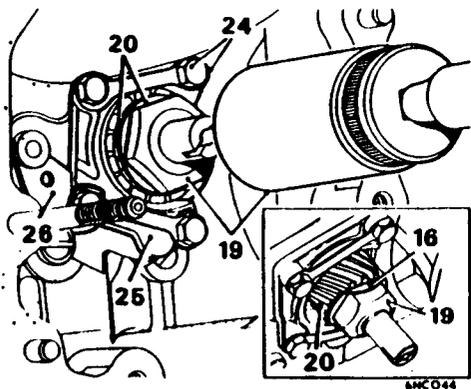
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25. Remove the retainer complete with the adjustment shim(s).
26. Remove the reverse locking plate.
27. Withdraw the layshaft.
28. Take out the small thrust washer from the laygear, remove the laygear and the larger thrust washer.

29. Use tool 18G 257 to remove the first motion shaft bearing retaining circlip.
30. Use tools 18G 284 and 18G 284 B and withdraw the first motion shaft and bearing from the end casing.
31. Refer to removing procedure 'A', 'B' and 'C' on the illustration to remove the third motion shaft bearing.
  - 'A': Use a soft drift and drift the third motion shaft towards the clutch end of the gearbox. Take care not to disengage the third/fourth speed synchronizer from its hub as this would release its balls and springs.
  - 'B': Insert tool 18G 1127 with its relieved side against the bearing.
  - 'C': Drift the other end of the third motion shaft in the opposite direction to remove the third motion shaft bearing from the centre web of the casing.

*Note: Should the bearing not be completely removed from the centre web by the procedures given, it can be carefully levered out by using a screwdriver between the casing and the bearing circlip.*
32. Lift out the third motion shaft assembly.
33. Remove the oil strainer.
34. Withdraw the reverse idler shaft and gear.
35. Drift out the roll-pin securing the third/fourth speed selector fork to its shaft.
36. Remove the selector shaft and forks.
37. Remove the bellcrank lever pivot post nut and washer.
38. Lift out the bellcrank levers, washers and pivot sleeve. Note the location and markings on the levers for reassembly.

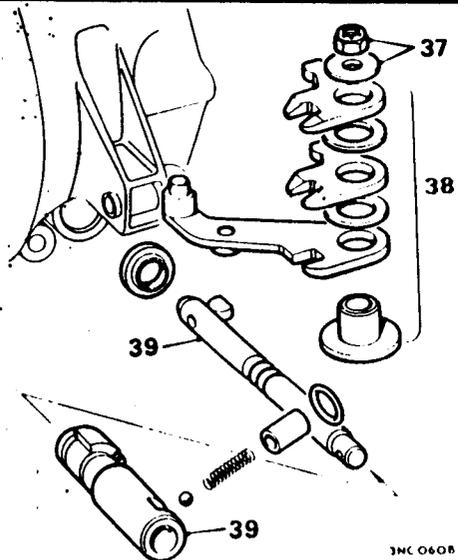


39. Withdraw the interlock spool and selector shaft from inside the casing.
40. Drift the bellcrank lever pivot post out of the gearbox casing if the 'O' ring oil seal is to be renewed.
41. Remove the idler gear bearing from the gearbox casing, using tool 18G 581 or 18G 1288 as determined by bearing size.
42. Remove the idler gear bearing from the flywheel housing, using tool 18G 581 or 18G 1288 as determined by bearing size.

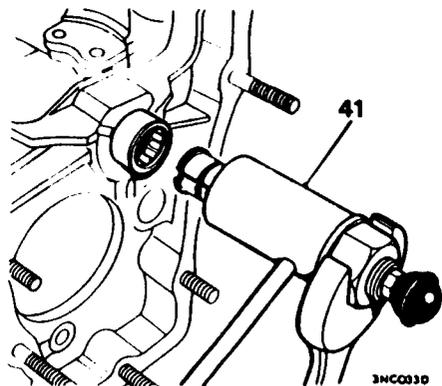
43. Extract the circlip retaining the outer race of the first motion shaft spigot bearing in the flywheel housing.

44. Use tool 18G 617 A to pull out the outer race (arrowed).
45. Remove the primary gear oil seal from the flywheel housing.

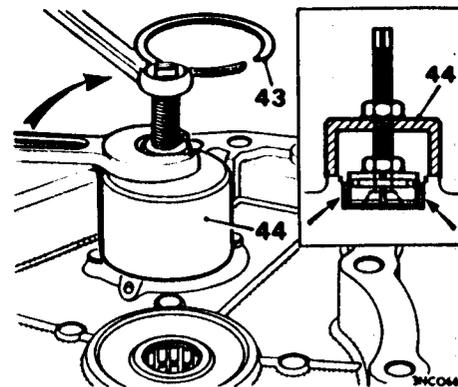
- Inspecting**
46. Clean all assemblies and examine for wear.



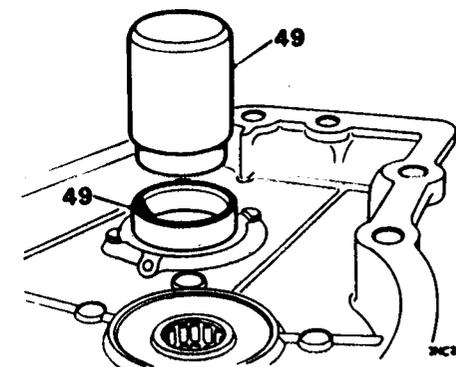
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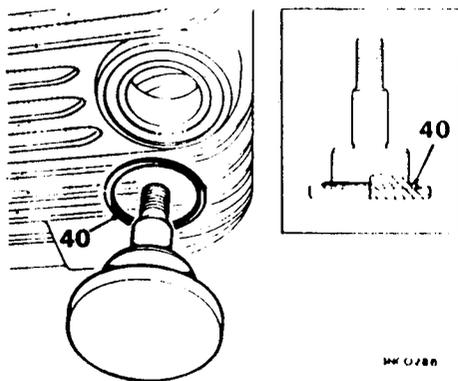
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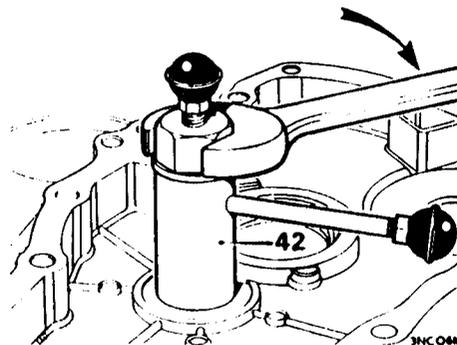
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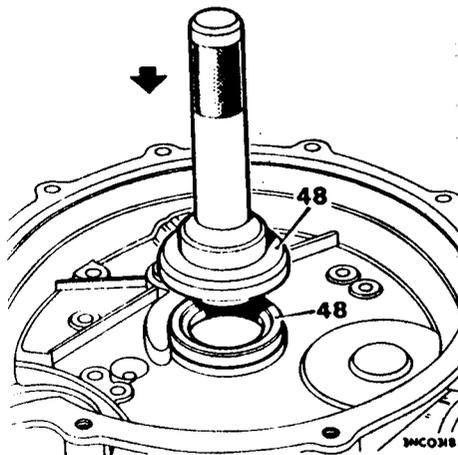
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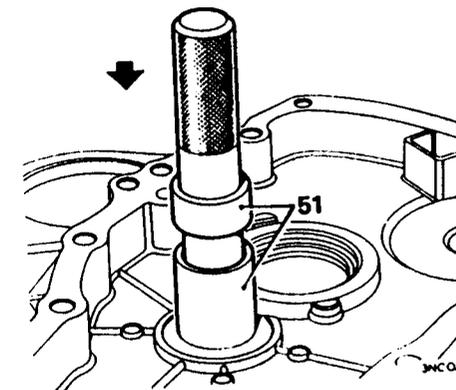
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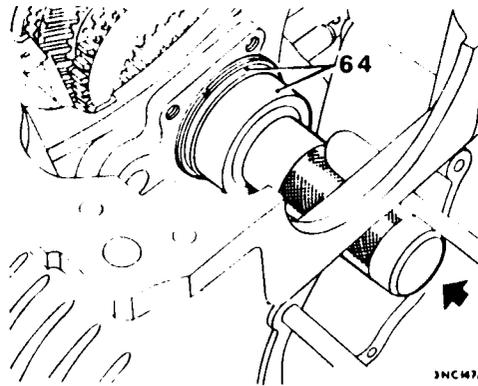
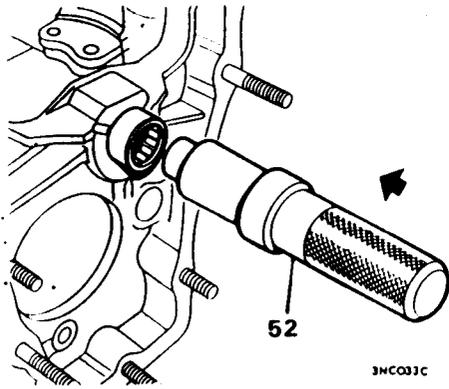
### Reassembling

47. Completely dismantle the main assemblies and thoroughly examine their components; refer to the overhaul procedure for each main assembly given in the reassembling procedure.

48. Smear the housing recess with Castrol LM grease and fit a new primary gear oil seal into the flywheel housing, using tools 18G 134 and 18G 134 BC.
49. Use the 'replacer' of tool 18G 617 A and drift the first motion shaft spigot bearing outer race into the flywheel housing.
50. Refit the bearing retaining circlip.

51. Use tool 18G 1126 with its outer sleeve or 18G 1289 or 18G 1338, as determined by bearing size, and drift the idler gear bearing into the housing to the depth governed by the outer sleeve or shoulder of the tool.

52. Drift the new idler gear bearing into the gearbox casing, using tool 18G 1126 or 18G 1289 or 18G 1338 as determined by bearing size.  
**CAUTION: Do not drift the bearing tight up against the housing lip.**
53. Lubricate and fit a new 'O' ring oil seal onto the bellcrank lever pivot post and drift it into the gearbox casing.
54. Insert the selector shaft into the interlock spool and refit the assembly into the gearbox with the operating stub facing away from the pivot post.



55. Refit the sleeve, bellcrank levers (in their correct order) onto the pivot post and tighten the self-locking nut.

**Note:** DO NOT turn the selector shaft and interlock spool into engagement with the bellcrank levers until the first and third motion shaft gear retaining nuts have been torque-tightened.

56. Refit the third/fourth speed selector fork.
57. Refit the first speed selector fork and drift the selector rod through the casing and forks; align the hole in the shaft with the hole in the third/fourth speed fork.
58. Drift in the roll pin until it is flush with the fork.
59. Refit the reverse idler gear into engagement with the reverse bellcrank lever pivot and refit the shaft.
60. Place the oil strainer into its location in the casing.
61. Dismantle and overhaul the third motion shaft assembly, see 37.20.31.

62. Dismantle and overhaul the first motion shaft assembly, see 37.20.31.

63. Insert the third motion shaft assembly into the gearbox assembly and locating in the two selector forks.

64. Use tool 18G 579 and drift the third motion shaft bearing into the centre web of the casing.

65. Insert the first motion shaft needle-roller bearing into its location in the gear.

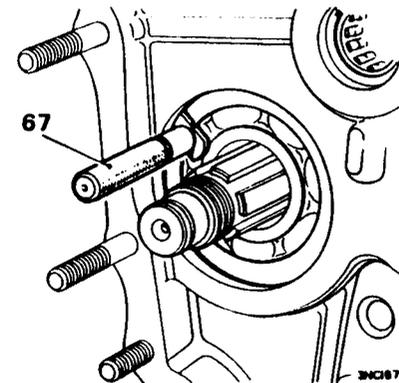
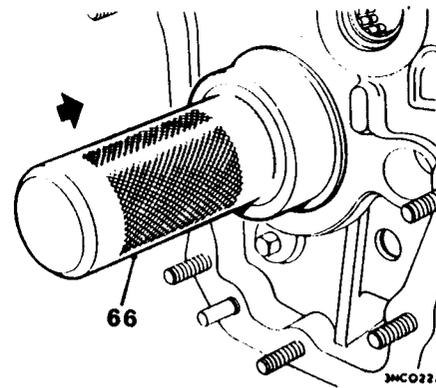
66. Drift the first motion shaft assembly into the casing, using tool 18G 579.

67. Use tool 18G 569 to gauge the correct thickness circlip required - try the thicker side of the tool first; the sizes are marked on the handle.

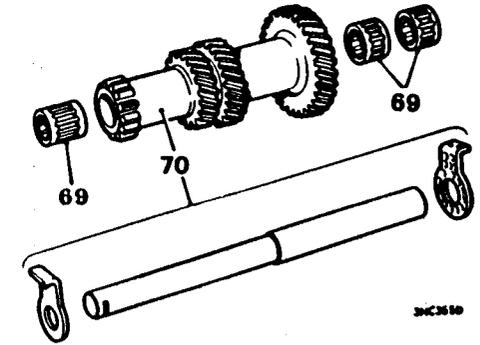
68. Select the correct circlip from the chart given below and fit it using tool 18G 257.

When gap is	Use Circlip Part No.
0.096 to 0.098 in (2.43 to 2.48 mm)	2A 3710
0.098 to 0.100 in (2.48 to 2.54 mm)	2A 3711

69. Insert the needle-roller bearings into the laygear.
70. Refit the laygear and shaft with its thrust washers.

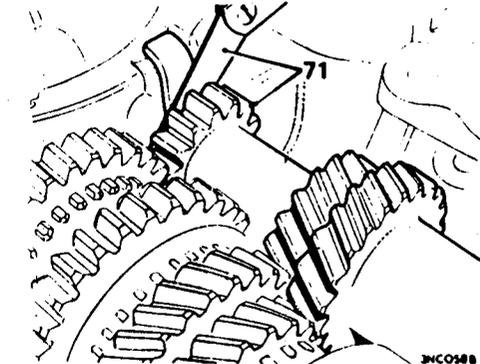


71. Use feeler gauges and check the laygear end-float, which should be 0.002 to 0.006 in (0.05 to 0.15 mm). Select and fit the required washer from the chart given below:

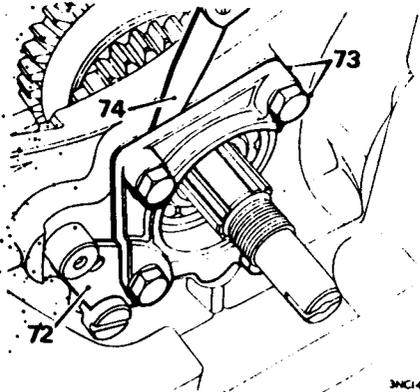


Layshaft thrust washer chart

Washer thickness		Part No.
Inches	mm	
0.123 to 0.124	3.12 to 3.14	22G856
0.125 to 0.126	3.17 to 3.20	22G857
0.127 to 0.128	3.22 to 3.25	22G858
0.130 to 0.131	3.30 to 3.32	22G859



72. Refit the layshaft and reverse shaft locking plate; turn the shafts if necessary until the slots are correctly positioned.
73. Refit the third motion shaft bearing retainer without any shims, lightly and evenly tighten the retainer bolts.



74. Check the gap with feeler gauges; select the required thickness of shims from the chart given below:

When gap is	Use shims totalling
0.005 to 0.006 in (0.13 to 0.15 mm)	0.005 in (0.13 mm)
0.006 to 0.008 (0.15 to 0.20 mm)	0.007 in (0.18 mm)
0.008 to 0.010 in (0.20 to 0.25 mm)	0.009 in (0.23 mm)
0.010 to 0.12 in (0.25 to 0.30 mm)	0.011 in (0.28 mm)
0.012 to 0.014 in (0.30 to 0.35 mm)	0.013 in (0.33 mm)
0.014 to 0.015 in (0.35 to 0.38 mm)	0.015 in (0.38 mm)

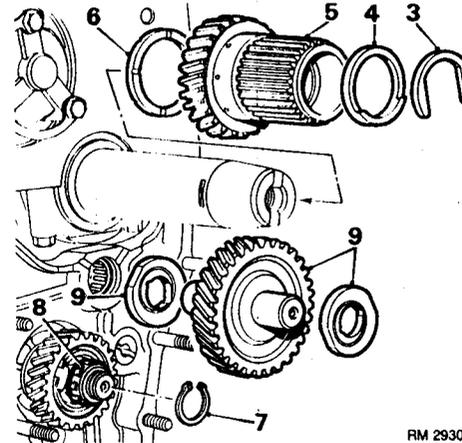
75. Fit the shims under the layshaft and reverse shaft locking plate.
76. Refit the bearing retainer with new lock washers, tighten the securing screws to the torque figure given in 'TORQUE WRENCH SETTINGS'. Tap over the lock washer tabs.
77. Engage first and fourth gears simultaneously to lock the gear train.

78. Refit the final drive pinion, a new lock washer and the securing nut onto the third motion shaft.
79. Tighten the final drive gear pinion nut, using tool 18G 587, to the torque figure given in 'TORQUE WRENCH SETTINGS'. Tap over the lock washer tabs.
80. Refit the first motion shaft gear with a new lock washer. Refit and tighten the securing nut to the torque figure given in 'TORQUE WRENCH SETTINGS'. Tap over the lock washer tab.
81. Refit the first motion shaft roller-bearing and refit the retaining circlip with tool 18G 1004.
82. Move first and fourth gears to the neutral position.
83. Rotate the selector shaft and interlock spool into engagement with the bellcrank levers.
84. Insert the oil suction pipe into the strainer.
85. Fit a new joint washer and locking plates, tighten the external flange securing screws first, then the pipe bracket screws. Tap over the locking plate tabs.
86. Refit the speedometer drive housing with a new joint washer to the gearbox casing. Tighten the securing nuts and screws to the torque figure given in 'TORQUE WRENCH SETTINGS'.
87. Refit the speedometer drive pinion with a new joint washer.
88. Refit the engine mounting adaptor housing.
89. Fit the nylon bush and 'O' ring (if applicable) into the final drive housing. Smear bush and 'O' ring with lithium based grease prior to fitting.

**CAUTION:** Two types of bush may be fitted, one with and one without

an 'O' ring. The bushes are not interchangeable. Bushes with 'O' rings may, however, be fitted to early gearboxes which did not have the nylon bush fitted.

90. Fit a new selector shaft oil seal; smear the seal with clean engine oil prior to fitting.
91. After fitting seal, check that nylon bush does not protrude beyond the face of the final drive housing.
92. Fit oil seal protector sleeve 18G 1236 over the selector shaft then fit the differential and housing taking care not to disturb the nylon bush.
93. Adjust the final drive gear assembly, see 54.10.08.



RM 2930

94. Refit the selector shaft sleeve, ball and spring before fitting the final drive end covers.
95. Refit the gearbox to the engine, see 37.20.01.
96. Refit the engine/gearbox assembly, see 12.37.01.

## PRIMARY DRIVE GEAR TRAIN

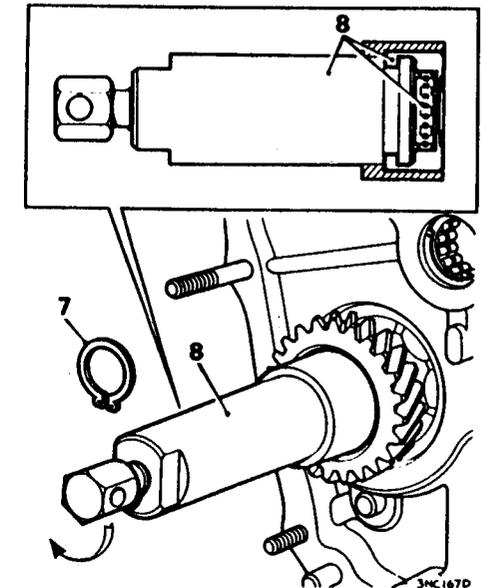
Remove and refit 37.20.11

Idler gear end-float - check and adjust 37.20.10

**Service tool:** 18G 705, 18G 705 C, 18G 1004, 18G 1043, 18G 1089, 18G 1089-1

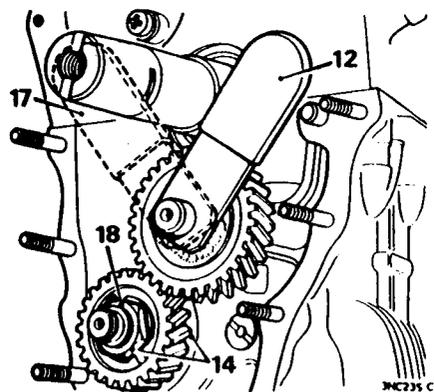
### Removing

1. Remove the clutch/flywheel, see 33.10.01.
2. Remove the flywheel housing, see 12.53.01.
3. Remove the primary gear rear thrust washer.
4. Remove the backing ring.
5. Pull off the primary gear.
6. Remove the primary gear front thrust washer.
7. Remove the circlip retaining the first motion shaft roller bearing, using tool 18G 1004.

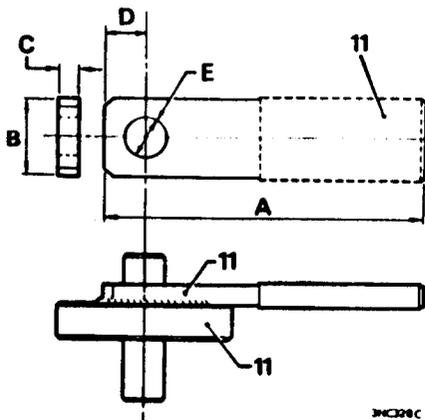


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8. Use tool 18G 705 and 18G 705 C to pull off the first motion shaft roller bearing.
9. Remove the idler gear and thrust washers.
10. Make up and use a tool to lock the gear train while the first motion shaft gear retaining nut is slackened. Make the tool using an old idler gear and a piece of steel bar approximately 5 1/4 in x 1 1/2 in x 3/8 in to the dimensions given below:
  - A. 5 1/4 in (133 mm)
  - B. 1 1/2 in (38 mm)
  - C. 3/8 in (9.5 mm)
  - D. 3/4 in (19.05 mm)
  - E. 3/4 in (19.05 mm)



11. Drill a 3/4 in (19.05 mm) dia hole in the bar as shown in the illustration and arc-weld the bar to the old idler gear. Wrap several thicknesses of tape around the bar where it will contact the crankshaft.
12. Position the tool into the idler gear bearing with the handle against the crankshaft.



13. Knock back the lock washer tab securing the first motion shaft gear retaining nut.

14. Remove the retaining nut and lift off the first motion shaft gear.

#### Inspecting

15. Examine all gears for undue wear or damage, and replace as a complete set if necessary. Check the thrust washers and replace as required with those selected after checking the idler gear and primary gear end-float.

#### Refitting

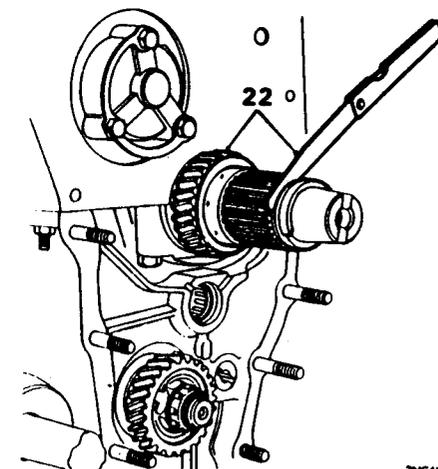
16. Fit the first motion shaft gear with a new lock washer.
17. Position the gear train holding tool on the opposite side of the crankshaft.
18. Refit and tighten the first motion shaft gear retaining nut, see 'TORQUE WRENCH SETTINGS'.
19. Remove the gear train holding tool.
20. Primary gear end-float: Refit the primary gear with its front thrust washer, with the chamfered side of the washer (arrowed) towards the crankshaft.
21. Refit the rear backing ring and thrust washer.

22. Check the primary gear end-float with feeler gauges; the amount of end-float should be from 0.0035 to 0.0065 in (0.089 to 0.165 mm). Adjust if necessary by fitting the correct thickness thrust washer from the range given below.

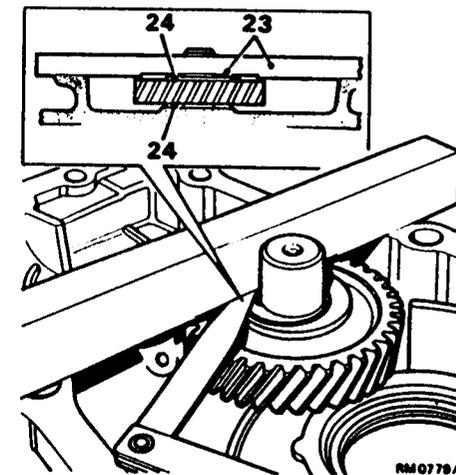
#### Primary gear thrust washer chart

0.112 to 0.114 in (2.84 to 2.89 mm)
0.114 to 0.116 in (2.89 to 2.94 mm)
0.116 to 0.118 in (2.94 to 2.99 mm)
0.118 to 0.120 in (2.99 to 3.04 mm)
0.120 to 0.122 in (3.04 to 3.09 mm)

23. Fit the idler gear to the flywheel housing with a nominal sized thrust washer (refer to **Data**) on each side. Position tool 18G 1383 on the flywheel housing with its recessed face downwards and measure the gap between the recessed face of the tool and the front thrust washer. Maintain the original thickness of the front thrust washer if the original gears are to be refitted. Select thrust washers to bring the end-float within the limits given in **Data**. Re-check the end-float.



24. Oil the thrust washers and fit the idler gear and thrust washers as an assembly to the gearbox casing.
25. Fit tool 18G 1043 over the primary gear and screw the two guides into the two bottom holes in the crankcase.
26. Refit the flywheel housing, see 12.53.01.
27. Refit the clutch/flywheel, see 33.10.01.



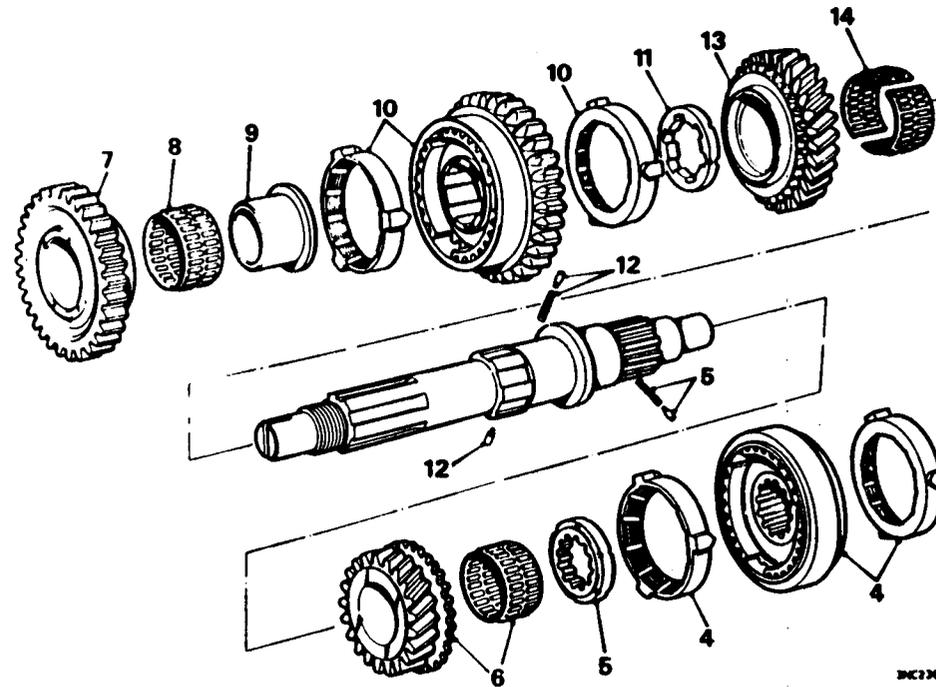
## THIRD MOTION SHAFT

Overhaul 37.20.31

Service tool: 18G 186, 18G 572

### Dismantling

1. Remove the engine/gearbox assembly, see 12.37.01.
2. Remove the gearbox from the engine, see 37.20.01.
3. Carry out the procedure to remove the third motion shaft assembly from the gearbox casing, see 37.20.04.
4. Remove the third/fourth speed synchronizer and baulk rings.
5. Press in the front thrust washer plunger and turn the washer until its splines register with those on the shaft; remove the thrust washer plunger and spring.
6. Remove the third speed gear with its needle-roller bearing.
7. From the other end of the shaft, remove the first speed gear.
8. Remove the first speed gear needle-roller bearing.
9. Withdraw the needle-roller bearing journal.
10. Remove the combined reverse mainshaft gear and first/second speed synchronizer assembly with its baulk rings.
11. Press in the two plungers securing the rear thrust washer, turn it to align with the shaft splines, and withdraw it from the shaft.
12. Remove the two plungers and spring.
13. Remove the second speed gear.
14. Remove the second speed gear split caged needle-roller bearing.
15. Remove the baulk rings from the synchronizer assemblies.



16. Wrap a cloth around each synchronizer assembly to retain the balls and springs, push the synchronizer hub from the sliding coupling.

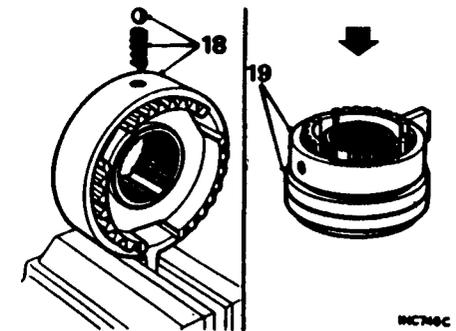
### Inspecting

17. Examine all gear teeth for excessive wear or damage. Check the third motion shaft bearing for excessive wear, pitting, security of cages and the fit of the bearing in the gearbox casing. Check the two thrust washers for wear, and renew as necessary. Examine the baulk rings for wear; they should be checked with their mating tapers on the gears. If the baulk rings do not engage before they contact the edge of the gear, the

hub and baulk rings must be renewed. Check the splines on the third motion shaft for wear. Examine the synchronizer balls and springs, and renew as necessary.

### Reassembling

18. Hold tool 18G 572 in a vice and reassemble each synchronizer hub to its respective coupling. Place the synchronizer hub into the tool, locate a spring and ball through the loading in the synchronizer hub. Press the ball and spring into the hub and turn it to the next loading position. Repeat this procedure with the other two balls and springs.



**CAUTION:** When loading the synchronizers, always turn the unit in the same direction, otherwise a ball may be released and cause injury to the operator.

19. Place the synchronizer coupling on a flat surface with the hub (still assembled in tool 18G 572) above it and with the cut outs in alignment. Give the hub a sharp tap with a hammer shaft to knock the hub into the coupling. Repeat this procedure on the other synchronizer assembly.
20. Hold the third motion shaft in a vice fitted with soft-faced jaws.
21. Refit the second speed gear complete with its split-caged needle-roller bearing.
22. Insert the plungers and spring into the shaft; refit the thrust washer with its machined grooves on the underside into position. Push in both plungers simultaneously and push down on the thrust washer until both plungers are engaged, then turn the thrust washer one spline to lock it in position.
23. Refit the combined reverse mainshaft gear and first/second speed synchronizer assembly complete with baulk rings.

24. Refit the first speed gear needle-roller bearing journal; use tool 18G 186 to drift it into the shaft if it is a tight fit.
25. Refit the first speed gear and needle roller bearing.
26. Hold the complete assembly together and reverse the holding position of the third motion shaft in the vice whilst the remaining components are assembled on the opposite end.
27. Refit the third speed gear and needle-roller bearing.
28. Repeat the procedure in 22 to refit the other thrust washer, except that it has only one retaining plunger.
29. Refit the third/fourth speed synchronizer and baulk rings.
30. Carry out the procedure to refit the third motion shaft assembly to the gearbox, see 37.20.04.
31. Refit the gearbox to the engine, see 37.20.01.
32. Refit the engine/gearbox assembly, see 12.37.01.

## FIRST MOTION SHAFT

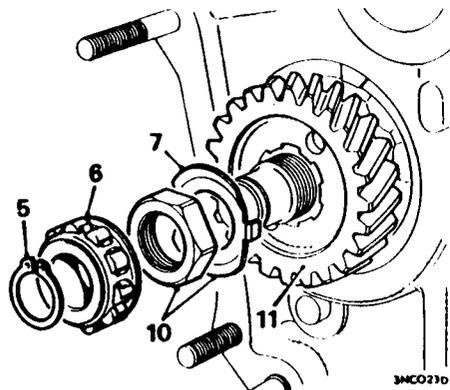
**Overhaul** 37.20.34

**Service tool:** 18G 257, 18G 284, 18G 284 B, 18G 569, 18G 579, 18G 705, 18G 705 C, 18G 1004

### Dismantling

1. Drain the engine/gearbox oil.
2. Remove the engine/gearbox assembly, see 12.37.01.
3. Remove the clutch/flywheel, see 33.10.01.
4. Remove the flywheel housing, see 12.53.01.
5. Use tool 18G 1004 to remove the first motion shaft roller bearing circlip.

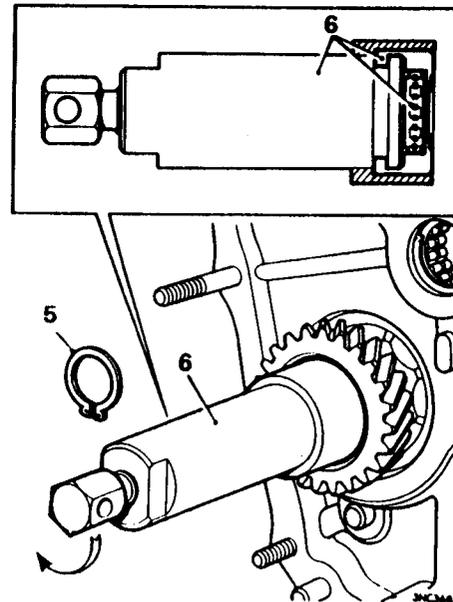
6. Use tools 18G 705 and 18G 705 C to withdraw the roller bearing off the first motion shaft.
7. Knock back the lock washer tab from the first motion shaft securing nut.



8. Remove the idler and primary gears.
9. Fit the primary gear train holding tool - illustration and make-up details given in 37.20.11.
10. Remove the first motion shaft gear securing nut and lock washer.
11. Pull off the first motion shaft gear.
12. Use tool 18G 257 to remove the circlip retaining the first motion shaft bearing.
13. Use impact tool 18G 284 with adaptor tool 18G 284 B and withdraw the first motion shaft assembly from the gearbox casing.
14. Press the first motion shaft out of the bearing.

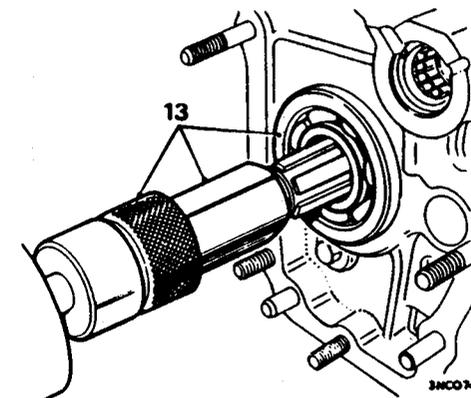
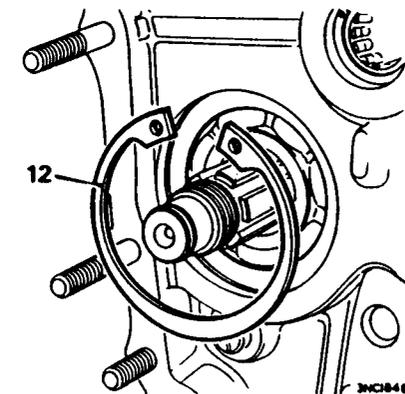
### Inspecting

15. Examine the gear and baulk ring surfaces for undue wear. Check the first motion shaft bearing and the internal needle roller bearing for wear, and renew as necessary.

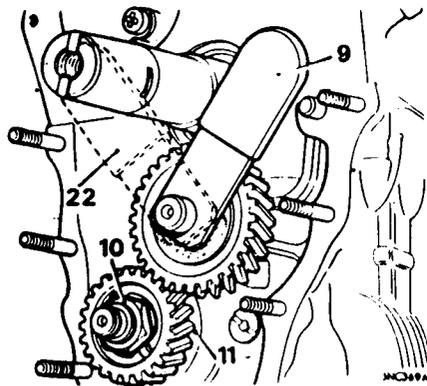


### Reassembling

16. Press the first motion shaft into the bearing.
17. Lubricate the internal needle-roller bearing and insert it into the first motion shaft.
18. Locate the baulk ring into the third/fourth speed synchronizer hub.
19. Drift the first motion shaft assembly into the casing, using tool 18G 579.
20. Use tool 18G 569 to gauge the correct thickness circlip required - try the thicker side of the tool first; the sizes are marked on the handle.
21. Select the correct circlip from the chart given and fit it using tool 18G 257.



When gap is	Use Circlip Part No.
0.096 to 0.098 in (2.43 to 2.48 mm)	2A 3710
0.098 to 0.100 in (2.48 to 2.54 mm)	2A 3711
22. Position the primary gear train holding tool so that its handle is against the opposite side of the crankshaft.	



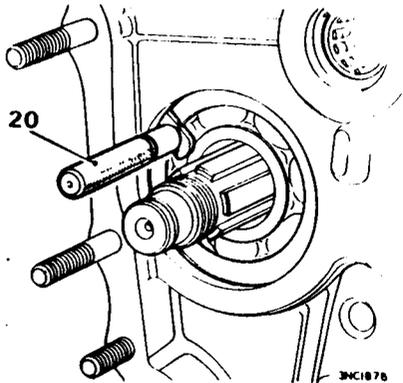
26. Refit the crankshaft primary gear with its thrust washers and backing ring, check the end float, and adjust if necessary, see 12.21.28.
27. Refit the flywheel housing, see 12.53.01.
28. Refit the clutch/flywheel, see 33.10.01.
29. Refit the engine/gearbox assembly, see 12.37.01.
30. Refill the engine/gearbox with oil up to the 'MAX' mark on the dipstick.

### SPEEDOMETER DRIVE GEAR

Remove and refit 37.25.01

#### Removing

1. Remove the engine/gearbox assembly, see 12.37.01.
2. Remove the bolts retaining the radiator to the engine mounting bracket.
3. Remove the engine mounting bracket.
4. Remove the adaptor plate from the speedometer drive housing.

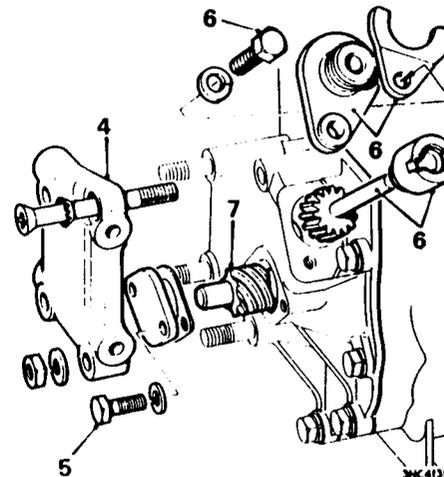


23. Refit the first motion shaft gear with a new lock washer. Refit and tighten the securing nut, see 'TORQUE WRENCH SETTINGS'.
24. Drift the roller bearing onto the first motion shaft and refit the retaining circlip, using tool 18G 1004.
25. Remove the gear train holding tool and refit the idler gear with its thrust washers; note that the longer spindle of the gear locates in the gearbox.

5. Remove the end plate securing screws and remove the end plate and joint washer.
6. Remove the securing screw and withdraw the speedometer drive pinion and housing assembly.
7. Withdraw the speedometer drive gear.

#### Refitting

8. Reverse the procedure in 2 to 7, fitting new joint washers where required.
9. Refit the engine/gearbox assembly, see 12.37.01.



### SPEEDOMETER DRIVE GEAR PINION

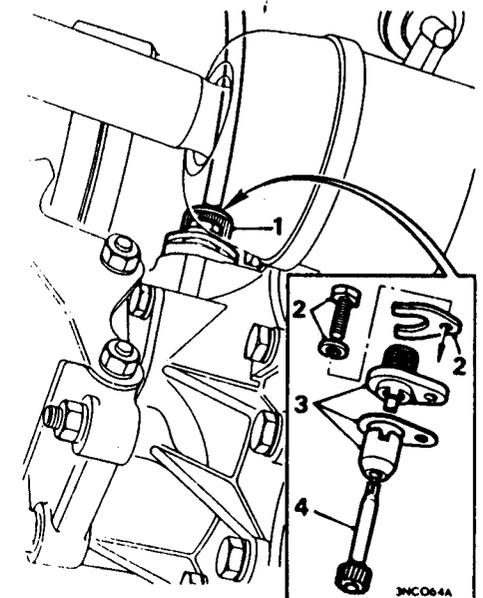
Remove and refit 37.25.05

#### Removing

1. Disconnect the speedometer drive cable from the pinion housing.
2. Remove the screw, spring washer and retainer plate securing the pinion housing.
3. Remove the pinion housing assembly.
4. Pull out the speedometer drive pinion.

#### Refitting

5. Reverse the procedures in 1 to 4, noting the following:
  - a. Fit a new pinion housing joint washer.
  - b. Do not overtighten the speedometer cable knurled connection.



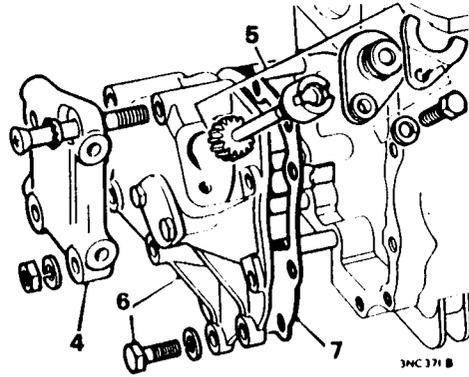
## SPEEDOMETER DRIVE HOUSING

Remove and refit

37.25.09

### Removing

1. Remove the engine/gearbox assembly, see 12.37.01.
2. Remove the bolts retaining the radiator to the engine mounting bracket.
3. Remove the engine mounting bracket.
4. Remove the adaptor plate from the speedometer drive housing.
5. Remove the speedometer drive pinion housing securing screw and withdraw the drive pinion assembly.
6. Remove the speedometer drive housing securing screws and withdraw the housing.
7. Remove the housing joint washer.



### Refitting

8. Reverse the procedure in 2 to 7, fitting new joint washers where required.
9. Refit the engine/gearbox assembly, see 12.37.01.

## GEARBOX - Automatic

### DESCRIPTION 44.00.01

The automatic gearbox incorporates a three-element fluid torque converter coupled with a bevel gear train which provides four forward gears and reverse. The system is controlled by a floor-mounted selector lever within a gated quadrant marked with six positions:

Selector positions

'R' for reverse

'N' for neutral

'1' for first gear

'2' for second gear

'3' for third gear

'D' for automatic drive using all forward gears.

The system can be used as a fully automatic four-speed gearbox, with the gears changing automatically from rest to maximum speed according to the throttle position and load. If a lower gear is required to obtain greater acceleration, an instant full throttle position, i.e. 'kick-down' on the accelerator, immediately produces the down change.

Complete manual control or over-ride is possible in the '1', '2' and '3' positions. However, it is very important that downward changes are effected within the speed range of the gear selected otherwise serious damage may result to the automatic gearbox components. The second '2', third '3' and top gears, provide engine braking whether driving 'manual' or 'automatic'. Manual selection allows the driver to stay in a particular gear to suit conditions.

**Note:** There is NO engine braking in first gear '1', it is a 'FREE WHEEL' gear on over-run.

### Recommended speed ranges

	m.p.h.	km/h
First '1'	0 to 25	0 to 40
Second '2'	5 to 45	8 to 72
Third '3'	15 to 55	25 to 88

### MECHANICAL SYSTEM

- refer to diagrams on pages 44 - 2 to 44 - 4

#### Torque converter

The hydraulic torque converter has a maximum torque conversion ratio of 2 : 1 and provides a means of obtaining additional engine torque when starting from rest and accelerating in first, second and third ratios.

#### Clutches

The hydraulically operated multi-disc clutches connect the gear train to the final drive. In forward ratios the forward clutch is applied; in reverse gear the top and reverse clutch is applied. The top and reverse clutch has a tandem piston arrangement; when a reverse gear is engaged both pistons are pressurised and provide a greater clamping load to the clutch plates.

#### Bands and servos

Three servo-operated bands are used; second gear band is applied for second gear, the third gear band for third gear, the reverse gear band for reverse. The bands apply a clamping load on members of the gear train and hold them stationary to provide the gear ratios.

#### One-way clutch

The one way clutch is used in the first ratio of drive. The forward clutch is applied, the carrier is stationary, its reaction being controlled by the one-way clutch.

### Gear train

The gear train is of the epicyclic type and has eight spiral bevel gears. Engine power is transmitted from the converter output gear through an idler gear to the input gear which drives the bevel reduction gears in the gear train assembly.

### Governor

The governor is sensitive to both road speed and throttle position, and controls the upward and downward gear-changes while 'D' is selected.

### HYDRAULIC SYSTEM

- refer to diagrams on pages 44 - 5 and 44 - 6

The automatic gearbox is controlled hydraulically by the valve block assembly under the combined influence of the driver, using the selector lever and throttle pedal, together with a governor, sensitive to throttle pedal operation and road speed.

#### Oil Pump

The engine oil pump has a high potential output and serves both the engine lubrication and automatic gearbox from a common oil supply.

#### Valve block

The valve block consists of three basic units, i.e. the lid, valve chest, and pipe chest. The valve chest incorporates the various valves, details of which are given below.

The selector valve directs oil from the main supply to either the governor valve for automatic gear-shifting, or to the appropriate clutch or servo for manual selection.

The regulator valve controls the main line pressure, a secondary piston on the valve boosts this pressure when reverse is selected.

The governor valve movement is controlled by the mechanical governor and it directs the oil flow to the appropriate clutch or servo for automatic gear-shifts.

The relay valves are used for shifts from second to third and third to top. They enable the clutch or servo required to be supplied either from the selector valve in 'manual' control or the governor valve in 'automatic'. In addition, pistons are fitted in front of the second and third relay valves to ensure that on up-shifts the engagement of the new ratio and release of the old occur simultaneously to prevent engine over-speeding between shifts. A relay valve is not required for the first gear as the torque reaction is controlled mechanically by a one-way clutch.

The engagement control valve has a primary function of eliminating harsh engagement when selecting 'D' or a forward gear from the rest position.

#### Operation of engagement control valve.

When a forward gear is selected, the selector valve in the valve block directs oil to shuttle valves located in the back of the valve block. The oil passes through the shuttle valves and pressurizes the third and reverse gear servos, thus applying the brake bands and bringing the rotating components of the gear train gently to rest. The oil flows simultaneously to the engagement control valve which, at a predetermined pressure, directs oil to the forward clutch; and as there is relatively little movement between the driving and driven members the gear engagement is smooth.

To complete the operating sequence, oil is also fed behind the shuttle valves which move and allow the oil pressure in the third and reverse servos to exhaust, thus releasing the third and reverse gear bands.

### Converter

The three-element type converter is bolted to the tapered end of the crankshaft. Oil under pressure is directed into the converter; surplus oil from the converter passes through a low pressure valve, eventually into the gear train for lubrication and return to sump.

Torque multiplication is at maximum at turbine stall and slightly above 2:1 varying infinitely as turbine speed increases to a 1:1 ratio when the stator rotates at the same speed as the impeller and turbine.

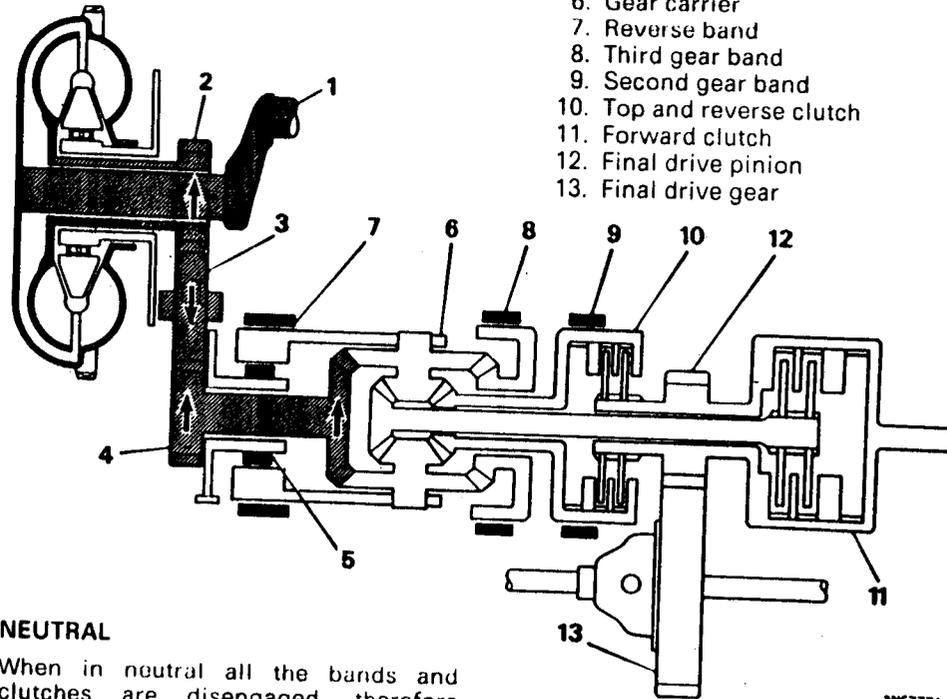
### Low pressure valve

This valve controls the pressure in the converter to 30 lbf/in<sup>2</sup> (2.1 kgf/cm<sup>2</sup>). When the engine is stopped the valve is seated, preventing the converter draining. This ensures that the oil level is stable when checking the combined engine/gearbox oil level and also provides an efficient converter when starting the engine.

## MECHANICAL POWER FLOW DIAGRAMS

The power flow diagrams indicate how the various ratios are obtained. Four speeds and reverse are provided and these are brought into operation by engaging the appropriate friction members.

### NEUTRAL



### KEY TO COMPONENTS

1. Crankshaft
2. Converter output gear
3. Idler gear
4. Input gear
5. One-way clutch
6. Gear carrier
7. Reverse band
8. Third gear band
9. Second gear band
10. Top and reverse clutch
11. Forward clutch
12. Final drive pinion
13. Final drive gear

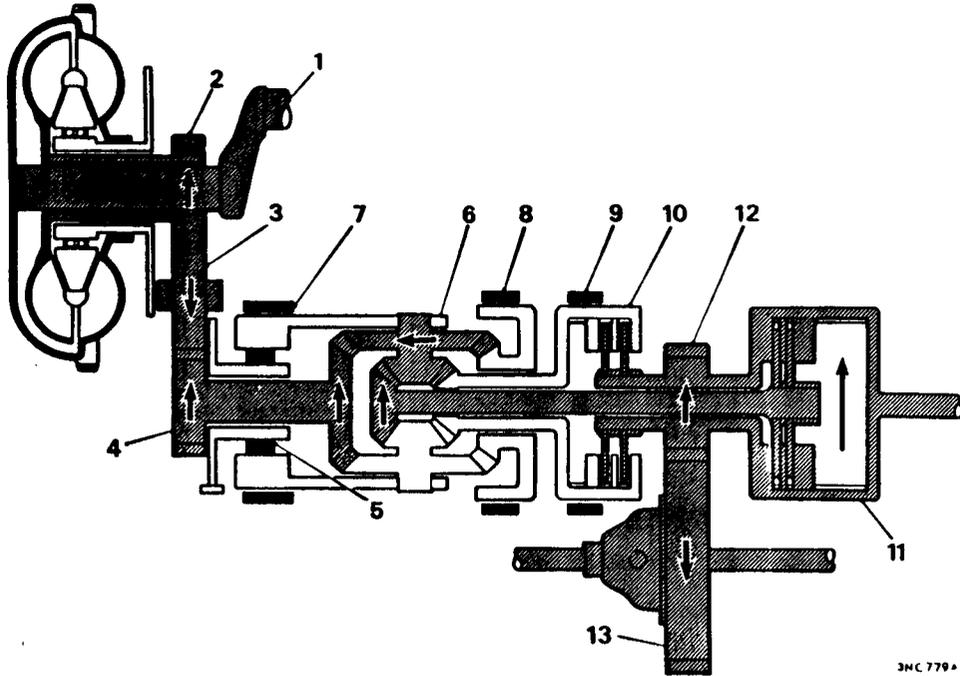
### NEUTRAL

When in neutral all the bands and clutches are disengaged, therefore there is no drive to the final drive pinion.

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## MECHANICAL POWER FLOW DIAGRAMS

### FIRST GEAR



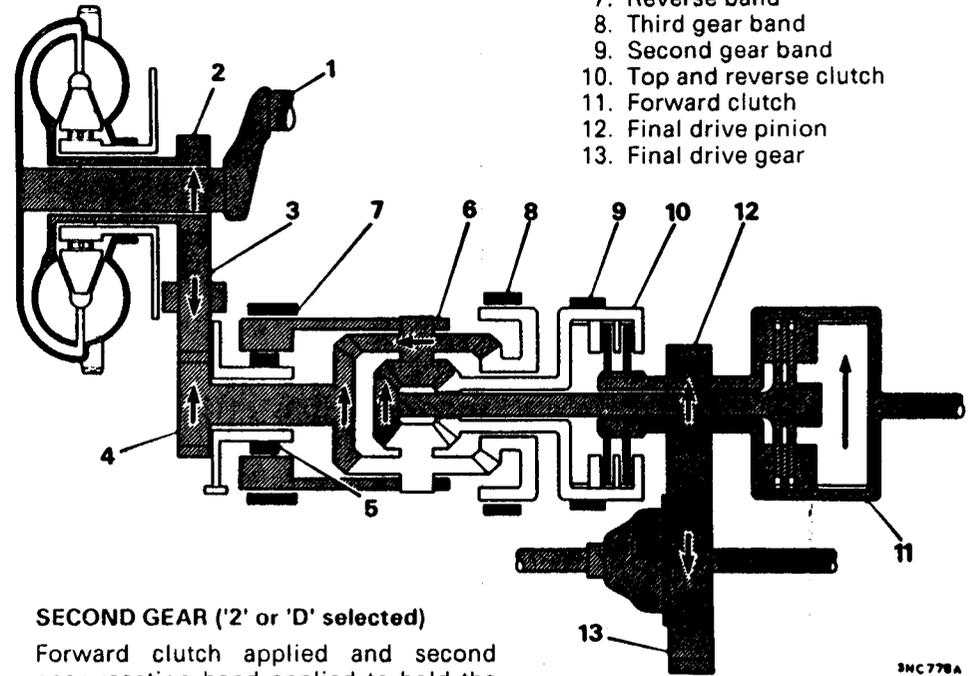
#### FIRST GEAR ('1' or 'D' selected)

Forward clutch applied and the one-way clutch operative. The carrier is stationary, its reaction being controlled by the one-way clutch.

The input bevel gear drives the planet wheels and the planet pinions drive the forward output pinion and shaft. Power is thus transferred through the planet assemblies to the mainshaft, forward clutch and the forward output gear.

Gear ratio 2.69:1.

### SECOND GEAR



#### SECOND GEAR ('2' or 'D' selected)

Forward clutch applied and second gear reaction band applied to hold the top and reverse clutch drum stationary. With the planet gear cluster orbiting around the reverse output bevel gear, power is transmitted from the input bevel gear through the planets to the mainshaft.

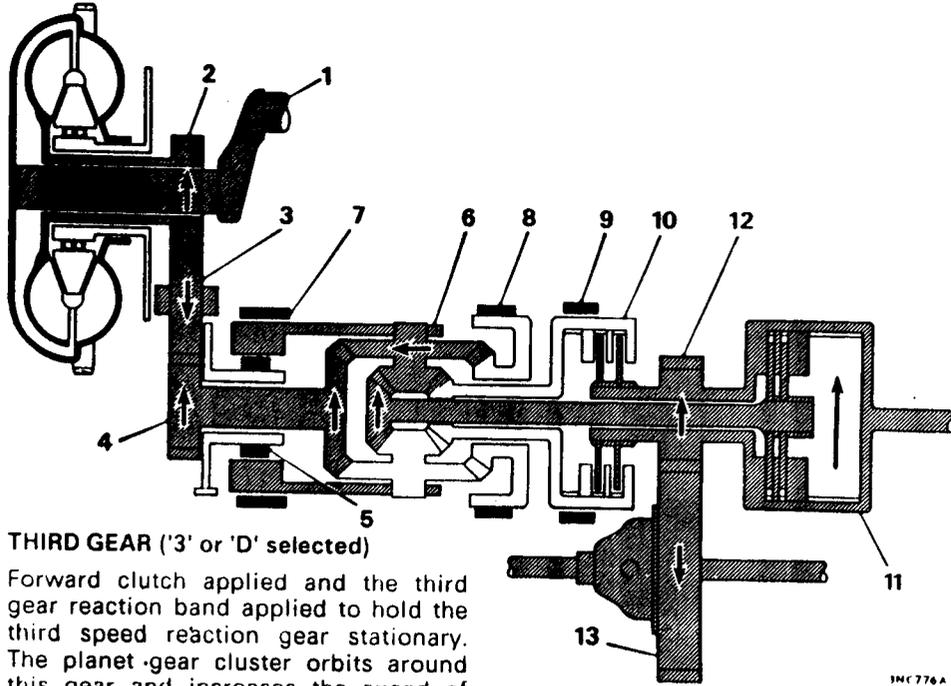
Gear ratio 1.845:1.

### KEY TO COMPONENTS

1. Crankshaft
2. Converter output gear
3. Idler gear
4. Input gear
5. One-way clutch
6. Gear carrier
7. Reverse band
8. Third gear band
9. Second gear band
10. Top and reverse clutch
11. Forward clutch
12. Final drive pinion
13. Final drive gear

# MECHANICAL POWER FLOW DIAGRAMS

## THIRD GEAR

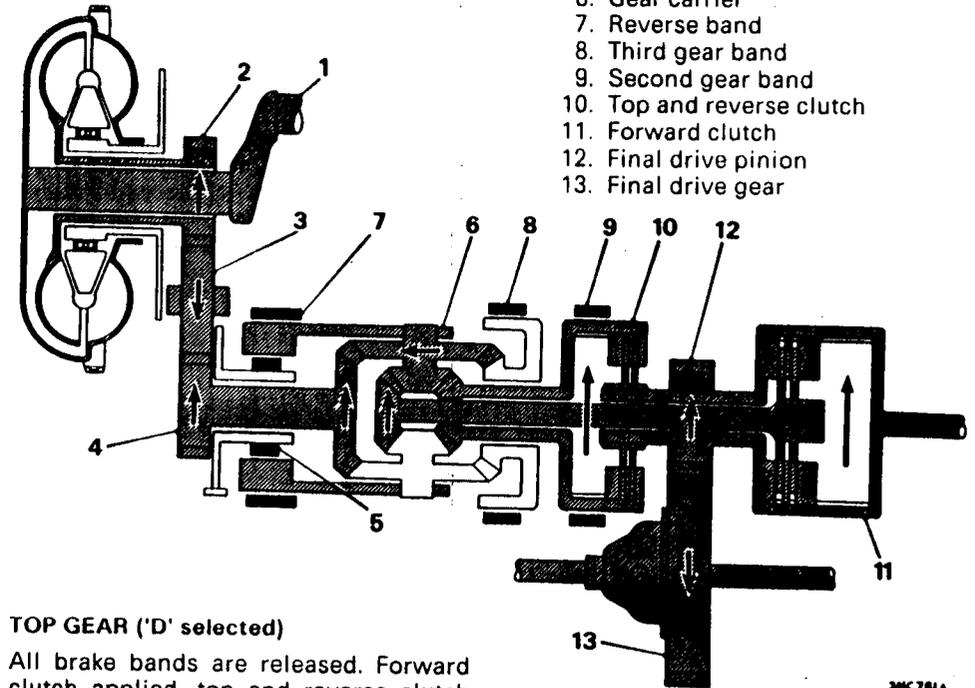


### THIRD GEAR ('3' or 'D' selected)

Forward clutch applied and the third gear reaction band applied to hold the third speed reaction gear stationary. The planet gear cluster orbits around this gear and increases the speed of the carrier. Power is transmitted from the input bevel gear through the planets to the mainshaft.  
Gear ratio 1.46:1.

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## TOP GEAR



### TOP GEAR ('D' selected)

All brake bands are released. Forward clutch applied, top and reverse clutch applied. This in effect holds the bevel and reduction gears stationary within the gear carrier. The complete assembly then rotates as one unit to provide direct drive.  
Gear ratio 1.0:1.

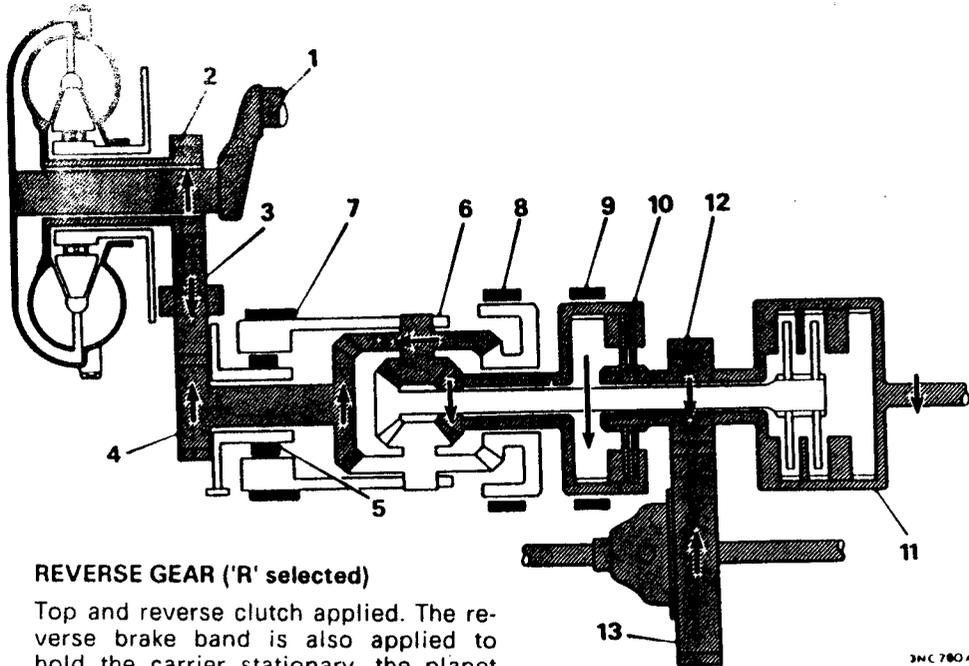
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## KEY TO COMPONENTS

1. Crankshaft
2. Converter output gear
3. Idler gear
4. Input gear
5. One-way clutch
6. Gear carrier
7. Reverse band
8. Third gear band
9. Second gear band
10. Top and reverse clutch
11. Forward clutch
12. Final drive pinion
13. Final drive gear

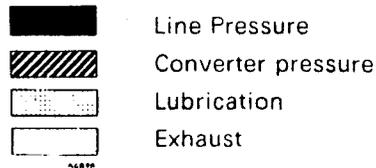
## Mechanical Power Flow Diagrams

### Reverse Gear



### REVERSE GEAR ('R' selected)

Top and reverse clutch applied. The reverse brake band is also applied to hold the carrier stationary, the planet gears rotate the third speed reaction gear in the opposite direction to the input gear. Power is transmitting reverse drive through top and reverse clutch to the final drive.  
Gear ratio 2.69:1.

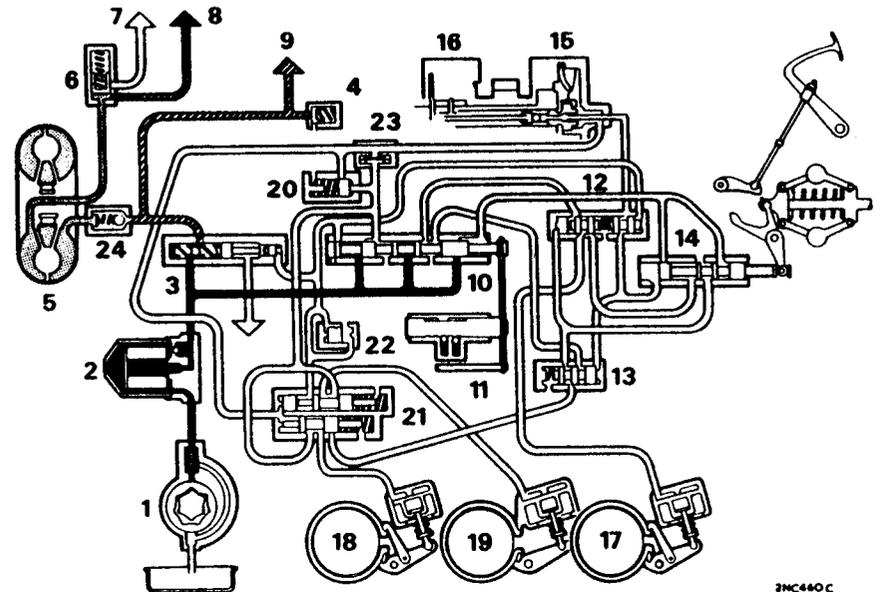


## LINE PRESSURE AND LUBRICATION DIAGRAMS

### KEYS TO DIAGRAMS

- |                                    |  |
|------------------------------------|--|
| 1. Main oil pump                   | 17. Second gear brake band               |
| 2. Oil filter                      | 18. Third gear brake band                |
| 3. Regulator valve                 | 19. Reverse gear brake band              |
| 4. Engine lubricating relief valve | 20. Engagement control pressure valve    |
| 5. Converter                       | 21. Engagement control shuttle valves    |
| 6. Low pressure valve              | 22. One-way dump valve                   |
| 7. To sump                         | 23. One-way flap valve                   |
| 8. Gear train lubrication          | 24. Restrictor valve (in converter pipe) |
| 9. Engine lubrication              |  |
| 10. Selector valve                 |  |
| 11. Selector valve detent          |  |
| 12. Second and top gear valves     |  |
| 13. Third gear valve               |  |
| 14. Governor valve                 |  |
| 15. Forward clutch                 |  |
| 16. Top and reverse clutch         |  |

### NEUTRAL



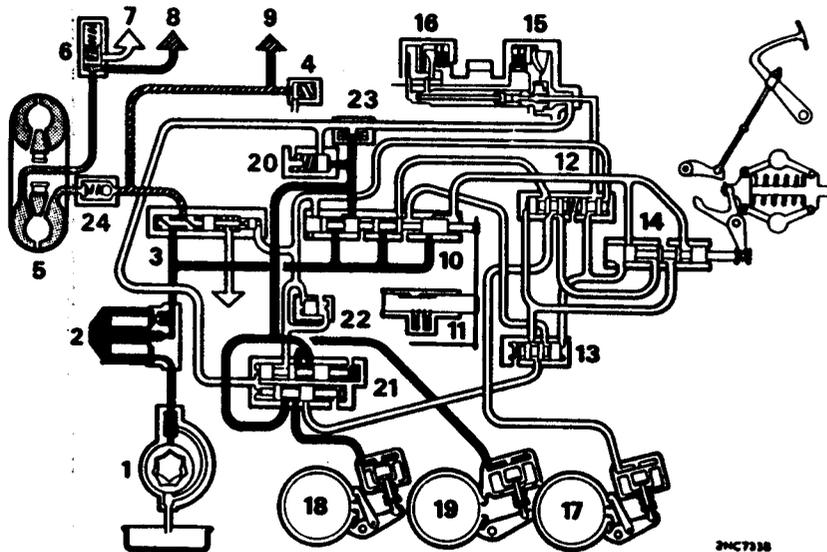
3NC460C

# LINE PRESSURE AND LUBRICATION DIAGRAMS

## FORWARD CLUTCH ENGAGEMENT STAGE 1:

The selector valve directs oil through the shuttle valves to pressurize the third and reverse gear servos, and simultaneously to the engagement control valve, which, at a predetermined pressure, directs oil to apply the forward clutch.

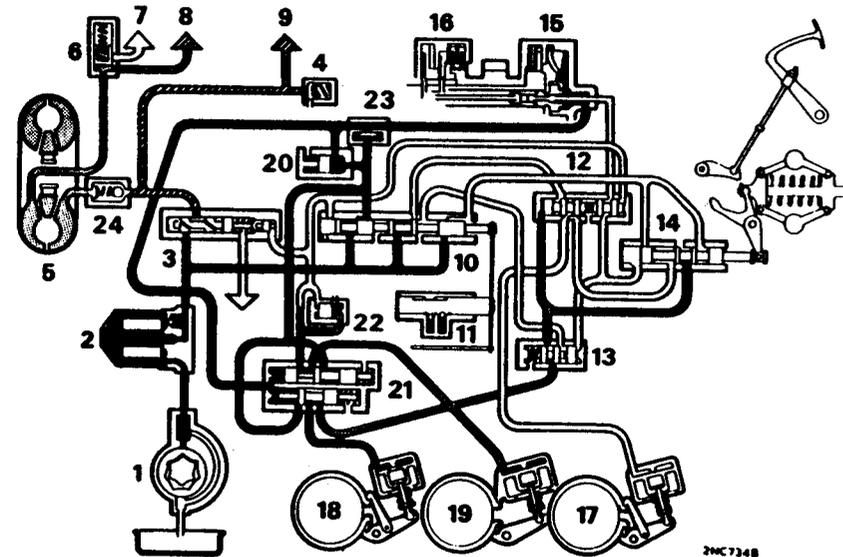
2NC734B



2NC734B

## FORWARD CLUTCH ENGAGEMENT STAGE II:

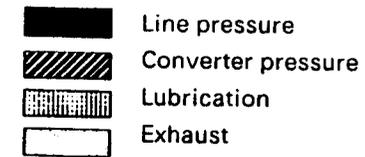
With the forward clutch applied, the shuttle valves move and allow the oil pressure in the third and reverse servos to exhaust and thus release the third and reverse gear bands.



2NC734B

### KEY TO DIAGRAMS

- |                                    |  |
|------------------------------------|--|
| 1. Main oil pump                   | 12. Second and top gear valves           |
| 2. Oil filter                      | 13. Third gear valve                     |
| 3. Regulator valve                 | 14. Governor valve                       |
| 4. Engine lubrication relief valve | 15. Forward clutch                       |
| 5. Converter                       | 16. Top and reverse clutch               |
| 6. Low pressure valve              | 17. Second gear brake band               |
| 7. To sump                         | 18. Third gear brake band                |
| 8. Gear train lubrication          | 19. Reverse gear brake band              |
| 9. Engine lubrication              | 20. Engagement control pressure valve    |
| 10. Selector valve                 | 21. Engagement control shuttle valves    |
| 11. Selector valve detent          | 22. One-way dump valve                   |
|                                    | 23. One-way flap valve                   |
|                                    | 24. Restrictor valve (in converter pipe) |



## SERVICE REQUIREMENTS 44.01.01

1. Fully road test and diagnose faults before dismantling an automatic gearbox. Use the road test procedure and diagnosis chart in 44.01.04; make adjustments as necessary and re-test after rectification.
2. High standards of cleanliness are essential: Clean the outside of the casing with paraffin prior to the removal of any components. Rags and cloth must be clean and lint free, preferably nylon.
3. Prior to assembly, clean all parts in chlorinated industrial solvent only. Renew all defective components. Lubricate all components in engine oil. **DO NOT assemble dry.**
4. Use new joint washers. Where jointing compound is required use Hylomar SQ32M, Hermetite or Wel-seal, or an equivalent.
5. Retain thrust washers and bearings with petroleum jelly; do not use grease.
6. Tighten screws, bolts and nuts to the recommended torque figure.
7. For all operations where access is required beneath the vehicle, it should be on a lift, over a pit or the front raised on stands.
8. **Service parts are available only from LEYLAND CARS Service and Parts, through authorised Distributors and Dealers.**

## EXAMINATION OF COMPONENTS

44.01.02

Transmission case and servo castings .....	Check for cracks and obstruction in passages
Front and rear pump .....	Check for scoring and excessive wear
Shaft .....	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
Sealing rings .....	Check fit in groove and wear (evident by lip overhanging the groove)

## TEST EQUIPMENT

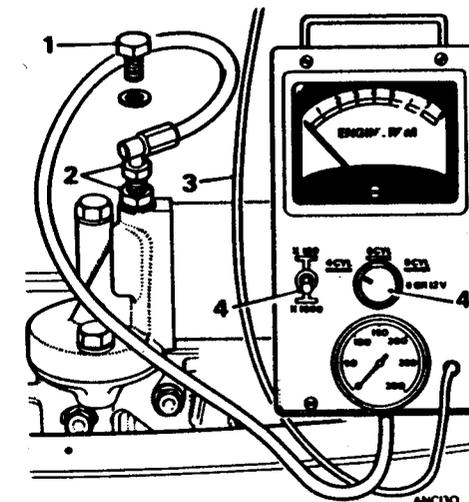
Connecting

44.01.03

*Service tool: 18G 677 C, 18G 677 Z*

Connecting

1. Remove the screwed plug from the oil filter head
2. Fit tool adaptor 18G 677 C into the filter head and connect the pressure pipe union of tool 18G 677 Z onto the adaptor.
3. Connect the tachometer connections of tool 18G 677 Z as follows:
  - a Red connection to ignition coil (+)
  - b Black connection to battery earth (-).
4. Set tool 18G 677 Z to '4' CYL and 'X1000'.



## TEST PROCEDURE

44.01.04

**Service tool:** 18G 677C, 18G 677Z

Connect test equipment 18G 677Z to the engine transmission as described in 44.01.03 and position the equipment inside the car where it can be read from the driver's seat. Carry out this test procedure completely, in order given noting: Tests 1 to 4 Rectify any fault as it is found before proceeding to the next test. Tests 5 to 11. It may be possible to complete these tests, noting any faults in order to rectify them after the tests. However, it must be noted that this could allow one fault to mask another.

Test	Fault	Rectification
1 Check the oil level	a Oil level incorrect	1a Correct the oil level ('MAINTENANCE')
2 Check the throttle with the pedal fully depressed	a Throttle not fully open	2a Adjust the throttle cable
3 Check that the starter will operate only when 'N' is selected	a Starter will not operate in 'N' b Starter operates in all positions	3a Adjust the inhibitor switch (44.15.18) 3b Check the inhibitor switch and its wiring for short-circuiting
4 Check the adjustment of the selector cable (44.30.04)	a The cable is out of adjustment	4a Adjust the cable (44.30.04)
5 If possible, run the engine until it reaches its normal operating temperature. Chock the wheels, apply the brakes and run the engine at 1,000 rev/min. Select each transmission position in turn and note the pressure registered.	a In position 'N', '1', '2', '3', 'D': Less than 75 lbf/in <sup>2</sup> (5.3 kgf/cm <sup>2</sup> ) b In position 'R': Less than 115 lbf/in <sup>2</sup> (8 kgf/cm <sup>2</sup> )	5a Refer to 'PRESSURE TEST DIAGNOSIS' (44.01.05) 5b Refer to 'PRESSURE TEST DIAGNOSIS' (44.01.05)
6 Apply the hand and foot brakes, and with the engine idling, select 'R' from 'N' and '1' from 'N'	a Excessive bump on engagement of 'R' or '1' b Engine stalls on engagement of 'R' or '1'	6a Reduce engine idle speed 6b Increase engine idle speed

Test	Fault	Rectification
7 Select '1', release the brakes and check that the car drives forward but that there is no engine braking when the throttle is released	a Car does not drive forward b Engine braking can be felt	7a Remove and check the forward clutch; if satisfactory renew the free wheel 7b Renew the free wheel
8 Select '1' and drive away, using the manual gear-change to select '2' and '3' progressively as the road speed increases. When the road speed is above 25 m.p.h. (40 km.h) select 'D' and release the throttle pedal	a Drive in '1' but not in '2' b Drive in '1' and '2', but not in '3'. c Drive in '1', '2', and '3', but no upward gear-change (to fourth gear) on selecting 'D'	8a Check the second gear brake band adjustment. If satisfactory, check the second gear servo. 8b Check the third gear brake band adjustment. If satisfactory, check the third gear servo. 8c Check the kick-down linkage adjustment. If correct, check the governor for freedom of operation. If the governor is satisfactory, remove and check the top reverse clutch
9 Stop the car, select 'D' and accelerate up through the gears using 'kick-down'. Check that the gear-changes occur within the speed range, see 'SHIFT SPEEDS' (44.01.07)	a Gear-changes occur at low speeds b Gear-changes occur at high speed	9a Check the kick-down linkage adjustment 9b Check the kick-down linkage adjustment. If correct, check the governor for freedom of operation

Test	Fault	Rectification
10 Stop the car, select 'R' and drive the car backwards	a Car will not drive backwards	b Check reverse gear brake band adjustment. If satisfactory, check the reverse servo.
11 Chock the wheels and apply the hand and foot brakes. Select 'R' and depress the throttle pedal fully for <b>not more than 10 seconds</b> . Note the highest rev/min obtained. Select 'D' and hold full throttle for <b>not more than 10 seconds</b> . Note the highest rev/min obtained.	a A reading outside the range 1,400 to 1,500 rev/min	11a Refer to ' <b>STALL TEST DIAGNOSIS</b> ' (44.01.06)

## PRESSURE TEST DIAGNOSIS

44.01.05

The figures given in test 5 of the 'TEST PROCEDURE' (44.01.04) are the minimum acceptable figures for a satisfactory transmission line pressure. Pressure variations due to temperature changes may be ignored as long as the pressure does not drop below the figure given.

Check the figures obtained in the pressure test (test 5) against the following table:

*Note: When repairs are being carried out to rectify a low pressure fault, take the opportunity to examine other components which are accessible and which may have been affected by the low pressure.*

## STALL TEST DIAGNOSIS 44.01.06

The maximum engine speed obtained in the stall test (test 11 in 44.01.04) is an indication of the condition of the engine, converter, and transmission. Check the engine speed obtained in the stall test against the following table:

Rev/min	Indication
Below 1,000	Stator slip (defective converter)
Below 1,300	Engine power down
1,400 to 1,500	Satisfactory
Over 1,500	Transmission slip

Fault	Possible cause
1 Low pressure in all selector positions	a Blocked oil strainer b Damaged valve block c Worn or leaking pump d Wrongly positioned filter gasket
2 Low pressure in positions '1', '2', '3', and 'D'	a Leakage from forward clutch or forward clutch supply line
Low pressure in position '2'	a Leakage from second gear servo or second gear servo supply line
Low pressure in position '3'	a Leakage from third gear servo or third gear servo supply line
Low pressure in position 'R'	a Leakage from reverse servo to reverse servo supply line b Leakage from top/reverse clutch or top/reverse clutch supply line

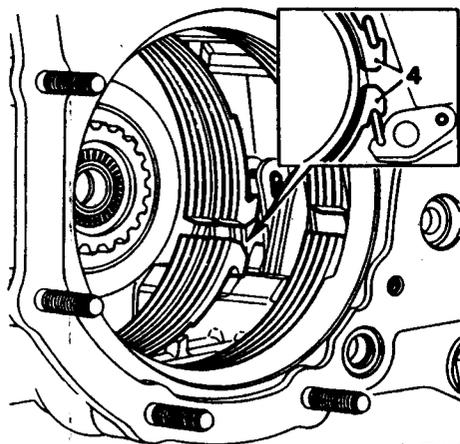
## SHIFT SPEEDS

44.01.07

The following chart indicates the speed ranges at which the automatic gear changes should take place when driving with the throttle in the kick-down position.

### Shift speed chart

Selector	M.P.H.						KM/H					
	Up-shifts			Down-shifts			Up-shifts			Down-shifts		
'D' Forced throttle (kick-down)	1-2	2-3	3-4	4-3	3-2	2-1	1-2	2-3	3-4	4-3	3-2	2-1
	25-33	37-45	49-57	47-39	39-31	26-18	40-53	60-72	78-91	76-64	62-50	41-29



3NC708

## BRAKE BANDS

Remove and refit

44.10.18

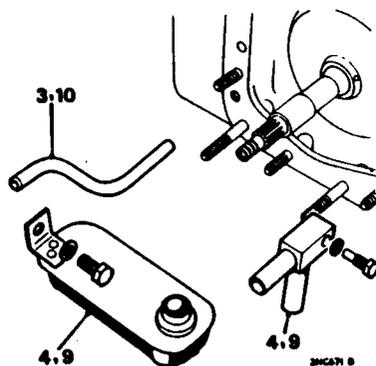
### Removing

1. Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Remove the gearbox from the engine, see 44.20.01.
3. Remove the gear train assembly, see 44.36.01.
4. Unhook the three brake bands from the servo reaction levers and struts.
5. Manoeuvre each band out through the top of the gearbox.

**WARNING: Do not use an airline to blow lining dust, asbestos dust can be a serious health hazard if inhaled. Use methylated spirit or denatured alcohol to wash dust from components. Do not use any petroleum-based fluids.**

### Refitting

6. Refit the three bands into the gearbox and engage them onto the servo reaction levers and struts, commencing with the second gear band, third gear band and finally the 'wider' reverse gear band.



7. Refit the gear train assembly, see 44.36.01.
8. Remove the front cover and check the brake band adjustment, see 44.30.06.
9. Refit the gearbox to the engine, see 44.20.01.
10. Refit the engine/automatic gearbox assembly, see 12.37.01.

## FORWARD CLUTCH

Remove and refit

44.12.04

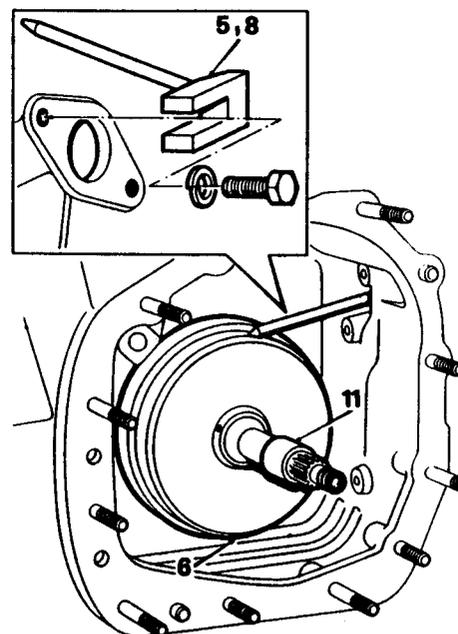
**Service tool:** 18G 1094, 18G 1097

### Removing

1. Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Remove the governor housing assembly, see 44.22.01.
3. Remove the forward clutch feed pipe.
4. Remove the oil strainer and pick-up pipe.
5. Remove the forward clutch retaining tool 18G 1097.
6. Withdraw the forward clutch from the gearbox casing.

### Refitting

7. Refit the forward clutch and ensure that the clutch plates engage the forward clutch hub splines. Rotate the clutch assembly back-

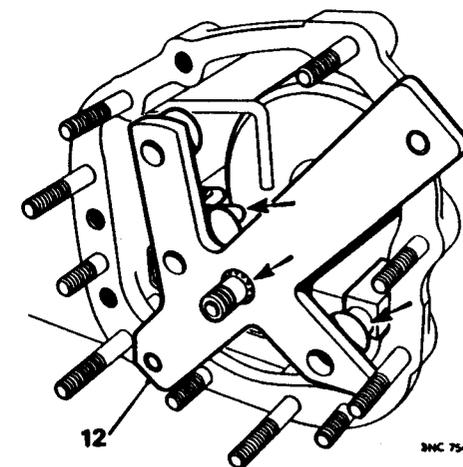


3NC748A

wards and forwards to assist engagement; when correctly fitted, there is only a small clearance between the forward clutch and the centre web of the gearbox casing.

**CAUTION: If the clutch is not fully engaged on the hub splines, the flange of the governor housing will not contact the gearbox casing; any excessive force used may damage the clutch plates.**

8. Refit tool 18G 1097 to retain the position of the forward clutch.
9. Refit and secure the oil strainer assembly.
10. Refit the forward clutch feed pipe (long end into the gearbox casing).
11. Pull the nylon assembly sleeve back over the rings on the forward clutch shaft; it will become safely displaced along the shaft when the governor housing is refitted.



3NC 754B

12. Fit tool 18G 1094 to align the forward clutch shaft and the oil pipes 'arrowed'; remove the tool.
13. Fit a new governor housing joint washer coated with Hylomar jointing compound (or similar equivalent) onto the casing.
14. Refit the governor housing assembly, see 44.22.01.
15. Refit the engine/automatic gearbox assembly, see 12.37.01.

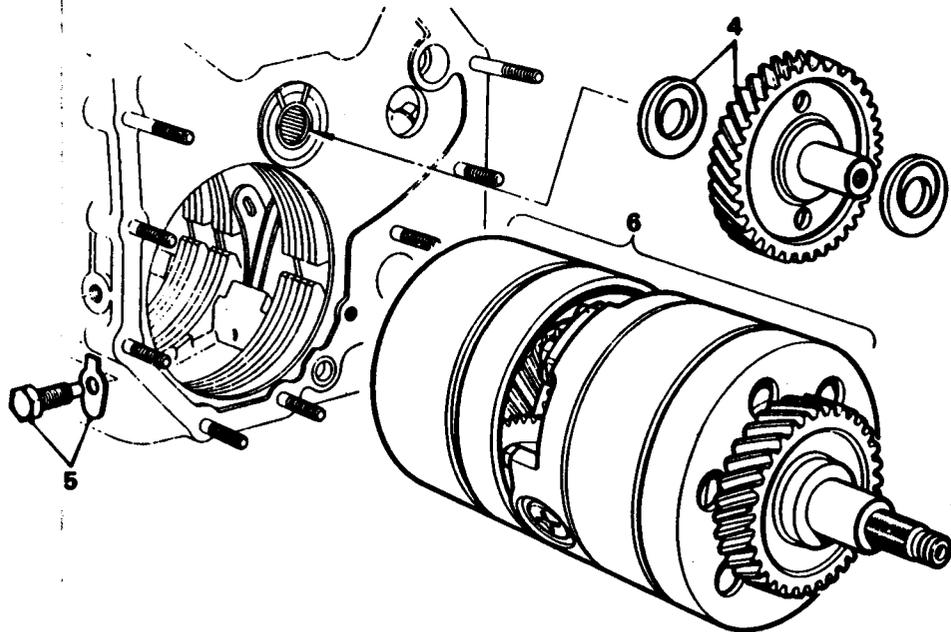
## TOP AND REVERSE CLUTCH

Remove and refit

44.12.07

### Removing

1. Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Remove the converter assembly, see 44.17.07.
3. Remove the converter housing, see 44.17.01.
4. Remove the idler gear.
5. Knock back the lock washer tab and remove the dowel bolt securing the gear train assembly into the gearbox casing.



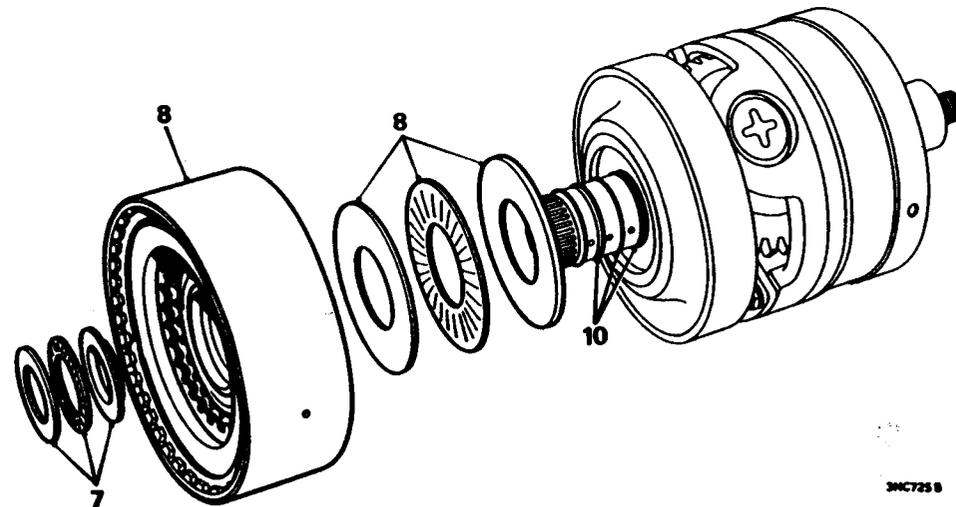
3NC74A

6. Pull out the gear train assembly complete with the free-wheel reaction member and the top and reverse clutch assembly.
7. Remove the thrust washer, needle thrust bearing and the stepped thrust washer from the end of the top and reverse clutch.
8. Pull the top and reverse clutch off the gear train, noting the thrust washer (thin), needle thrust bearing, and selective thrust washer (thick), which locate onto the reverse output gear shaft.

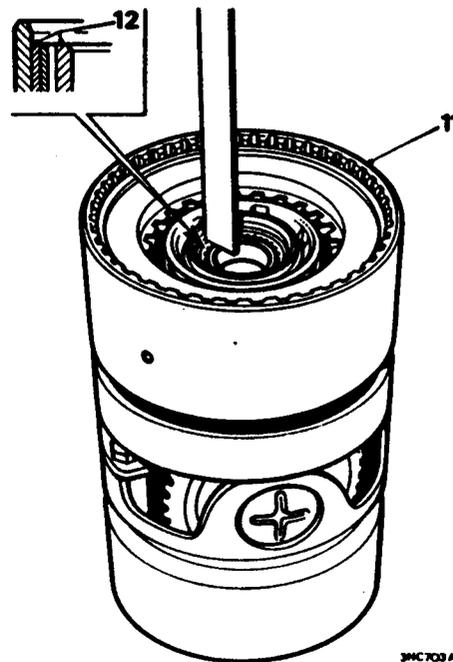
**Refitting**

9. Ensure that the thrust washers and needle thrust bearing referred to in 8 are correctly located.

10. Check that the 'O' ring seals located on the reverse output gear shaft are in good condition; renew as necessary.
11. Refit the top and reverse clutch to the gear train assembly.
12. Check across the splined end of the reverse output shaft and the adjacent face of the top and reverse clutch. Both faces must be exactly level with no gap. If both faces are not level with each other, measure the difference in height and follow the procedure in 13 to 17.
13. Lift off the top and reverse clutch.
14. Remove the thrust washers and needle thrust bearing.



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3NC703A

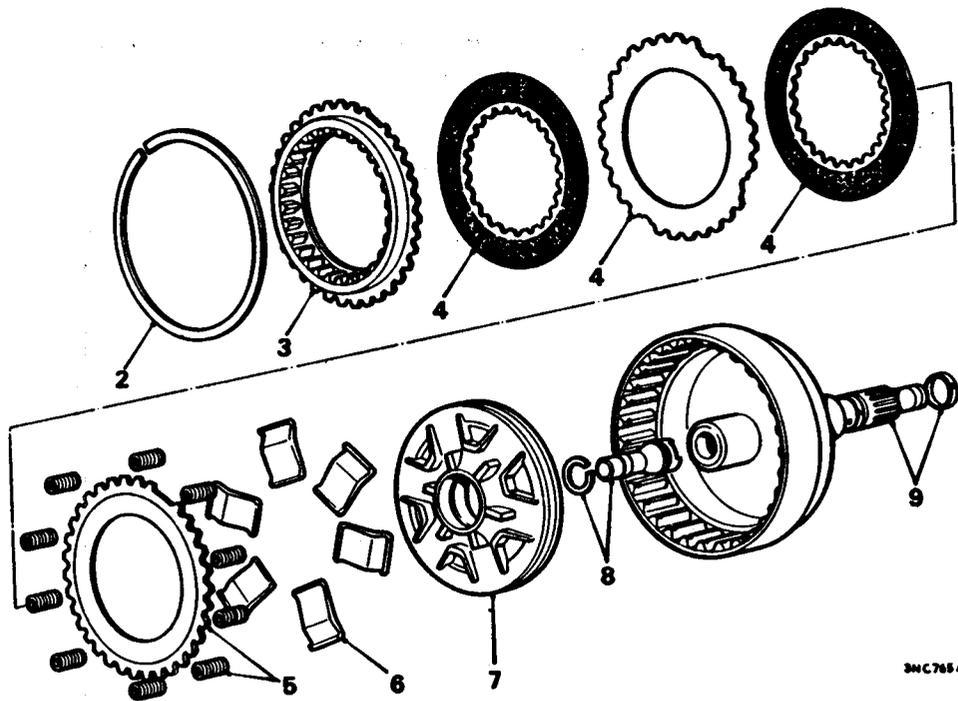
15. Measure the thickness of the selective (thick) thrust washer fitted; select the required thickness washer from the size chart given below.

*Note: This adjustment ensures that the third speed reaction gear has no end-float and the correct backlash is maintained.*

**Selective washer size chart**

inches	mm	Part Nos
0.076 to 0.078	1.93 to 1.98	22G 748
0.072 to 0.074	1.83 to 1.88	22G 749
0.068 to 0.070	1.73 to 1.78	22G 750
0.064 to 0.066	1.63 to 1.68	22G 751

16. Fit the selected thrust washer, needle thrust bearing and the thin thrust washer.
17. Refit the top and reverse clutch and re-check that the two faces are now exactly level.

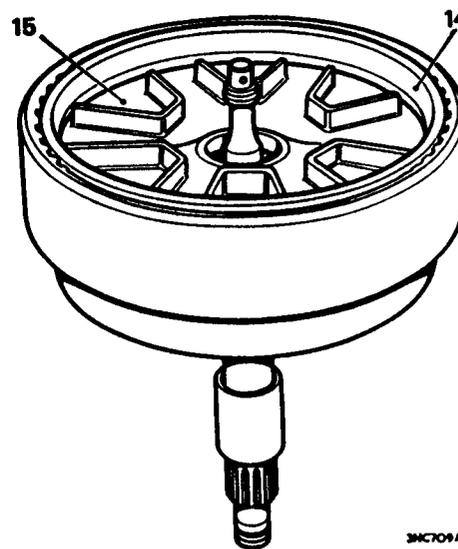


3NC785A

18. Smear petroleum jelly onto the stepped thrust washer and locate it on the end of the top and reverse clutch.
19. Smear petroleum jelly onto the thrust washer and needle roller bearing and fit them into their location on the top and reverse clutch hub (inside gearbox).
20. Refit the gear train complete with the free-wheel support and the top and reverse clutch into the gearbox. Use hand pressure only to push it into position; quick rotation of the input gear backwards and forwards will assist in engagement of the top and reverse friction plates with the top and reverse clutch hub splines.

**Note:** When correctly assembled the dowel bolt will engage easily in the free-wheel support.

21. Fit a new lock washer, refit and tighten the dowel bolt securing the gear train. Tap over the lock washer tab.
22. Refit the idler gear.
23. Refit the converter housing, see 44.17.01.
24. Refit the converter assembly, see 44.17.07.
25. Refit the engine/automatic gearbox assembly, see 12.37.01.



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## FORWARD CLUTCH

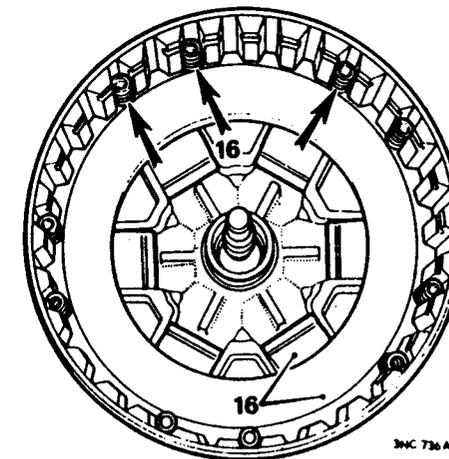
Overhaul

44.12.10

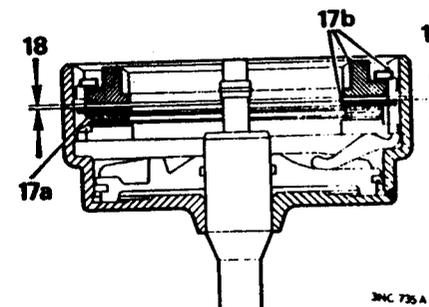
Service tool: 18G 1102

### Dismantling

1. Remove the forward clutch, see 44.12.04.
  2. Remove the end-plate retaining circlip.
  3. Remove the end-plate.
  4. Remove the clutch plates (two paper-faced interposed with one steel intermediate plate).
- WARNING:** Do not use an airline to blow lining dust, asbestos dust can be a serious health hazard if inhaled. Use methylated spirit or denatured alcohol to wash dust from components. Do not use any petroleum-based fluids.
5. Lift out the piston return springs and the pressure plate.
  6. Remove the six toggles.



3NC 736 A



3NC 735 A

7. Use an air pressure line and blow out the piston.
8. Extract the circlip retaining the reverse shut-off valve and withdraw the valve.
9. Remove the cast-iron sealing rings if replacements are to be fitted.

### Inspecting

10. Check all parts for wear, and renew as required. Fit new 'O' rings and seals to the piston and the reverse shut-off valve piston.

11. Check the cast-iron sealing rings for wear; the rings should not have any sideways movement in their locating grooves; renew as required.
12. Examine all clutch plates and renew those showing signs of wear or damage.

#### Reassembling

13. Refit the reverse shut-off valve piston and secure with a new retaining circlip.
14. Fit tool 18G 1102 into the forward clutch drum.
15. Lubricate the piston seal with oil, insert the piston into the tool (lips of the seal facing outwards), press the piston fully into its bore and remove the tool.
16. Refit the toggles, pressure plate and the piston return springs. Locate the spring in the order illustrated.

#### Adjusting

17. End-float adjustment. Assemble the remaining components in the following order for the purpose of checking the adjustment.
  - a Refit the two paper-faced plates together.
  - b Refit the intermediate plate, end plate and the retaining circlip.
18. Check with feeler gauges the clearance between the intermediate plate and the end plate. The end-float required is given in DATA.

#### DATA

Clearance between intermediate plate and end plate ..... 0.010 to 0.035 in (0.25 to 0.9 mm)

19. Remove and measure the thickness of the intermediate and end plates, and from this measurement select from the chart given below the correct thickness plate(s) to rectify the end-float to within the tolerance given in DATA.

#### Intermediate and end plate chart

PLATE	THICKNESS	PART No.
Intermediate	0.064 in (1.70 mm)	27H 7722
Intermediate	0.074 in (1.88 mm)	37H 7033
End	0.342 in (8.22 mm)	27H 7724
End	0.362 in (9.21 mm)	37H 7032

#### Reassembling

20. Reassemble the clutch plates in the correct order (exploded view illustration) and refit the retaining circlip.
21. Check that the paper-faced plates will move freely, align the plates with each other to assist when refitting the unit.
22. Refit the forward clutch, see 44.14.02.

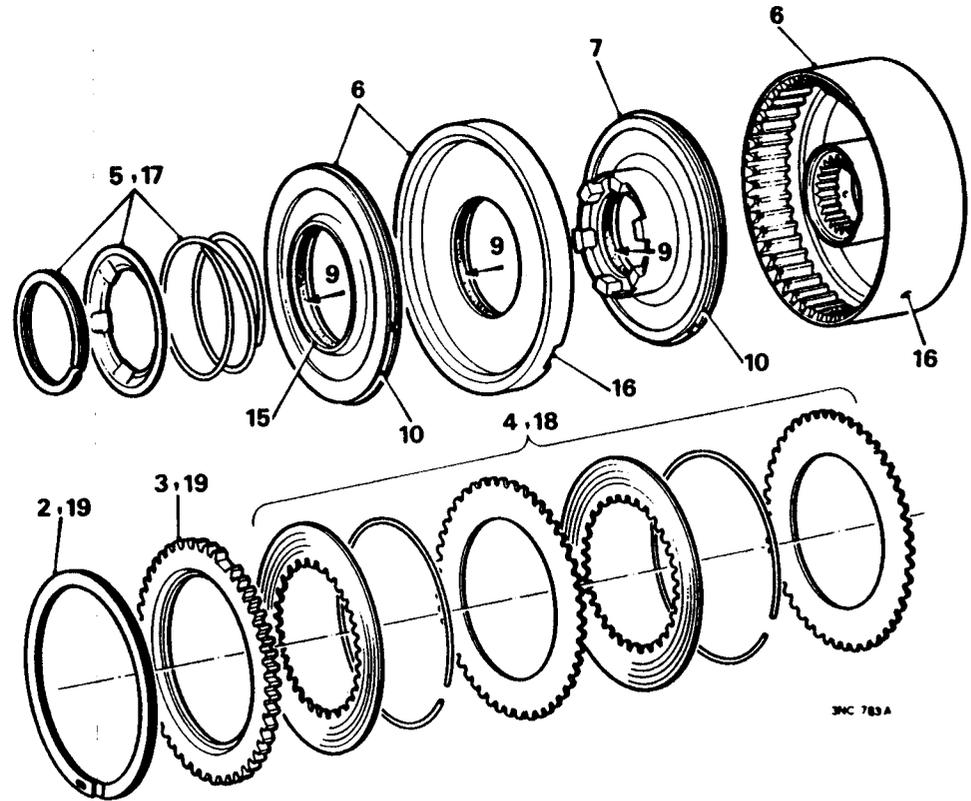
### TOP AND REVERSE CLUTCH

**Overhaul** 44.12.13

**Service tool:** 18G 1103

#### Dismantling

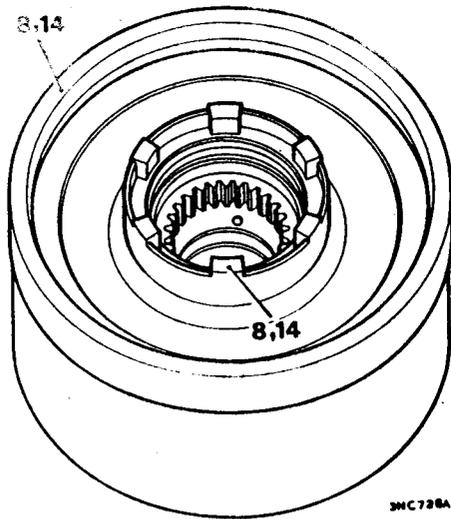
1. Remove the top and reverse clutch, see 44.12.07.
2. Remove the Spirolox retaining circlip.



3. Remove the retainer plate.
  4. Lift out the clutch plates and separation spring rings.
- WARNING:** Do not use an airline to blow lining dust, asbestos dust can be a serious health hazard if inhaled. Use methylated spirit or denatured alcohol to wash dust from components. Do not use any petroleum-based fluids.
5. Remove the Spirolox retaining circlip, spring retainer and the piston return coil spring.

6. Lightly shock the clutch drum against a flat surface to remove the top gear piston and cylinder as one unit.
7. If the reverse booster piston has also been shocked out of its bore in the clutch drum, refit it, easing the piston ring in with a screwdriver.
8. Fit tool 18G 1103 into the clutch unit, hold both together upside-down and shock the assembly against a flat surface to remove

37C 783A

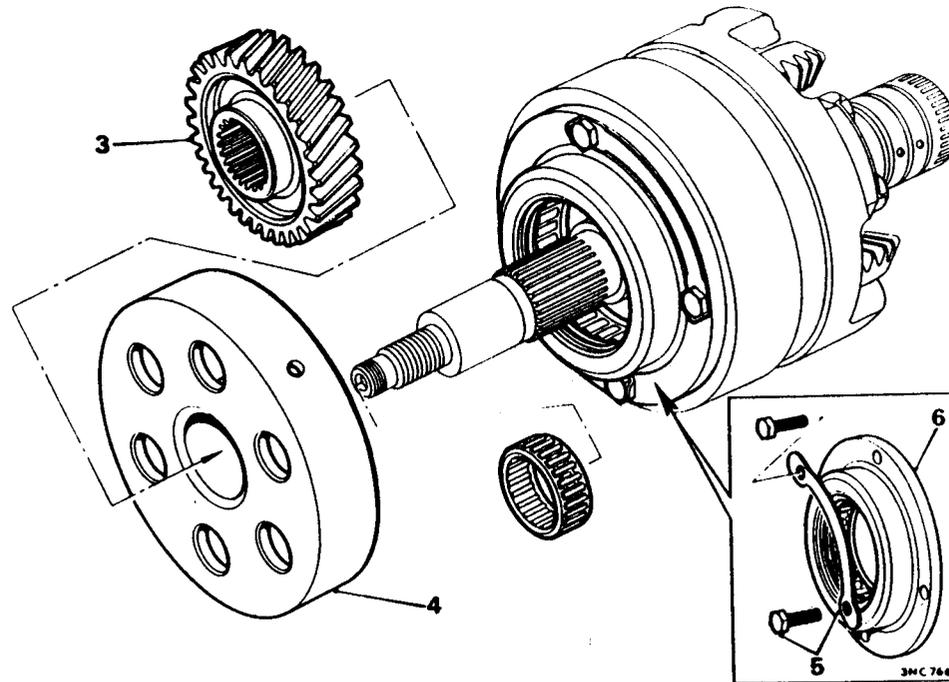


the reverse booster piston from the clutch drum into the tool. Lift out tool 18G 1103 complete with the piston and remove the piston from the tool.

9. Remove the seals 'arrowed' from the top gear piston, cylinder, and reverse gear booster piston.
10. Remove, if necessary, the piston rings from the top gear piston and the reverse gear booster piston.

#### Inspecting

11. Examine all parts for wear and renew those showing signs of wear or damage. Renew all oil seals in the piston and cylinder.
12. Check the piston rings, and replace if necessary. The piston ring gap for both rings when fitted in their respective bores is 0.016 to 0.020 in (0.4 to 0.5 mm).



#### Reassembling

13. Lubricate the new seals with oil and fit them to their respective components.
14. Insert tool 18G 1103 into the clutch unit, refit the reverse gear booster piston (boss facing outwards) into the tool, push it squarely downwards into its bore and remove the tool.
15. Refit the top gear piston into its cylinder, with the boss facing outwards.
16. Refit the top gear piston and cylinder assembly into the clutch, with the cut-aways on the rear outer edge of the cylinder opposite the holes in the clutch drum.

17. Refit the top gear piston return spring, spring retainer and the Spirolox retaining circlip.
18. Refit the clutch plates and separator spring rings in the order illustrated, with the cut-away portion of the steel plates in alignment.
19. Refit the retainer plate and the Spirolox retaining circlip.

**Note:** Before refitting the clutch unit ensure that the bronze plates can be moved freely into alignment with each other.

20. Refit the top and reverse clutch, see 44.12.07.

## FIRST GEAR FREE-WHEEL ASSEMBLY

Remove and refit

44.12.16

#### Removing

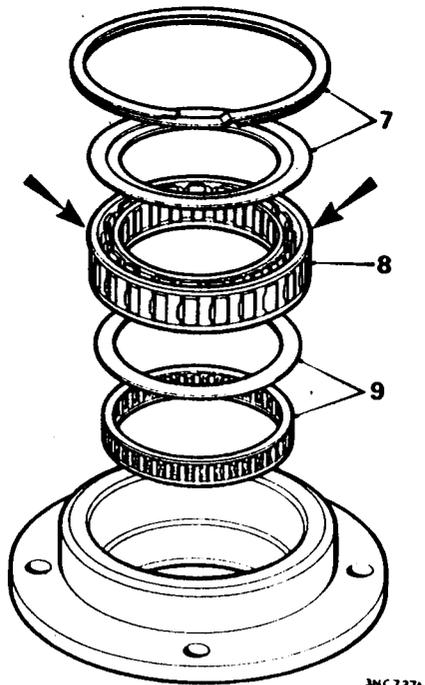
1. Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Remove the gear train, see 44.36.01.
3. Pull off the input gear.
4. Remove the first gear free-wheel reaction member.
5. Knock back the locking plate tabs and remove the bolts retaining the first gear free-wheel assembly to the gear train.
6. Lift off the first gear free-wheel housing assembly.
7. Remove the Spirolox retaining circlip and end plate spacer.
8. Lift out the first gear free-wheel.
9. Remove the intermediate spacer plate and needle thrust bearing.

#### Inspecting

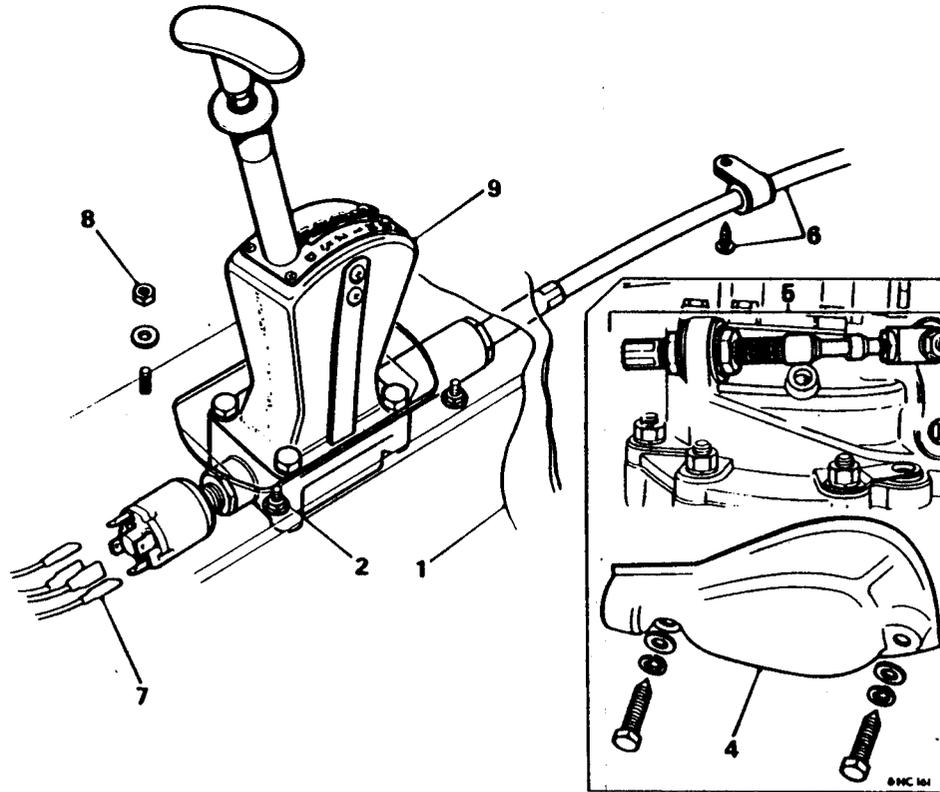
10. Examine the free-wheel unit and needle thrust bearing for excessive wear or damage, and renew if necessary.

#### Refitting

11. Reverse the removing procedure in 7 to 9 to refit the components into the free-wheel housing. Ensure that the lip of the free wheel 'arrowed' is positioned uppermost otherwise the unit will be inoperative in use.
12. Refit the first gear free-wheel housing assembly to the gear train; use new locking plates, tighten the retaining bolts and lock up the locking plate tabs.
13. Re-fit the free-wheel reaction member and input gear.
14. Refit the gear train, see 44.36.01.
15. Refit the engine/automatic gearbox assembly, see 12.37.01.



3NC727A



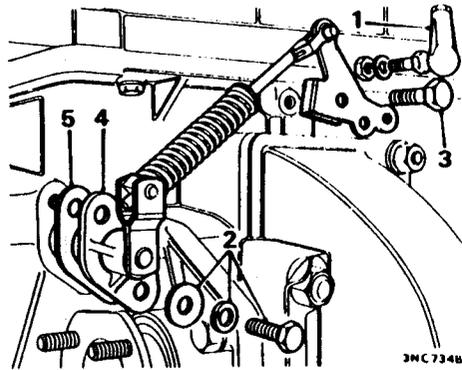
## SELECTOR MECHANISM ASSEMBLY

Remove and refit 44.15.04

Overhaul 44.15.05

### Removing

1. Pull back the front floor covering
2. Slacken the four nuts retaining the selector mechanism mounting plate to the floor panel.
3. Raise the car on a hoist.
4. Remove the bellcrank cover plate.
5. Disconnect the selector cable from the gearbox, see 44.15.08.
6. Remove the screw retaining the cable clip to the floor panel and pull the cable clear of the gearbox.
7. Note the inhibitor switch wiring connections and disconnect the wires.
8. Remove the nuts retaining the selector mechanism mounting plate to the floor panel.
9. Remove the selector mechanism with cable attached from the car; note that a joint washer is fitted between the mounting plate and floor panel.
10. Remove the rubber grommet from the base of the selector mechanism housing and hold the assembly in a vice.



3NC734B

## KICK-DOWN CONTROL

Remove and refit 44.15.01

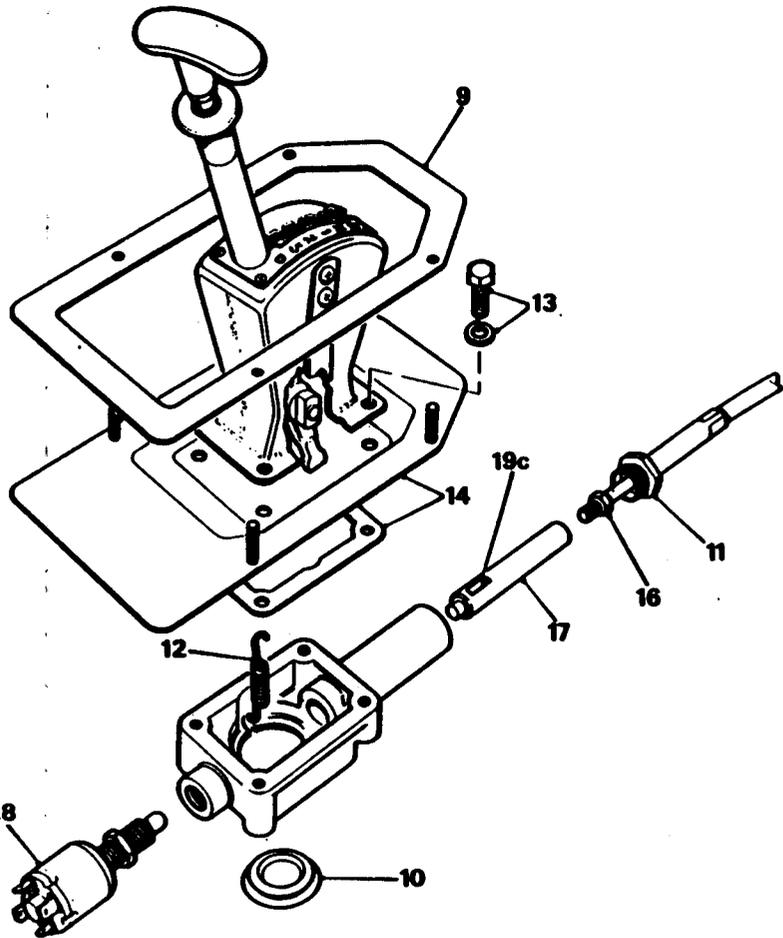
### Removing

1. Disconnect the governor kick-down control rod ball-end from the control.
2. Remove the two set screws and washers securing the control to the gearbox casing.
3. Remove the pivot bolt securing the control linkage to the gearbox casing.
4. Withdraw the governor control out of the gearbox.

### Refitting

5. Fit a new joint washer to the control assembly, insert the governor control lever into the gearbox and positioned as shown illustrated.
6. Refit the kick-down control securing screw and pivot bolt. Tighten the kick-down control to gearbox casing securing screws to 5 lbf ft (0.7 kgf m).
7. Re-connect the governor kick-down control rod ball-end to the control.

11. Slacken the nut retaining the outer cable to the housing.
12. Release the reverse return spring from the underside of the housing.
13. Unscrew the four screws retaining the selector mechanism quadrant to the housing.
14. Remove the selector mechanism quadrant; lift off the mounting plate and joint washer.
15. Unscrew the outer cable out of the housing with the operating plunger attached.

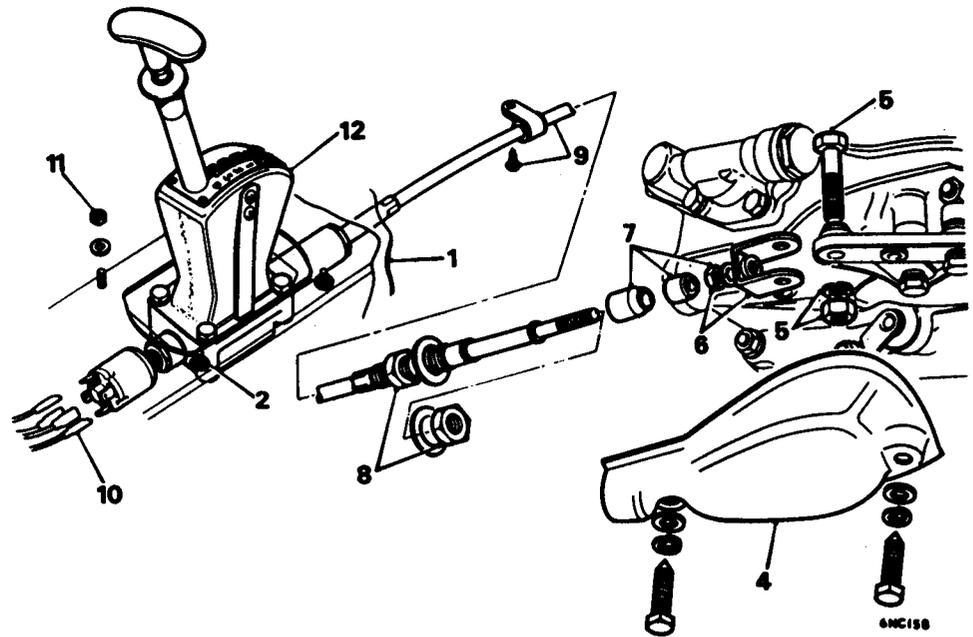


16. Hold the plunger with a screwdriver through the slot, and slacken the nut securing the inner cable to the plunger.
17. Unscrew the plunger from the selector cable.
18. Unscrew and remove the inhibitor switch.

#### Refitting

19. Reverse the procedure in 1 to 18 noting the following:
  - a Lubricate all moving parts with a graphite based grease.
  - b Screw the inner cable fully into the plunger and tighten the nut.

© MC 159



- c Fit the plunger into the housing with the relieved side of the slot uppermost to accept the selector lever.
20. Adjust the selector cable assembly, see 44.30.04.
21. Check that the engine can **ONLY** be started when 'N' is selected, see 44.15.18.

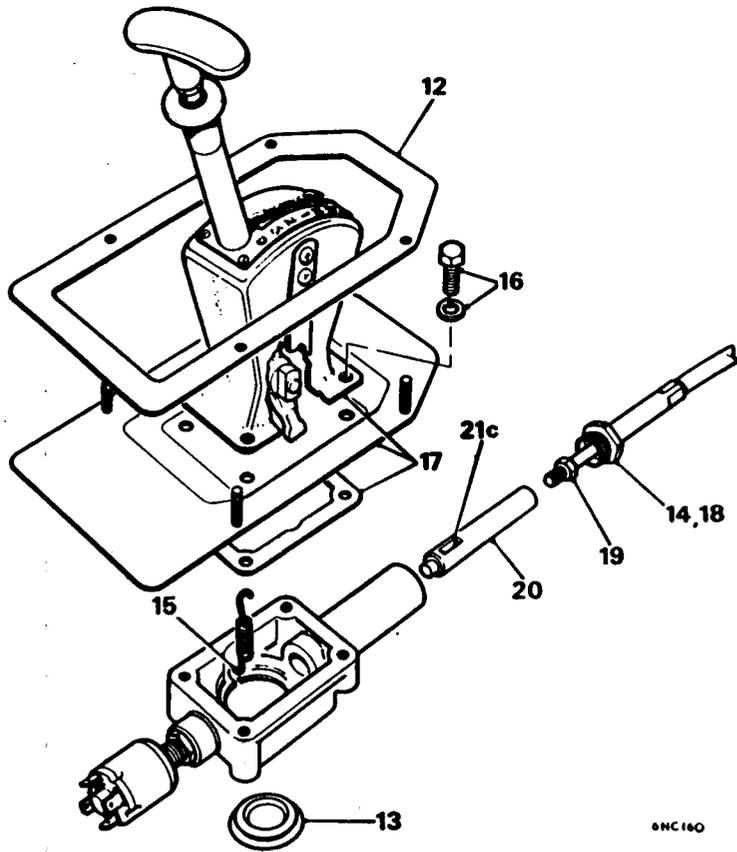
#### SELECTOR CABLE ASSEMBLY

Remove and refit 44.15.08

#### Removing

1. Pull back the front floor covering.
2. Slacken the four nuts retaining the selector mechanism mounting plate to the floor panel.

3. Raise the car on a hoist.
4. Remove the bellcrank cover plate.
5. Remove the bolt, nut and washers retaining the cable fork to the bellcrank lever.
6. Slacken the fork retaining nut and unscrew the fork from the cable.
7. Remove the fork retaining nut and the two rubber ferrules.
8. Unscrew and remove the outer cable locking nut, pull the cable clear of the gearbox and remove the other locking nut.
9. Remove the screw retaining the cable clip to the floor panel.
10. Note the inhibitor switch wiring connections and disconnect the wires.



6NC160

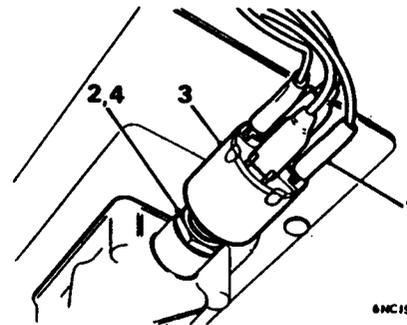
11. Remove the nuts retaining the selector mechanism mounting plate to the floor panel.
12. Remove the selector mechanism with cable attached from the car; note that a joint washer is fitted between the mounting plate and floor panel.
13. Remove the rubber grommet from the base of the selector mechanism housing and hold the assembly in a vice.

14. Slacken the nut retaining the outer cable to the housing.
15. Release the reverse return spring from the underside of the housing.
16. Unscrew the four screws retaining the selector mechanism quadrant to the housing.
17. Remove the selector mechanism quadrant; lift off the mounting plate and joint washer.
18. Unscrew the outer cable out of the housing with the operating plunger attached.

19. Hold the plunger with a screwdriver through the slot, slacken the nut securing the inner cable to the plunger.
20. Unscrew the plunger from the selector cable.

#### Refitting

21. Reverse the procedure in 1 to 20 noting the following:
  - a Lubricate all moving parts with a graphite based grease.
  - b Screw the inner cable fully into the plunger and tighten the nut.
  - c Fit the plunger into the housing with the relieved side of the slot uppermost to accept the selector lever.
22. Before connecting the cable fork to the bellcrank lever arm, check the position of the arm and adjust the cable, see 44.30.04.
23. Check that the engine can **ONLY** be started when 'N' is selected, see inhibitor switch adjustment 44.15.18.



6NC157

## STARTER INHIBITOR SWITCH

- Remove and refit **44.15.19**  
 Check and adjust, 4 to 10 **44.15.18**

#### Removing

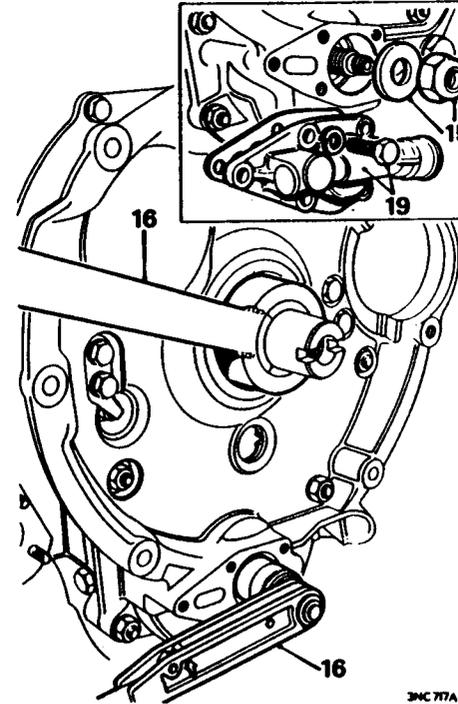
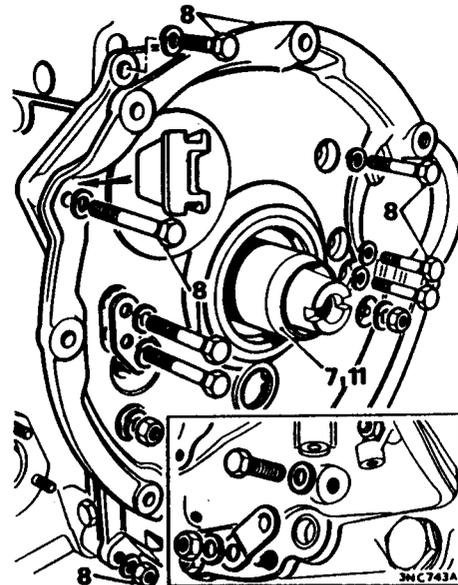
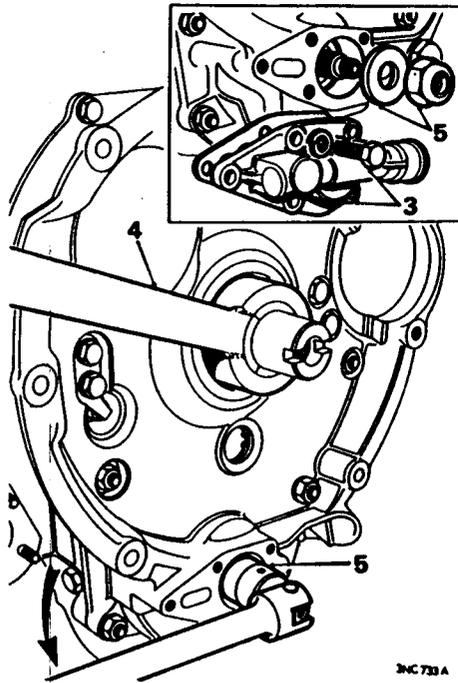
1. Disconnect the electrical connections at the switch.
2. Release the locking nut.
3. Unscrew and remove the switch from the selector mechanism housing.
4. Remove the locking nut.

#### Refitting

5. Position the selector lever at 'N'.
6. Screw the locking nut onto the switch.
7. Screw the switch into the selector mechanism housing.

#### Adjusting

8. Connect a test lamp and battery to the two (red/white) wiring connections. Unscrew the switch from the housing mechanism until the test lamp goes out.
9. Screw the switch into the housing mechanism until the lamp just lights, then screw the switch in a further one-half turn and tighten the locknut.
10. Check with the selector lever that the lamp only lights up when 'N' is selected.
11. Remove the test lamp and battery and connect up the wiring connections.
12. Check that the engine will only start when 'N' is selected.



## CONVERTER HOUSING

Remove and refit **44.17.01**

*Service tool: 18G 1088, 18G 1098*

### Removing

1. Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Remove the converter, see 44.17.07.
3. Remove the securing screws and detach the low pressure valve from the converter housing.
4. Fit tool 18G 1088 over the converter output gear to hold the crankshaft.
5. Remove the input gear self-locking nut.

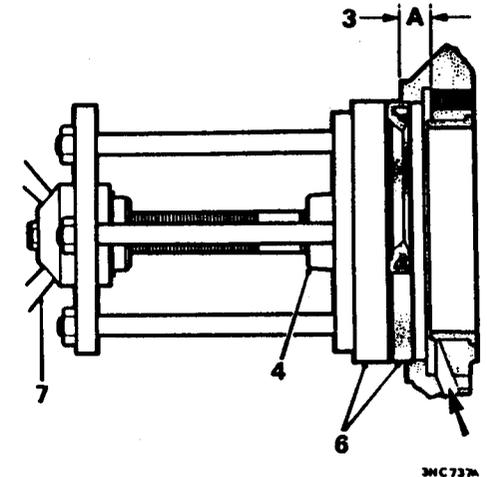
6. Remove the two set screws securing the bell-crank lever to the converter housing.
7. Fit tool 18G 1098 over the converter output gear.
8. Remove the nuts and the screws securing the converter housing to power unit; withdraw the housing partially and disconnect the feed pipe from the housing.
9. Remove the housing and its joint washer.

### Refitting

10. Check that the joint faces are clean and free from burrs; rectify as necessary and fit a new joint washer.
11. Ensure that tool 18G 1098 is still positioned on the converter output gear.

12. Refit the converter housing, connecting the feed pipe to the housing. Ensure that the feed pipe and the nylon pipe assembly at the valve block are aligned then push the housing fully home. Remove tool 18G 1098.
13. Refit the securing nuts and screws; note that the U.N.C. threaded screws secure the housing to the gearbox casing while those threaded U.N.F. screw into the cylinder block.
14. Tighten the screws and nuts to the torque figure given in 'TORQUE WRENCH SETTINGS'.
15. Refit the washer and self-locking nut to the input gear shaft.

16. Use tool 18G 1088 to hold the converter output gear, and tighten the input shaft nut to the torque figure given in 'TORQUE WRENCH SETTINGS'.
17. Refit the bell-crank lever.
18. Connect the gear selector cable and adjust, see 44.15.04.
19. Refit the low pressure valve with a new joint washer.
20. Refit the converter, see 44.17.07.
21. Refit the engine/automatic gearbox assembly, see 12.37.01.



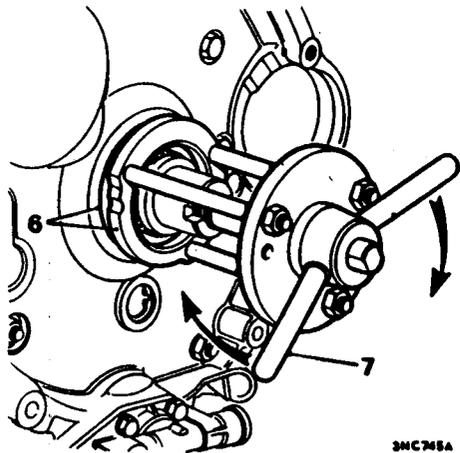
## CONVERTER HOUSING OIL SEAL

Remove and refit **44.17.04**

*Service tool: 18G 1068 A, 18G 1068 B, 18G 1087*

### Removing - engine in car

1. Remove the converter assembly, see 44.17.07.



- Remove the old seal, using tool 18G 1087; hook the tool into the oil seal groove and top outwards on the tool, working round the seal until removed.

#### Refitting

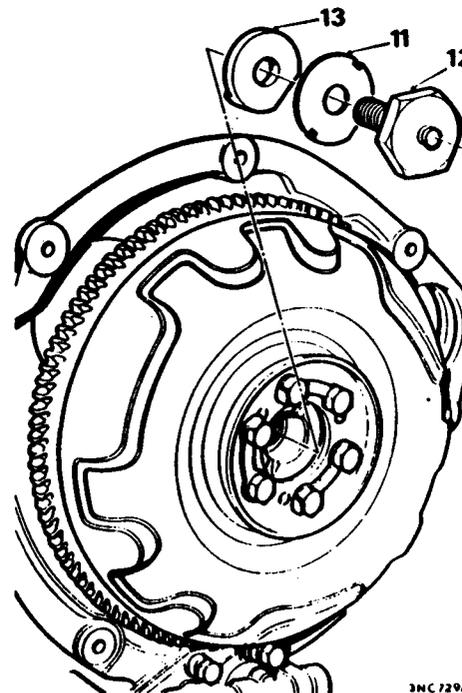
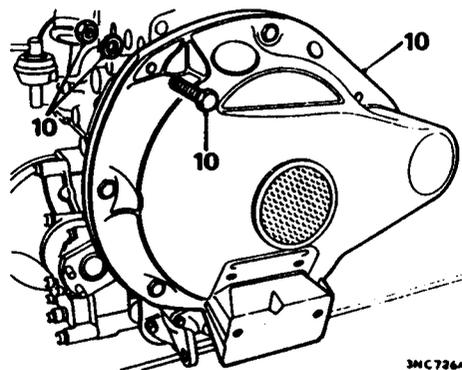
**IMPORTANT:** The new seal must be fitted to the correct depth in order that the drain hole 'arrowed' behind the seal remains open.

- Take a depth measurement from any convenient point on the periphery of the housing bore of the front face of the housing to the undercut face 'A' illustrated. This measurement will be approximately  $\frac{3}{8}$  in (9.5 mm), but should it be more or less than this measurement, this must be taken into account and either added to or subtracted from  $\frac{3}{8}$  in (9.5 mm).  
Example: If the measurement is  $\frac{3}{8}$  in (9.5 mm), fit the new seal to be flush with the front face of the converter housing. If the measurement is less than  $\frac{3}{8}$  in (9.5 mm), fit the seal proud of the housing

face by the difference of the measurement obtained.

**Note:** The converter housing face is not machined, therefore the initial measurement position and that used when fitting a new seal must always be taken from the same position on the housing.

- Screw the short threaded end of tool 18G 1068 A securely into the crankshaft.
- Liberally lubricate the new oil seal.
- Assemble the new seal together with tool 18G 1068 B into position on the housing as illustrated.
- Screw in the wing nut of the tool until the seal is pressed into the housing to the depth of the measurement taken in procedure 3.
- Remove tools 18G 1068 B and 18G 1068 A.
- Refit the converter assembly, see 44.17.07.



#### CONVERTER ASSEMBLY

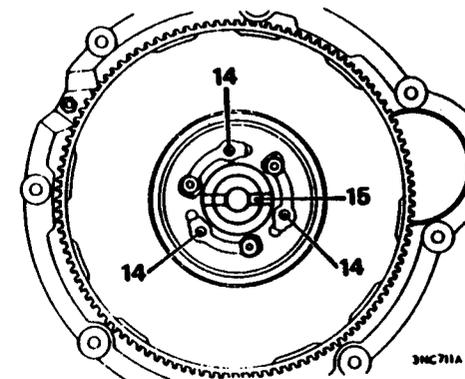
Remove and refit 44.17.07

Service tool: 18G 587, 18G 1086

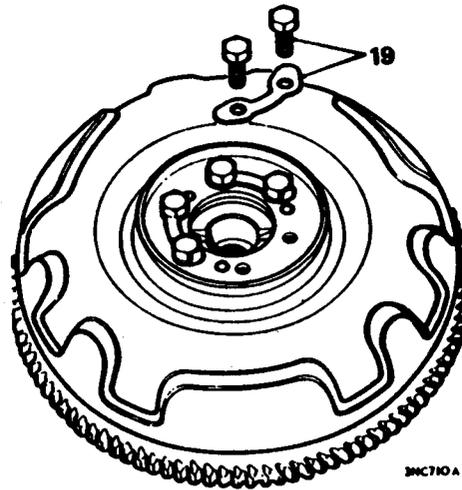
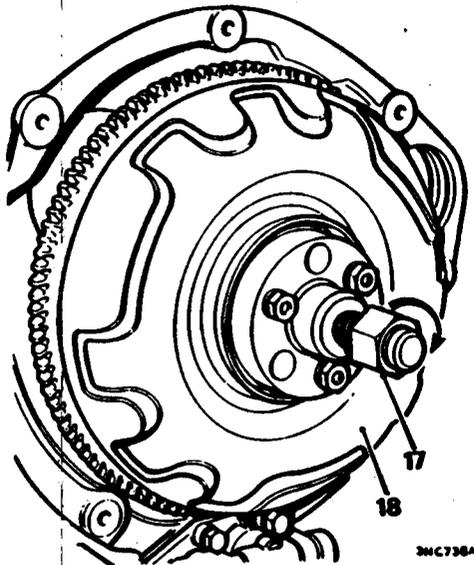
#### Removing

- Raise the car and support it under the suspension members.
- Fit engine lifting brackets to the rocker cover securing nuts and support the power unit.
- Disconnect the engine tie-rod from the rear of the cylinder block.
- Disconnect the exhaust pipe at the manifold flange.
- Remove the oil filter bowl and head assembly, see 44.24.07.
- Remove the nuts and bolts securing the right-hand engine mounting to the sub-frame.

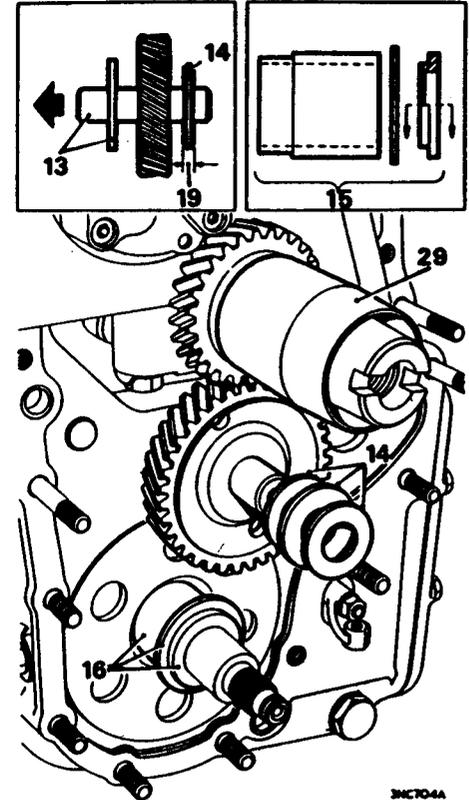
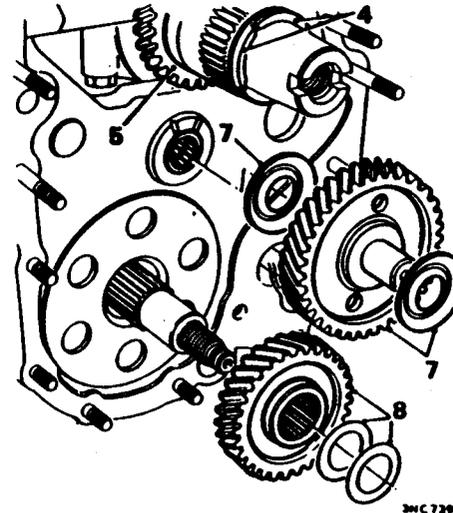
- Raise the rear of the engine sufficiently to remove the nuts and bolts securing the starter motor and the converter cover.
- Disconnect and remove the starter motor.
- Turn the converter cover slightly anti-clockwise and remove the cover complete with engine mounting attached.
- Remove the converter cover retaining bolts and nuts and lift off the cover.
- Knock back the lock washer tab from the converter retainer bolt.
- Hold the converter from turning and remove the converter retaining bolt, using tool 18G 587.
- Lever out the key plate locating the converter to the crankshaft.
- Knock back the locking tabs and remove three equally spaced set-screws from the converter centre.
- Rotate the converter until the crankshaft slot is horizontal.
- Insert the plug of tool 18G 1086 into the end of the crankshaft.



17. Fit tool 18G 1086 onto the converter and screw in the centre bolt until the converter is released from the crankshaft taper; remove the tool.
18. Lift off the converter; note that it will still retain a quantity of oil.



23. Hold the converter from turning and tighten the retaining bolt to the torque figure given in 'TORQUE WRENCH SETTINGS', tap over the lock washer tab.
24. Refit the converter cover.
25. Refit the starter motor.
26. Refit the oil filter assembly with a new joint washer, see 44.24.07
27. Reverse the procedure in 1 to 4.



#### Refitting

19. Remove each pair of bolts in turn from the converter centre and fit new locking plates. Tighten the bolts to the torque figure given in **TORQUE WRENCH SETTINGS**, and lock up the locking tabs.  
**IMPORTANT:** Do not remove all six screws from the converter at one time.
20. Refit the converter onto the converter output gear and align the offset slot of the converter with that in the end of the crankshaft.
21. Refit the key plate into the slot.
22. Fit the converter retaining bolt with a new lock washer.

#### PRIMARY DRIVE GEARS

Remove and refit 44.17.10

*Service tool:* 18G 191, 18G 191 A, 18G 1089 A, 18G 1089/1, 18G 1098

#### Removing

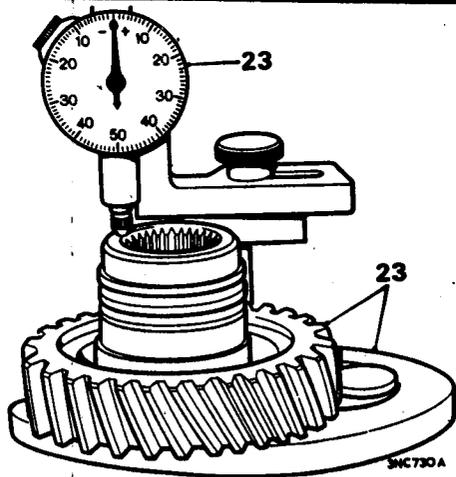
1. Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Remove the converter assembly, see 44.17.07.
3. Remove the converter housing, see 44.17.01.
4. Remove the converter output gear rear thrust washer and backing ring.

5. Pull off the converter output gear.
6. Remove the output gear front thrust washer.
7. Remove the idler gear and thrust washers.
8. Remove the input gear and adjustment shims.

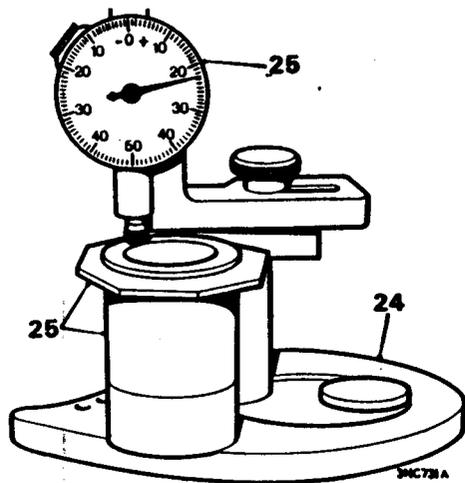
**Note:** The procedure for checking the end-float adjustment of the idler and converter output gears and the pre-load adjustment of the input gear is detailed below:

#### Adjusting

9. Converter output gear: Refit the output gear front thrust washer, with the chamfered side of the washer (arrowed) towards the crankshaft.



10. Refit the converter output gear with its rear backing ring and rear thrust washer.
11. Check the converter output gear end-float with feeler gauges; the clearance should be from 0.0035 to 0.0065 in (0.099 to 0.16 mm). Adjust if necessary by selecting and fitting correct thickness thrust washer from the range given below.



### Converter output gear thrust washer chart

0.112 to 0.114 in	(2.85 to 2.90 mm)
0.114 to 0.116 in	(2.90 to 2.95 mm)
0.116 to 0.118 in	(2.95 to 3.0 mm)
0.118 to 0.120 in	(3.0 to 3.05 mm)

12. Remove the converter output gear after adjustment.
13. Idler and input gears: Assemble the idler gear to the gearbox with a thrust washer on the gearbox side of the gear.
14. Use the larger washers of tool 18G 1089 with a dental wax washer interposed between the two onto the converter housing side of the idler gear.
15. Cut a dental wax washer and interpose it between tool 18G 1089 A and 18G 1089/1; this assembly replaces the input gear for checking the pre-load adjustment.
16. Fit tool 18G 1089 A and 18G 1089/1 with the wax washer onto the input gear shaft.
17. Fit a new converter housing joint washer; refit the housing and tighten the retaining bolts and nuts to the torque figure given in 'TORQUE WRENCH SETTINGS'. Do not fit the output shaft nut.
18. Remove the converter housing.
19. Remove the idler gear and washers. Measure the total thickness of the thrust washer and tool 18G 1089 with its wax washer.

### DATA

Converter output gear end-float	0.0035 to 0.0065 in (0.09 to 0.16 mm)
Idler gear end-float	0.004 to 0.007 in (0.10 to 0.18 mm)
Input gear pre-load	0.001 to 0.003 in (0.02 to 0.07 mm)

Subtract 0.004 to 0.007 in (0.10 to 0.18 mm) from the total thickness of the measurement taken to obtain the correct idler gear end-float.

20. Select two washers of approximately equal thicknesses from the range given below.

### Idler gear thrust washer chart

0.130 to 0.131 in	(3.30 to 3.32 mm)
0.132 to 1.133 in	(3.35 to 3.37 mm)
0.134 to 0.135 in	(3.40 to 3.42 mm)
0.136 to 0.137 in	(3.45 to 3.47 mm)
0.138 to 0.139 in	(3.50 to 3.53 mm)

21. Fit the selected thrust washers onto and refit the idler gear.
22. Input gear pre-load: Remove dummy input gear (tools 18G 1089 A and 18G 1089/1 with wax washer) from the input gear shaft, keep the complete assembly together and place to one side.
23. Place the input gear onto a surface plate or onto tool 18G 191 A and use dial test indicator gauge, tool 18G 191, to take a mean reading. Set the dial test indicator gauge to zero as illustrated.
24. Remove the input gear, and substitute the complete assembly removed in procedure 22 onto tool 18G 191 A or a surface plate.
25. Check the additional thickness measurement of this assembly. The mean reading obtained on the dial test indicator gauge indicates the total thickness of adjustment shims required to eliminate end-float. to

this figure, also add a shim thickness of 0.001 to 0.003 in (0.025 to 0.07 mm) to give the required input bearing pre-load adjustment. Select the required thickness of shims from the chart below.

### Input gear shims

0.003 in	(0.07 mm)
0.012 in	(0.30 mm)

### Refitting

26. Refit the input gear and shims.
27. Remove the housing joint washer used for the 'adjusting' procedure and fit a new one.
28. Refit the converter output gear and thrust washers.
29. Fit tool 18G 1098 over the output gear.
30. Refit the converter housing, see 44.17.01.
31. Refit the converter assembly, see 44.17.07.
32. Refit the engine/automatic gearbox assembly, see 12.37.01.

## GEARBOX ASSEMBLY -Automatic

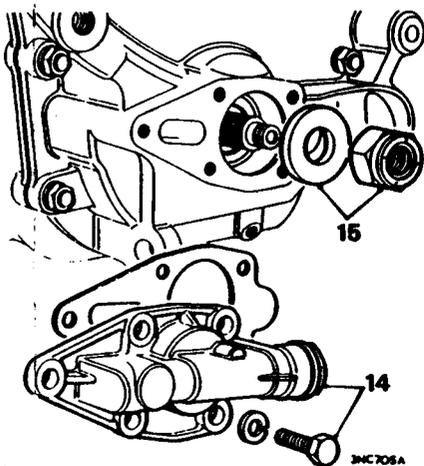
### Remove and refit 44.20.01

*Service tool: 18G 587, 18G 1088, 18G 1098*

### Removing

1. Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Drain the oil.
3. Remove the oil filter assembly.
4. Remove the starter motor.
5. Remove the securing nuts and bolts and detach the converter end-cover.
6. Knock back the lock washer on the converter retaining bolt.

7. Hold the converter from turning and use tool 18G 587 to remove the converter retaining bolt.
8. Remove the key plate locating the converter to the crankshaft.
9. Turn the converter until the end slot is horizontal.
10. Knock back the locking tabs and remove three equally spaced set screws from the converter centre.  
**CAUTION: Do not remove all six set screws at one time.**
11. Locate the plug adaptor of tool 18G 1086 into the end of the crankshaft.
12. Screw tool 18G 1086 onto the converter, hold the converter from turning and screw in the centre bolt of the tool to release the converter from the crankshaft taper.
13. Lift off the converter and remove the tool. Note that the converter will still retain a quantity of oil.



14. Remove the low pressure valve retaining screws and detach the valve.

15. Hold the converter output gear with toll 18G 1088 and remove the input gear self-locking nut and washer.
16. Remove the two set screws securing the bell-crank lever to the converter housing.
17. Remove the rubber block (grommet) from the converter housing.
18. Remove the set screws, nuts, and spring washers securing the converter housing to the power unit.
19. Locate tool 18G 1098 over the converter output gear.
20. Withdraw the converter housing.
21. Disconnect the external engine oil feed pipe from the adaptor on the gearbox casing.
22. Lever the main oil feed pipe from the oil pump and gearbox casing.
23. Remove the nuts and set screws securing the engine to the gearbox.
24. Fit suitable lifting equipment to the engine and lift the engine away from the gearbox.

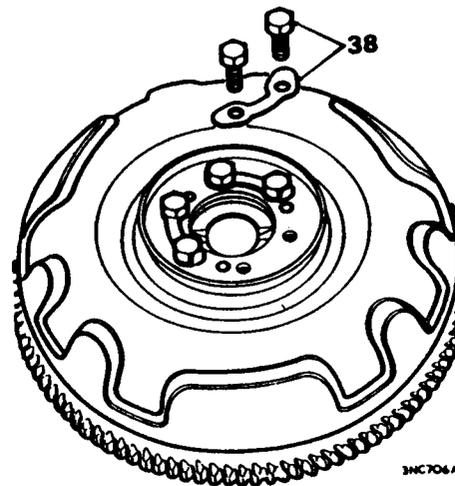
#### Inspecting

25. Ensure that all joint faces are clean and free from burrs.
26. Check that all oil seals and 'O' rings are in perfect condition, and fit replacements where required to the following components:
  - a Oil feed pipe 'O' rings (pump to block).
  - b Main oil strainer pick-up pipe 'O' ring.
  - c Front main bearing cap oil seal.

#### Refitting

27. Grease the joint faces of the engine crankcase and locate the new joint washers into position.
28. Position the front main bearing cap oil seal on the transmission case.

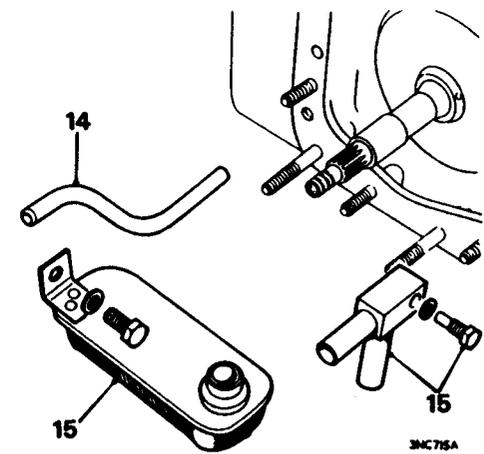
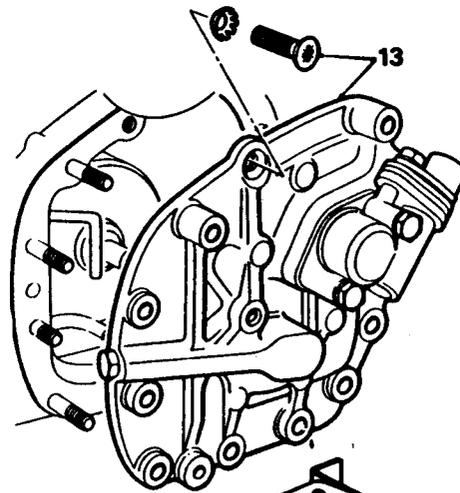
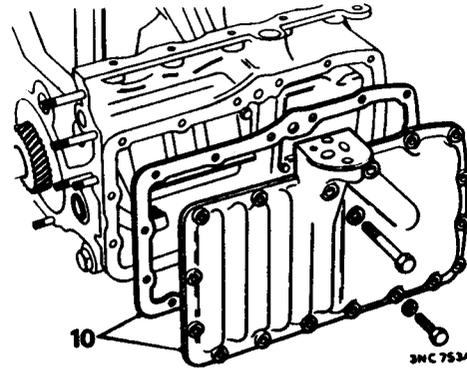
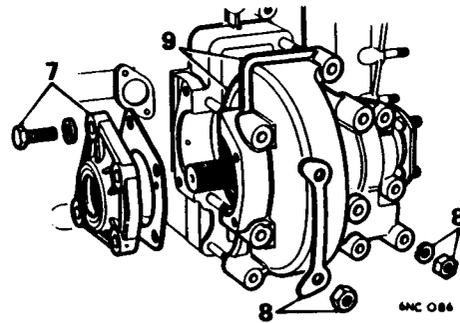
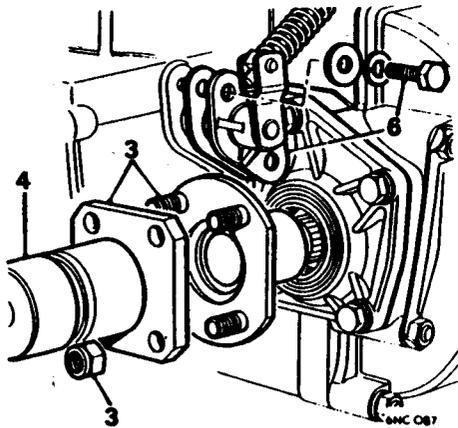
29. Lower the engine onto the gearbox and start the retaining nuts and spring washers onto the studs before completely lowering the engine onto the gearbox; tighten all retaining nuts evenly and trim off any excess joint from the rear of the unit.
30. Connect up and tighten the external oil feed pipe.
31. Refit the internal oil feed pipe into its locations in the oil pump and cylinder block.
32. Fit a new converter housing joint washer to the power unit.
33. Fit tool 18G 1098 over the converter output gear.
34. Refit the converter housing and ensure that the converter outlet pipe is in alignment with the nylon guide so that the pipe will enter the valve block pipe chest. Tighten the housing retaining bolts and nuts to the torque figure given in 'TORQUE WRENCH SETTINGS'.



#### Note:

a The screws threaded U.N.C. locate in the gearbox casing.

- b The screw with the copper washer is fitted adjacent to the transverse selector rod.
35. Fit tool 18G 1088 onto the converter output gear.
36. Refit the input shaft washer and Nyloc nut, hold the converter output gear from turning with tool 18G 1088 and tighten the retaining nut to the torque figure given in 'TORQUE WRENCH SETTINGS'; remove the tool.
37. Refit the low pressure valve with a new joint washer
38. Remove each pair of bolts in turn from the converter centre and refit them with new locking plates. Tighten the bolts to the torque figure given in 'TORQUE WRENCH SETTINGS'.  
**CAUTION: Do not remove all six bolts from the converter centre at one time.**
39. Refit the converter and align the offset slot with that on the crankshaft; insert the locating key plate.
40. Refit the converter retaining bolt with a new lock washer, hold the converter from turning and tighten the bolt with tool 18G 587 to the torque figure given in 'TORQUE WRENCH SETTINGS'. Tap over the lock washer tab.
41. Insert the rubber block into its location in the converter housing and refit the converter end cover.
42. Refit the gear selector bell-crank lever.
43. Refit the starter motor.
44. Refit the engine oil filter assembly, see 44.24.07.
45. Refit the engine/automatic gearbox assembly, see 12.37.01.
46. Refill the engine/automatic gearbox with oil, see 'MAINTENANCE'.



## GEARBOX ASSEMBLY - Automatic

Overhaul 44.20.06

Service tool: 18G 284, 18G 284-4, 18G 1094, 18G 1095, 18G 1096, 18G 1097

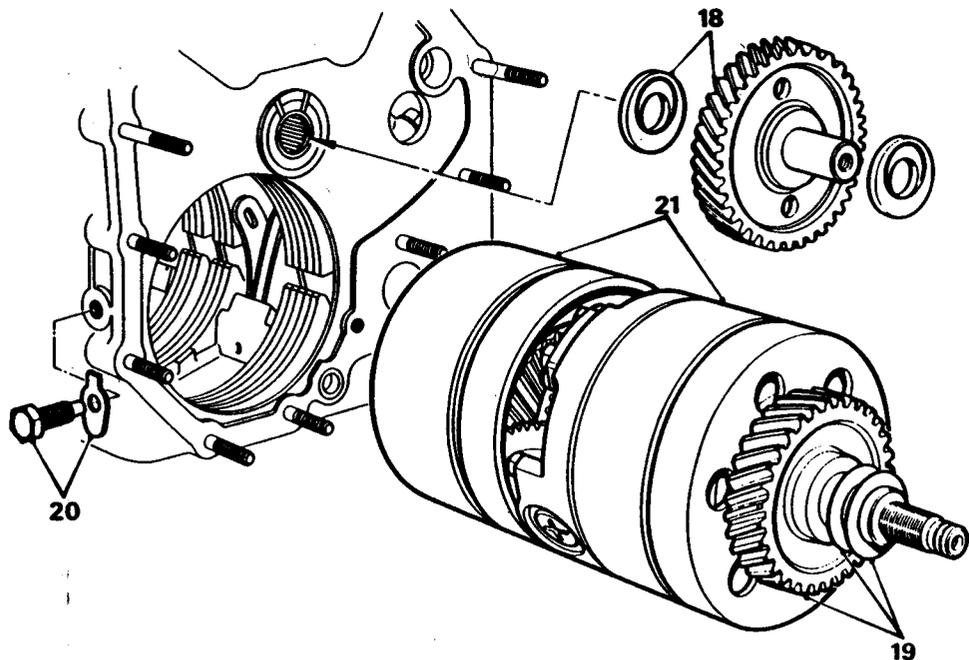
### Dismantling

1. Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Remove the gearbox from the engine, see 44.20.01.
3. Fit tool (adaptor) 18G 284-4 to the differential driving flange and secure with the drive shaft universal joint nuts.
4. Screw tool 18G 284 onto 18G 284-4 and impact the driving flange off the splined shaft.
5. Repeat the procedure in 3 and 4 to remove the other driving flange.
6. Remove the securing screws and detach the kick-down control assembly.
7. Remove the differential end cover securing screws and remove the cover.
8. Release the locking plate tabs and remove the differential/final drive housing securing nuts.

9. Withdraw the housing and final drive assembly.
10. Remove the front cover securing screws and detach the cover.
11. Remove the securing nuts and detach the engine mounting casting from the governor housing.
12. Fit tool 18G 1097 to hold the forward clutch in place.
13. Remove the governor housing securing screw and nuts and withdraw the housing assembly.
14. Pull out the forward clutch feed pipe.
15. Remove the dowel bolt and set screw securing the pick-up pipe and oil strainer and lift out the strainer assembly.

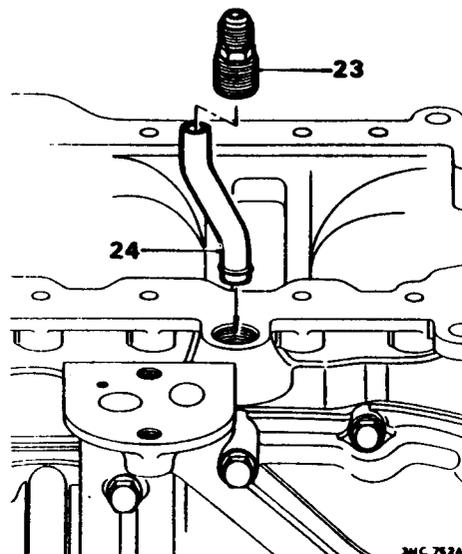
16. Remove tool 18G 1097 and withdraw the forward clutch assembly.
17. Pull out the gear train assembly; note the reverse shut-off valve located in the end of the shaft.

18. Remove the idler gear and thrust washers.
19. Remove the input gear with its pre-load adjustment shims.
20. Tap back the lock washer tab of the dowel bolt retaining the gear train.
21. Pull out the gear train assembly complete with the top and reverse clutch.

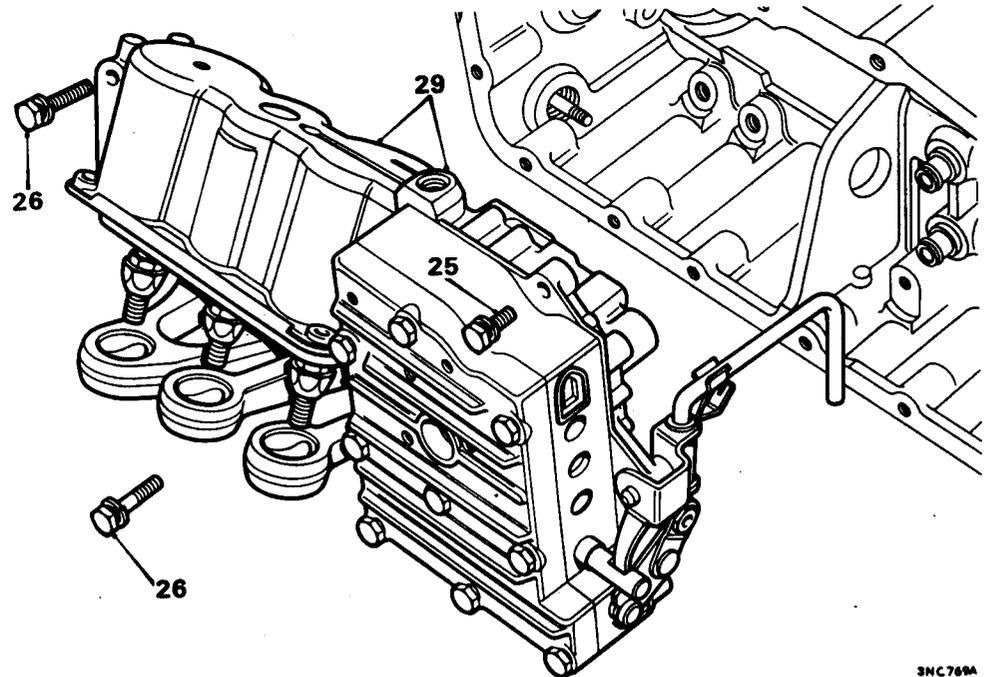


3NC 713A

22. Unscrew and pull out the transverse selector rod.
23. Unscrew and remove the engine oil feed pipe adaptor.
24. Withdraw the shaped copper pipe through the adaptor hole.
25. Remove the valve block retaining bolts.
26. Remove the servo unit retaining bolts.
27. Unhook the brake bands from the servo reaction levers and struts.
28. Remove the brake bands from the casing.
29. Remove the servo unit and valve block as a complete assembly.



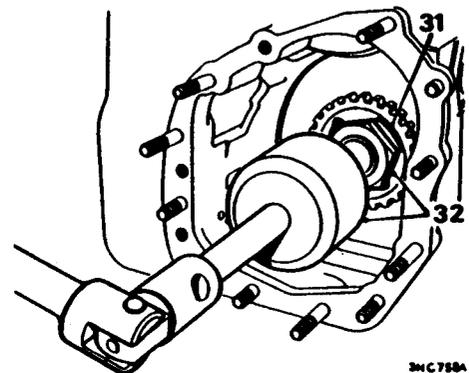
3NC 752A



3NC 769A

30. Remove the needle thrust bearing and washer which will have remained in the top and reverse clutch hub when the gear train assembly was removed.
31. Knock back the lock washer tabs on the forward clutch splined hub nut.
32. Use tool 18G 1095 to hold the top/reverse splined hub, and remove the hub retaining nut with tool 18G 1096.
33. Drift the top/reverse clutch hub out of the centre web of the gearbox casing.
34. Remove the final drive gear pinion with its selective thrust washer.
35. Drift out both bearings from opposing sides of the centre web. Drift the bearings on their outer race so that each bearing will be removed in one piece.

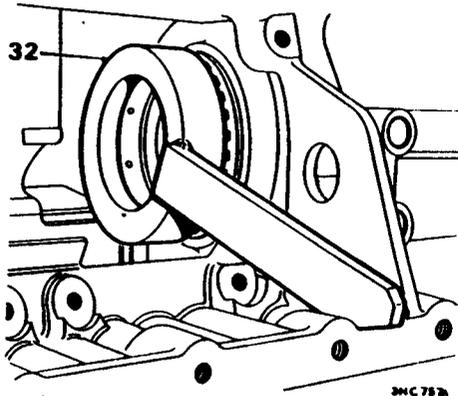
36. Support the extreme outer edge of the bearing on a vice and drift out the forward clutch splined hub.
37. Withdraw the main oil pick-up pipe and remove the strainer.
38. Use tool 18G 581 to withdraw the idler gear needle roller bearing out of the gearbox casing.



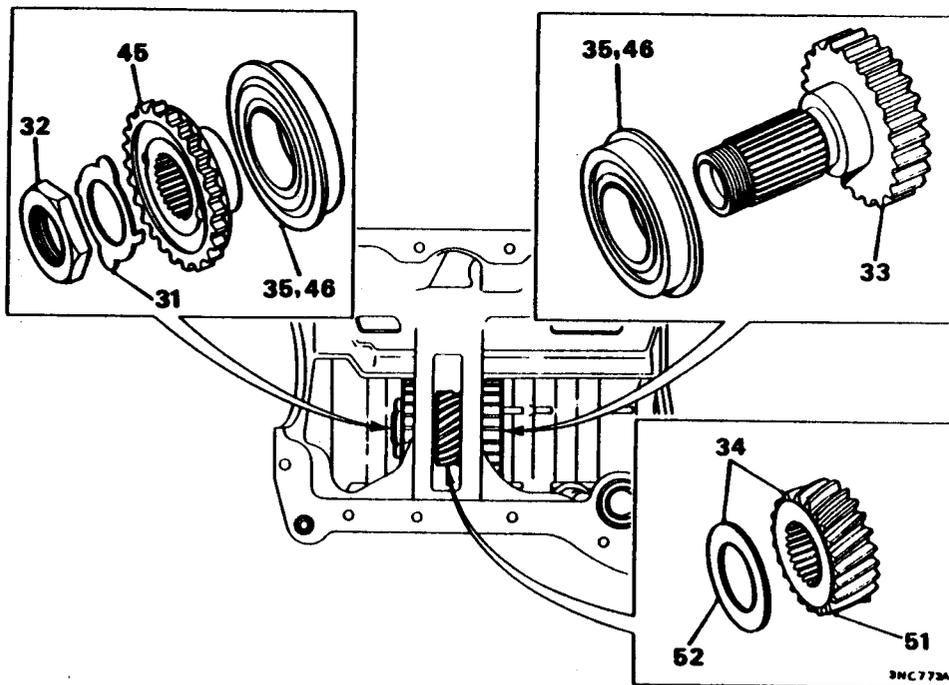
3NC 758A

### Inspecting

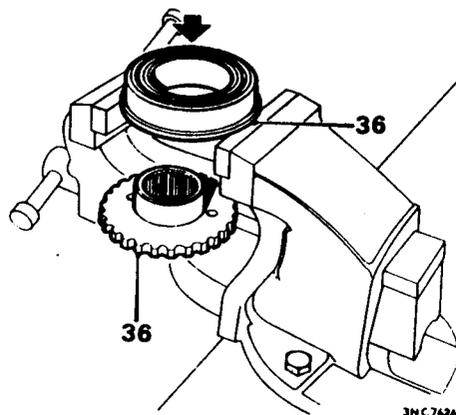
39. Absolute cleanliness is essential; use fuel (petrol) or paraffin (kerosene) where necessary for cleaning. Dry the components with an air pressure line or use lint-free rag.
40. Dismantle each particular unit or assembly and overhaul it following the procedure given; reference will be made in the 'Reassembling' sequence to the operation number covering the overhaul procedure for each particular assembly.
41. All 'O' rings and seals should be renewed; inspect all cast iron sealing rings for wear or sideways movement in their locating grooves, and renew as necessary.



42. Examine all joint faces for burrs or damage and rectify as necessary. Always fit new joint washers, lock washers and locking plates.
43. Immerse all 'O' rings and seals in clean engine oil prior to reassembling each unit, and ensure that they are well lubricated when re-

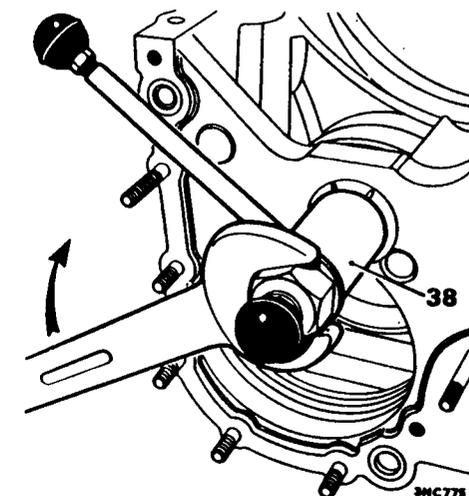
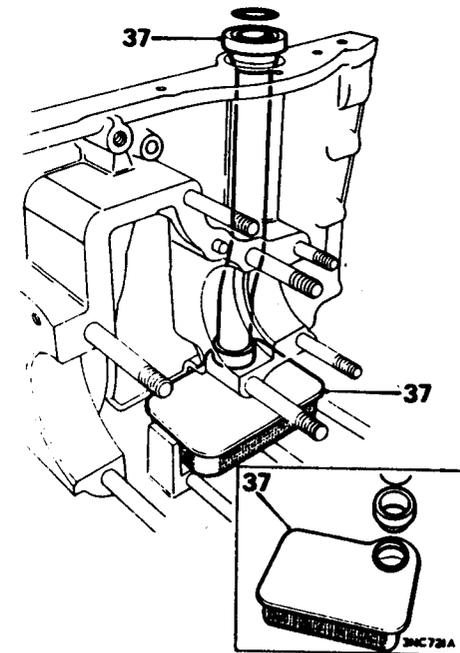


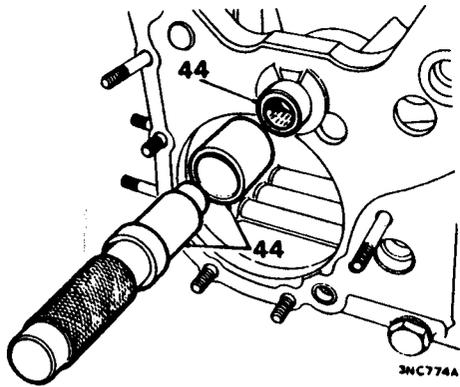
building the gearbox assembly. Use petroleum jelly where necessary when reassembling to secure thrust washers and races in position.



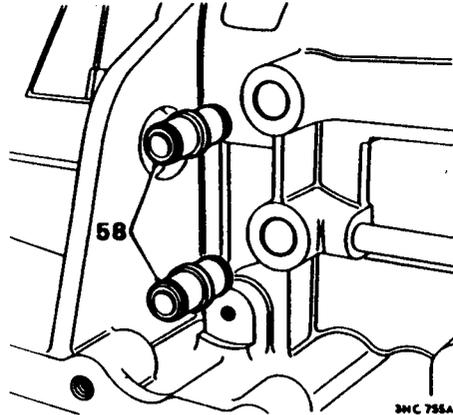
### Reassembling

44. Refit the idler gear needle roller bearing using tool 18G 1126. Drift the bearing into the casing as far as the sleeve on the tool will allow.
45. Drift the forward clutch splined hub into its bearing.
46. Refit the top/reverse clutch hub bearings into the centre webs of the gearbox casing. Drift each bearing on its outer cage until the bearing register contacts the casing web.
47. Refit the top/reverse clutch hub, together with the final drive gear pinion but without the selective shim washer.
48. Lightly tighten the clutch hub retaining nut until light friction is felt on the bearings when rotating the hub.

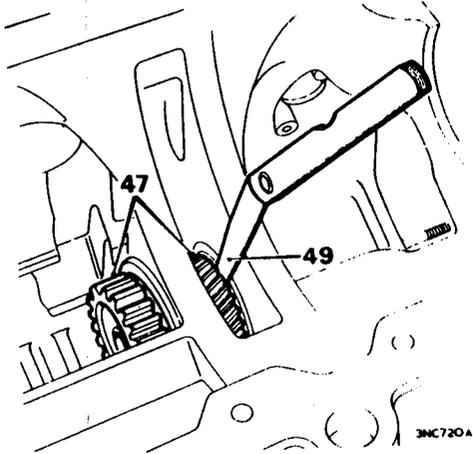




51. Remove the retaining nut and drift out the top/reverse clutch hub and withdraw the final drive gear pinion.



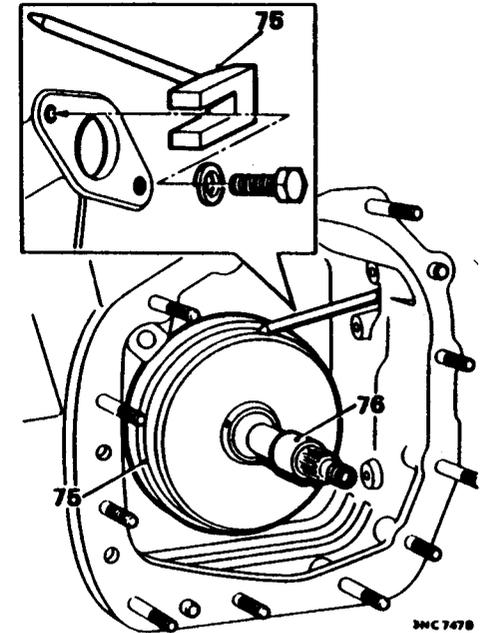
52. Smear the selected shim washer with petroleum jelly and stick it onto the forward clutch side of the pinion for assembly purposes.
53. Refit the complete assembly and fit a new top/reverse clutch hub nut lock washer. Use tool 18G 1095 to hold the hub, and tighten the top/reverse hub nut with tool 18G 1096 to the torque figure given in **'TORQUE WRENCH SETTINGS'**.
54. Check that there is only light friction on the bearings when rotating the hub; the bearing pre-load is 0.002 in (0.05 mm). Tap over the lock washer tabs.
55. Insert the three brake bands into the casing and place them in their fitted positions.
56. Overhaul the servo assembly, see 44.34.04.
57. Overhaul the valve block assembly, see 44.40.04.
58. Refit the two valve block connections into the gearbox casing.



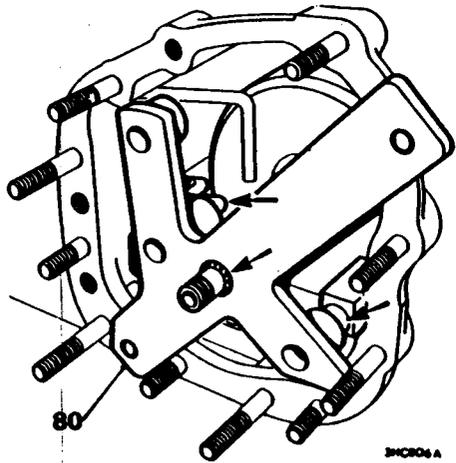
49. Check with feeler gauges the gap existing between the final drive gear pinion and the forward clutch hub bearing face.
50. From the gap measurement taken subtract 0.002 in (0.05 mm) and select a shim washer of this thickness from the range available.

59. Assemble the valve block and servo unit as an assembly and refit it into the gearbox casing.
60. Refit and tighten the servo unit securing bolts to the torque figure given in **'TORQUE WRENCH SETTINGS'**.
61. Refit and tighten the valve block securing bolts to the torque figure given in **'TORQUE WRENCH SETTINGS'**.
62. Locate the brake bands onto the servo unit reaction levers and struts.
63. Screw the transverse selector rod fully into the valve block linkage.
64. Overhaul the top and reverse clutch, see 44.12.13.
65. Overhaul the first gear free-wheel assembly, see 44.12.16.
66. Reassemble the overhauled assemblies onto the gear train, check that the faces of the reverse output shaft and the top/reverse clutch are level, see 44.12.07.
67. Refit the stepped thrust washer onto the end of the top/reverse clutch with petroleum jelly.
68. Smear petroleum jelly onto the thrust bearing and secure them in position in the top/reverse clutch hub in the gearbox casing.
69. Refit the forward output shaft with its reverse shut-off valve.
70. Refit the gear train assembly into the gearbox. Use hand pressure only to push it into position; quick rotation of the input gear backwards and forwards will assist engagement of the top and reverse clutch friction plates with the top and reverse clutch hub splines.
- Note: When correctly assembled, the dowel bolt will engage easily in the free-wheel reaction member.*
71. Fit a new lock washer, refit and tighten the dowel bolt and tap over the lock washer tab.

72. Carry out the brake band 'adjusting' procedure 4 to 8 in 44.30.06.

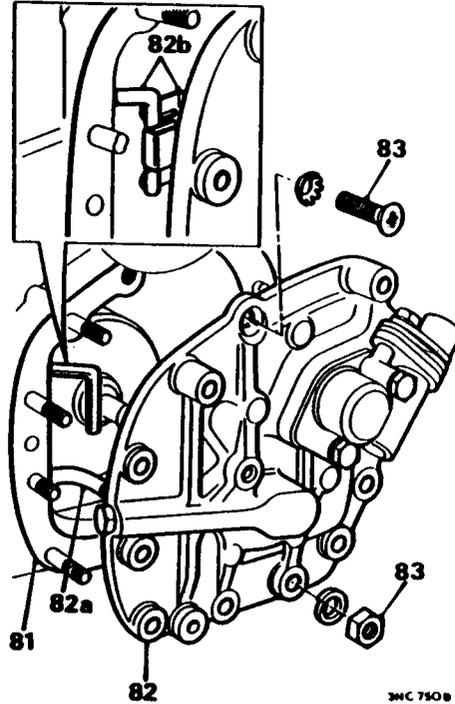


73. Overhaul the forward clutch assembly, see 44.12.10.
74. Refit the forward clutch and ensure that the clutch plates engage the forward clutch hub splines. Rotate the clutch assembly backwards and forwards to assist engagement; when correctly fitted, there is only a small clearance between the forward clutch and the centre web of the gearbox casing.
- CAUTION:** If the clutch is not fully engaged on the hub splines, the flange of the governor housing will not contact the gearbox casing; any excessive force used may damage the clutch plates.



75. Use tool 18G 1097 to hold the forward clutch securely in position until the governor housing has been refitted.
76. Pull the nylon assembly sleeve back over the rings on the forward clutch shaft; it will become safely displaced along the shaft when the governor housing is refitted.
77. Refit the auxiliary oil strainer assembly and secure with the set screw and the dowel bolt locating the pick-up pipe.
78. Refit the forward clutch feed pipe (long end into the gearbox casing).
79. Overhaul the governor housing assembly, see 44.22.04.
80. Locate tool 18G 1094 onto the gearbox casing dowels and align the pipes and forward clutch shaft; remove the tool.
81. Fit a new joint washer coated with Hylomar jointing compound (or similar equivalent) onto the casing.

82. Refit the governor housing giving particular attention to the following points as the housing is being pushed onto the studs:
  - a Check that the forward clutch feed pipe has started to engage its location in the housing.
  - b Check that the governor valve linkage engages correctly between the two forks and the spring clip drive of the governor unit.

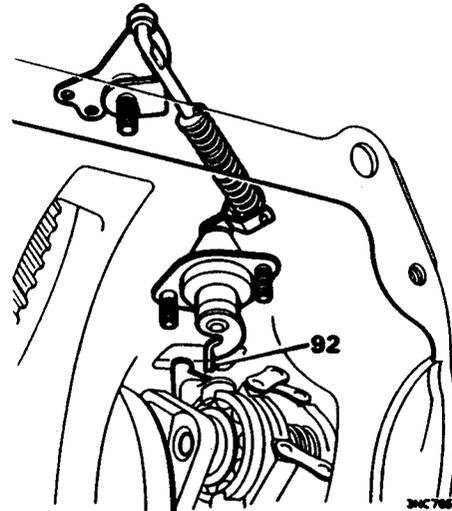


a Check that the forward clutch feed pipe has started to engage its location in the housing.

#### DATA

Top/reverse clutch hub bearing pre-load .....	0.002 in (0.05 mm)
Brake band adjustment (see 44.30.06) .....	0.040 to 0.080 in (1.02 to 1.03 mm)
Input gear bearing pre-load .....	0.001 to 0.003 in (0.02 to 0.08 mm)
Idler gear end-float .....	0.004 to 0.007 in (0.10 to 0.18 mm)

83. Tighten the governor housing securing nuts and screw.
84. Remove the forward clutch holding tool 18G 1097.
85. Refit the engine mounting casting to the governor housing.
86. Refit the main oil pick-up pipe and strainer.
87. Refit and adjust the differential/final drive assembly; see the 'Reassembling' procedure in 54.10.08.



88. Refit the idler gear and thrust washers.
89. Refit the input gear with its adjustment shims.
90. Refit the gearbox to the engine, see 44.20.01.
91. Fit a new joint washer coated with Hylomar jointing compound (or similar equivalent) and refit the front cover.
92. Refit the kick-down control assembly with the lever positioned as illustrated.
93. Refit the engine/automatic gearbox assembly, see 12.37.01.

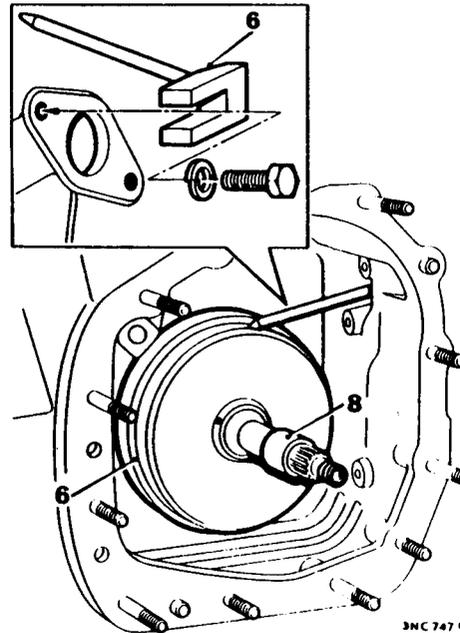
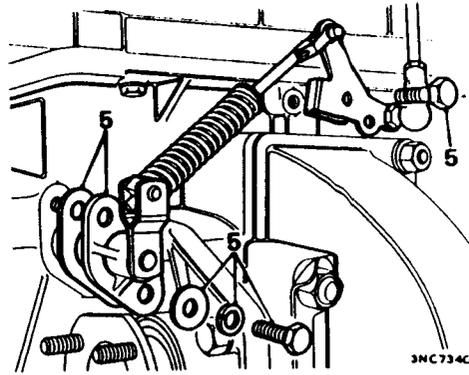
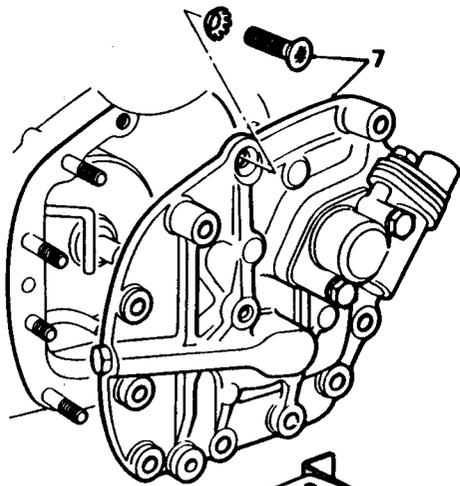
### GOVERNOR HOUSING ASSEMBLY

Remove and refit 44.22.01

*Service tool:* 18G 1094, 18G 1097

#### Removing

1. Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Drain the engine/automatic gearbox oil, see 'MAINTENANCE'.
3. Remove the radiator assembly from the engine, see 26.40.04.
4. Remove the securing nuts and detach the engine mounting adaptor bracket complete with the mounting attached from the governor housing.
5. Remove the screws and detach the kick-down control assembly from the gearbox casing.
6. Fit tool 18G 1097 to retain the position of the forward clutch.
7. Remove the securing nuts and withdraw the governor housing assembly.



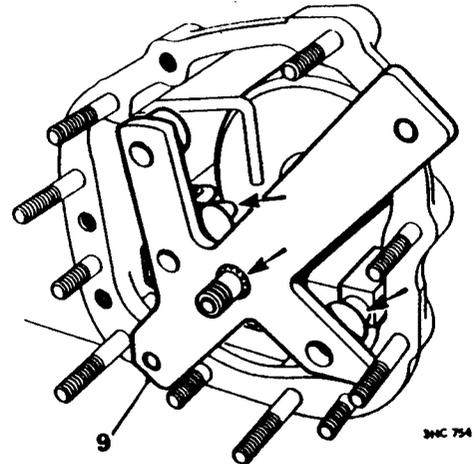
### Refitting

8. Pull the nylon assembly sleeve back over the rings on the forward clutch shaft, it will become safely displaced along the shaft when the governor housing is refitted.
9. Locate tool 18G 1094 onto the gearbox casing dowels and align the pipes and forward clutch shaft; remove the tool.
10. Smear or spray Hylomar jointing compound (or equivalent) onto a new joint washer and fit it to the gearbox casing.

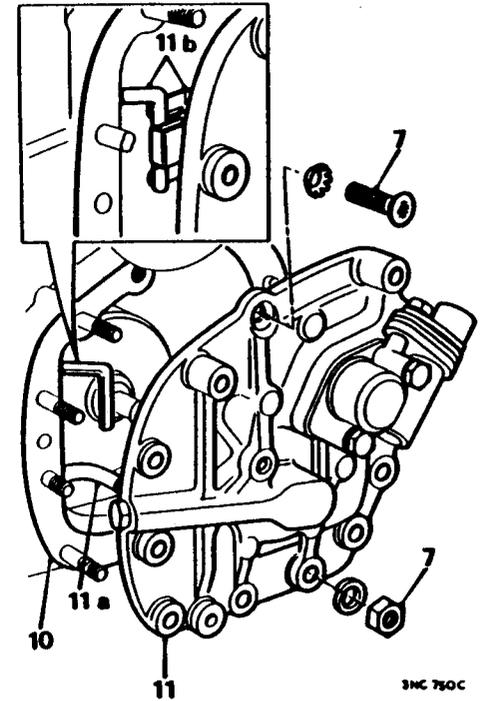
11. Refit the governor housing giving particular attention to the following points as the housing is being pushed onto the studs:

a Check that the forward clutch feed pipe has started to engage its location in the housing.

b It is extremely important to ensure that the governor valve linkage engages correctly with the spring clip drive of the governor as the housing is pushed on. The link engages between the two forks and the spring clip and TH-AT is its operating position; it **MUST NOT** enter into the centre open portion of the clip.



12. Torque tighten the governor housing nuts, see 'TORQUE WRENCH SETTINGS'.
13. Refit the engine mounting adaptor plate to the governor housing.
14. Remove tool 18G 1097.
15. Refit the kick-down control and torque tighten the securing screws, see 'TORQUE WRENCH SETTINGS'.
16. Refit the radiator assembly, see 26.40.04.
17. Refit the engine/automatic gearbox assembly, see 12.37.01.



18. Refill the engine/automatic gearbox with oil, see 'MAINTENANCE'.

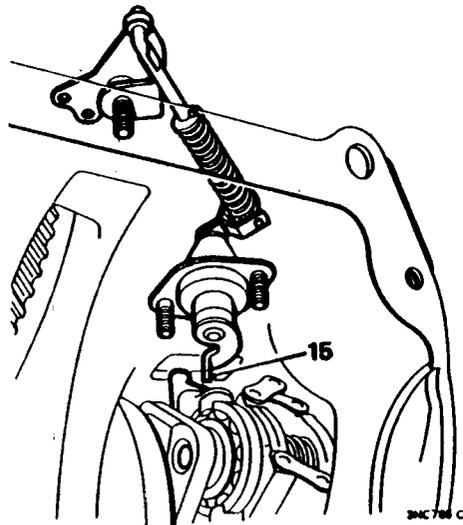
## GOVERNOR ASSEMBLY

Overhaul 44.22.04

Service tool: 18G 1106

### Dismantling

1. Remove the governor housing assembly, see 44.22.01.
2. Remove the one screw and withdraw the speedometer drive pinion components.
3. Remove the two securing screws, detach the pinion housing and withdraw the speedometer drive gear.



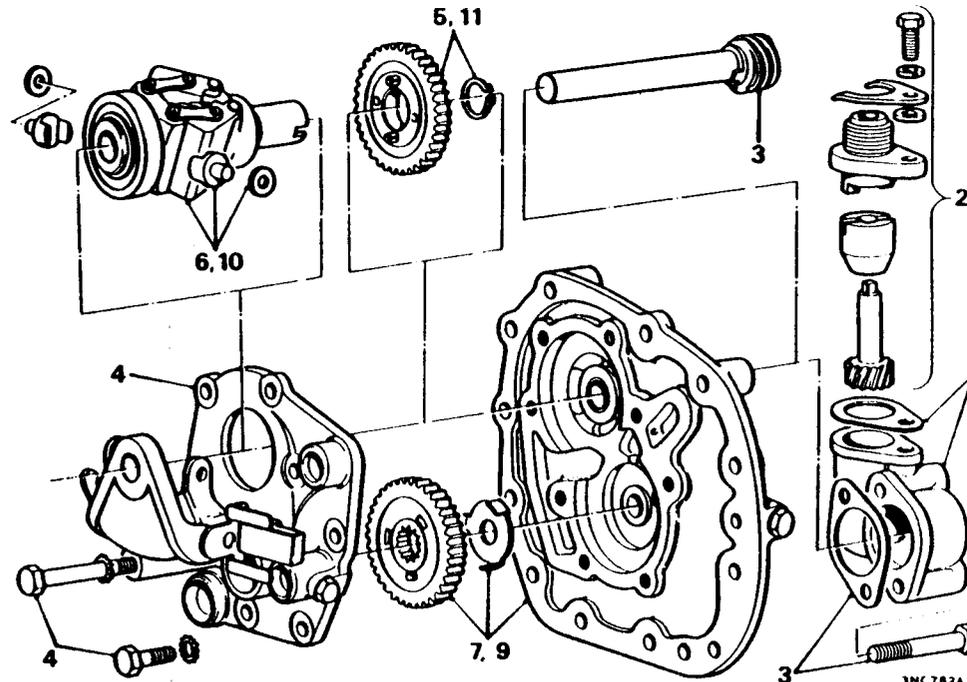
4. Remove the set screws and bolt securing the governor mounting plate and remove it from the end housing.
5. Remove the gear retaining circlip and withdraw the gear off the governor shaft.
6. Remove the governor unit with its bearing retaining trunnions and washers.
7. Remove the second auxiliary pump gear and steel thrust washer from the governor housing end-cover.

#### Inspecting

8. Examine all components for wear or damage; renew the governor assembly if the bearing requires replacement. Renew the gear and casing assemblies as necessary.

#### Reassembling

9. Reassemble the gear and thrust washer into the governor housing end cover.
10. Refit the governor assembly with its retaining trunnions and washers to the mounting plate.



11. Refit the other gear and retaining circlip onto the governor assembly.
12. Refit the two housing assemblies together and centralize the assemblies and gear with tool 18G 1106.
13. Tighten the retaining screws and bolt to the torque figure given in 'TORQUE WRENCH SETTINGS', remove the tool.
14. Insert the speedometer drive gear through the end housing and governor unit.
15. Refit the pinion housing with a new joint washer and refit the pinion assembly.
16. Refit the governor housing assembly, see 44.22.01.

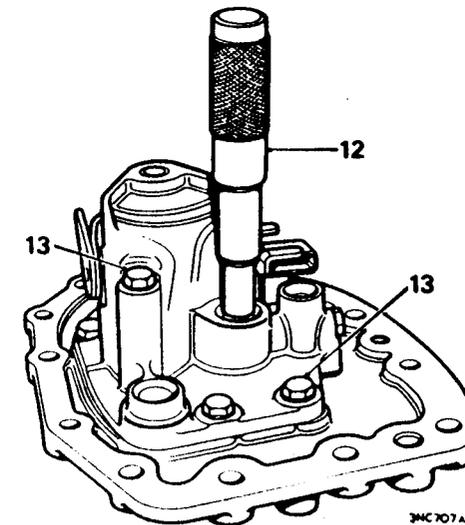
### KICK-DOWN CONTROL LINKAGE

**Check and adjust** 44.30.02

**Service tool:** 18G 677Z

#### Checking

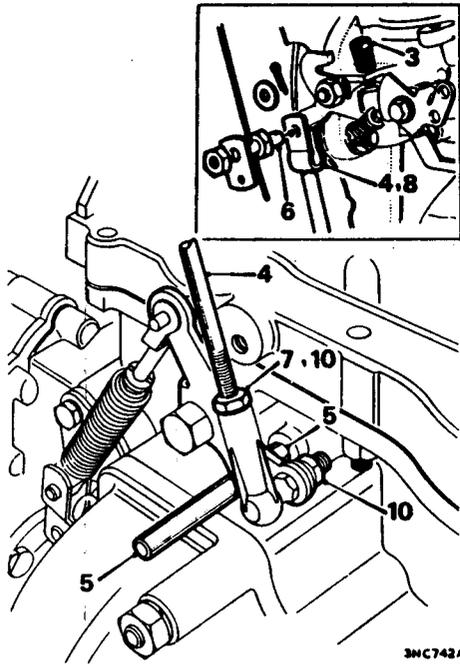
1. Connect the tachometer connections of tool 18G 677 Z, see 44.01.01.
2. Run the engine to its normal running temperature.
3. Check the engine idling speed with the tachometer, and adjust if necessary the carburettor idling screw to give an idle speed of 750 rev/min.
4. Disconnect the kick-down control rod at the carburettor.



5. Insert a 1/4 in (6.0 mm) diameter rod through the hole in the intermediate bell-crank lever and locate in the hole in the gearbox casing.
6. Check if the kick-down control rod can now be re-connected to the carburettor, with its fulcrum pin an easy sliding fit through its forked end and the carburettor throttle lever.

#### Adjusting

7. Slacken the kick-down rod ball-joint locking nut.
8. Disconnect the forked end of the rod at the carburettor lever and turn the rod until the correct length is obtained.
9. Re-connect the rod at the carburettor lever, tighten the ball-joint locking nut and remove the checking rod.



10. Test drive the car to ensure that the 'kick-down' changes occur within the speed range given in Test 9 of the 'TEST PROCEDURE' 44.01.02.

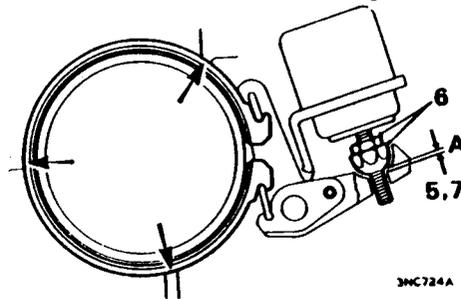
- a If the gear changes occur at a lower speed, slacken the ball joint locking nut, disconnect the ball-joint and screw it onto the rod a further two complete turns. Reconnect and tighten the ball-joint and re-check the kick-down changes.
- b If the gear changes occur at a higher speed, follow the procedure in 'a' except that the ball-joint must be unscrewed two complete turns to lengthen the rod.

### SELECTOR CABLE

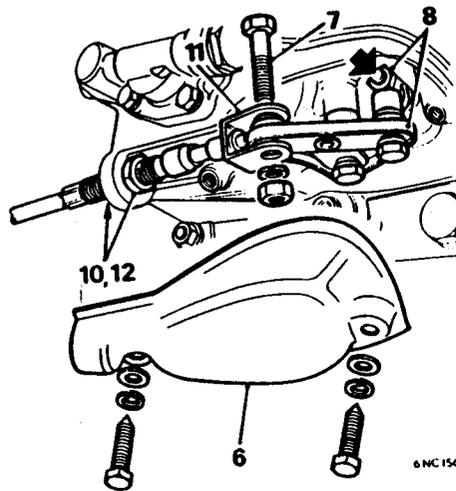
Check and adjust 44.30.04

#### Checking

1. Firmly apply the handbrake.
2. Select 'N' and start the engine.



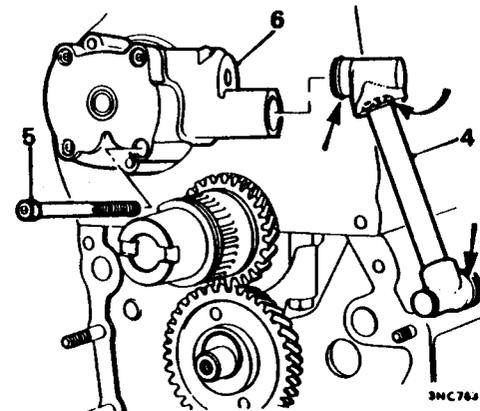
3. Move the selector lever to the 'R' position and check that reverse gear is engaged. Slowly move the lever back towards the 'N' position, checking that 'reverse' gear is disengaged just before or exactly when the lever locates the 'N' position.



4. Repeat the procedure in 3 with the 'first' gear '1' position.

#### Adjusting

5. Raise the car on a hoist or jack up the front and support both sides.
6. Remove the securing screws and detach the bellcrank cover plate.
7. Remove the nut and bolt securing the cable fork to the bellcrank lever.
8. Move the bellcrank lever to pull the transverse rod fully out, then push the rod back in TWO detents.
9. Move the selector lever to the 'N' position on the quadrant.
10. Slacken the adjusting nuts retaining the cable to the gearbox casing.
11. Position the cable fork until the bellcrank pivot bolt can easily be inserted through the fork and bellcrank lever.
12. Tighten the cable adjusting nuts and repeat the procedure in 11.
13. Repeat the checking procedure in 1 to 4.
14. Ensure that the cable fork pivot bolt is tight and refit the bellcrank cover plate.
15. Lower the car.



### BRAKE BANDS

Check and adjust

44.30.06

#### Checking

1. Remove the front grille.
2. Drain the engine/automatic gearbox oil, see 'MAINTENANCE'.
3. Raise the car on a hoist or jack up the car and place supports under the body front side-members, see 'JACKING'.
4. Remove the front cover securing bolts and lift off the cover complete with the oil filter assembly.
5. Check the brake band adjustment; the free movement 'A' between the servo lever and the spherical nut should be 0.040 to 0.080 in (1.02 to 1.03 mm).

#### Adjusting

6. Slacken the locknut and turn the spherical adjusting nut until the brake band is in contact with the transmission casing stops (arrowed) and all slack is eliminated.
7. Turn the spherical adjusting nut downwards nine flats to obtain the clearance 'A'; this should give the minimum clearance.
8. Re-check that the clearance is within the tolerance figures given; hold the spherical nut and tighten the locknut.
9. Repeat the procedure in 5 to 8 to adjust the other two brake bands.
10. Fit a new joint washer coated with Hylomar jointing compound (or similar equivalent).
11. Refit the front cover and tighten the retaining bolts.
12. Lower the car.
13. Refill the engine/automatic gearbox with oil, see 'MAINTENANCE'.
14. Refit the front grille.

## MAIN PUMP ASSEMBLY

### Remove and refit 44.32.01

#### Removing

1. Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Remove the converter assembly, see 44.17.07.
3. Remove the converter housing, see 44.17.01.
4. Withdraw the oil feed pipe (pump to gearbox casing).
5. Use an Allen key and remove the oil pump retaining screws.
6. Remove the oil pump assembly; the pump drive coupling may also be attached or it may stay in the end of the camshaft.

#### Refitting

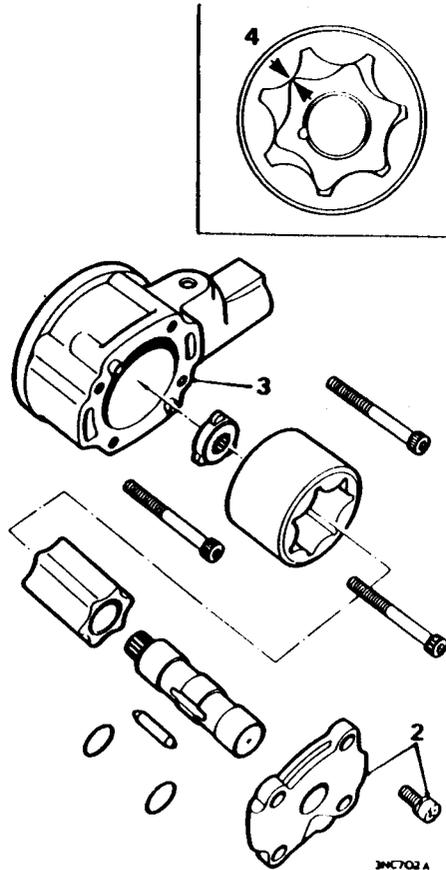
7. Renew the oil pump joint washer and ensure that it is correctly fitted.
8. Refit the pump with the splined shaft engaging the drive coupling; refit and tighten the retaining screws.
9. Check the oil seals on and in the oil feed pipe 'arrowed', and renew as required.
10. Refit the oil feed pipe.
11. Refit the converter housing, see 44.17.01.
12. Refit the converter assembly, see 44.17.07.
13. Refit the engine/automatic gearbox assembly, see 12.37.01.

## MAIN PUMP ASSEMBLY

### Overhaul 44.32.04

#### Dismantling

1. Remove the main pump assembly, see 44.32.01.
2. Remove the one retaining screw and detach the pump cover.



3. Place a straight-edge across the face of the pump body and measure the clearance between the top face of the rotors and the underside of the straight-edge. The clearance should not exceed 0.005 in (0.13 mm). If the clearance is excessive, this may be remedied by lapping the joint face of the pump body.

4. Measure the clearance between the rotor lobes when they are positioned as shown. If the clearance is in excess of 0.006 in (0.15 mm), the pump assembly must be renewed.

#### Inspecting

5. Clean and examine components for wear or damage; renew the pump assembly if necessary.

#### Reassembling

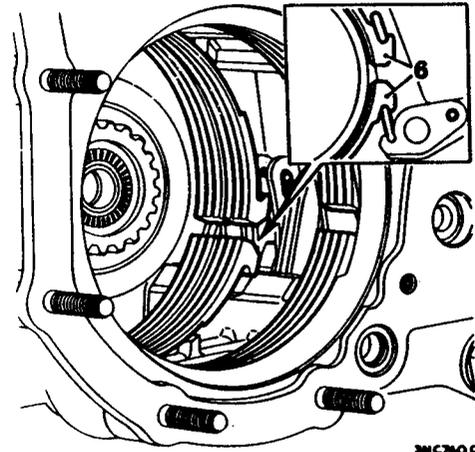
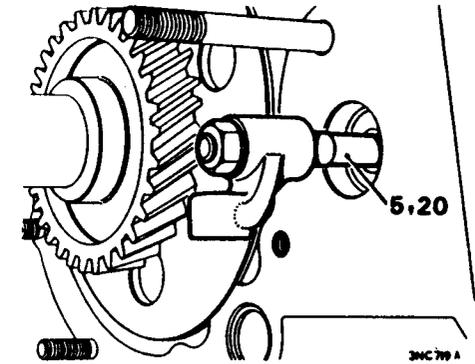
6. Refit the pump cover and refit the retaining screw.
7. Refit the main pump assembly, see 44.32.01.

## SERVO ASSEMBLY

### Remove and refit 44.34.01

#### Removing

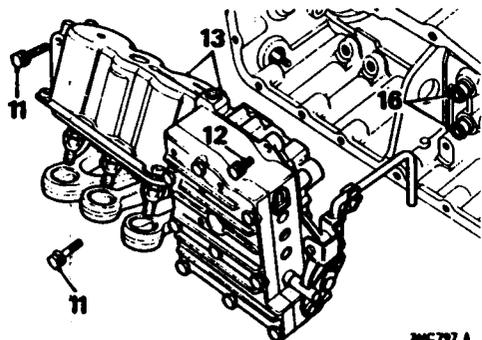
1. Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Remove the converter assembly, see 44.17.07.
3. Remove the converter housing, see 44.17.01.
4. Remove the gear train assembly, see 44.36.01.
5. Unscrew and remove the transverse selector rod.
6. Unhook the three brake bands from the servo reaction levers and struts.
7. Remove the front cover securing bolts and lift off the cover complete with the oil filter assembly.
8. Slacken the engine oil pipe banjo union bolt and disconnect the other end of the pipe from the adaptor.
9. Unscrew and remove the adaptor.
10. Withdraw the shaped copper pipe through the adaptor hole.
11. Remove the servo assembly securing bolts.



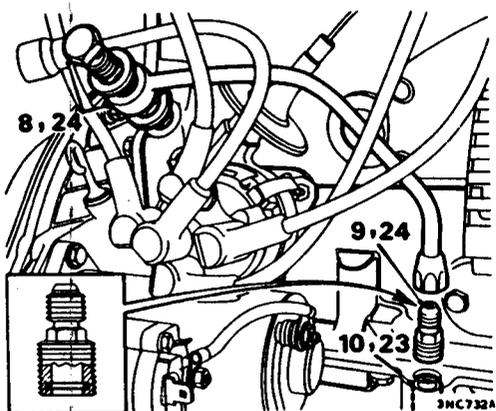
12. Remove the three bolts securing the valve block.
13. Withdraw the servo unit and valve block as an assembly from the gearbox casing.
14. Detach the servo unit from the valve block.

#### Refitting

15. Assemble the servo unit to the valve block.
16. Fit the two valve block connections into the locations in the gearbox casing.

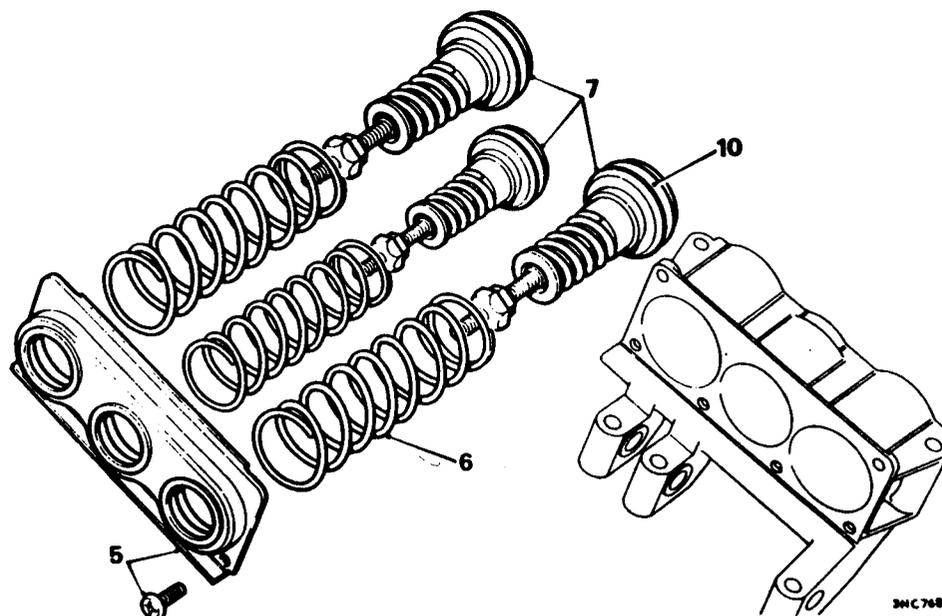


3NC707 A



3NC732A

17. Refit the servo/valve block assembly loosely into the gearbox casing with the valve block linkage located over the web in the casing.
18. Engage the valve block linkage with the spring clip drive of the governor unit; see the procedure in 15 to 17 of 44.40.01.
19. Refit and tighten the valve block and servo unit securing bolts to the torque figures given in **TORQUE WRENCH SETTINGS**.
20. Screw the transverse selector rod fully into the valve block selector valve linkage.



3NC768 A

21. Locate the brake bands onto the servo unit reaction levers and struts.
22. Refit the gear train assembly, see 44.36.01.
23. Refit the shaped copper pipe through the adaptor hole and locate it in the valve block pipe chest.
24. Screw in the adaptor and reconnect the engine oil feed pipe.
25. Use a new joint washer coated with Hylomar jointing compound (or similar equivalent) and refit the front cover.
26. Refit the converter housing, see 44.17.01.
27. Refit the converter assembly, see 44.17.07.
28. Refit the engine/automatic gearbox assembly, see 12.37.01.

## SERVO ASSEMBLY

### Overhaul

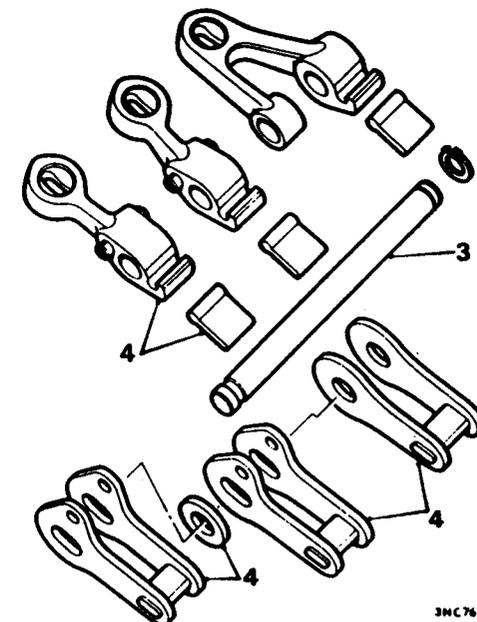
44.34.04

### Dismantling

1. Remove the servo assembly, see 44.34.01.
2. Detach the servo unit from the valve block assembly.
3. Remove the centre shaft.
4. Lift out the servo levers, reaction levers, washer, and struts.
5. Hold the servo cover and remove the securing screws and cover.
6. Lift out the piston springs.
7. Pull out the servo pistons.

### Inspecting

8. Examine all parts for wear and check the bores of the servo unit for scoring; fit a new assembly if the bores are damaged.

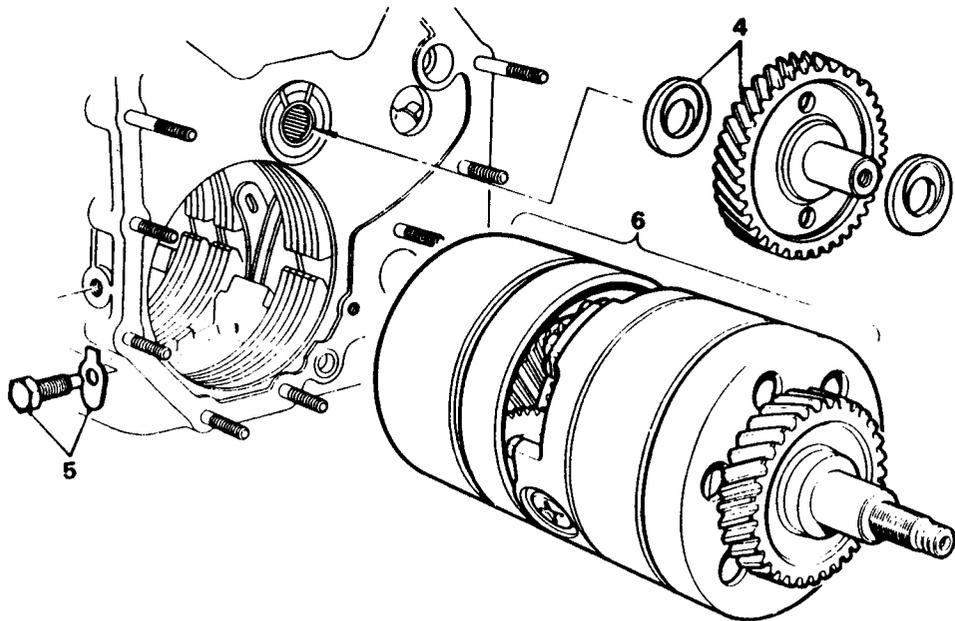


3NC761 A

9. Renew the piston seals and any other parts as required.

### Reassembling

10. Lubricate the new seals with oil and fit them onto their respective pistons (the lips of the seals facing inwards towards the bores).
11. Reverse the removing procedure in 2 to 7, ensuring correct assembly of the reaction levers and struts (with the washer correctly positioned as illustrated).
12. Reassemble the servo unit to the valve block.
13. Refit the servo assembly, see 44.34.01.



3NC 714 A

## GEAR TRAIN

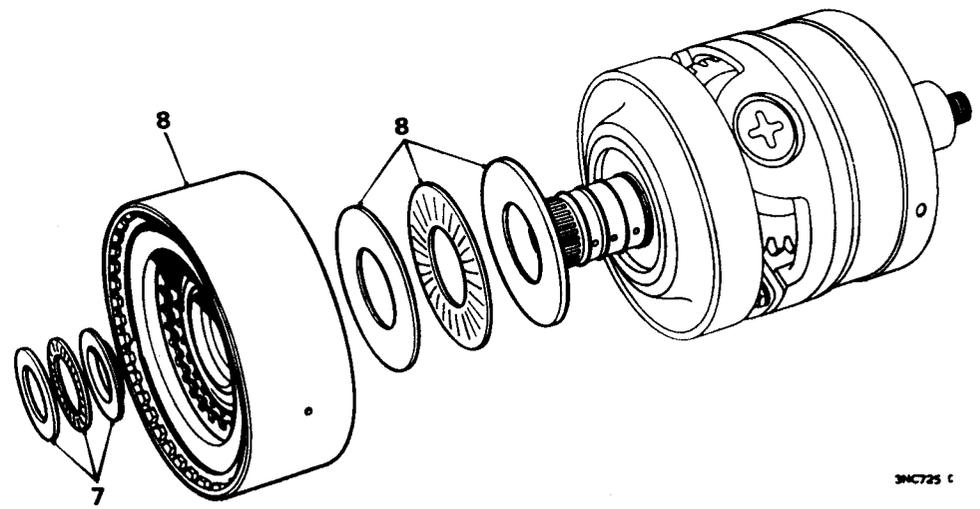
Remove and refit

44.36.01

### Removing

1. Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Remove the converter assembly, see 44.17.07.
3. Remove the converter housing, see 44.17.01.
4. Remove the idler gear.
5. Knock back the lock washer tab and remove the dowel bolt retaining the gear train assembly into the gearbox casing.
6. Pull out the gear train assembly complete with the free-wheel reaction member and the top and reverse clutch assembly.

7. Remove the thrust washer, needle thrust bearing and the stepped thrust washer from the end of the top and reverse clutch.
8. Pull the top and reverse clutch off the gear train, noting the thrust washer (thin), needle thrust bearing, and selective thrust washer (thick), which locate onto the reverse output gear shaft.
9. Pull off the input gear.
10. Remove the first gear free-wheel reaction member.
11. Knock back the locking plate tabs and remove the bolts retaining the first gear free-wheel assembly to the gear train.



3NC725 C

12. Lift off the first gear free-wheel housing assembly.

*Note: If a new gear train is to be fitted, the assembly will be complete with the third speed reaction gear; this is equivalent to the unit removed and the necessary components removed from the unit as detailed in the procedure 7 to 12.*

### Refitting

13. Reverse the removing procedure, fitting new locking plates where applicable. Torque tighten to the figures given in 'TORQUE WRENCH SETTINGS' and lock over the locking plate tabs.
14. Check that the top and reverse clutch end face is level with the output shaft; see the procedure in 11 to 17, see 44.12.07.
15. Refit the idler gear.
16. Refit the converter housing, see 44.17.01.
17. Refit the converter assembly, see 44.17.07.
18. Refit the engine/automatic gearbox assembly, see 12.37.01.

## SPEEDOMETER DRIVE PINION

Remove and refit

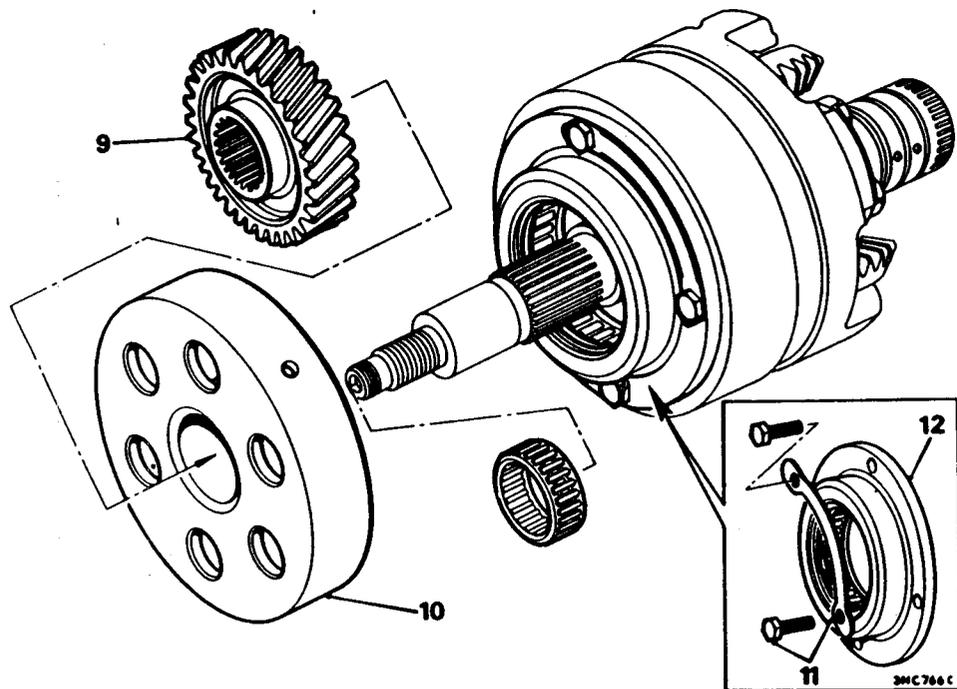
44.38.04

### Removing

1. Disconnect the speedometer drive cable from the pinion housing.
2. Remove the securing screw and withdraw the spring plate, pinion bearing housing and the drive pinion assembly.
3. Extract the pinion from the housing.

### Refitting

4. Refit the pinion into the housing.
5. Fit a new joint washer, refit the pinion bearing housing and spring plate and tighten the securing screw.
6. Connect up the speedometer drive cable.



### SPEEDOMETER DRIVE GEAR

**Remove and refit** 44.38.07

#### Removing

1. Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Remove the screws securing the radiator to the engine mounting adaptor bracket.
3. Remove the nuts retaining the engine mounting adaptor bracket to the governor housing and detach the bracket.
4. Remove the securing screw and withdraw the spring plate, pinion bearing housing and the drive pinion assembly.

5. Remove the two securing screws and detach the drive pinion housing from the governor housing.
6. Withdraw the speedometer drive gear.

#### Refitting

7. Refit the speedometer drive gear, if the gear cannot easily be pushed fully into engagement with the governor, follow the procedure in 8 to 10.
8. Disconnect the kickdown control rod ball-joint, remove the screws and detach the kickdown control assembly from the gearbox casing.

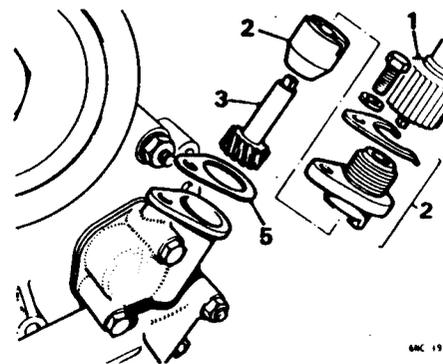
9. Insert a finger through the hole and raise the governor end bearing into alignment and push the drive gear spindle fully into engagement.
10. Refit and connect up the kickdown control assembly.
11. Reverse the procedure in 2 to 6.
12. Refit the engine automatic gearbox assembly, see 12.37.01.

### VALVE BLOCK ASSEMBLY

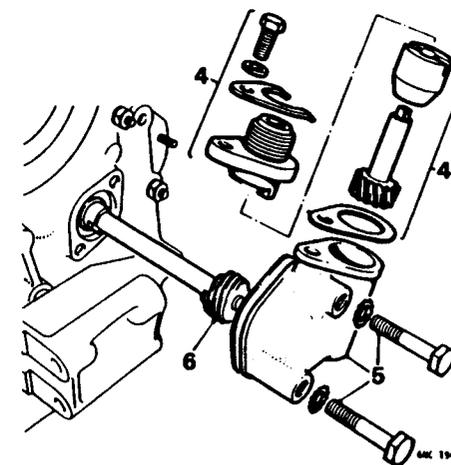
**Remove and refit** 44.40.01

#### Removing

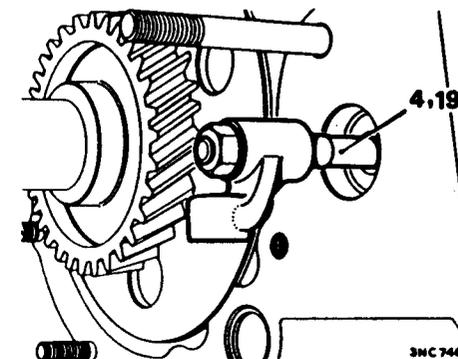
1. Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Remove the converter assembly, see 44.17.07.
3. Remove the converter housing, see 44.17.01.
4. Unscrew and withdraw the transverse selector rod out of the gearbox.



5. Remove the front cover securing bolts and lift off the cover complete with the oil filter assembly.

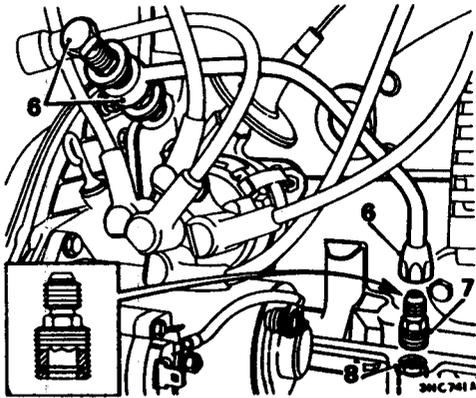


6. Slacken the engine oil pipe banjo union bolt and disconnect the other end of the pipe from the adaptor.
7. Unscrew and remove the adaptor.
8. Withdraw the shaped copper pipe through the adaptor hole.



9. Remove the servo unit securing bolts.

10. Remove the three bolts securing the valve block to the gearbox casing.
11. Pull the valve block outwards to release the governor valve operating link from the spring clip drive mechanism of the governor unit.
12. To remove the complete valve block assembly, follow the operation sequence illustrated and detailed below in 'a' to 'd'. 'Arrows' indicate the direction of movement of the valve block and servo units.

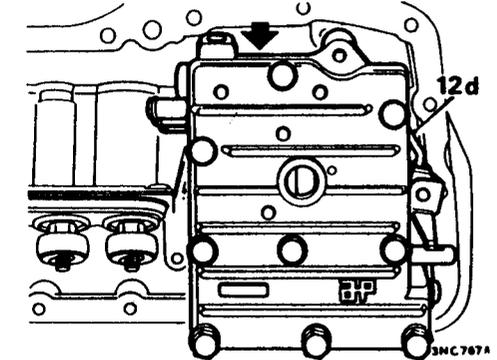
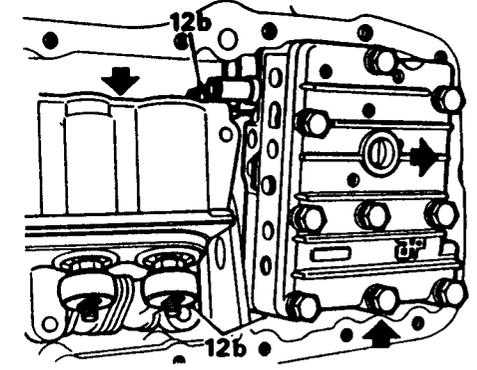
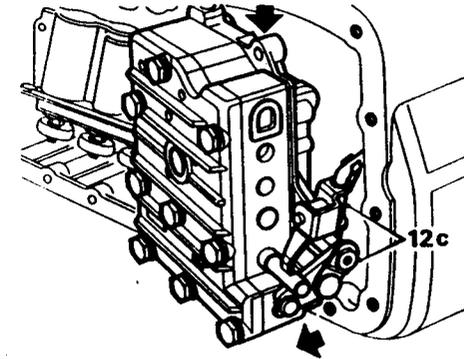
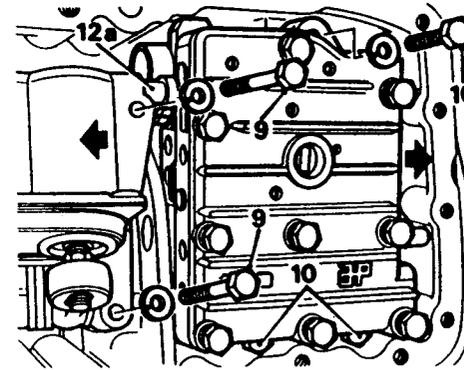


- a Move the valve block away from the servo until the three interconnecting pipes are released from the servo.
- b Pull the servo unit downwards and move the valve block upwards and sideways to get the connecting pipes over the top of the servo unit.
- c Manoeuvre the valve block so that the selector valve and governor valve linkage is clear of the casing.

- d Pull the linkage end of the valve block outwards, lift the governor rod link over the web in the gearbox casing and remove the valve block assembly.
13. Before refitting, check the 'O' rings on the interconnecting pipes and the valve block to casing connections. Fit new 'O' rings as required and refit the two short connections into their locations in the gearbox casing.

#### Refitting

14. Refit the valve block, noting the following:
  - a Locate the governor link over the web in the transmission before attempting to position the valve block and engage the pipes.
  - b Reverse the sequence 'a' to 'd' in procedure 12 to get the valve block in position and the interconnecting pipes engaged in the servo unit.
  - c Finally engage the governor valve link with the spring clip drive of the governor; see the procedure in 15 to 17.
15. Using a long thin screwdriver, insert it between the governor carrier and the bearing to provide the required angle of the spring clip drive with the valve block link.
16. Hold the link with a pair of suitable pliers and push the link fully into engagement with the spring clip drive (as illustrated). Pull out the screwdriver.
17. Push the valve block inwards to engage it with the pipe connections in the gearbox casing.
18. Refit and tighten the valve block and servo unit securing bolts to the torque figures given in **'TORQUE WRENCH SETTINGS'**.



19. Screw the transverse selector rod fully into the valve block selector valve linkage.
20. The remainder is a reversal of the removing procedure.
21. Refit the converter housing, see 44.17.01.
22. Refit the converter assembly, see 44.17.07.
23. Refit the engine/automatic gearbox assembly, see 12.37.01.

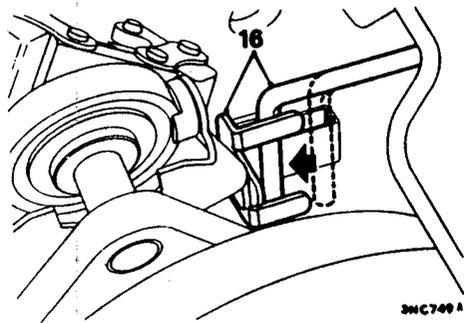
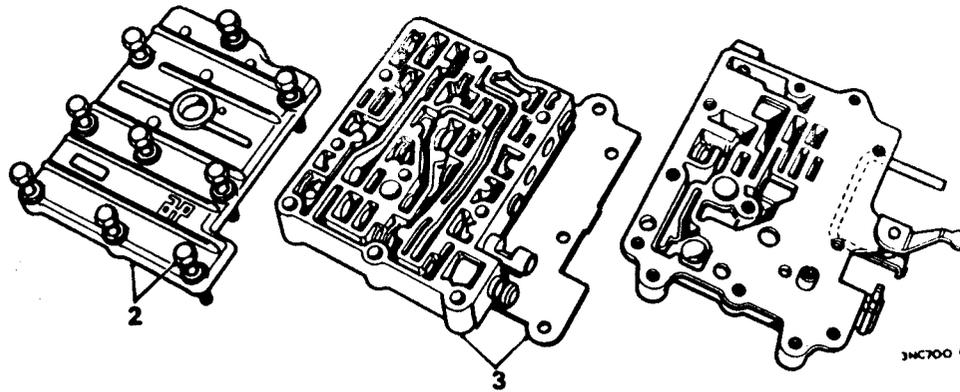
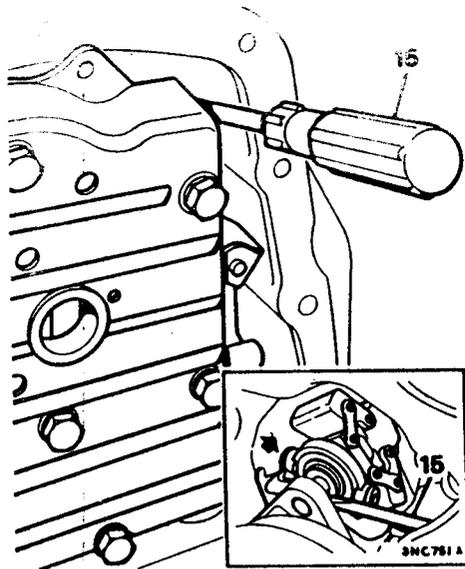
## VALVE BLOCK ASSEMBLY

Overhaul 44.40.04

### Dismantling

1. Remove the valve block assembly, see 44.40.01.

*Note: Before dismantling the valve block it must be remembered that the valves are selected for each bore. It is important to reassemble each valve into its original bore and position. Absolute cleanliness is essential, therefore it is advisable to dismantle the unit on a clean sheet of paper.*



2. Remove the retaining bolts and detach the lid.
3. Remove the valve chest and separator plate from the pipe chest, not the small flap valve fitted between the valve chest and separator plate.
4. Remove the selector valve.
5. Remove the governor valve.
6. Remove the 'C' clips and plugs and withdraw the regulator valve components.
7. Remove the 'C' clips and plug and withdraw the engagement control valve components.
8. Remove the 'C' clips and plugs and withdraw the second and fourth gear valves and components.

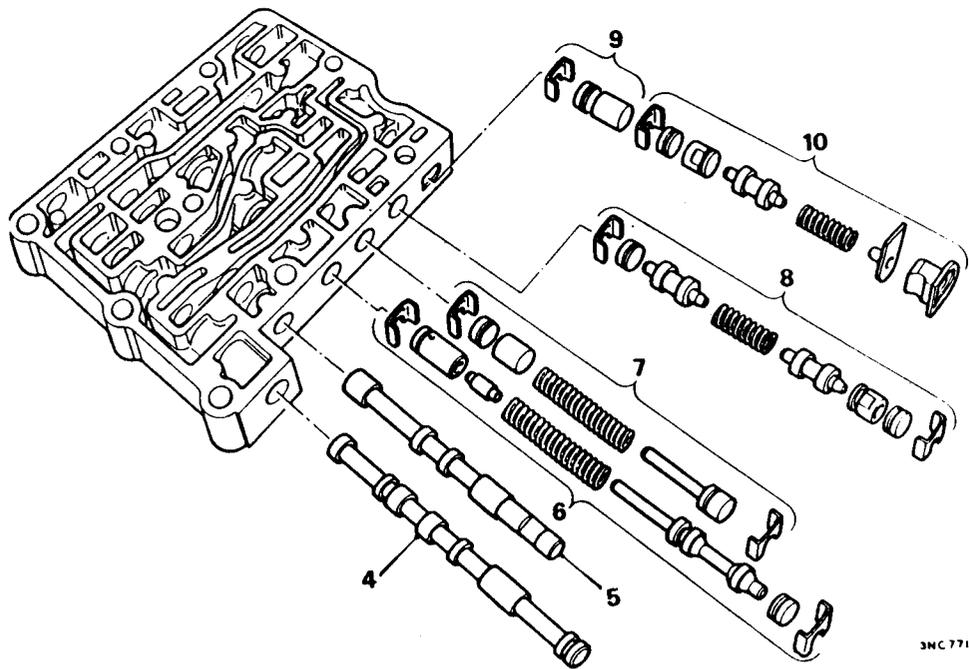
9. Remove the end 'C' clip and extract the plug and one-way dump valve.
10. Remove the centre 'C' clip, plastic end plug and spring retainer; extract the third gear valve components.
11. Pipe chest. The third gear and reverse gear shuttle valves are located in the back of the pipe chest. Depress the abutment plug and remove the retaining washer, third gear shuttle valve and spring.
12. Repeat the procedure in 11 to remove the reverse gear shuttle valve, except that an engagement piston is also fitted in the same bore.

#### Inspecting

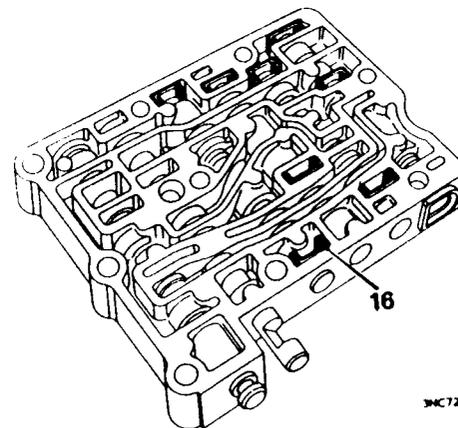
13. Clean all parts thoroughly in clean fuel (petrol) or paraffin (kerosene) and dry off using an air pressure line.
14. Check for burrs on the valves and bores, check that all valves move freely in their respective bores. Immerse all components in clean engine oil before reassembling.

#### Reassembling

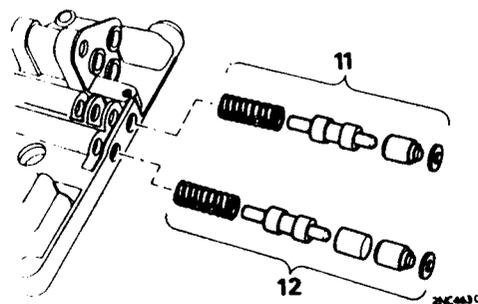
15. Reverse the dismantling procedure in 2 to 12 with the components fitted in the order illustrated.
16. Check that all 'C' clips have been correctly located and fitted as shown in the illustration.



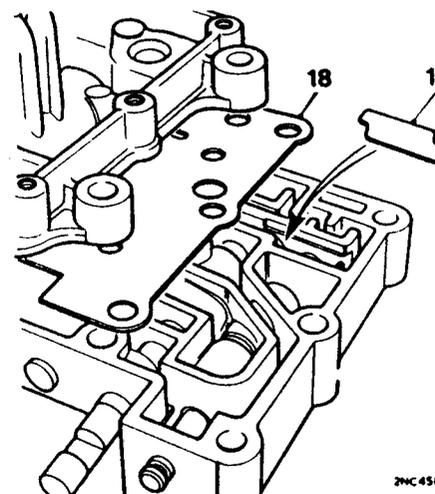
3NC771A



3NC723 A



3NC683C



3NC458 C

17. When refitting the main sections together, start with the valve chest - front face downwards and insert the flap valve into its location (arrowed).
18. Refit the separator plate and pipe chest to the valve chest and locate the governor operating lever with the governor valve, and the selector rod link into the grooved end of the selector valve.
19. Hold the complete assembly together, turn it over, and refit the lid.
20. Tighten the lid retaining bolts, see **'TORQUE WRENCH SETTINGS'**.
21. Refit the valve block assembly, see 44.40.01.

## DRIVE SHAFT

Remove and refit

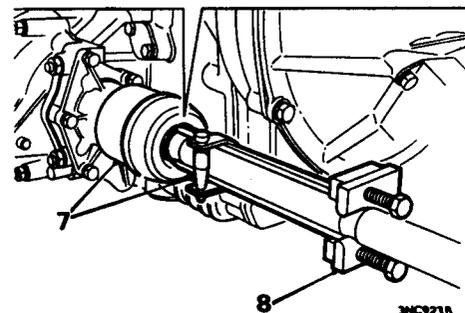
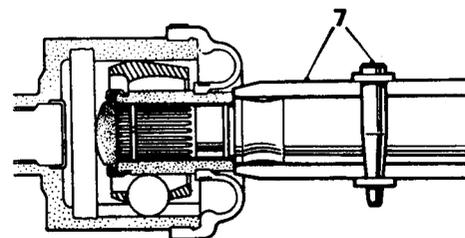
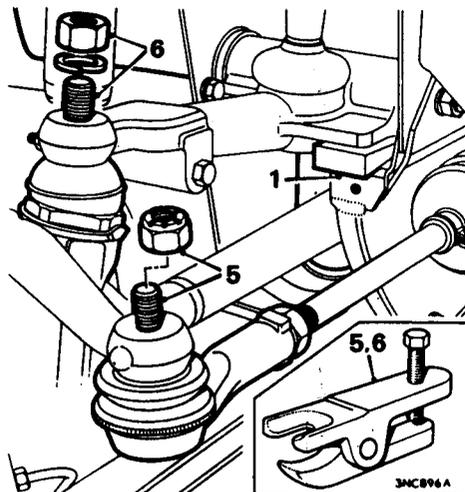
47.10.01

Service tool: 18G 1063, 18G 1243

### Removing

1. Remove the one screw retaining the suspension upper arm rebound rubber and place a solid wedge of the same thickness in its place.
2. Slacken the road wheel nuts.
3. Remove the split pin retaining the drive shaft nut and slacken the nut.
4. Jack up the vehicle, place stands under the sub-frame side members and remove the road wheel.
5. Remove the nut retaining the steering tie-rod ball joint and release the joint from the steering lever, using Service tool 18G 1063
6. Remove the upper swivel hub ball pin retaining nut and spring washer. Release the joint, using Service tool 18G 1063, and refit the retaining nut loosely. Remove the disc shield.
7. Assemble Service tool 18G 1243 to the drive shaft with the tool hard against the inboard joint before inserting the taper pin.
8. Insert the 'U' shaped part of the tool into the groove on the shaft, tighten the two bolts evenly until the drive shaft is released from the inboard joint. Remove the tool.
9. Remove the nut and disconnect the swivel hub ball pin from the suspension upper arm.  
**WARNING: Take care not to stretch the brake hose.**
10. Retain the position of the inboard joint boot and at the same time withdraw the shaft out of the joint.
11. Push the shaft inwards and over the top of the final drive assembly; remove the drive-shaft retaining nut and tap the shaft out of the driving flange.

12. Withdraw the drive shaft out of the swivel hub and then outwards away from the vehicle.
13. Remove the hub bearing water shield.



### Refitting

14. Reverse the procedure in 1 to 13, noting:
  - a position the hub bearing water shield onto the drive shaft as shown;'A' = 0.25 in (6 mm) approximately.
  - b Push the drive shaft smartly into the inboard joint to lock the shaft into the joint.
  - c Tighten the swivel hub ball pin retaining nut, see 'TORQUE WRENCH SETTINGS'.
  - d Tighten the drive shaft nut, see 'TORQUE WRENCH SETTINGS'.

## DRIVE SHAFT BOOT

Remove and refit

47.10.03

Service tool: 18G 1099

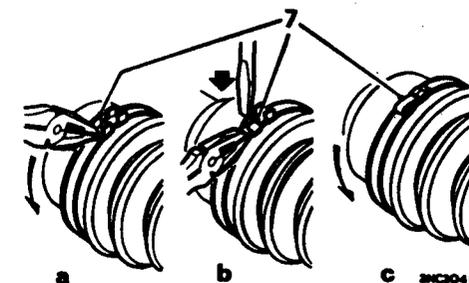
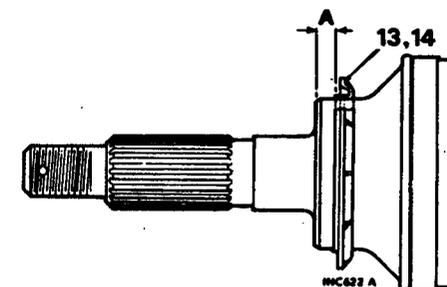
### Removing

1. Remove the drive shaft, see 47.10.01.
2. Cut through the rings securing the boot.
3. Withdraw the boot off the drive shaft.

### Refitting

4. Thoroughly clean the joint assembly.
5. Position the new boot on the drive shaft.
6. Pack the bearing with 1 oz (30 cm<sup>3</sup>) of Duckhams Bentone Grease Q5795.  
**Note: Do not overfill the joint, allowance must be made for the grease remaining in the joint.**

7. Use tool 18G 1099 to secure the boot retaining clips, noting the following:
  - a The clip must be fitted with the fold in the clip facing toward the forward rotation of the drive shaft.
  - b Pull the free end of the clip tightly between the front locking tabs of the clip and close the front locking tabs onto the clip.
  - c Fold the clip back over the front locking tabs and close the rear locking tabs to secure the clip end.



8. Alternative method: Secure the boot to the joint using 20 S.W.G. soft iron wire, wind the wire twice around the boot, twist the ends firmly together several turns and bend the ends away from the direction of rotation.
9. Refit the drive shaft, see 47.10.01.

## CONSTANT VELOCITY JOINT

**Remove and refit** 47.10.04

**Service tool:** 18G 1099

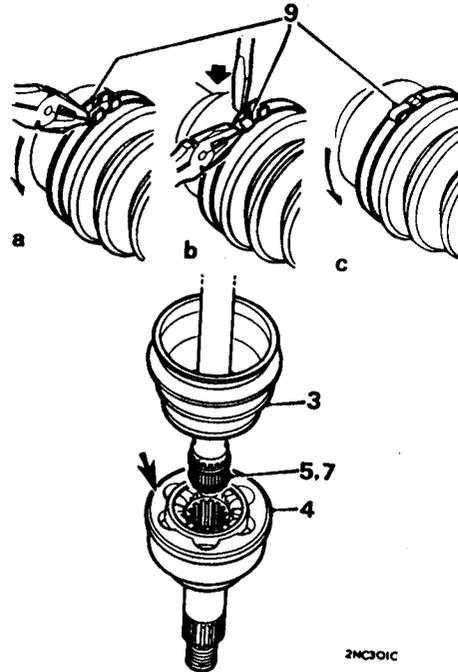
### Removing

1. Remove the drive shaft, see 47.10.01.
2. Cut the ring securing the boot to the outer member of the constant velocity joint.
3. Fold back the boot to expose the joint.
4. Hold the drive shaft vertical, use a soft faced mallet and strike the edge of the constant velocity joint to release it from the drive shaft.
5. Remove the drive shaft spring ring.

### Refitting

6. Thoroughly clean the constant velocity joint assembly.
7. Fit a new spring ring to the drive shaft, compress the ring on the shaft to assist entry of the shaft into the inner member; use a soft faced mallet to drift the drive shaft into the inner member.
8. Pack the bearing with 1 oz (30 cm<sup>3</sup>) of Duckhams Bentone Grease Q5795.
9. Use tool 18G 1099 to secure the boot retaining clip, noting the following:
  - a The clip must be fitted with the fold in the clip facing toward the forward rotation of the drive shaft.

- b Pull the free end of the clip tightly between the front locking tabs of the clip and close the front locking tabs onto the clip.
  - c Fold the clip back over the front locking tabs and close the rear locking tabs to secure the clip end.
10. Refit the drive shaft, see 47.10.01.



2NC301C

## DRIVE SHAFT INBOARD JOINT

**Remove and refit** 47.10.14

**Service tool:** 18G 1063, 18G 1240, 18G 1243

### Removing

1. Withdraw the drive shaft from the inboard joint, but do not unlock or slacken the drive shaft nut, see 47.10.01.
2. Withdraw the drive shaft out of the inboard joint and position the shaft over the top of the final drive housing.
3. Use tool 18G 1240 to release the inboard joint from the final drive; insert the tool between the joint and the final drive end cover and strike the flat face of the tool inwards towards the final drive, this will release the joint.
4. Remove the inboard joint.
5. Detach the oil flinger from the inboard joint.

### Refitting

6. Reverse the procedure in 1 to 5, noting the following:
  - a Fit a new oil flinger if it has been damaged.
  - b Tighten the swivel hub ball pin retaining nuts, see 'TORQUE WRENCH SETTINGS'.

## DRIVE SHAFT INBOARD JOINT BOOT

**Remove and refit** 47.10.16

**Service tool:** 18G 1099 and 18G 1251

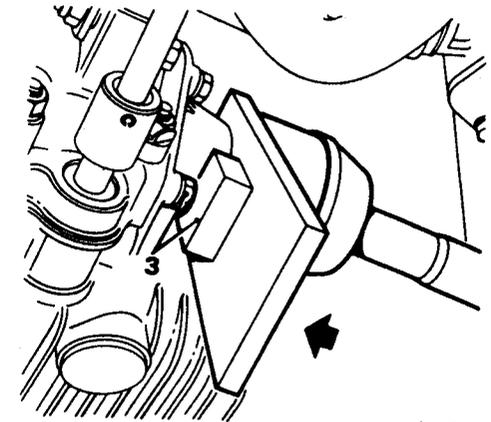
### Removing

1. Remove the drive shaft inboard joint, see 47.10.14.
2. Remove and discard the two retaining rings and the rubber boot from the inboard joint.

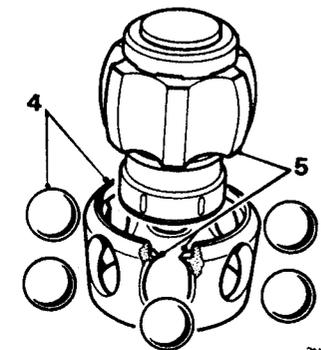
3. Withdraw the joint inner member and ball cage assembly from the joint outer member.
4. Insert a screwdriver between the joint inner member and each ball in turn and push the balls out of the ball cage.
5. Rotate the ball cage until the grooves inside the cage coincide with the lands on the joint inner member and withdraw the cage from the inner member.

### Refitting

6. Clean all components in a cleaning solvent.



6NC 056



2NC305E

7. Assemble the joint inner member, ball cage and balls, reversing the procedure in 4 and 5 and ensuring that the long tapered end of the ball cage faces towards the drive shaft end of the joint inner member.

8. Fit the joint inner member assembly into the joint outer member.

9. Fit a new retaining ring to the inner neck of a new rubber boot, with the chamfered end of the ring towards the inside of the boot.

10. Fold back the boot and, using tool 18G 1251, the mandrel of which must be lubricated with a liquid detergent or rubber lubricant, fit the boot to the joint inner member.

11. Withdraw the joint inner member and boot assembly from the joint outer member and remove all traces of detergent.

12. Pack the joint inner and outer members with 50 cm<sup>3</sup> of Shell S7274 Tivella 'A' grease and fit the inner member into the outer member.

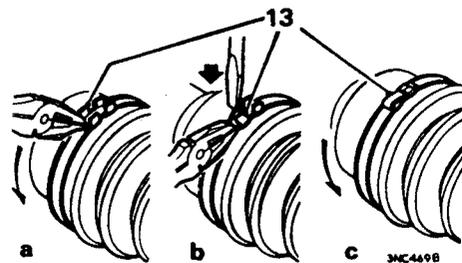
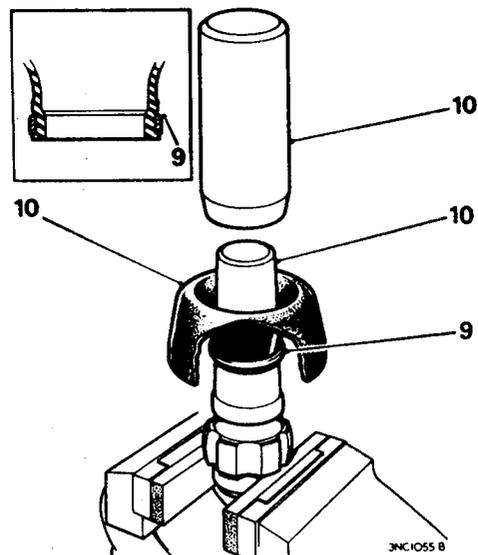
13. Secure the rubber boot to the joint outer member, using a service clip and tool 18G 1099. The clip must be fitted with the fold in the clip facing towards the direction of the joint forward rotation.

a Pull the free end of the clip tightly between the clip front locking tabs.

b Close the front locking tabs onto the clip

c Fold the clip back over the front locking tabs and close the rear locking tabs to secure the clip end.

14. Refit the drive shaft inboard joint, see 47.10.14.





## DIFFERENTIAL, FINAL DRIVE GEAR AND PINION

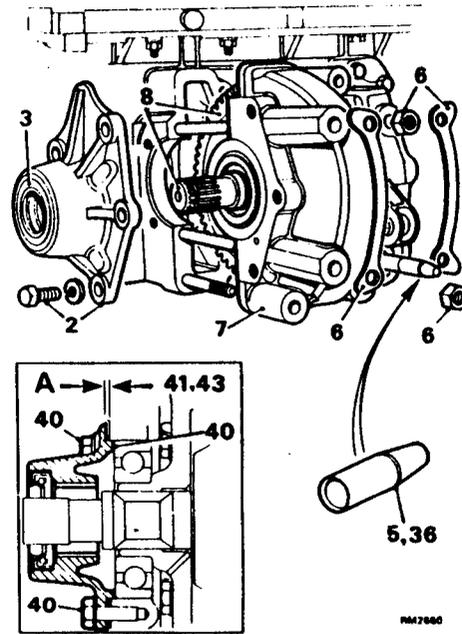
**Overhaul** 54.10.08

**Service tool:** 18G 2, 18G 2 G, 18G 578, 18G 587, 18G 1236, 18G 1238

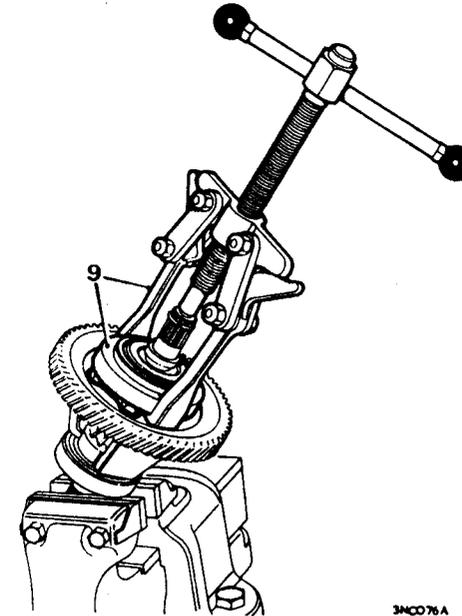
### Dismantling

1. a Remove the engine/gearbox assembly, see 12.37.01.  
b Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Remove the securing screws and detach the final drive end covers: note the adjustment shims fitted beneath the cover on the crown wheel side.
3. Remove the oil seals from the end-covers.
4. Extract the selector shaft detent spring, sleeve and ball.
5. Locate tool 18G 1236 oil seal protector sleeve over the selector shaft.
6. Knock back the locking plate tabs from the final drive housing securing nuts, remove the nuts and locking plates.
7. Pull off the final drive housing; discard the oil seal and remove the nylon bush (if fitted) noting the type of bush fitted, i.e with or without an 'O' ring.
8. Remove the final drive/differential unit.
9. Use tools 18G 2 and 18G 2 G to pull the bearings off the differential cage. The bearings are marked 'THRUST' on their outer face.
10. Mark the crown wheel and differential cage for assembly purposes.
11. Tap back the locking plate tabs and remove the crown wheel securing bolts.
12. Remove the crown wheel complete with the differential gear which is located in it.

13. Pull the differential gear out of the crown wheel.
14. Drift out the roll-pin retaining the differential pinion in the direction indicated.
15. Drift out the pinion pin.
16. Remove the differential gear thrust block.



17. Remove the pinions and thrust washers.
18. Withdraw the other differential gear and washer.
19. Remove the speedometer drive gear pinion, see 37.25.05.
20. Remove the speedometer drive housing, see 37.25.09.
21. Knock back the lock washer tab from the final drive gear pinion nut.



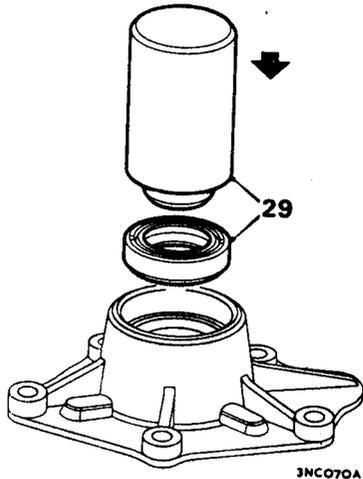
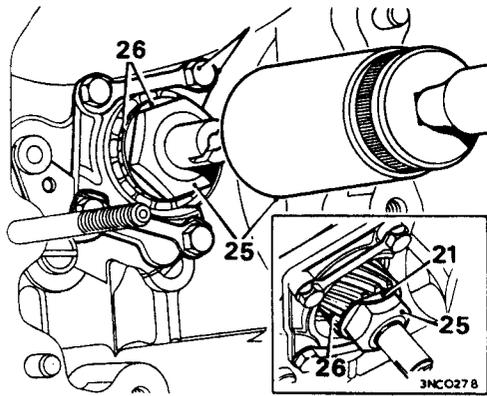
22. Rotate the selector shaft anti-clockwise to disengage the operating stub and the interlock spool from the bellcrank levers.
23. Lever the first/second speed selector fork towards the centre web of the gearbox casing to engage first gear.
24. Use a screwdriver and carefully drift the centre bellcrank lever inwards to select fourth gear; the gear train is now locked in two gears.
25. Use tool 18G 587 to remove the final drive gear pinion securing nut.
26. Withdraw the final drive gear pinion and lock washer.

### Inspecting

27. Clean and examine all components for wear or damage. Fit new pinion and differential gears as a complete set if any are worn and reassemble with new thrust washers. If it is necessary to renew the crown wheel and/or pinion they must be renewed as a pair.

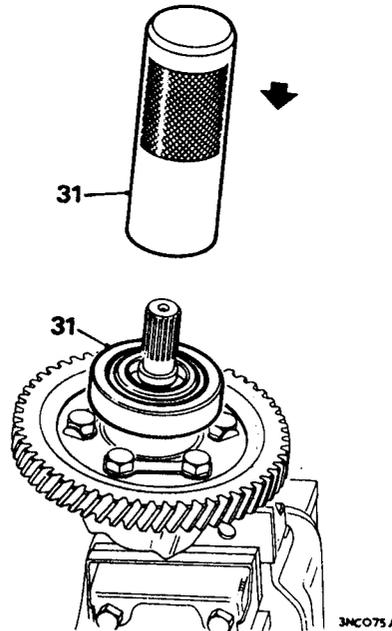
### Reassembling

28. Reverse the procedure in 4 to 26, noting the following:
  - a Clean off all traces of the old joint washers and check all joint faces are free from burrs; fit new joint washers.
  - b Fit new locking washers and plates.
  - c Tighten the nuts and bolts securing the various components to the torque figures given in 'TORQUE WRENCH SETTINGS' and tap over the locking plate tabs.
29. Fit new oil seals into the differential end-covers, using tool 18G 1238.
30. Move the selector bellcrank levers into the neutral position and rotate the interlock spool and selector shaft stub into engagement with the bellcrank levers.
31. Use tool 18G 578 to drift the bearings onto the differential cage with their 'THRUST' markings facing outwards.
32. Refit the final drive/differential unit into the gearbox casing with a slight bias towards the flywheel end the engine.
33. Fit the nylon bush and 'O' ring (if applicable) into the final drive housing. Smear bush and 'O' ring with lithium based grease prior to fitting.



**CAUTION:** Two types of bush may be fitted, one with and one without an 'O' ring; the bushes are not interchangeable. Bushes with 'O' rings may be fitted to early gearboxes which did not have the nylon bush fitted.

34. Fit a new selector shaft oil seal; smear seal with clean engine oil prior to fitting.



35. After fitting seal, check the nylon bush does not protrude beyond the face of the final drive housing.
36. Fit oil seal protector sleeve 18G 1236 over the selector shaft, then fit the differential and housing, taking care not to disturb the nylon bush.
37. Fit new locking plates and screw on all securing nuts sufficiently to hold the final drive unit firmly and yet allow the unit to be displaced by the fitting of the end cover on the flywheel.
38. Refit the end cover (flywheel end) together with a new joint washer; ensure the the oil holes in the end cover are aligned with those on the final drive housing.

39. Tighten the screws evenly in diagonal sequence to ensure maximum contact between the inner face of the cover and the bearing outer race.

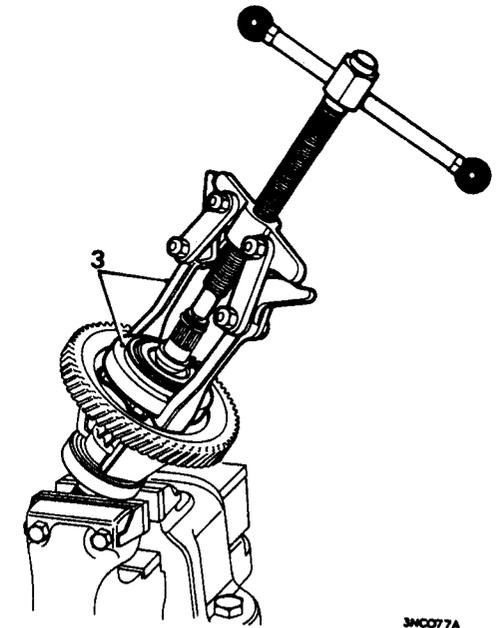
**Note:** As the screws are tightened the final drive differential unit will be displaced away from the flywheel converter end of the engine to allow the bearing pre-load adjustment to be carried out.

40. Bearing pre-load adjustment: Fit the other end cover without its joint washer shims and tighten the securing screws in diagonal sequence just sufficiently for the cover register to nip the bearing outer race; overtightening will distort the cover flange.

41. Take feeler gauge measurements in several positions between the cover flange and the gearbox final drive housing; variations in measurement will indicate that the cover securing screws have not been tightened evenly; adjust the tension on the screws accordingly until the same reading is obtained in all positions.

**Note:** If no gap exists between the flange and the housing, remove the cover and add a known thickness of shims between the cover and bearing to produce a clearance. The thickness of shims fitted must be included in the calculation of the pre-load shim requirement.

42. The clearance 'A' between the cover flange and housing is taken up by the new joint washer which has a compressed thickness of 0.007 in (0.18 mm), plus the necessary number of shims to give the pre-load required; see the example given below:



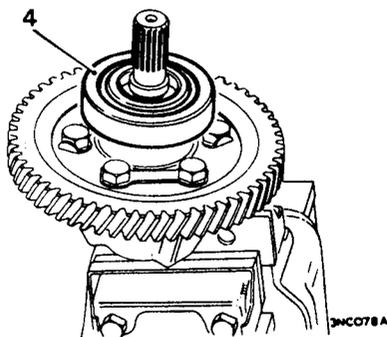
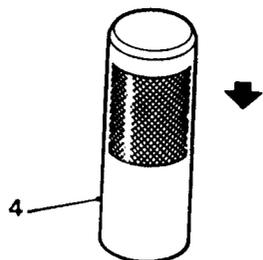
**Example:**

Joint washer (compressed thickness)	0.007 in (0.18 mm)
Measure clearance 'A'	0.005 in (0.13 mm)
Therefore endfloat (without shims) =	0.002 in (0.05 mm)
Mean pre-load required	0.004 in (0.10 mm)
Therefore thickness of shims required =	0.006 in (0.15 mm)

43. Smear the adjustment shims with grease and fit them to the thrust face of the bearing.

Fit the new joint washer, refit and tighten the end cover securing screws, see 'TORQUE WRENCH SETTINGS'.

44. a Refit the engine/gearbox assembly, see 12.37.01.  
 b Refit the engine/automatic gearbox assembly, see 12.37.01.



## DIFFERENTIAL CAGE BEARINGS

Remove and refit 54.10.12

Service tool: 18G 2, 18G 2 G, 18G 578

### Removing

1. a Remove the engine/gearbox assembly, see 12.37.01.  
 b Remove the engine/automatic gearbox assembly, see 12.37.01.
2. Remove the differential/final drive gear assembly from the power unit, see the procedure in 54.10.08.
3. Use tools 18G 2 and 18G 2 G to pull the bearings off the differential case. The bearings are marked 'THRUST' on their outer face.

### Refitting

4. Drift the bearings onto the differential cage using tool 18G 578, with the 'THRUST' markings facing outwards.
5. Refit the final drive/differential unit into the gearbox casing, see the procedure in 54.10.08.
6. a Refit the engine/gearbox assembly, see 12.37.01.  
 b Refit the engine/automatic gearbox assembly, see 12.37.01.

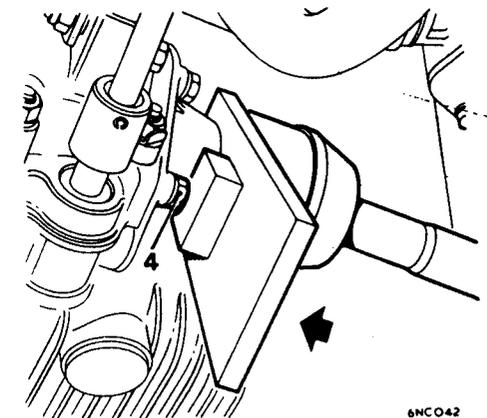
## DIFFERENTIAL END COVER OIL SEAL

Remove and refit 54.10.17

Service tool: 18G 1063, 18G 1238, 18G 1240

### Removing

1. Raise the front of the car and place stands beneath the body front side-members.
2. Drain the engine/gearbox oil.
3. Remove the road wheel.
4. Use tl 18G 1240 to release the required drive shaft inboard joint from the differential.
5. Release and disconnect the suspension lower arm from the swivel hub, using tool 18G 1063.
6. Release and disconnect the suspension upper arm from the swivel hub, using tool 18G 1063.
7. Support the swivel hub assembly to avoid stretching the hydraulic brake hose.
8. Withdraw the drive shaft assembly complete with the inboard joint out of the differential sufficiently to enable the differential end cover to be removed.
9. Locate the upper swivel pin into the suspension arm and screw the securing nut on loosely to hold the swivel hub and avoid stretching the brake hose.
10. Remove the differential end-cover as detailed below:
  - a Left-hand side: Remove the securing screws and withdraw the end-cover complete with its joint washer, note that the adjustment shims are fitted against the face of the differential cage bearing.
  - b Right-hand side: Remove the securing screws and withdraw the end-cover complete with its joint washer; note that the cover



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is under tension from the gearbox selector shaft detent spring which will be partly exposed.

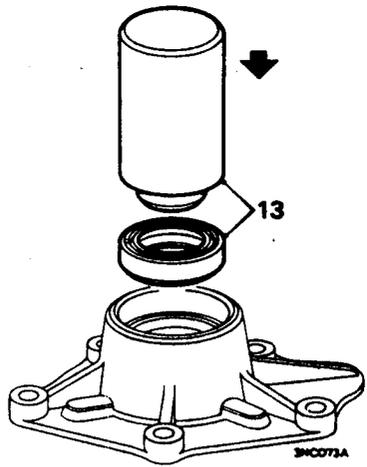
11. Remove the old seal from the end-cover.
12. Clean off all traces of the old joint washer from the mating faces of the cover and housing.

### Refitting

13. Use tool 18G 1238 to drift the new oil seal into the end-cover.
14. Fit a new joint washer to the end-cover.
15. Reverse the procedure in 1 to 10, noting the following: Tighten the end cover retaining screws, see 'TORQUE WRENCH SETTINGS'.

## DATA

Bearing pre-load .....	0.004 in (0.1 mm)
Differential bearing shim sizes available .....	0.002 in (0.05 mm)
	0.006 in (0.15 mm)
	0.010 in (0.25 mm)
	0.020 in (0.50 mm)





## STEERING RACK AND PINION

Remove and refit

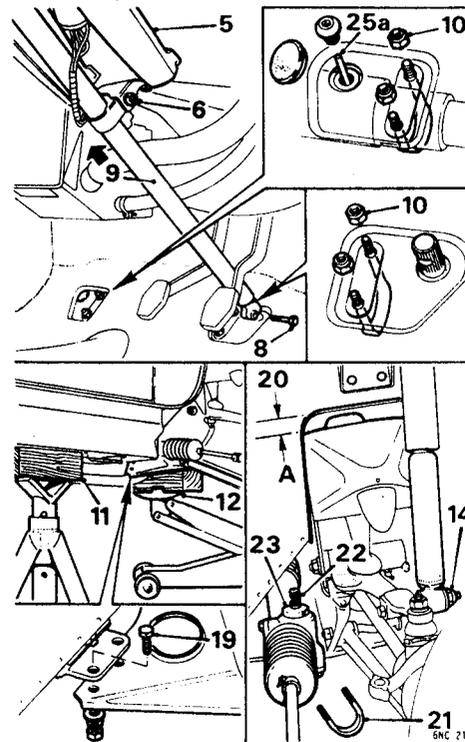
57.25.01

Service tool: 18G 1063

### Removing

1. Remove the air cleaner assembly - **Not Turbo Models**.
2. **Turbo Models only:** Remove the centre console, see 76.25.01. Remove the screws securing the clock and switch panel to the heater unit; move the panel aside.
3. **All Models:** Remove the exhaust pipe to manifold clamp.
4. Slacken the bracket screw and remove the bolt securing the top engine steady rod to the block, noting the earthing cable and large washer (if fitted). Turn the bracket to the upright position and push the steady rod aside.
5. Remove the two bolts securing the sub-frame turrets to the body cross-member.
6. Remove the right-hand cowl from the steering column.
7. Slacken the column clip shear bolt, make a saw cut and use a screwdriver.
8. Pull back the covering from the toe-board.
9. Remove the column to pinion pinch bolt.
10. Pull the column upwards to free it from the pinion.
11. Remove the four locknuts securing the rack 'U' bolts to the toe-board.
12. Slacken the front road wheel nuts, raise and support the vehicle under the edge of the floor panel to the rear of the slinging bracket. Use wooden blocks against the floor.
13. Position a jack and cross beam with support pads under the sub-frame (below the lower arm pivot point).

14. Remove the road wheels.
15. Disconnect the dampers from the suspension top arms.
16. Remove the ball pin locknuts and disconnect the ball joints from the steering arms, using tool 18G 1063.
17. Disconnect the exhaust pipe steady clamp from the engine bracket.
18. Remove the through bolt (lever housing over as necessary) and free the gear change housing from its bracket.
19. Slacken the front sub-frame mounting to body centre bolts.
20. Remove the four screws securing the rear mountings to the sub-frame.



21. Lower the rear of the sub-frame to give a gap of 20 mm (0.75 in) between the top of the turret and the valance aperture 'A'. Use a wedge if required.
22. Extract the 'U' bolts and plastic anti-friction strips from between the rack tube and the sub-frame.
23. Move the rack downwards and turn to bring the pinion vertical to clear the aperture. Carefully manoeuvre out from between the sub-frame and body on the driver's side.
24. Remove the pinion housing to body seal.

### Refitting

25. Remove the centralizing plug from the rack tube.  
New rack assembly: Check that the rack contains grease - refill if necessary see 'LUBRICATION CAPACITIES'.
26. Reverse the procedure in 1 to 23, use new plastic anti-friction strips if required, noting the following:
  - a Align the pinion and centre column:
    - i Fit the rack and leave the 'U' bolts slack.
    - ii Remove the grommet from the toe-board. Centralize the rack and insert a 6 mm (0.25 in) diameter dowel (e.g drill shank) through the rack casing and engage the hole in the rack.
    - iii Hold the steering wheel with its spokes horizontal/centre spoke vertical and engage the pinion splines. Remove the dowel. Turn the steering from the lock to lock.
    - iv Fit and tighten the pinion clamp bolt.

- v With the rack 'U' bolts still slack, offer up the column clip to the parcel shelf clamp plate, there **MUST NOT** be any sideways strain to align the two. Should any sideways strain occur, slacken the parcel shelf clamp plate screws, align the clip into the clamp plate and fit a new shear bolt. Tighten the parcel shelf clamp plate screws.
  - vi Tighten the 'U' bolts progressively a half-turn at a time. Ensure that the thread on each 'U' bolt protrudes equally through each nut.
  - vii Torque tighten the new shear bolt to shear the head.
- b Tighten the following to the figures given in '**TORQUE WRENCH SETTINGS**':
    - Column to pinion clip bolt
    - Rack 'U' bolt nuts
    - Column clip shear bolt
    - Tie-rod ball pin nut
    - Road wheel nuts
27. Check front wheel alignment, see '**MAINTENANCE**'.

## STEERING RACK HOUSING SEAL

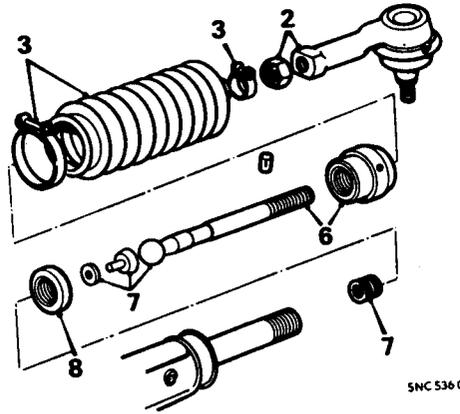
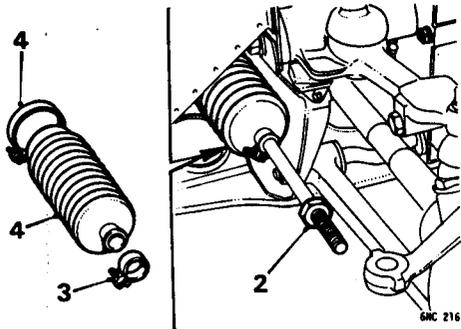
Remove and refit

57.25.02

Service tool: 8G 1063

### Removing

1. Remove the ball joint from the steering tie-rod, see 57.55.02.
2. Remove the ball joint locknut.
3. Remove the small clip securing the seal to the tie-rod.
4. Slacken the large clip or remove the wire clip and pull the seal from the rack housing and tie-rod.



### Refitting

5. Wipe the tie-rod and the end of the housing clean.
6. Reverse the procedure in 1 to 4, noting:
  - a. Lubricate the contact area of the seals, position the large clip on the seal and push the seal onto its location on the housing.
  - b. Inject the correct quantity of the recommended oil, see 'CAPACITIES AND LUBRICANTS'.
  - c. Fit the ball joint and check front wheel alignment.

## STEERING RACK AND PINION

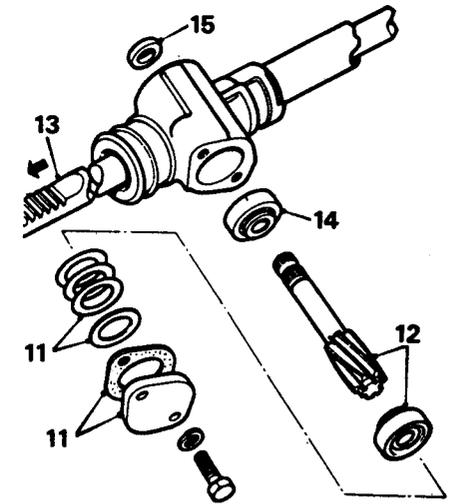
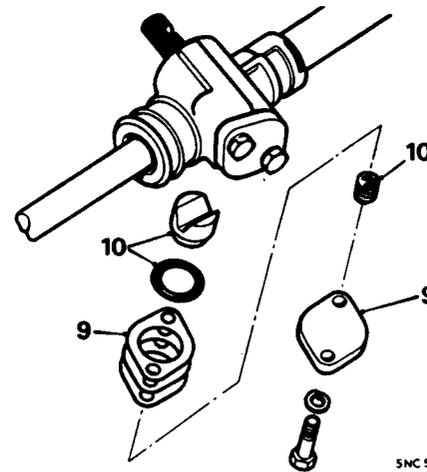
Overhaul 57.25.07

Service tool: 18G 207, 18G 207 A, 18G 1278

### Dismantling

1. Remove the steering rack and pinion assembly, see 57.25.01. Hold the unit in a vice.
2. Slacken the ball joint locknuts and remove both ball joints and locknuts from the steering tie-rods.

3. Remove the small clips, slacken the large clips (or cut wire) and remove the seals and clips. A quantity of oil will be released.
4. Drain the oil from the rack housing.
5. Drill out the grooved pin securing each ball housing: 3.97 mm dia x 4 mm deep  $5/32$  in dia x  $5/32$  in deep.
6. Unlock and unscrew each ball housing, using tool 18G 1278. *Note: If they are to be refitted, the tie-rod, ball seat, ball housing and locknut must be refitted to the end from which they were removed.*
7. Withdraw the tie-rod ball seat and thrust spring from each end of the rack.
8. Unscrew the locknuts from the rack.
9. Remove the rack damper cover plate together with its shims.
10. Withdraw the damper thrust spring, support yoke and 'O' ring seal from the rack housing.
11. Remove the pinion end-cover, joint washer and shims.
12. Push out the pinion and the lower bearing.



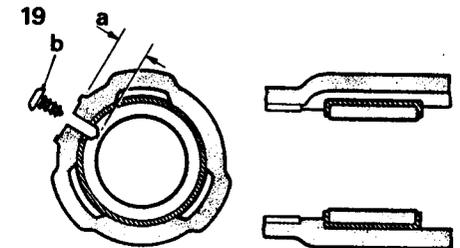
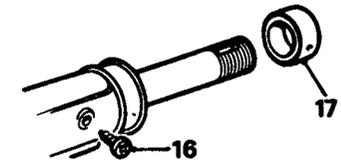
13. Withdraw the rack from the pinion end of the rack housing. **CAUTION:** The rack teeth will damage the rack bush if the rack is withdrawn from the plain end of the rack housing.
14. Withdraw the pinion upper bearing from the rack housing.
15. Extract the pinion oil seal from the rack housing.
16. Remove the rack bush retaining screw (or rivet).
17. Extract the rack bearing assembly.

### Inspecting

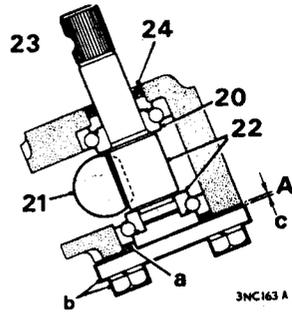
18. Clean all parts and examine for wear; particularly the rack and pinion teeth, tie-rod ball housing and seat, ball end socket and rack seals. Fit new parts as necessary.

### Reassembling

Lubricate internal components before assembling.



19. Fit a new bearing into the rack housing and against the backing disc.
  - a Drill a 3.0 mm ( $\frac{1}{16}$  in) dia. blind hole into the rack bush, through the retaining screw hole, to a depth of 10.5 mm (0.42 in) measured from the spot facing of the screw hole.
  - b Coat the retaining screw with sealing compound and after tightening the screw check that the bush bore is not distorted.



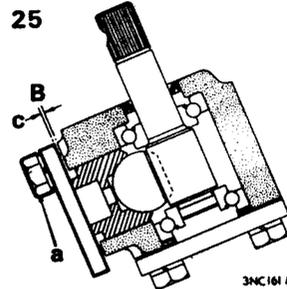
20. Fit the upper bearing to the pinion and push the upper bearing fully into the rack housing. Remove the pinion.
21. Insert the rack into the housing from the pinion end. Centralize the rack and insert 6 mm (0.25 in) dia. dowel through the rack casing and engage the hole in the rack.
22. Fit the pinion and lower bearing.
23. Fit the pinion and cover pre-loading the bearing as follows:
  - a Fit the bearing shims until the pack stands proud of the pinion housing.
  - b Fit the pinion end-cover and tighten the bolts lightly and evenly.

- c Measure the gap 'A' between the end-cover and the rack housing.
- d Remove the end-cover and adjust the shim pack to obtain a gap as given in **DATA**, ensuring the standard shim is against the end-cover.
 

Shims available as follows:

  - 0.002 in 0.06 mm
  - 0.005 in 0.13 mm
  - 0.010 in 0.25 mm

Standard shim  
0.060 in 1.52 mm
- e Fit a new joint washer, apply sealing compound to the threads of the bolt adjacent to the damper cover, and tighten the end-cover bolts.

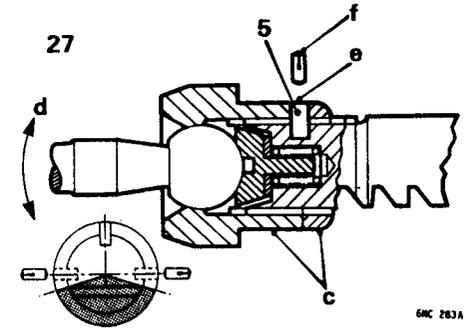


24. Fit a new pinion oil seal flush with the end of the housing and with its sealing lips towards the pinion bearing.
25. Fit the cover-plate and rack support yoke and adjust as follows:
  - a Tighten the cover-plate bolts evenly until the rack is lightly clamped by the support yoke.
  - b Remove the rack centralizing dowel. Turn the pinion through 180° in each direction and, if necessary, adjust the cover-plate bolts to obtain free movement without binding.

- c Measure the clearance 'B' between the cover-plate and housing, use a feeler gauge.
- d Remove the cover-plate and reassemble, fitting a new 'O' ring seal to the support yoke and shims to the value of the feeler gauge measurement plus support yoke to cover plate clearance - **DATA**.
- e Tighten the cover-plate bolts.
- f Turn the pinion through 180° in each direction from centre and ensure there is no tightness or binding.
 

Fit tools 18G 207 and 18G 207 A to the pinion, ensure all moving parts are well lubricated, and check the torque load required to start movement of the pinion, which must not exceed 15 lbf in, 0.17 kgf m.

26. Centralize the rack and insert the dowel.
27. Fit and adjust each tie-rod as follows:
  - a Screw a ball housing locknut onto each end of the rack to the limits of the thread.



- b Locate the thrust spring and ball seat in the end of the rack. Insert the tie-rod in its ball housing, well lubricate the ball and tighten the ball housing until the tie-rod ball is pinched.
- c Screw the locknut up to the ball using, slacken the ball housing one-eighth of a turn and tighten the locknut, using tool 18G 1278; ensure that the housing does not turn.
- d Attach a spring balance to the end of the tie-rod and check that the torque required to articulate the joint is between 32 to 52 lbf

## DATA

Pinion bearing pre-load	0.001 to 0.003 in	0.025 to 0.076 mm
Shim gap	0.011 to 0.013 in	0.28 to 0.33 mm
Rack support yoke to cover-plate clearance	0.002 to 0.005 in	0.05 to 0.13 mm
Ball pin centre dimension	41.64 in	10.56 mm
Rack travel either side of centre	2.10 in	53.34 mm
Pinion turns lock to lock	2.8	

in, 0.36 to 0.59 kgf m. Adjust the ball housing to obtain the correct pre-load on the ball joint.

- e Protect the rack housing from swarf and drill between the housing and locknut to the specified depth:  
3.97 mm dia x 8.00 mm deep.  
 $\frac{5}{32}$  in dia x  $\frac{5}{16}$  in deep.

**CAUTION:** The rack end must not be drilled more than three times and at least 90° from a previous drilling and **DO NOT** drill in the arc subtended by the teeth.

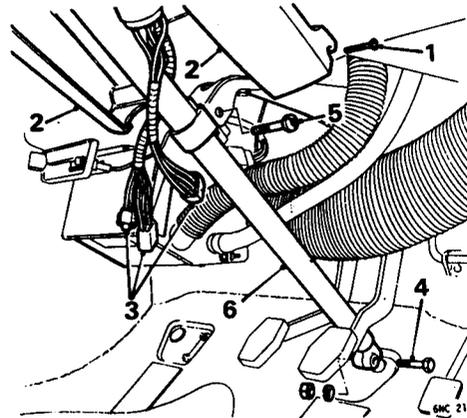
- f Drive in a grooved pin and retain by peening over the edge of the hole four times using a chisel.
28. Fit one of the rack seals and secure, hold the rack assembly upright and pour in the correct quantity and grade of oil, see 'CAPACITIES AND LUBRICANTS'.  
Fit the second rack seal and secure
  29. Screw the ball joint locknut onto the tie-rods and screw on each ball joint an equal amount until the ball-pin centre dimension is as given in **DATA**.  
Tighten the locknuts sufficiently to prevent the ball joints turning.
  30. Refit the steering rack and pinion assembly, see 57.25.01

## STEERING COLUMN ASSEMBLY

Remove and refit 57.40.01

### Removing

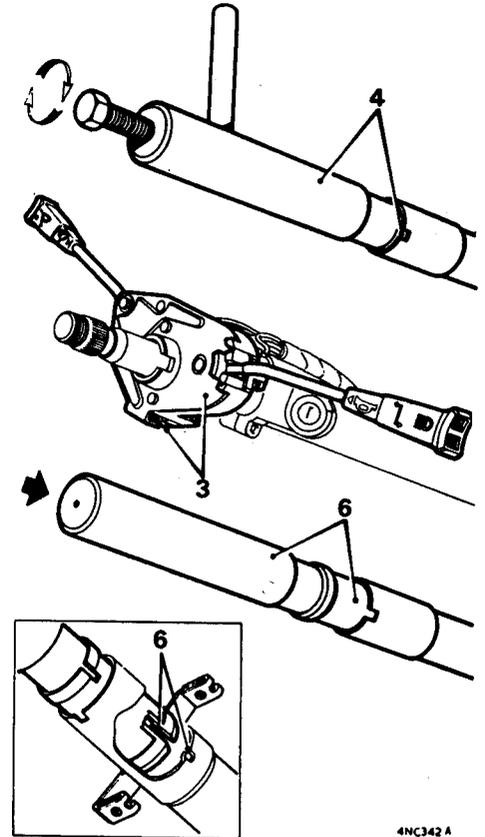
1. Remove the screw from the bottom of the cowl.
2. Unscrew the screws securing the two halves of the cowl to the column bracket and withdraw the cowl.
3. Disconnect the three wiring multi-connectors located under the panel.
4. Remove the column to pinion pinch bolt.



5. Remove the column clip shear bolt. Cut a slot in the head of the bolt or use an extractor.
6. Set the road wheels in the straight ahead position. Pull the column from the pinion and remove the steering column assembly.

### Refitting

7. Centralize the steering rack: Pull back the floor covering and remove the floor grommet. Use an Allen key and remove the plug from the rack tube. Insert a 6 mm, 0.25 in diameter dowel through the rack tube and engage the hole in the rack.
8. Hold the column with the steering wheel spokes horizontal/centre spoke vertical and fit the column onto the pinion.
9. Fit the new shear bolt and leave slack. Tighten the column to pinion pinch bolt.
10. Remove the dowel and refit the plug and grommet. Ensure the column is aligned with the pinion, see 57.25.01.
11. Position the outer column to give 2 mm,  $\frac{1}{16}$  in. clearance 'B' between the steering wheel hub and the boss of the indicator switch.
12. Fully tighten the shear bolt.
13. Reconnect the wiring multi-connectors and refit the cowl.



## STEERING COLUMN TOP BUSH

Remove and refit 57.40.09

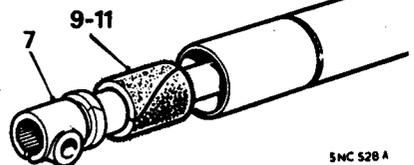
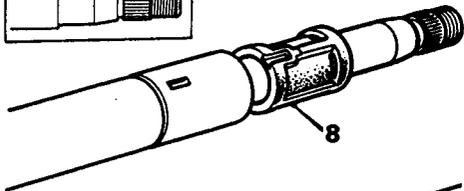
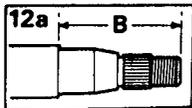
Service tool: 18G 1191

### Removing

1. Disconnect the battery.
2. Remove the steering wheel, see 57.60.01.
3. Loosen the retaining screws and lift the combined indicator/wiper/wash switch over the end of the column.
4. Fit tool 18G 1191 into the top bush and extract the bush from the column.

### Refitting

5. Smear the inside surface of the bush and fill the grooves with a graphite grease.
6. Using tool 18G 1191, drive the bush chamfered end first into the column ensuring that the shouldered slot in the bush engages the detent in the outer column.
7. Reverse the procedure in 1 to 3.



SNC 528 A

## STEERING COLUMN ASSEMBLY

Overhaul 57.40.10

Inner column 1 to 3, 5 to 9, 11 and 12  
57.40.03

Service tool: 18G 2, 18G 2 E, 18G 1191

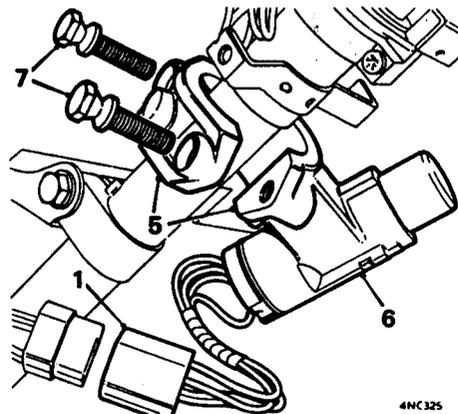
### Dismantling

1. Remove the steering column assembly, see 57.40.01.
2. Prise the hub cover from the centre of the steering wheel.
3. Hold the column clamp in a vice and remove the wheel retaining nut and lockwasher.
4. Mark the wheel hub and inner column for refitting reference.
5. Pull the steering wheel from the inner column, using tool 18G 2 and 18G 2E.
6. Slacken the retaining screw and remove the indicator/wiper/washer switch.
7. Pull the inner column from the outer column.
8. Extract the top bush from the outer column, use tool 18G 1191 if required.
9. Extract the felt bush from the bottom of the outer column.

10. Extract the shear bolts and remove the ignition/steering lock.

### Assembling

11. Soak the new felt bush in oil.
12. Lubricate the bore and grooves of the top bush with a graphite grease. Fit the top bush, using tool 18G 1191, chamfered end first ensuring that the shouldered slot engages the detent in the outer column.
13. Pass the outer column over the inner column and insert the felt bush into the lower end of the outer column.
14. Reverse the procedure in 1 to 6, noting:
  - a Fit the ignition/steering lock and **check its action before shearing the bolts**.
  - b Refit the steering wheel, see 57.60.01.



4NC325

## STEERING COLUMN LOCK AND IGNITION STARTER SWITCH

Remove and refit 57.40.31

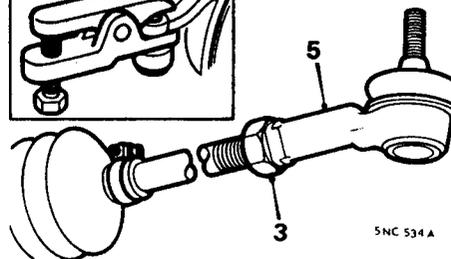
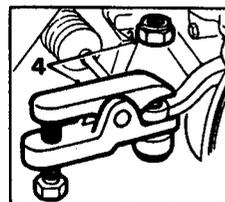
Ignition starter switch (86.65.03)

### Removing

1. Disconnect the ignition switch multi-connector and release the clip retaining the cable.
2. Remove the securing screws and separate the cowl halves.
3. Drill out the shear bolt heads from the clamp plate. Alternatively: Use an extractor to remove the bolts.
4. Free the lock assembly from the clamp plate.

### Refitting

5. Centralize the lock body over the slot in the outer column and fit the clamp plate, but do not shear the bolt heads.
  6. Connect the ignition/starter switch multi-plug.
- Check that the steering lock and switch operate correctly.**
7. Tighten the new shear bolts until the heads break off.
  8. Reverse the procedures in 1 and 2.



SNC 534 A

## STEERING TIE-ROD BALL JOINT

Remove and refit 57.55.02

Service tool: 18G 1063

### Removing

1. Apply the hand brake, slacken the road wheel nuts, jack-up and support one side.
2. Remove the road wheel.
3. Slacken the ball joint locknut.
4. Remove the ball pin locknut and disconnect the ball joint from the steering lever, using tool 18G 1063.
5. Unscrew the ball joint from the tie-rod.

### Refitting

6. Reverse the procedure in 1 to 5 noting:
  - a Ensure the tie-rods are equal in length, exposed thread length equal.
  - b Tighten the following to the figure given in 'TORQUE WRENCH SETTINGS'.  
Ball joint locknut  
Road wheelnuts.
7. Check front wheel alignment and adjust if necessary, see 'MAINTENANCE'.

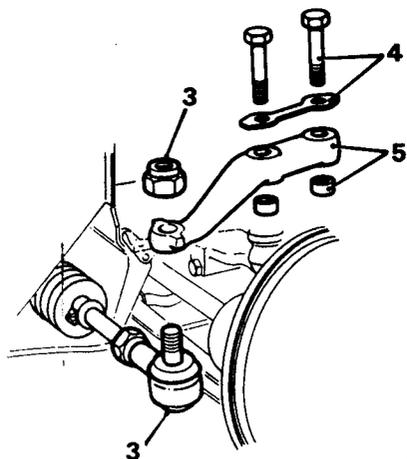
## STEERING LEVER

Remove and refit 57.55.29

Service tool: 18G 1063

### Removing

1. Apply the handbrake, slacken the road wheel nuts, jack-up and support one side.
2. Remove the road wheel.
3. Remove the ball pin locknut and disconnect the ball joint from the steering lever, using tool 18G 1063.



SNC 535 A

4. Release the lock washer tabs and remove the bolts.
5. Remove the steering wheel from the swivel hub and extract the two ring dowels.

#### Refitting

6. Reverse the procedure in 1 to 5, noting:
  - a Ensure the mounting faces on the hub and steering arm are clean.
  - b Use a new lock washer and, if necessary, renew the ring dowels.
  - c Tighten the following to the figure given in 'TORQUE WRENCH SETTINGS'.
    - Steering lever to hub bolts
    - Ball joint lock nut
    - Road wheel nuts.

## STEERING WHEEL

Remove and refit 57.60.01

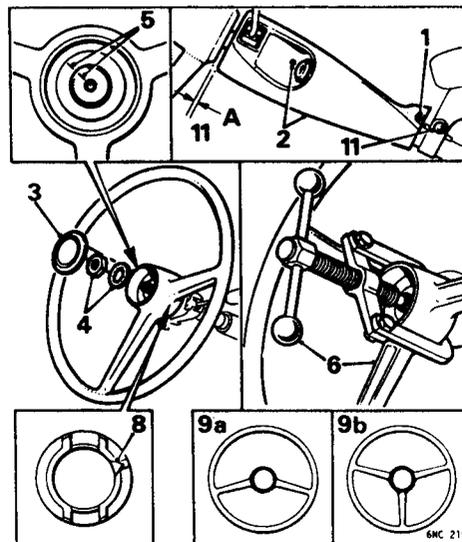
Column cowl, 1, 2 and 11 57.40.29

Service tool: 18G 2, 18G 2 E

#### Removing

1. Remove the screw from the bottom of the cowl.
2. Unscrew the screws securing the two halves of the cowl to the column bracket and withdraw the cowl.
3. Prise the hub cover from the centre of the steering wheel.
4. Remove the wheel retaining nut and lock washer.
5. Mark the wheel hub and inner column for refitting reference.
6. Pull the wheel from the inner column, using toll 18G 2 and 18G 2 E.

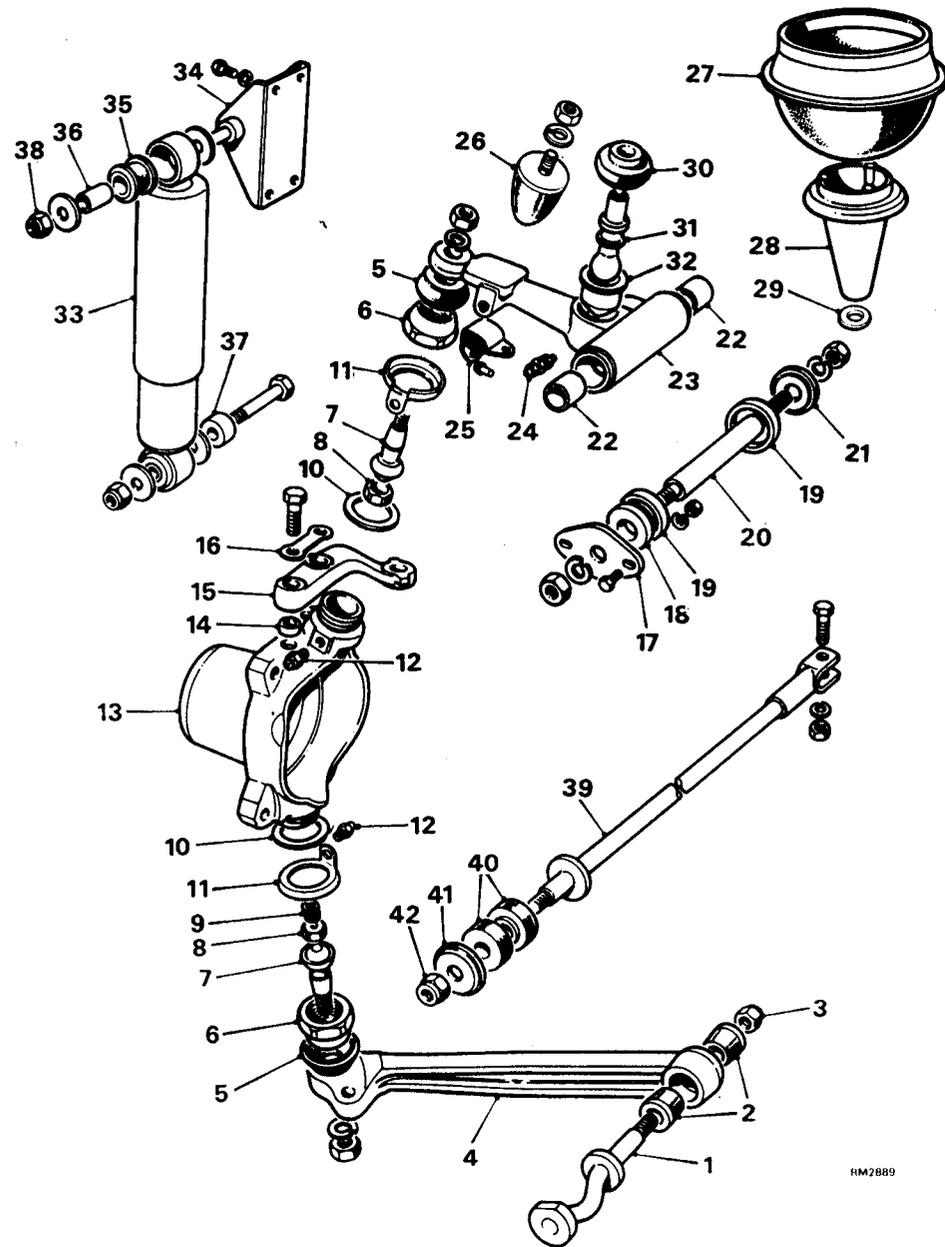
8. Align the slots in the switch bush with the wheel hub, ensuring the triangle is pointing towards the horn push.
9. Fit the steering wheel.
  - a Spokes horizontally.
  - b Centre spoke vertical.
10. Tighten the wheel nuts to the figure given in 'TORQUE WRENCH SETTINGS'. Refit the hub cover.
11. Set the cowl to give a clearance of 3 mm ( $\frac{1}{8}$  in) from the wheel hub 'A', slacken the clamp bolt and move the outer column as necessary.



#### Refitting

7. Set the road wheels in the straight ahead position.



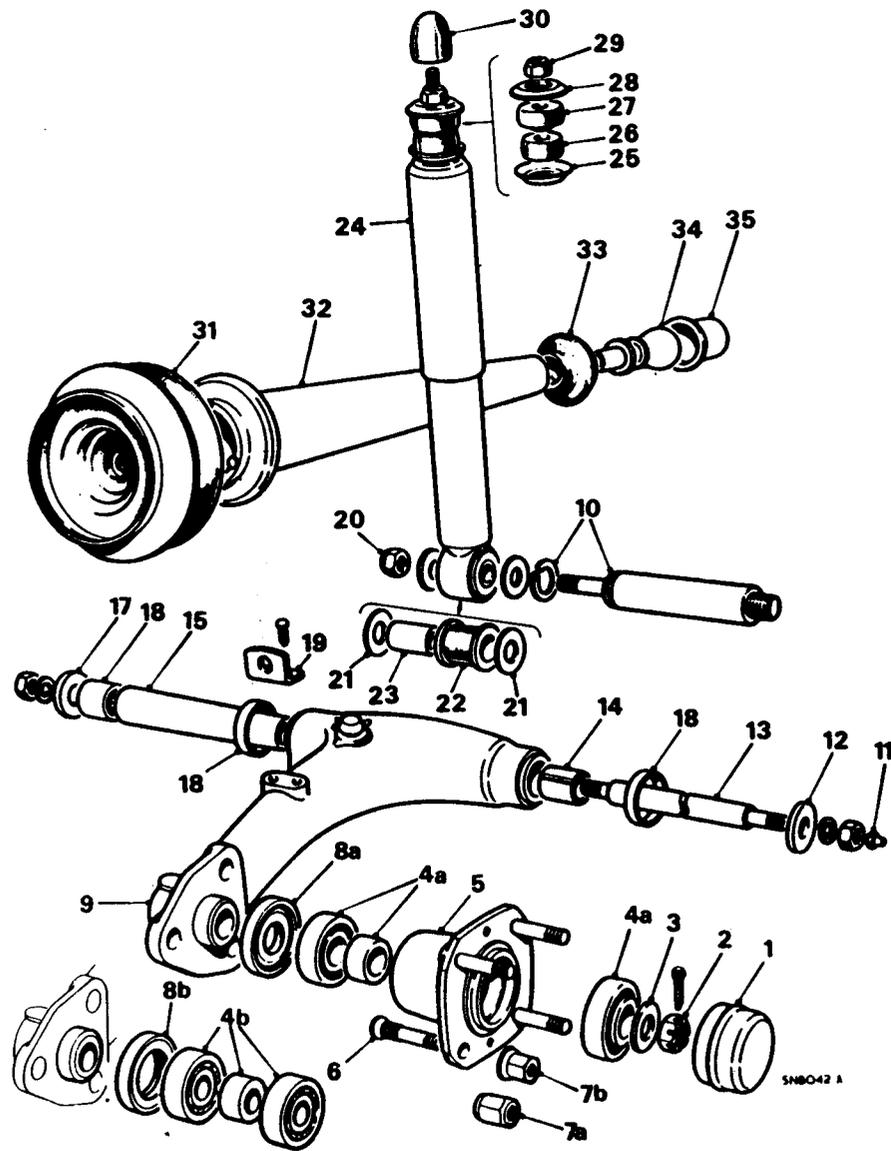


## FRONT SUSPENSION COMPONENTS

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Shaft lower support arm</li> <li>2. Bushes</li> <li>3. Locknut</li> <li>4. Support arm - lower</li> <li>5. Dust cover</li> <li>6. Ball pin retainer</li> <li>7. Ball pin</li> <li>8. Ball seat</li> <li>9. Spring - lower ball joint</li> <li>10. Shims</li> <li>11. Lockwasher</li> <li>12. Grease nipple - straight</li> <li>13. Swivel hub*</li> <li>14. Ring dowel</li> <li>15. Steering arm</li> <li>16. Lockwasher</li> <li>17. Retaining plate</li> <li>18. Thrust collar</li> <li>19. Sealing rings</li> <li>20. Shaft - upper support arm</li> <li>21. Thrust washer</li> </ol> | <ol style="list-style-type: none"> <li>22. Needle roller bearings</li> <li>23. Support arm - upper</li> <li>24. Grease nipple - angled</li> <li>25. Rebound buffer</li> <li>26. Bump buffer</li> <li>27. Cone spring - rubber (14 mm thread)</li> <li>28. Strut - front</li> <li>29. Packing washer strut (when fitted)</li> <li>30. Dust cover</li> <li>31. Knuckle end</li> <li>32. Ball socket</li> <li>33. Damper - hydraulic - adjustable on some Turbo Models</li> <li>34. Mounting bracket - damper</li> <li>35. Ferrule - rubber</li> <li>36. Ferrule sleeve</li> <li>37. Spacer-damper to upper arm</li> <li>38. Locknut</li> <li>39. Tie-rod</li> <li>40. Pads - spigotted</li> <li>41. Cup washer</li> <li>42. Locknut</li> </ol> |
|--|--|

\*1275 GT components not interchangeable

RM2889



## REAR SUSPENSION COMPONENTS

1. Grease retaining cap
  2. Nut- stub shaft (L.H. Thd. L.H. shaft)
  3. Washer -special
  - 4a. Ball bearing and spacer - set
  - 4b. Taper bearing and spacer - set GT\*
  5. Rear hub\*
  6. Wheel stud\*
  - 7a. Wheel nut
  - 7b. Wheel nut - GT\*
  - 8a. Oil seal
  - 8b. Oil seal - GT\*
  9. Radius arm
  10. Stub shaft and circlip (L.H. Thd. L.H. shaft)
  11. Lubricating nipple
  12. Thrust washer
  13. Pivot shaft
  14. Bush - bearing
  15. Lubricating tube
  16. Needle roller bearing
  17. Thrust washer
  18. Sealing rings
  19. Hose bracket
  20. Locknut - damper to pin
  21. Washers - special
  22. Ferrule - rubber
  23. Ferrule sleeve
  24. Damper - hydraulic - adjustable on some Turbo models
  25. Retaining washer (Armstrong damper only)
  26. Mounting rubber - plain
  27. Mounting rubber - spigotted
  28. Retaining washer
  29. Locknut
  30. Buffer - damper
  31. Cone spring - rubber
  32. Strut - rear
  33. Dust cover
  34. Knuckle end
  35. Ball socket
- \*1275 GT components not interchangeable with standard parts

## FRONT HUB COMPONENTS

### 'A' MINI except 1275 GT

- 1 Swivel hub
- 2 Drive shaft
- 3 Water shield
- 4 Oil seal - inner
- 5 Oil seal spacer\*
- 6a Ball bearing and spacer - set
- 6b Taper bearing and spacer - set\*

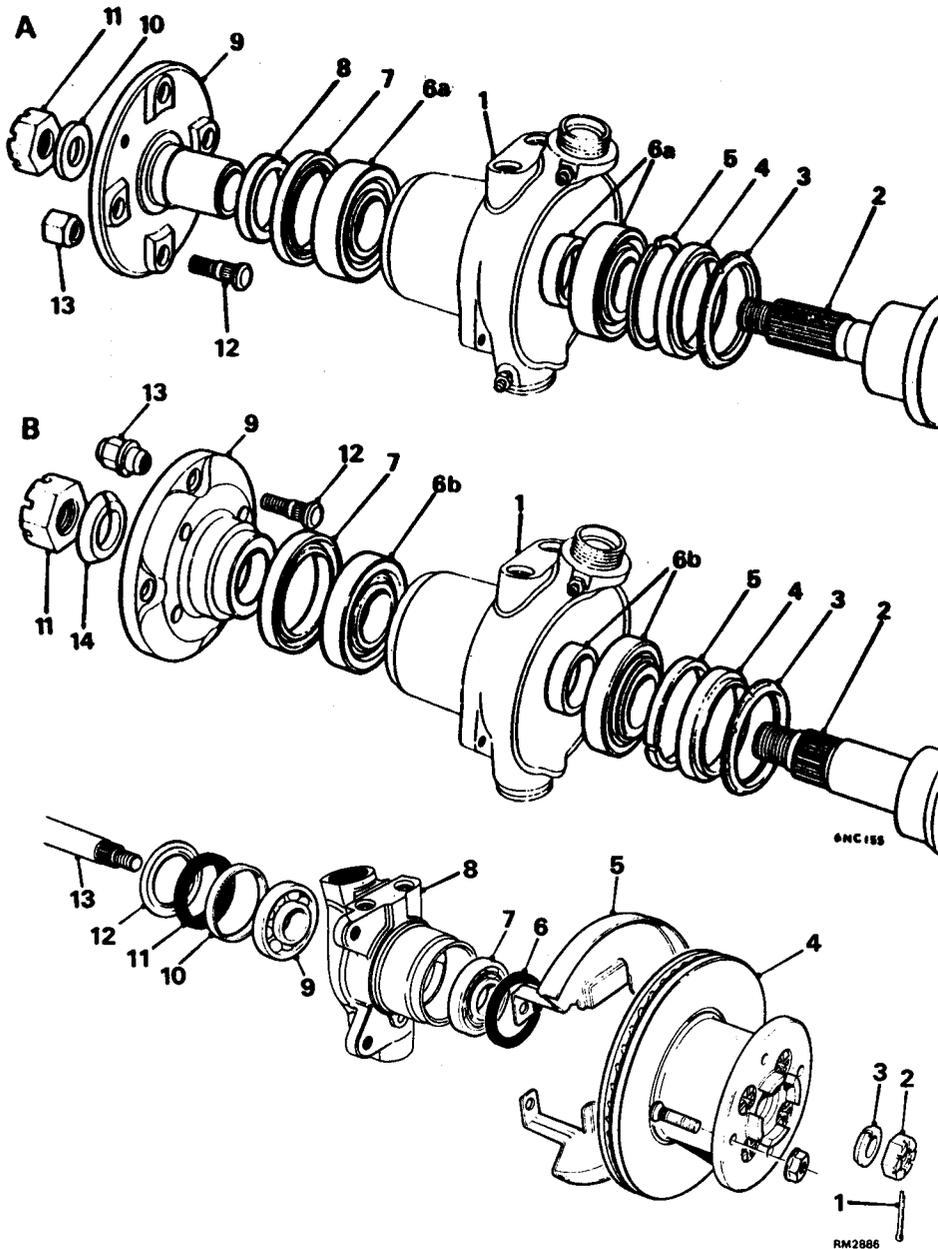
### 'B' 1275 GT

- 7 Oil seal outer
  - 8 Distance ring
  - 9 Driving flange\*
  - 10 Washer - special
  - 11 Slotted nut\*
  - 12 Wheel stud\*
  - 13 Wheel nut\*
  - 14 Outer collar - split\*
- \*1275 GT components not interchangeable

## FRONT HUB COMPONENTS

### 'C' TURBO

- 1. Split pin
- 2. Slotted nut
- 3. Outer collar - split
- 4. Drive flange/ventilated brake disc
- 5. Disc shield
- 6. Outer oil seal
- 7. Taper bearing
- 8. Swivel hub
- 9. Ball bearing
- 10. Spacer
- 11. Inner oil seal
- 12. Bearing water shield
- 13. Drive shaft



## HYDRAULIC DAMPERS

Adjust - Turbo only 68.15.00

**Note:** Two types of damper may be fitted, Spax or Koni. The adjustable, Spax type, may be identified by the slotted screw adjacent to the lower mounting. Dampers are pre-set at the factory and should not normally require adjustment but where a single or pair of dampers are to be replaced, the setting of the existing dampers must be ascertained and the replacement damper(s) adjusted to the same setting.

### Check existing damper(s)

1. Using a suitable screwdriver, turn the adjuster in an anti-clockwise direction and count the number of 'clicks' until the adjuster reaches the stop.

**Note:** The last 'click' will be less pronounced than the others.

2. If the adjuster will not turn, the damper is at the original setting and no adjustment to the replacement damper is required.

### Adjust replacement damper(s)

3. Turn the adjuster on the replacement damper(s) in a clockwise direction until the necessary number of 'clicks' has been reached.

**Note:** The first 'click' will be less pronounced than the remainder. After the maximum number of 'clicks' (14) the adjuster will 'free wheel'. This is to prevent over-adjustment with consequent damage to the damper.

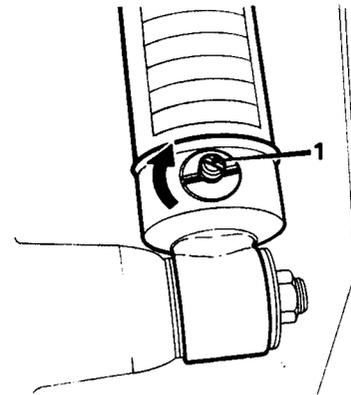
## FRONT BUMP RUBBER

Remove and refit 1 to 3 and 6 68.15.01

Rebound buffer 1, and 4 to 6 68.15.08

### Removing

1. Slacken the wheel nuts, raise and support the vehicle one side. Remove the front road wheel.

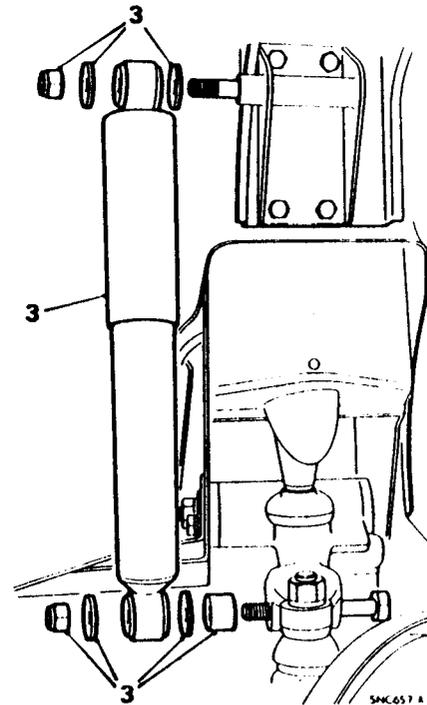


RM287B

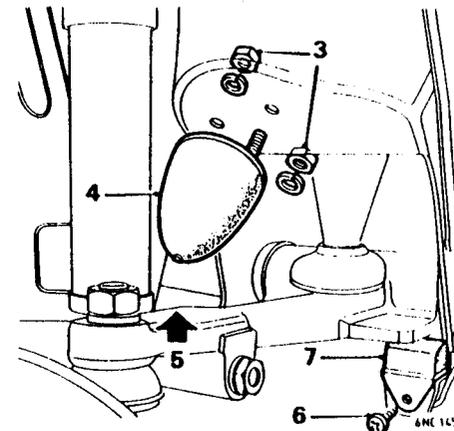
2. Remove the front strut and joint, see 68.30.68.
3. Remove the two nuts and spring washers securing the bump rubber to the sub-frame.
4. Remove the bump rubber.
5. Jack up under the lower arm until the upper arm is clear of the rebound buffer.
6. Remove the screw securing the rebound buffer to the sub-frame.
7. Remove the rebound buffer.

### Refitting

8. Reverse the procedure in 1 to 7.



SNC657A



ANC 145A

## HYDRAULIC DAMPER - FRONT

Remove and refit 68.15.16

### Removing

1. Slacken the road wheel nuts, jack up and support the front of the vehicle - one side.
2. Remove the road wheel.
3. Unscrew the locknuts and remove the damper assembly, note the large washers on each side of the damper mountings and the spacer against the top arm.

**Note:** Store the damper upright if it is to be refitted.

**Turbo only:** Make a note of the damper adjustment setting - Spax type damper only

### Refitting

**WARNING:** If adjustable (Spax) dampers are fitted, it is essential that replacement dampers are of the correct type. Always ensure that the damper adjustment is at the correct setting relative to the other dampers fitted to the vehicle - see Damper - adjust - Turbo Models only.

4. Hold the new damper upright in a vice and compress and extend it six times through its full stroke to expel air. If necessary, continue this operation until there is no free travel when changing direction of stroke. Retain the damper upright until fitted.
5. Reverse the procedure in 1 to 3.
6. **Turbo only:** Adjust the damper setting relative to the other dampers on the vehicle - Spax type damper only - see Damper Adjust - Turbo Models

## HYDRAULIC DAMPER - REAR

### Remove and refit - left-hand

Saloon 68.15.22

Van, Pick-up, Estate, 2 to 9 68.15.22

Right-hand - All models, 2 to 9 68.15.23

### Removing

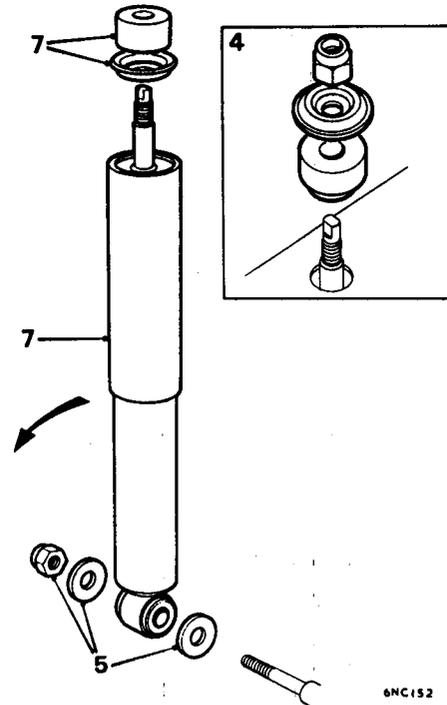
1. Saloon only - left-hand side: Remove the fuel tank, see 19.55.01.
2. Slacken the road wheel nuts, jack up and support the rear of the vehicle - one side.
3. Remove the road wheel.
4. From inside the rear of the vehicles:  
Remove the buffer from the damper stud, when fitted.  
Hold the damper stud, unscrew the locknut and remove the cup washer and spigotted rubber bush.
5. Remove the locknut and plain washer securing the damper to the radius arm stud.
6. Compress the damper, rotate it rearwards to the horizontal and remove it from the radius arm stud.
7. Remove the rubber bush and cup washer (Armstrong damper only) from the top of the damper and the plain washer from the radius arm stud.

**Note:** Store the damper upright if it is to be refitted.

**Turbo only:** Make a note of the damper adjustment setting - Spax type damper only

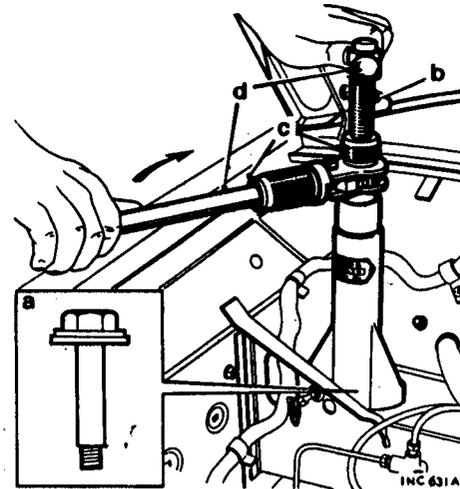
### Refitting

**WARNING:** If adjustable (Spax) dampers are fitted, it is essential that replacement dampers are of the correct type. Always ensure that the damper adjustment is at the correct setting relative to the other dampers fitted to the vehicle - see Damper - adjust - Turbo Models only.



6NC152

8. Hold the new damper upright in a vice and compress and extend it six times through its full stroke to expel air. If necessary, continue this operation until there is no free travel when changing direction of stroke. Retain the damper upright until fitted.
9. Reverse the procedure in 1 to 7.
10. Turbo only: Adjust the damper setting relative to the other dampers on the vehicle - Spax type damper only - see Damper Adjust - Turbo Models only



## UPPER ARM - FRONT SUSPENSION

Remove and refit, 1 to 12 and 15

68.20.02

Overhaul

68.20.18

Strut and joint, 1 to 7 and 15

68.30 68

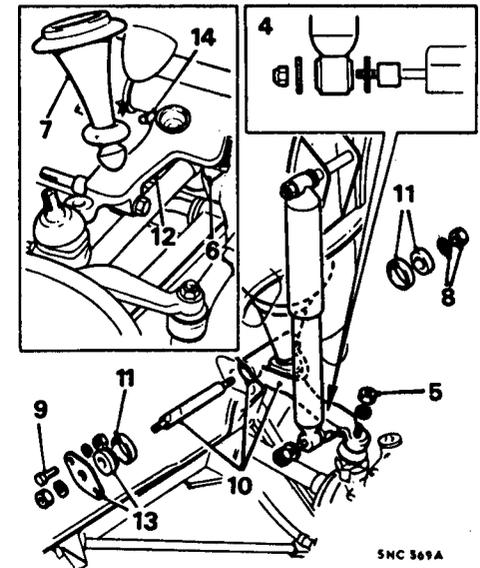
**Service tool:** 18G 574B, 18G 574-1, 18G 581, 18G 582, 18G 1063

### Removing

1. Slacken the road wheel nuts, raise and support the front of the vehicle - one side.
2. Remove the road wheel.
3. Compress the spring unit:
  - a Remove the bolt securing the sub-frame tower to the body crossmember.
  - b Position tool 18G 574B and screw the centre (14 mm) screw nine complete turns into the spring unit.
  - c Use the ratchet handle to turn the centre nut until it makes contact with the body of the tool.

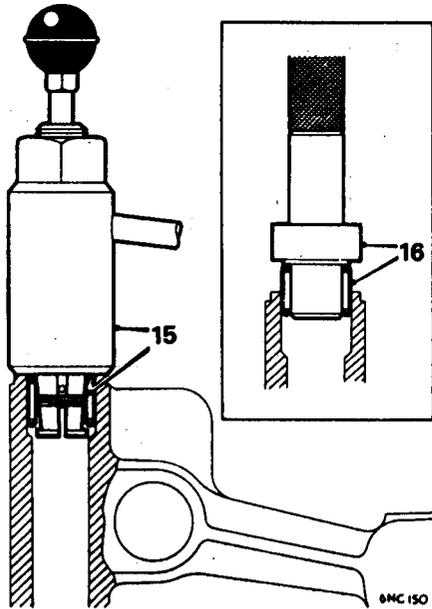
d Hold the centre screw to prevent rotation and turn the ratchet handle clockwise to compress the spring sufficiently to allow the spring strut to be extracted.

4. Disconnect the hydraulic damper from the upper arm. Compress the damper to clear.
5. Remove the retaining nut and release the upper suspension arm from the swivel hub, using tool 18G 1063. Support the driving flange to prevent straining the brake hose.
6. Remove the rebound rubber.
7. Lever the spring strut ball from its seat in the top arm and extract the strut assembly.
8. Remove the nut and spring washer from the rear end of the pivot shaft.



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9. Remove the two screws securing the thrust collar retaining plate to the sub-frame.



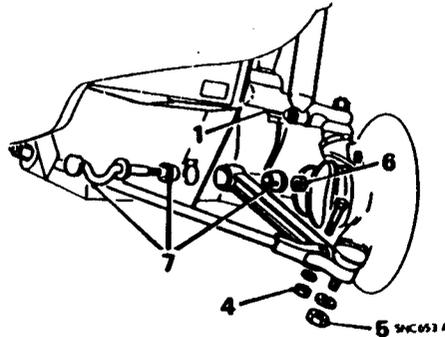
10. Lever the pivot shaft forward, twist the upper arm outwards and pull it from the pivot shaft.
11. Remove the rear thrust washer and seals from the upper arm.
12. Remove the upper arm assembly from the front of the sub-frame.
13. Remove the thrust collar from the pivot shaft.
14. Remove the grease nipple.
15. Hold the upper arm in a vice and extract the needle bearings using tool 18G 581.

#### Refitting

16. Press the needle roller bearings with their marked ends outwards into the upper arm, using tool 18G 582. Smear the needle bearings with grease.

17. Reverse the procedure in 1 to 14, noting:

- a Fit the thrust washers with the lubrication grooves towards the radius arm.
- b Grease the upper arm pivot shaft.
- c Apply Dextragrease Super G.P. to the cup and assemble the ball and dust cover to the strut. Fit the ball and seat assembly into the top arm and carefully locate and fit the strut.  
AUTOMATIC: Fit a packing washer to the strut.
- d Tighten the following to the figures given in 'TORQUE WRENCH SETTINGS'  
Upper arm pivot shaft nut  
Swivel hub ball pin nut  
Road wheel nuts



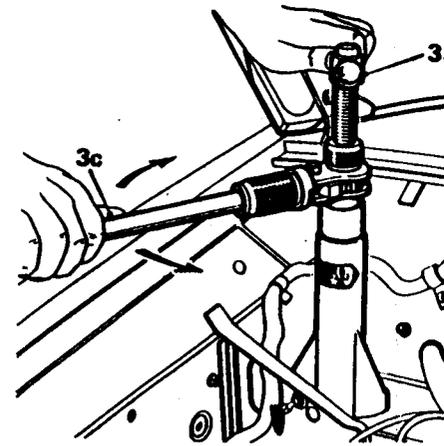
### LOWER ARM- FRONT SUSPENSION

Remove and refit 68.20.10

Service tool: 18G 1063

#### Removing

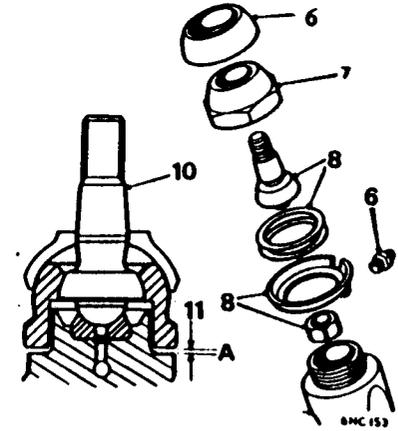
1. Insert a packing piece between the top arm and the rebound rubber.
2. Slacken the road wheel nuts, jack up and support one side.



3. Remove the road wheel.
4. Remove the through bolt and disconnect the tie-rod from the lower arm.
5. Remove the retaining nut and release the lower arm from the swivel hub, using tool 18G 1063.
6. Remove the nut and washer from the rear end of the pivot shaft.
7. Remove the lower arm and mounting rubbers.

#### Refitting

8. Reverse the procedure in 1 to 7, noting:
  - a Ensure the flat on the pivot shaft head is located correctly.
  - b Tighten the pivot shaft nut when the suspension is supporting the weight of the vehicle to ensure the mounting rubbers are not pre-tensioned.
  - c Tighten the following to the figures given in 'TORQUE WRENCH SETTINGS'  
Swivel hub ball pin nut  
Tie-rod to lower arm nut  
Road wheel nuts  
Lower arm pivot shaft nut.



### FRONT HUB BALL JOINT - UPPER

Remove and refit 68.20.43

Service tool: 18G 574B, 18G 587, 18G 1063

#### Removing

1. Slacken the road wheel nuts, jack-up and support the front of the vehicle - one side.
2. Remove the road wheel.
3. Compress the rubber cone spring.
  - a Remove the bolt securing the sub-frame tower to the body crossmember.
  - b Position tool 18G 574B and screw the centre (14 mm) screw nine complete turns into the spring unit.
  - c Use the ratchet handle to turn the centre nut until it makes contact with the body of the tool.
  - d Hold the centre screw to prevent rotation and turn the ratchet clockwise to compress the spring sufficiently to allow the top arm to be lifted.
4. Support the lower arm.

5. Remove the nut and spring washer securing the ball pin to the upper arm.  
Release the pin, using tool 18G 1063.
6. Remove the dust cover and grease nipple.
7. Knock back the lockwasher and unscrew the ball pin retainer, using tool 18G 587.
8. Remove the ball pin, seat, shims and lockwasher.
9. Thoroughly clean all components. Examine and fit new parts as necessary.

#### Refitting

10. Assemble the upper ball pin without the shims and lockwasher.
11. Tighten the retainer until there is no free movement between the ball pin and its seating but is free to swivel. Measure the gap between the retainer and the hub 'A'.
12. Deduct 0.90 mm (0.030 in) from the gap measured to obtain the thickness of shims required.  
The ball pin must have no nip to 0.08 mm (0.003 in) end-float, add a further 0.05 mm (0.003 in) shim if necessary.

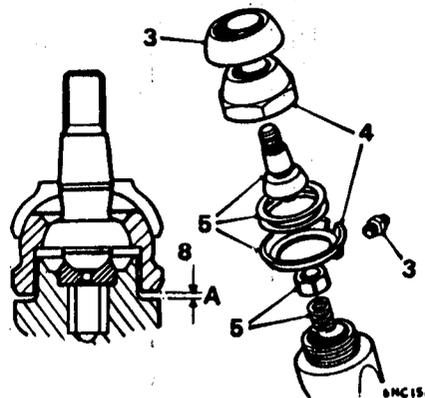
#### Shim sizes:

0.05 mm 0.002 in  
0.08 mm 0.003 in  
0.13 mm 0.005 in  
0.25 mm 0.010 in  
0.51 mm 0.020 in

**CAUTION:** It is imperative that the ball joint should be able to rotate and articulate freely in all planes after adjustment has taken place.

13. Pack the joint with grease and assemble complete with lockwasher and grease nipple.
14. Torque tighten the retainer and tap the lockwasher against three flats of the retainer - one adjacent to the brake backplate/disc.

15. Reverse the procedure in 1 to 5, noting:  
Tighten the following to the figures given in 'TORQUE WRENCH SETTINGS'.  
Ball retainer to hub  
Ball pin to suspension arm nuts  
Road wheel nuts



### FRONT HUB BALL JOINT - LOWER

Remove and refit, 1 to 6, 7 to 9 68.20.44

Set - one side 68.20.42

Service tool: 18G 574B, 18G 587, 18G 1063

#### Removing

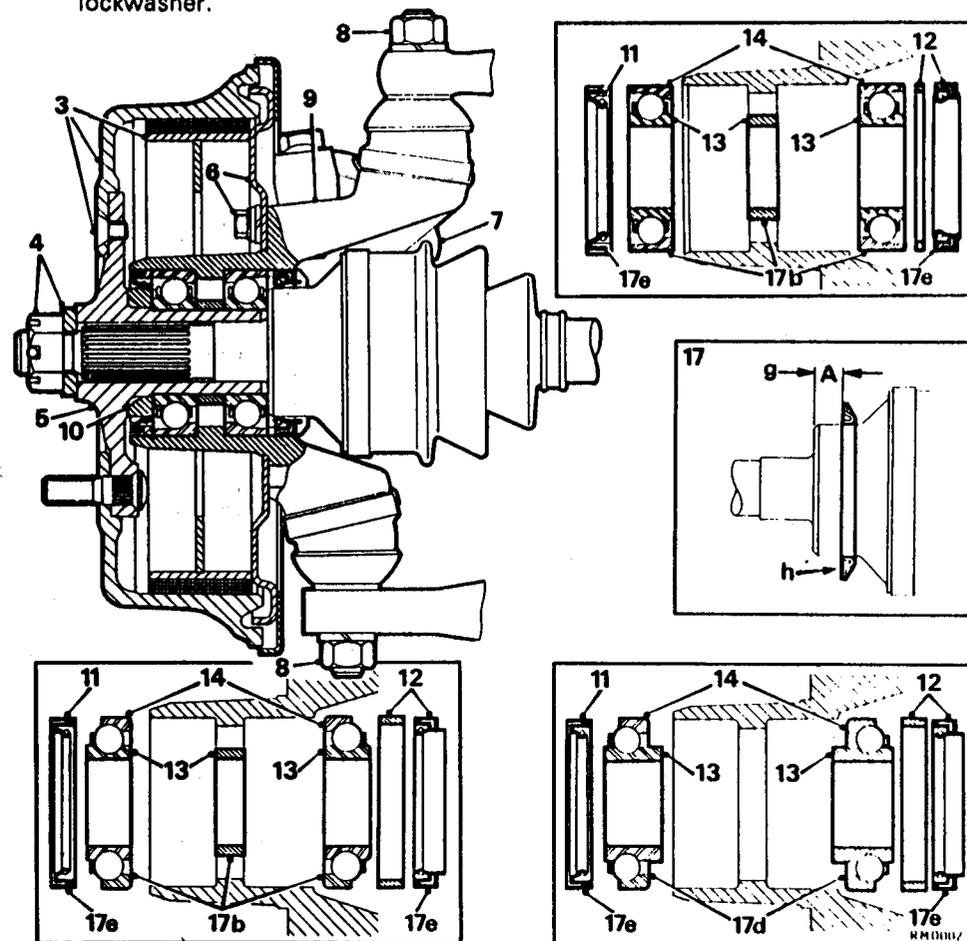
1. Remove the swivel hub assembly, see 68.25.13.
2. Hold the hub upright in a vice with the lower ball joint uppermost.
3. Remove the grease nipple and dust cover.
4. Knock back the lockwasher and unscrew the ball pin retainer, using tool 18G 587.
5. Remove the ball pin, seat, spring, shims and lockwasher.

6. Thoroughly clean all components. Examine and fit new parts as necessary.
7. Hold the swivel hub upright and remove the upper ball joint.

#### Refitting

8. a Assemble the lower ball pin without the spring, shims and lockwasher.  
b Assemble the upper ball pin without the shims and lockwasher.

9. Select the shims required, see 68.20.43.
10. Refit the swivel hub assembly.



## FRONT HUB BEARINGS - DRUM BRAKE

Remove and refit 68.25.13

Oil seals 68.25.20

**Service tool:** 18G 134, 18G 134DO, 18G 304, 18G 304F, 18G 1063, 18G 1330

### Removing

1. Slacken the road wheel nuts, remove the split pin and slacken the hub nut.
2. Raise the front of the vehicle, support one side and remove the road wheel.
3. Slacken the brake-shoe adjusters, remove the brake drum and the brake shoes, see 70.40.02.
4. Remove the hub nut and washer.
5. Pull the driving flange from the drive shaft, using tool 18G 304 and 18G 304F.
6. Remove the brake back plate securing screws, withdraw the back plate from the swivel hub and support it to prevent straining the brake hose.
7. Disconnect the ball pin from the steering lever, using tool 18G 1063.
8. Disconnect the ball pin joints from the upper and lower suspension arms using tool 18G 1063.
9. Pull the swivel hub from the drive shaft.
10. Remove the distance piece (chamfer to the flange).
11. Extract the outer oil seal.
12. Extract the inner oil seal and oil seal spacer.
13. Drive out the inner race of each bearing and remove the bearing distance ring (if fitted).
14. Drive out the outer races from the hub.
15. Withdraw the water shield from the drive shaft.

### Inspecting

16. Thoroughly clean the components and discard the oil seals. Examine the hub and shaft for wear, damage or cracks. Inspect the bearings for wear, fitting of the races and tracking.

### Refitting

17. Reverse the procedure in 1 to 15, noting:
  - a Pack the bearings with a recommended grease and dip the oil seals in oil before fitting.
  - b The bearings (with separate spacer) must be fitted with the thrust sides facing each other. These can be identified by the markings stamped on the side of the bearings.
  - c Bearings having a narrow outer race must be pressed into the hub using tool 18G 1330.
  - d Some types of bearings do not require a spacer because the inner races are lengthened to butt against each other. These bearings must only be fitted in pairs and with the markings facing outwards.
  - e The oil seals must be fitted with the sealing lips inwards, using tools 18G 134 and 18G DO, noting that the inner seal has a lip on its outer face.
  - f When replacing wide race bearings with narrow race bearings, the steel spacer fitted between the inner bearing and the oil seal must be replaced by the wider nylon spacer.
  - g Position the water shield 6 mm ( $\frac{1}{4}$  in) 'A' onto the drive shaft.
  - h Fill the sealing face of the water shield with grease.
  - j Tighten the following to the figures given in 'TORQUE WRENCH SETTINGS'.

Swivel ball pin nuts.  
Drive shaft nut  
Steering level ball pin nut  
Road wheel nuts.

## FRONT HUB BEARINGS - DISC BRAKE

Remove and refit 68.25.13

Oil seals - 1 to 11 and 13 68.25.20

Front hub assembly, 1 to 9 and 13

**Service tool:** 18G 134, 18G 134DO, 18G 304, 18G 304F, 18G 1104, 18G 1104B, 18G 1063

### Removing

1. Slacken the road wheel nuts, jack up and support the front of the vehicle - one side.
2. Remove the road wheel.
3. Extract the split pin and slacken the hub nut.
4. Remove the two securing bolts and detach the brake caliper. Support the caliper ensuring the hose is not strained.
5. Remove the hub nut, split collar and pull the driving flange and disc assembly from the drive shaft, using 18G 304 and 18G 304F.
6. Remove the water shield.
7. Disconnect the steering ball pin from the steering lever, using tool 18G 1063.
8. Disconnect the top and bottom swivel hub ball joints, using tool 18G 1063.
9. Pull the swivel hub assembly from the drive shaft.
10. Extract the inner oil seal and spacer.
11. Extract the outer oil seal.

12. Bearings
  - a Remove the outer bearing race from the hub, remove the spacer (if fitted) and inner bearing race from the drive shaft.
  - b Drive the bearing outer races out of the hub.

## Not Turbo Models

### Refitting

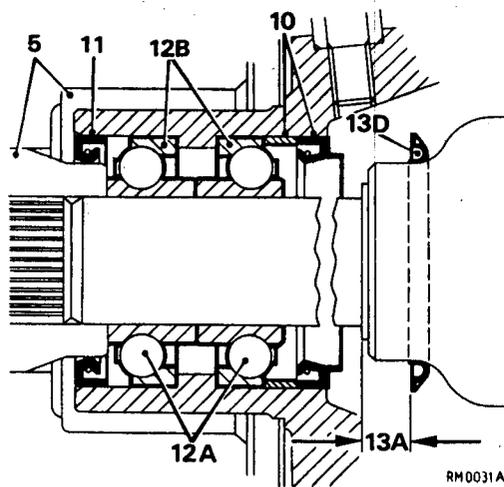
1. Reverse the procedure in 1 to 12, noting:

**CAUTION:** There is no spacer fitted between the bearings on turbo models. Press the bearings into the hub until they contact the machined shoulder.

  - a Pack the bearings with grease but do not fill the space between the bearings.
  - b Fit the oil seals and inner oil seal spacer, using tool 18G 134 and 18G 134DO noting the inner seal has a lip on its outer face. Pack the space between the bearings and oil seals with grease.
  - c Position the water shield 6 mm ( $\frac{1}{4}$  in) 'A' onto the drive shaft.
  - d Fill the sealing face of the water shield with grease. Pull the drive shaft into the hub, using tool 18G 1104 and 18G 1104B.

## Turbo Models only

Tighten the following nuts to the figure given in 'TORQUE WRENCH SETTINGS':  
Swivel hub ball pin nuts  
Drive shaft hub nut  
Steering lever ball pin nut  
Road wheel nuts



## FRONT HUB ASSEMBLY

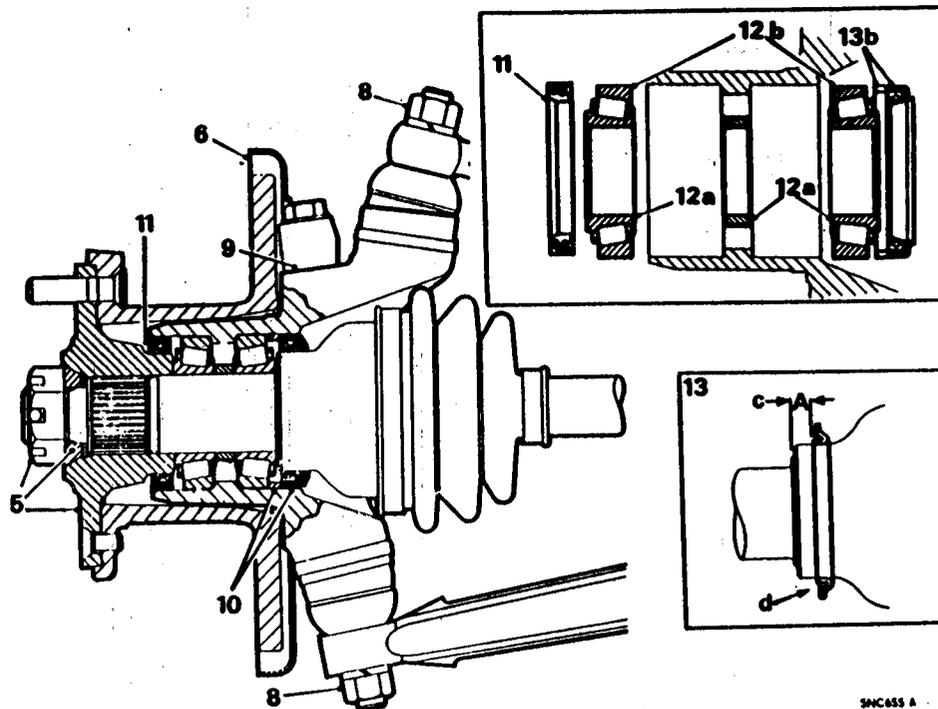
Overhaul 68.25.08

### Dismantling

1. Remove the front hub oil seals and bearings, see 68.25.13/20.
2. Remove the steering lever, see 57.55.29.
3. Remove the ball joints, see 68.25.04.

### Assembling

4. Reverse the procedure in 1 to 3, using new parts as necessary.



## REAR HUB BEARINGS

Remove and refit, 1 to 11,  
13 and 14 68.25.38

Oil seal, 1 to 7, 9 and 14 68.25.44

Wheel studs, 1 to 7, 12 and 14 68.25.50

Service tool: 18G 304, 18G 304F

### Removing

'A' MINI except 1275GT 'B' 1275 GT and Turbo

1. Release the hand brake.
2. Slacken the wheel nuts, raise and support the vehicle one side and remove the road wheel.
3. Slacken the brake-shoe adjuster.

4. Remove the two retaining screws and withdraw the brake drum. Wash all dust from the backplate assembly and drum, use brake cleaning fluid or denatured alcohol.

**WARNING: Do not use an air-line to blow out brake dust - asbestos dust from the brake linings can be a serious health risk if inhaled.**

5. Prise off the grease retaining cap.
6. Extract the split pin, unscrew the hub nut and remove the special washer, note:  
Left-hand hub - LEFT-HAND THREAD  
Right-hand hub - RIGHT-HAND THREAD

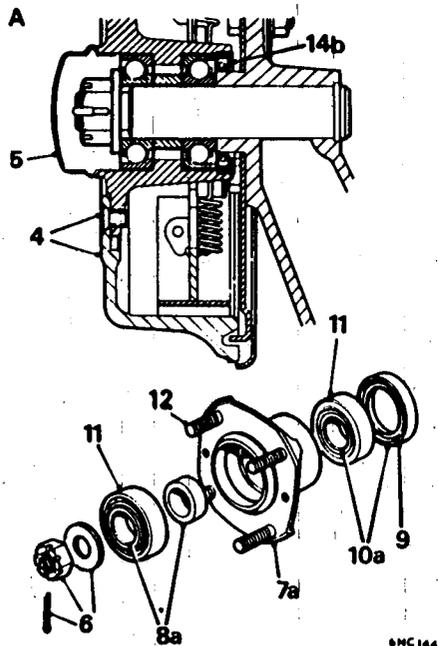
a Pull the hub assembly from the hub shaft, using tool 18G 304 and 18G 304F if necessary.

b 1275 GT and Turbo: Pull the hub assembly from the hub shaft.

7. a Drive out the inner race of the outer bearing and remove the spacer.  
b 1275 GT and Turbo: Remove inner race of the outer bearing and remove the spacer.
8. Extract the oil seal (1275 GT and Turbo).
9. a Drive out the inner race of the inner bearing and the oil seal.  
b 1275 GT and Turbo: Remove the inner race of the inner bearing.
10. Drive out the bearing outer races from the hub.
11. Press the wheel studs from the hub.

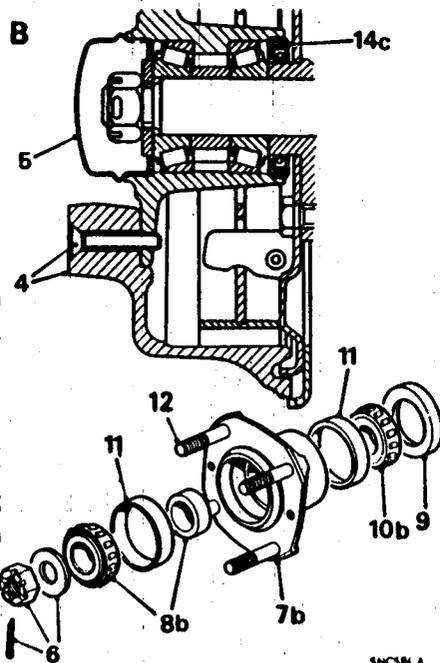
### Inspecting

12. Thoroughly clean the components and discard the oil seal. Examine the hub and shaft for wear, damage or cracks. Inspect the bearings for wear, fitting of the races and tracking.



#### Refitting

13. Reverse the procedure in 1 to 12, noting:
  - a Pack the bearing with a recommended grease and dip the oil seal in oil before fitting.
  - b Except 1275 GT and Turbo: The oil seal must be fitted with the lip **TOWARDS** the bearing.
  - c 1275 GT and Turbo only: The oil seal must be fitted with lip **AWAY** from the bearing.
  - d **DO NOT** put grease in the grease retaining cap\*.
  - e Tighten the following to the figures given in 'TORQUE WRENCH SETTINGS'.
    - Hub nut
    - Road wheel nuts.
  - f Adjust the rear brakes, see 70.25.03.



#### RUBBER CONE SPRING UNIT - FRONT

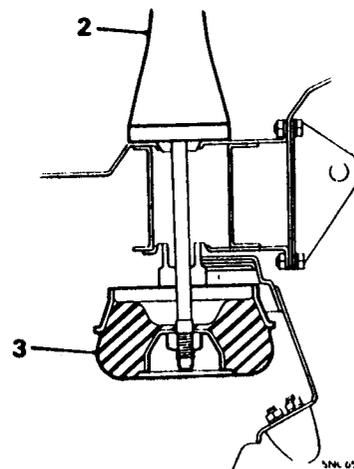
Remove and refit 68.30.62  
 Service tool: 18G 574B, 18G 1063

#### Removing

1. Remove the upper arm assembly, see 68.20.02.
2. Hold the centre screw of tool 18G 574B to prevent rotation and turn ratchet anti-clockwise to release the spring compression.
3. Unscrew the tool and extract the spring unit from inside the sub-frame tower.

#### Refitting

4. Reverse the procedure in 1 to 3.



#### RUBBER CONE SPRING UNIT - REAR

Remove and refit 68.30.64  
 Strut and joint, 1 to 5 and 7 68.30.68

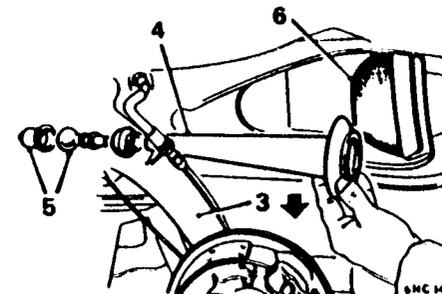
#### Removing

1. Slacken the road wheel nuts, jack-up and support the rear of the vehicle - one side. Remove the road wheel.
2. Remove the hydraulic damper, see 68.15.22/23.
3. Remove the radius arm, see 68.35.02.
4. Pull the strut from the spring unit and knuckle joint assembly.
5. Drive the knuckle joint from the strut.
6. Release the rubber cone from its location in the sub-frame.

#### Refitting

7. Reverse the procedure in 1 to 6, noting:
  - a Assemble the knuckle joint, lubricate with Dextragrease GP and locate into the radius arm.
  - b Ensure that the strut and knuckle joint are engaged as the radius arm is raised to fit the damper.

c Torque tighten the wheel nuts, see 'TORQUE WRENCH SETTINGS'.



#### RADIUS ARM PIVOT BEARINGS

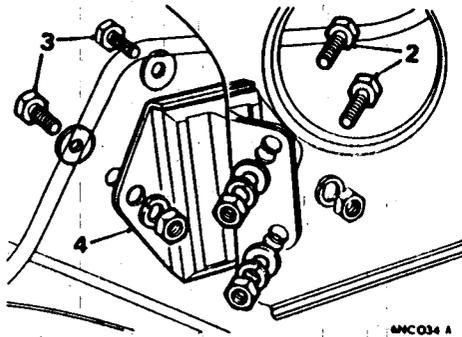
Remove and refit 68.35.10  
 Radius arm assembly, 1 to 11, and 22 to 24 68.35.02

Service tool: 18G 583, 18G 583B, 18G 584, 18G 588, 18G 588A, 18G 620

#### Removing

1. Slacken the road wheel nuts, jack-up and support the rear of the vehicle.
2. Remove the road wheel.
3. Support the radius arm and remove the hydraulic damper, see 68.15.22/23.
4. Disconnect the hand brake cable from the brake lever.
5. Remove the clevis pin securing the hand brake cable sector to the radius arm.
6. Disconnect the brake hose from the radius arm bracket. Plug the hose and pipe.
7. Remove the support and lower the radius arm, lever the strut from the rubber cone and remove the strut and knuckle joint assembly.
8. Remove the inner nut and spring washer securing the pivot shaft to the sub-frame.





### FRONT SUB-FRAME MOUNTING - REAR

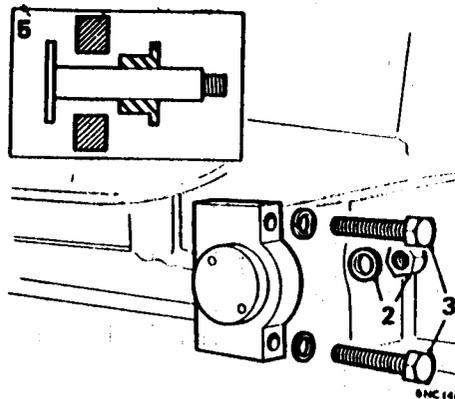
Remove and refit 68.40.03

#### Removing

1. Raise and support the vehicle - one side.
2. Remove the two screws securing the sub-frame to the rear mounting.
3. Pull back the floor covering from the toe-board. Remove the two nuts and spring washers securing the rear mounting to the body.
4. Extract the rear mounting.

#### Refitting

5. Reverse the procedure in 1 to 4.



### REAR SUB-FRAME MOUNTING - FRONT

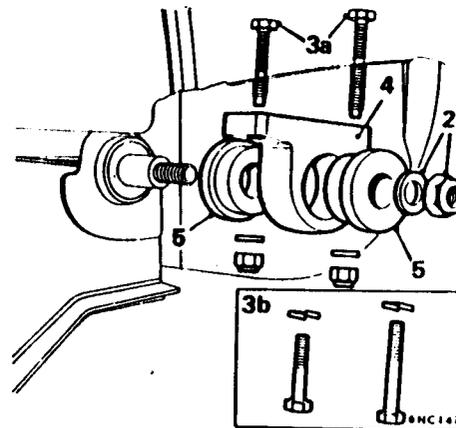
Remove and refit 68.40.08

#### Removing

1. Remove the radius arm assembly, see 68.35.02.
2. Remove the locknut and plain washer securing the support pin to the sub-frame.
3. Remove the two set screws securing the trunnion to the body.
4. Lever the sub-frame downwards away from the body and extract the trunnion assembly.
5. Withdraw the support pin and extract the bushes from the trunnion.

#### Refitting

6. Reverse the procedure in 1 to 5, noting that the step in the trunnion and the short bolt/screw are at the top.



### REAR SUB-FRAME MOUNTING - REAR

Remove and refit 68.40.09

#### Removing

1. Slacken the road wheel nuts, raise and support the vehicle one side and remove the road wheel.
2. Remove the locknut and plain washer securing the trunnion to the sub-frame.
3.
  - a Saloon: Remove the two locknuts, plain washers and bolts securing the trunnion to the floor.
  - a Estate, Van, Pick-up: Remove the two 7 screws securing the trunnion to the body.
4. Lever the sub-frame away from the body and remove the trunnion assembly.
5. Extract the bushes from the trunnion.

#### Refitting

6. Reverse the procedure in 1 to 5, noting that the step in the trunnion and the short bolt/screw are at the front.

## FRONT BRAKE DRUM

### Remove and refit

70.10.02

#### Removing

1. Apply the hand brake, remove the hub cap and slacken the road wheel nuts.
2. Raise the front of the vehicle and support one side.
3. Remove the road wheel.
4. Slacken the brake shoe adjusters.
5. Remove the two brake drum securing screws.
6. Withdraw the brake drum.
7. Wash all dust from the back plate assembly and drum; use brake cleaning fluid or denatured alcohol.

**WARNING: Do not use an airline to blow lining dust, asbestos dust can be a serious health hazard if inhaled. Use methylated spirit or denatured alcohol to wash dust from components. Do not use any petroleum-based fluids.**

#### Refitting

8. Reverse the procedure in 1 to 6, noting:  
Tighten the road wheel nuts, see 'TORQUE WRENCH SETTINGS'.
9. Adjust the brakes, see 70.25.03.

## REAR BRAKE DRUM

### Remove and refit

70.10.03

#### Removing

1. Release the hand brake.
2. Remove the hub cap and slacken the road wheel nuts.
3. Raise the rear of the vehicle and support one side.
4. Remove the road wheel.
5. Slacken the brake shoe adjuster.
6. Remove the two brake drum securing screws.
7. Withdraw the brake drum.

8. Wash all dust from the back plate assembly and drum; use brake cleaning fluid or denatured alcohol.

**WARNING: Do not use an airline to blow lining dust, asbestos dust can be a serious health hazard if inhaled. Use methylated spirit or denatured alcohol to wash dust from components. Do not use any petroleum-based fluids.**

#### Refitting

9. Reverse the procedure in 1 to 7, noting:  
Tighten the road wheel nuts to the torque figure given in 'TORQUE WRENCH SETTINGS'.
10. Adjust the brakes, see 70.25.03.

## FRONT BRAKE DISC

### Remove and refit

70.10.10

Service tool: 18G 304, 18G 304B

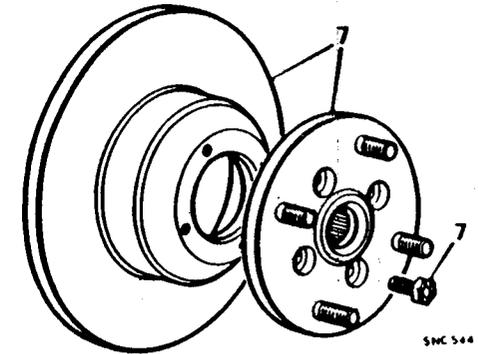
#### Removing

1. Apply the hand brake and slacken the road wheel nuts.
2. Raise the vehicle and support one side.
3. Remove the road wheel.
4. Remove the caliper securing bolts and support the caliper.
5. Remove the split pin (if fitted), drive shaft nut and extract the split collar.
6. Pull the driving flange and disc assembly from the drive shaft - use tool 18G 304 and 18G 304B if necessary.
7. Hold the disc in a vice (soft jaws) and remove the four bolts securing the driving flange to the disc.
8. Separate the driving flange and disc.

#### Refitting

**CAUTION: On Turbo models, the ventilated brake discs are handed. The R.H. disc is identified by a 45° chamfer on the drive flange mounting face.**

9. Reverse the procedure in 1 to 8, noting:
    - a. Clean the mating surfaces of the disc and driving flange.
    - b. Check the disc run out, which should not exceed 0.5 mm (0.002 in): use a dial gauge.
- Reposition the disc if necessary.
- c. Tighten the following to the torque figures given in 'TORQUE WRENCH SETTINGS':  
Driving flange to disc  
Drive shaft hub nut  
Caliper to hub  
Road wheel nuts



## FRONT DISC DUST SHIELD

### Remove and refit

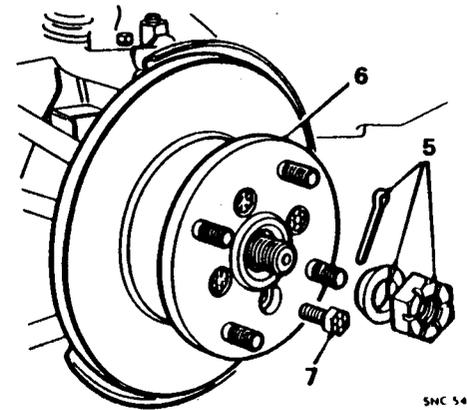
70.10.18

#### Removing

1. Apply the hand brake, slacken the road wheel nuts.
2. Raise the vehicle and support one side.
3. Remove the road wheel.
4. Remove brake caliper securing bolts and support the caliper.
5. Remove the screws retaining the two halves of the dust shield.
6. Remove the dust shield.

#### Refitting

7. Reverse the procedure in 1 to 6, noting:  
Tighten the following to the torque figures given in 'TORQUE WRENCH SETTINGS':  
Caliper to hub  
Road wheel nuts



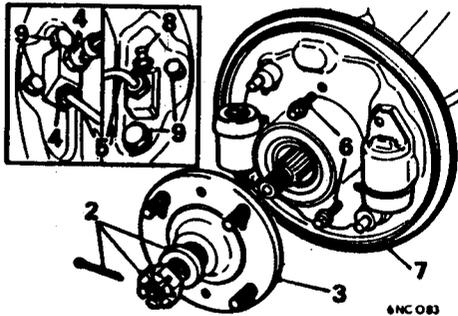
## FRONT BRAKE BACKPLATE

Remove and refit 70.10.25

Service tool: 18G 304, 18G 304F

### Removing

1. Remove the front brake shoes, see 70.40.02.
2. Remove the split pin, drive shaft nut and collar.
3. Using tools 18G 304 and 18G 304F to withdraw the driving flange from the drive shaft splines.
4. Slacken the brake hose and the wheel cylinder union.
5. Remove the bridge pipe from the wheel cylinders.
6. Remove the backplate securing bolts.
7. Remove the backplate from the swivel hub, releasing the backplate from the brake hose.
8. Remove the wheel cylinder bleed screws.

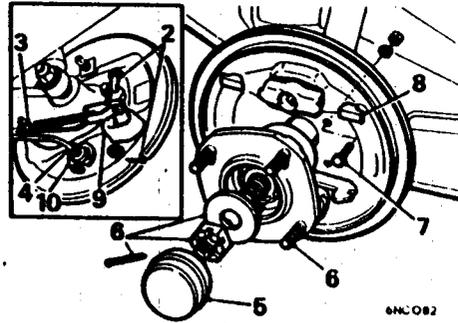


9. Remove the wheel cylinder securing bolts and withdraw the wheel cylinders and joint washers from the backplate.

### Refitting

10. Reverse the procedure in 1 to 9, noting: Tighten the following to the torque figures given in 'TORQUE WRENCH SETTINGS'.  
Back plate bolts  
Hub nut

Drive shaft nut  
Road wheel nuts  
Bleed screw



## REAR BRAKE BACKPLATE

Remove and refit 70.10.26

Service tool: 18G 304, 18G 304F

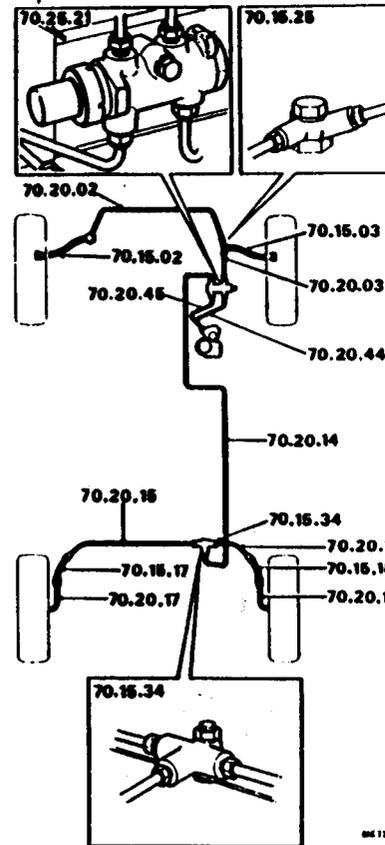
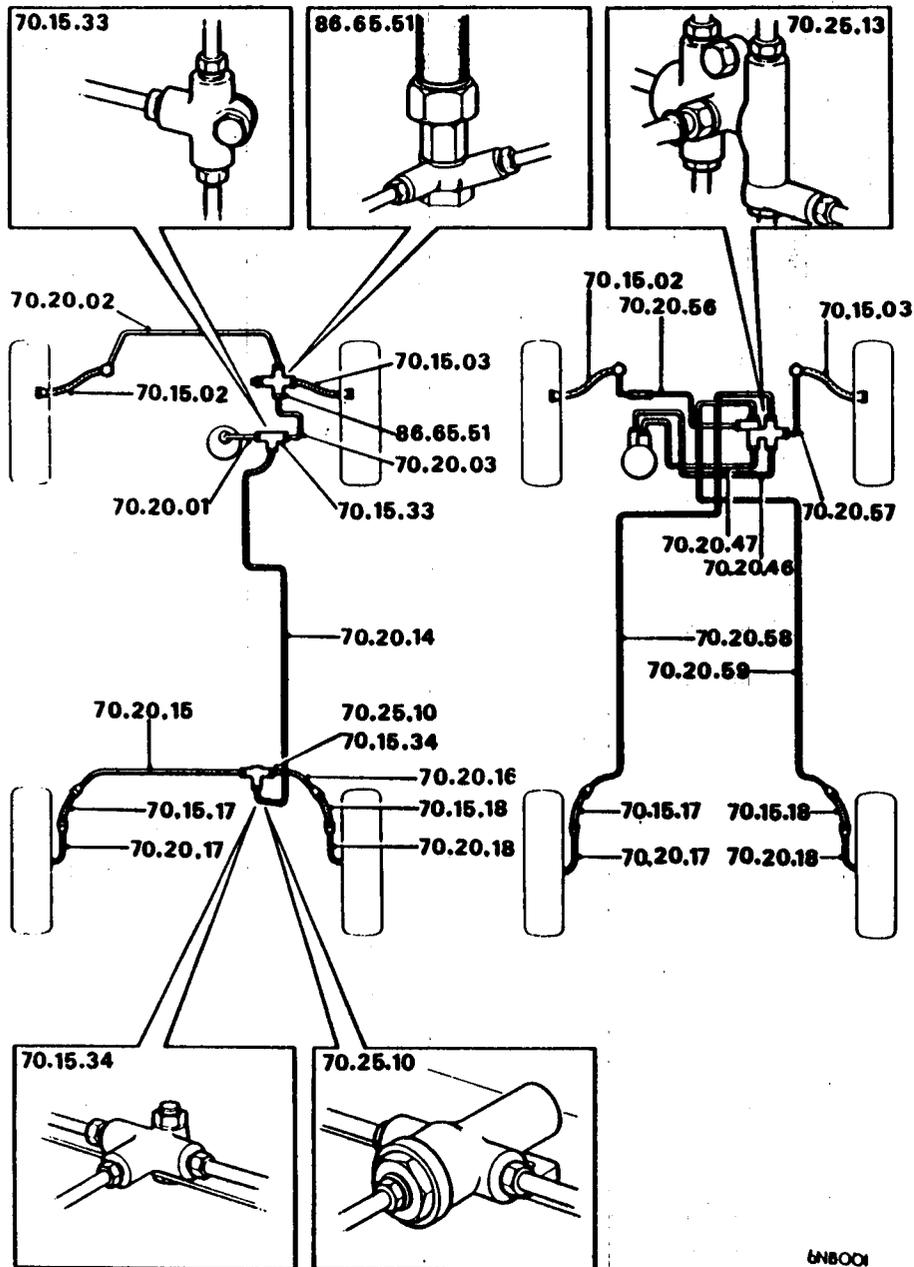
### Removing

1. Remove the brake shoes, see 70.40.03
2. Remove the split pin and clevis pin to release the hand brake cable.
3. Release the hand brake cable from the abutment bracket.
4. Disconnect the brake pipe from the wheel cylinder. Plug the pipe to prevent fluid loss.
5. Remove the grease retaining cap from the hub.
6. Remove the split pin and hub nut and remove the hub using service tools 18G 304 and 18G 304F.
7. Remove the back plate securing bolts and remove the back plate noting the abutment bracket.
8. Remove the brake shoe adjuster wedges.

9. Remove the hand brake lever shield.
10. Remove the wheel cylinder retaining circlip, remove the wheel cylinder and gasket.

### Refitting

11. Reverse the procedure in 1 to 10, noting: Tighten the following to the torque figures given in 'TORQUE WRENCH SETTINGS'.  
Back plate bolts  
Hub nut



### CONNECTORS

Two-way connector	70.15.32
Three-way - front	70.15.33
Three-way - rear	70.15.34

### PIPES

Remove and refit	
Feed to front multi-way connector	70.20.01
Feed to front left-hand hose connector	70.20.02
Feed to front right-hand hose connector	70.20.03
Feed to rear multi-way connector	70.20.14
Feed to rear left-hand hose connector	70.20.15
Feed to rear right-hand hose connector	70.20.16
Feed to rear left-hand wheel cylinder	70.20.17
Feed to rear right-hand wheel cylinder	70.20.18
Feed to two-way connector	70.20.27
Feed to pressure reducing valve - primary	70.20.44
Feed to pressure reducing valve - secondary	70.20.45
Feed to pressure differential warning actuator - primary	70.20.46
Feed to pressure differential warning actuator - secondary	70.20.47
Feed - pressure differential warning actuator to front left-hand hose	70.20.56
Feed - pressure differential warning actuator to front right-hand hose	70.20.57

### HOSES

Remove and refit	
Front - left	70.15.02
Front - right	70.15.03
Rear - left	70.15.17
Rear - right	70.15.18

6N8001

Feed - pressure differential warning actuator to rear left- hand hose 70.20.58

Feed - pressure differential warning actuator to rear right- hand hose 70.20.59

## PRESSURE DIFFERENTIAL WARNING ACTUATOR

Remove and refit 70.25.13

*Note: The operation numbers given are included on the illustrations of the braking systems to facilitate identification of the individual pipes and hoses.*

### Removing

1. Disconnect the pipe or hose at the end nearest to the master cylinder first and plug it to prevent loss of fluid.
2. Unscrew the pipe union.
3. Remove the locknut and lock washer.
4. Pull the hose from the bracket and remove the lock washer.
5. Release the body clips.
6. Remove the hose or pipe.

### Refitting

7. Reverse the procedure in 1 to 6, noting:
  - a Ensure the hoses are not twisted; hold the hose hexagon while tightening the locknut.
  - b Do not overtighten the pipe unions.
  - c Check all connections for signs of leakage after the system has been bled.
8. Bleed the braking system see 70.25.02.

## BLEEDING THE BRAKING SYSTEM

Bleed - all round 70.25.02

### Bleeding

Absolute cleanliness must be maintained throughout the entire bleeding operation, ensure that no dirt or grit enters the system. All equipment to be used must be free from fuel, paraffin, or any form of mineral oil.

1. Release the hand brake.
2. Adjust the brake shoes, see 70.25.03.
3. Check that all pipe and hose connections are tight and bleed screws are closed.
4. Top up the master cylinder reservoir with a recommended brake fluid, see 09.

### CAUTION:

- a *Never re-use fluid which has been bled from the system.*
- b **Do not allow the fluid level to fall so low that air can enter the system during bleeding; always top up the level.**



2NC124C

5. Fit a bleed tube to the front bleed screw which is farthest from the master cylinder and submerge the free end in a transparent container

containing brake fluid. Start bleeding the system working round the vehicle and finishing at the rear brake nearest to the master cylinder; A, B, C and D.

6. Open the bleed screw three-quarters of a turn.
7. Depress the brake pedal rapidly through its full stroke and allow it to return quickly to its stop (foot off).
8. Repeat this action until a flow of fluid is obtained then tighten the bleed screw at the end of a downward stroke.
9. Repeat the procedures in 6 to 8 at each bleed screw in turn. Top up the reservoir after tightening each bleed screw.
10. Carefully check the hydraulic system for leaks.
11. Drive the vehicle and test the brakes. Pedal travel should be short and feel solid with no indication of sponginess.

## BLEEDING THE SPLIT BRAKING SYSTEM

(With Separate Pressure Differential Warning Actuator)

Bleeding 70.25.02

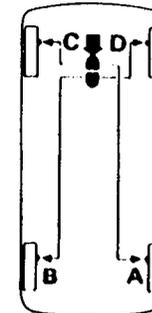
*Note: If only one half of the brake system has been disturbed, it is only necessary to bleed that half of the system provided air has not been allowed to enter the other half of the system. Absolute cleanliness must be maintained throughout the bleeding operation; ensure that no dirt or grit enters the system. All equipment to be used must be free from fuel, paraffin or any form of mineral oil.*

### Bleeding

1. Check all hose and pipe connections are tight and bleed screws are closed. Check and adjust rear brake shoe adjustment, see 'MAINTENANCE'.
2. Top up the master cylinder reservoir with a recommended brake fluid, see 'SERVICE LUBRICANTS'.

### CAUTION:

- a *Never re-use fluid which has been bled from the brake system.*
- b **Do not allow the fluid level to fall so low that air can be drawn into the system during bleeding, keep the reservoir at least half full.**



2NC 124C

3. Attach a bleed tube to the right-hand rear bleed screw 'A'. Submerge the end of the bleed tube in clean brake fluid in a transparent container.
4. Open the bleed screw one-half turn.
5. Fully depress the brake pedal rapidly and maintain for three seconds (minimum) before returning it slowly to its stop (foot off). Repeat this action after 15 seconds delay (minimum) until a flow of fluid is obtained free of air bubbles.

6. Hold the pedal down and tighten the bleed screw.
7. Repeat procedures 3, 4 and 5 at the left-hand rear 'B' bleed screw, and then the left-hand front 'C' followed by the right-hand front 'D'.
8. Check the brake pedal travel, which should feel solid without excessive movement.
9. Check the operation of the brake test switch and warning light, see 70.25.08.

## BLEEDING THE SPLIT BRAKING SYSTEM

(Master Cylinder with inbuilt Pressure Differential Warning Actuator or Low Fluid Level Sensor)

Bleeding 70.25.02

### Note:

- a A new master cylinder (fitted as replacement) may have a plastic spacer fitted between the pressure failure warning switch and the master cylinder body. Bleed the system with the spacer in position and then discard it; tighten the switch to the figure given in 'TORQUE WRENCH SETTINGS'.
- b NO spacer fitted: Remove the pressure failure switch, see procedure in 4 and then bleed the system.
- c Bleed the system starting with the secondary system, then the primary system; see procedure in 6 or 7 as applicable.
- d Absolute cleanliness must be maintained throughout the bleeding operation; ensure that

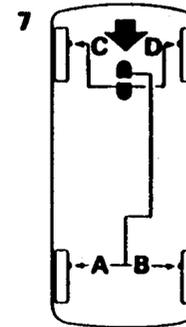
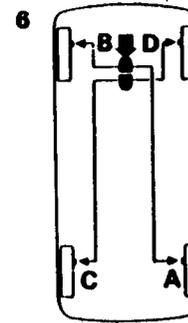
*no dirt or grit enters the system. All equipment to be used must be free from fuel, paraffin or any form of mineral oil.*

- e *If only one half of the brake system has been disturbed, it is only necessary to bleed that half of the system provided air has not been allowed to enter the other half of the system.*

### Bleeding

1. Raise the vehicle on a hoist or jack up and support both ends of the vehicle.
2. Check that all hose and pipe connections are tight and the bleed screws are closed.
3. Check and adjust rear brake shoe adjustment, see 'MAINTENANCE'.
4. Disconnect and remove the pressure failure switch from the master cylinder, see NOTES 'a' and 'b'.
5. Top up the master cylinder reservoir with a recommended brake fluid, see 'SERVICE LUBRICANTS': Do not allow the fluid level to fall so low that air can be drawn into the system during bleeding, keep the reservoir at least half full.  
**CAUTION:** Never re-use fluid which has been bled from the system.
6. Diagonal Split System  
R.H. Steering Model: Bleed in diagonal sequence, 'A', 'B', 'C' and 'D'.  
L.H. Steering Model: Bleed in diagonal sequence, 'C', 'D', 'A' and 'B'.  
Carry out operations 8 to 13.
7. Front to rear Split System:  
Bleed in rear to front sequence, 'A', 'B', 'C' and 'D'. Carry out operations 8 to 13.

8. Attach a bleed tube to the bleed screw and submerge the end of the tube into a transparent container containing brake fluid; open the bleed screw three-quarters of a turn.



9. A second operator is required to depress the brake pedal rapidly through its full stroke and maintain in this position for three seconds (minimum) before allowing it to return quickly to its stop (foot off). Repeat this action after 15 seconds delay (minimum) until a flow of fluid free of air bubbles is obtained; tighten the bleed screw whilst the pedal is held down at the end of a stroke.

10. Repeat the procedure in 9 in the correct sequence. After each point has been bled, top up the master cylinder to the bottom of the reservoir filler neck.
11. Check brake pedal travel, which should feel solid without excessive movement.
12. Before refitting the failure warning switch, connect the switch wiring and operate the switch plunger. Check that the failure switch and warning system is operating.
13. Refit the failure switch and tighten to the torque figure given in 'TORQUE WRENCH SETTINGS'.

## BLEEDING THE BRAKING SYSTEM - TURBO MODELS ONLY

Bleeding 70.25.02

a. The procedure covers bleeding the complete system but if only one part of the brake system has been disturbed, then it is only necessary to bleed that part of the system provided that air has not been allowed to enter the other part. Partial bleeding of the system is only permissible as follows.

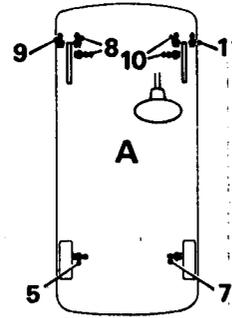
b. **Primary system:** If the front part of the primary system has been disconnected, the complete primary system must be bled front and rear. If only the rear part of the system has been disconnected however, then, provided air has not been allowed to enter the front part of the system, then only the rear part must be bled.

c. **Secondary system:** If any part of the secondary system has been disconnected, then the complete secondary system must be bled.

1. Raise the vehicle on a suitable lift.

2. Check that all pipe and hose connections are tight and bleed screws are closed.
3. Top-up the master cylinder with the approved brake fluid, see 'SERVICE LUBRICANTS'  
**WARNING: Absolute cleanliness must be maintained throughout the bleeding operation; ensure that no dirt or grit is allowed the system. All equipment used must be clean and free from fuel, paraffin, or any form of mineral oil. Never re-use fluid that has been bled from the system. Do not allow the fluid level in the master cylinder reservoir to fall so low that air is drawn into the system during the bleeding operation**
4. Check and if necessary adjust the rear brakes, see 'MAINTENANCE'
5. Fit a bleed tube to the L.H. rear bleed nipple and submerge the free end of the tube into a transparent container containing clean brake fluid. Open the bleed screw three quarters of a turn.
6. A second operator is required to depress the brake pedal rapidly through its full stroke, keep the pedal depressed for three seconds (minimum) then allow it to return to its stop unassisted. Repeat this action after a delay period of 15 seconds until a flow of fluid free of air bubbles is obtained. With the pedal depressed, tighten the bleed screw. Top-up the master cylinder reservoir.
7. Repeat operations 5 and 6 on the R.H. rear bleed nipple.
8. Repeat operations 5 and 6 on the two inner L.H. front bleed nipples.
9. Repeat operations 5 and 6 on the outer L.H. front bleed nipple.
10. Repeat operations 5 and 6 on the two inner R.H. front bleed nipples.

11. Repeat operations 5 and 6 on the outer R.H. front bleed nipple.
12. Repeat the procedures in 5 to 11 until the brake pedal feels firm without excessive travel.
13. Top-up the master cylinder reservoir and fit the cap.
14. Apply working pressure to the brake pedal for two minutes during which time, check the entire system for leaks and that brake pedal travel does not increase.
15. Road test the vehicle and test brake operation. Brake pedal operation should be short and feel solid with no trace of sponginess.



RM2883

## BRAKES

Adjust 70.25.03

Service tool: 18G 619A

### Disc brakes:

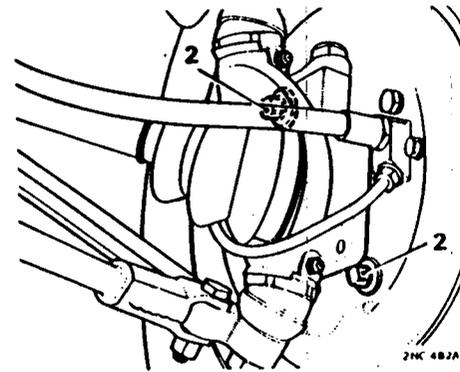
Front brake adjustment is made automatically during operation of the foot brake.

### Drum brakes - front

1. Block the rear wheels and raise the front of the car.
2. Turn the adjuster in the same direction as the forward rotation of the road wheel until the wheel is locked. Back off the adjuster the minimum amount necessary to allow the wheel to revolve freely.
3. Spin the wheel, apply the foot brake hard to centralize the brake shoes, and re-check the adjustment.
4. Repeat this procedure with each adjuster and repeat the same operation on the other front wheel.
5. Lower the vehicle to the ground.

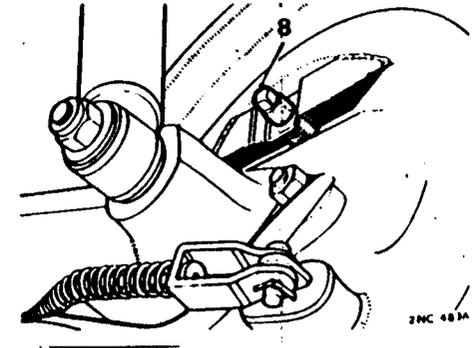
### Drum brakes - rear

6. Block the front wheels and raise the rear of the vehicle.



2MC 487A

9. Slacken the adjuster screw until the drum rotates without rubbing.
10. Lower the vehicle to the ground.



2MC 487A

## PRESSURE REGULATING VALVE

Remove and refit 70.25.10

### Removing

1. Raise the rear of the vehicle and support on stands.
2. Disconnect the brake pipes from the pressure regulating valve and plug the pipes to prevent fluid loss.
3. Remove the nut and bolt securing the valve to the sub frame and remove the valve assembly.
7. Fully release the hand brake and check that the cables are not pulling on the wheel cylinders.
8. Turn the adjuster screw in the backplate clockwise, viewed from the centre of the vehicle, until the brake drum is locked.

### Refitting

- Reverse the procedure in 1 to 3.
- Bleed the braking system, see 70.25.02.

## PRESSURE REGULATING VALVE

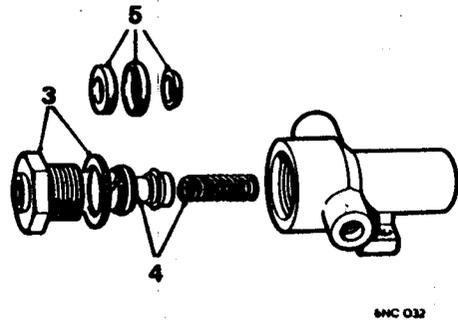
Overhaul 70.25.11

### Dismantling

- Remove the pressure regulating valve, see 70.25.10.
- Clamp the unit in a vice.
- Remove the valve end cap and sealing washer.
- Remove the valve assembly spring.
- Remove the seals from the piston.

### Inspecting

- Clean all components in brake fluid.
- Examine the cylinder bore for signs of wear.



### Reassembling

- Fit the valve assembly and spring.
- Refit the valve cap using a new gasket.
- Refit the pressure regulating valve assembly, see 70.25.10.

## PRESSURE DIFFERENTIAL WARNING ACTUATOR (P.D.W.A.)

Remove and refit 70.25.13

Reset 6 and 7 70.25.08

### Removing

- Pull the electrical connector off the switch.
- Disconnect and plug the hydraulic pipes.
- Unscrew the retaining bolt and remove the P.D.W.A. assembly.

### Refitting

- Reverse the procedure in 1 to 3, taking great care to seat the hydraulic pipes squarely in their connections; do not overtighten the unions. Ensure the unit is approximately horizontal.
- Bleed the split braking system, see 70.25.02.

### Reset

- Apply the brake pedal hard, the light should go out and stay out; when the brake pedal is released. If the light does not go out, the pressure in the system is unbalanced, the P.D.W.A. or its electrical switch are faulty. the fault must be rectified.
  - If the brake failure warning light is of: Check that the bulb will function; press the test-push and the light will glow.
- Apply pressure to the brake pedal: the light will remain off if the hydraulic system is functioning satisfactorily and will come on to indicate hydraulic failure in one side of the system.

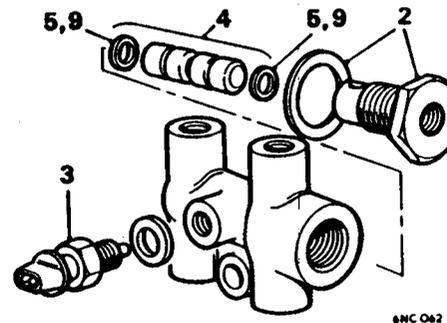
**WARNING: It must be appreciated that one circuit is inadequate as a normal service brake and the car should not be driven until the fault is rectified.**

## PRESSURE DIFFERENTIAL WARNING ACTUATOR (P.D.W.A.)

Overhaul 70.25.14

### Dismantling

- Remove the P.D.W.A. assembly, see 70.25.13.
- Remove the end plug and discard the copper washer.
- Unscrew the nylon switch.
- Withdraw the shuttle valve piston assembly from the bore; use a low-pressure air line to free the piston if necessary.
- Remove and discard the two piston seals.



### Inspection

- Thoroughly clean all the components using methylated spirit (denatured alcohol) or the recommended brake fluid, and dry with a lint-free cloth.
- Inspect the bore of the casing for scoring and damage. The complete assembly must be renewed if the bore is not in perfect condition.
- Reconnect the wiring to the switch, and actuate the switch plunger to test the switch operation and warning light circuit.

### Reassembling

- Fit two new seals to the piston.
- Lubricate the cylinder bore and the piston assembly with new brake fluid.
- Position the piston assembly, and push it fully into the bore.
- Fit a new copper washer to the end plug, screw in and torque tighten, see 'TORQUE WRENCH SETTINGS'.
- Screw in the switch and carefully tighten it to the torque figure given in 'TORQUE WRENCH SETTINGS'.
- Refit the P.W.D.A. assembly, see 70.25.13.

## PRESSURE REDUCING VALVE

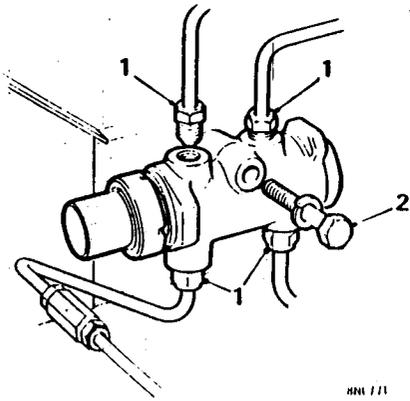
Remove and refit 70.25.21

### Removing

- Disconnect the hydraulic pipes.
- Unscrew the retaining bolt and remove the valve.

### Refitting

- Reverse the procedure in 1 and 2, noting:
  - Take great care to seat the hydraulic pipes squarely in their connections; **DO NOT** overtighten the unions.
  - Ensure the unit is approximately horizontal.
  - Bled the hydraulic system, see 70.25.02.



## BRAKE MASTER CYLINDER

Remove and refit 70.30.01

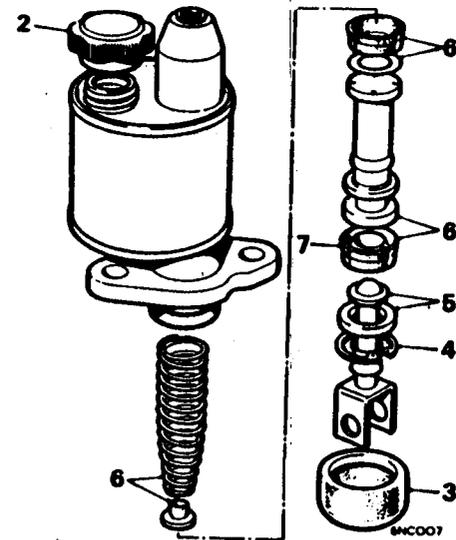
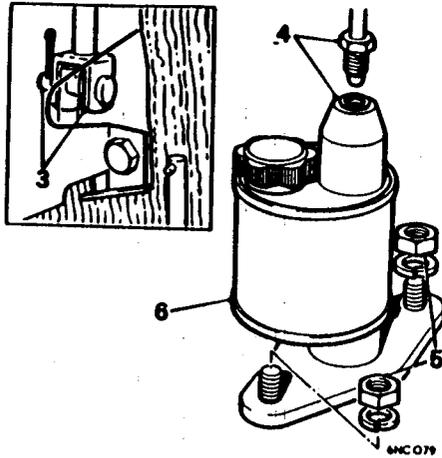
### Removing

1. Fit a bleed tube and open a front brake bleed screw, operate the brake pedal until the master cylinder reservoir is empty. Retighten the bleed screw and discard the fluid.

2. Disconnect the heater air intake flexible tube from the heater and the wheel arch.
3. Remove the clevis pin securing the push-rod to the brake pedal.
4. Disconnect the pipe union from the master cylinder.
5. Remove the master cylinder securing nuts.
6. Remove the master cylinder from the vehicle.

### Refitting

7. Reverse the procedure in 2 to 6.
8. Bleed the braking system, see 70.25.02.



## BRAKE MASTER CYLINDER

Overhaul 70.30.02

### Dismantling

1. Remove the brake master cylinder, see 70.30.01
2. Remove the filler cap and drain the fluid from the reservoir.
3. Detach the boot from the body and slide it off the push-rod.
4. Extract the circlip.
5. Remove the push-rod complete with dished washer.
6. Withdraw the piston complete with the secondary cup, the piston washer, main cup, spring retainer, and spring from the body.
7. Remove the secondary cup from the piston by carefully stretching it over the end of the piston.

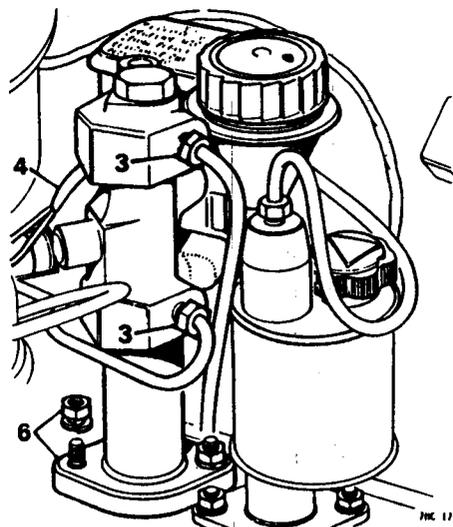
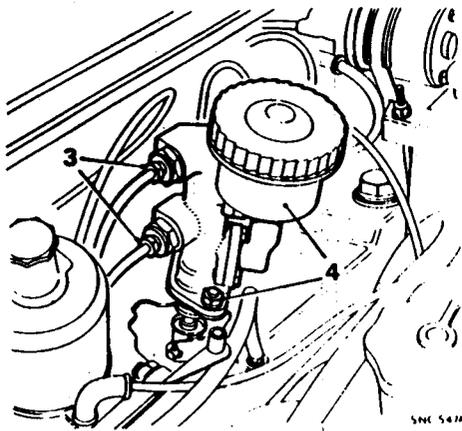
**CAUTION:** Care must be taken to avoid damaging the piston when removing the secondary cup.

### Inspecting

8. Clean the cylinder body in 0. industrial methylated spirit. Wash all internal parts in clean brake fluid.
9. Examine the master cylinder piston bore; if the bore is not scored or ridged new seals can be fitted. Renew the unit if the bores are ridged or scored.
10. Check that the inlet and outlet ports are free of obstruction.

### Reassembling

11. Immerse all components in a recommended brake fluid and assemble when wet.
12. Stretch the secondary cup over the piston with the lip of the cup facing the head (drilled end) of the piston.
13. Fit the spring retainer into the small diameter end of the piston, and insert the spring into the body, large diameter first.
14. Fit the main cup and cup washer over the spring retainer.  
**CAUTION:** When fitting the cups, carefully enter the lip edge first.
15. Insert the piston assembly fully into the cylinder bore.
16. Refit the push-rod assembly and secure it with the circlip.
17. Refit the boot to the push-rod and attach it to the cylinder body.
18. Refit the brake master cylinder, see 70.30.01.



## TANDEM BRAKE MASTER CYLINDER

Remove and refit 70.30.08

### Removing

1. Fit a bleed tube and open a front brake bleed screw, operate the brake pedal until the master cylinder reservoir is empty. Re-tighten the bleed screw and discard the fluid.
2. Release the bleed screw on the other front brake and repeat the procedure to empty the fluid reservoir.
3. Disconnect the hydraulic pipes from the master cylinder and plug the pipe ends to prevent loss of fluid or entry of dirt.
4. Unscrew the two nuts securing the master cylinder to the bulkhead, and lift it off, leaving the push-rod attached to the brake pedal.

### Refitting

5. Reverse the procedure in 3 and 4, tightening the securing nuts to the figure given in 'TORQUE WRENCH SETTINGS'.
6. Bleed the split braking system, see 70.25.02.

## TANDEM BRAKE MASTER CYLINDER

(with inbuilt Pressure Differential Warning Actuator)

Remove and refit 70.30.08

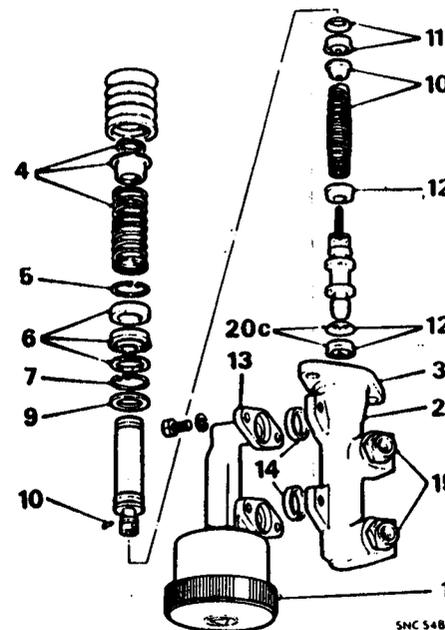
### Removing

1. Fit a bleed tube and open a front brake bleed screw, operate the brake pedal until the master cylinder reservoir is empty. Re-tighten the bleed screw and discard the fluid.
2. Repeat the procedure 1 on the other front brake to empty the fluid reservoir.
3. Disconnect the hydraulic pipes from the master cylinder and plug the pipe ends to prevent entry of dirt.

4. Disconnect the wiring connector from the brake failure switch on the cylinder body.
5. Remove the clevis pin securing the master cylinder push-rod to the brake pedal.
6. Remove the nuts retaining the master cylinder to the bulkhead and lift it off.

### Refitting

7. Reverse the procedure in 3 to 6.
8. Bleed the split braking system, see 70.25.02.



## TANDEM MASTER CYLINDER

Overhaul 70.30.09

Service tool: 18G 1112

### Dismantling

1. Drain the fluid from the reservoir and refit the cap.
2. Plug the pipe connections, thoroughly clean the exterior of the assembly.
3. Grip the cylinder body in a soft-jawed vice with the mouth of the bore uppermost.
4. Compress the return spring and remove the Spirolex ring from its groove in the primary piston, taking care not to distort the coils of the ring or score the bore of the cylinder. Remove the retainer and return spring.
5. Using tool 18G 1112, remove the piston retaining circlip. A slight radiusing of the sides of the tool may be necessary for ease of use on this master cylinder.
6. Move the piston up and down in the bore to free the nylon guide bearing, secondary seal and washer.
7. Using tool 18G 1112, remove the inner circlip.
8. Withdraw the primary and secondary piston assembly complete with stop washer.
9. Remove the stop washer.
10. Compress the spring separating the two pistons and drive out the roll-pin retaining the piston link to the primary piston. Remove the pin retainer and spring.
11. Remove the seal and washer from the primary piston.
12. Remove the seals and washer from the secondary piston.
13. Unscrew the four bolts securing the plastic reservoir to the body and remove the reservoir.

14. Remove the two reservoir sealing rings.
15. Unscrew the connection adaptors, discard the copper gaskets, and remove the spring and trap valves.

#### Inspecting

16. Clean all parts thoroughly in brake fluid and dry them with lint free cloth.
17. Examine all metal components for wear and damage and renew all worn damaged or suspect parts.

#### Reassembling

18. Reverse the procedure in 2 to 15, noting:
  - a Use a complete set of new rubber seals when reassembling.
  - b Immerse all internal components in a recommended brake fluid and assemble them while wet.
  - c Locate the piston washer over the head of the piston, convex surface first; carefully ease the seal over the piston and seat it with its flat surface against the washer.
  - d Fit new copper washers to the connection adaptors and tighten the connections.

## TANDEM BRAKE MASTER CYLINDER

(With Inbuilt Pressure Differential Warning Actuator)

Overhaul 70.30.09

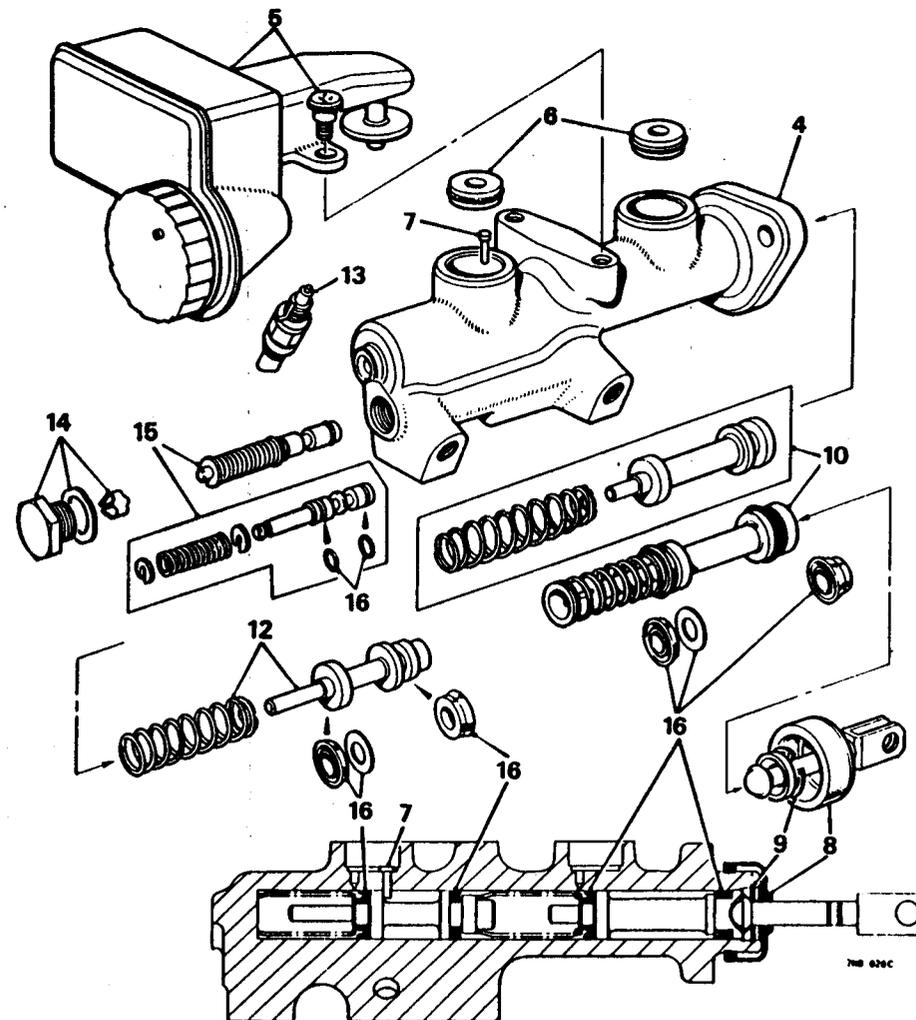
Service tool: 18G 1112

Note: A limited number of vehicles have been fitted with an interim type cylinder for the diagonal split brake system. Components which differ visually from

those fitted to the latest type cylinder are shown in insets to the main illustration.

#### Dismantling

1. Remove the tandem brake master cylinder (type with inbuilt pressure differential warning actuator), see 70.30.08.
2. Drain the fluid from the reservoir and refit the cap.
3. Plug the pipe connections and thoroughly clean the exterior of the unit.
4. Grip the cylinder body horizontally in a soft jawed vice with the reservoir uppermost.
5. Remove the reservoir retaining screws and detach the reservoir from the body.
6. Remove the reservoir sealing washers from the cylinder body.
7. Push the push-rod in as far as possible and use pliers to withdraw the stop pin from the recess - the stop pin retains the secondary piston.
8. Pull the sealing boot up the push-rod.
9. Push in on the push-rod and use tool 18G 1112 to withdraw the circlip out of the cylinder bore - remove the push-rod assembly.
10. Withdraw the primary piston assembly and spring.
11. Use an air pressure line in the hole from which the stop pin was removed to move the secondary piston assembly down the bore.
12. Remove the secondary piston assembly and spring from the cylinder bore.
13. Remove the brake failure switch.
14. Remove the end plug, washer and distance piece.
15. Extract the pressure differential piston assembly.



16. Remove the rubber seals from the pistons.

18. Examine the cylinder bore - if ridged or scored renew the unit. Renew all worn, damaged or suspect parts.

#### Inspection

17. Clean all components with new brake fluid and dry with lint-free cloth.

## Reassembling

19. Reverse the procedure in 4 to 16 and ensure scrupulous cleanliness is observed during assembly. Lubricate the cylinder bore, pistons and seals with clean brake fluid and fit the seals onto the pistons using fingers only. Refer to the illustration and ensure all seals are fitted correctly.
20. Refit the spring and secondary piston assembly into the bore taking care not to turn back the lip of the piston seal.
21. Use a soft metal rod and push the secondary piston down the bore whilst the stop pin is inserted in its locating hole. This assembly is now secured by the stop pin.
22. Refit the primary piston spring and piston assembly and the remaining components to the unit.
23. Position the two reservoir seals into the cylinder body recesses.
24. Refit the reservoir and tighten the securing screws, see **'TORQUE WRENCH SETTINGS'**; do not over-tighten.
25. Fit new 'O' ring seals onto the pressure differential piston, refit the piston assembly and distance piece. Tighten the end plug to the figure given in **'TORQUE WRENCH SETTINGS'**.
26. Refit the tandem brake master cylinder, see 70.30.08.  
*Note: If it is necessary to renew the master cylinder, the new cylinder may have a plastic spacer fitted between the failure switch and cylinder body. If a spacer is fitted, bleed the braking system with the spacer in position and then discard it. Tighten the failure switch to the figure given*

in **'TORQUE WRENCH SETTINGS'**.  
*If a spacer is not fitted, bleed the system with the failure switch removed, see **'BLEEDING THE SPLIT BRAKING SYSTEM'**. 70.25.02*

## BRAKE PEDAL

Remove and refit 1 to 9,  
11 and 12 70.35.01

### Removing

1. Disconnect the heater air intake flexible tube from the heater and wheel arch.
2. Slacken the heater securing nut.
3. Remove the two screws retaining the heater unit to the fascia and lower the assembly.
4. Remove the clevis pins from the brake and clutch push-rods.
5. Remove the pedal shaft retaining nut and washer.
6. Withdraw the pedal shaft.
7. Remove the brake and clutch pedals from the pedal bracket.
8. Detach the pedal return spring.
9. Remove the pedal rubber.

### Refitting

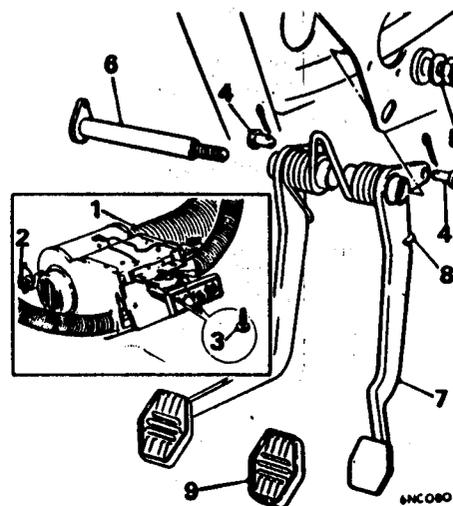
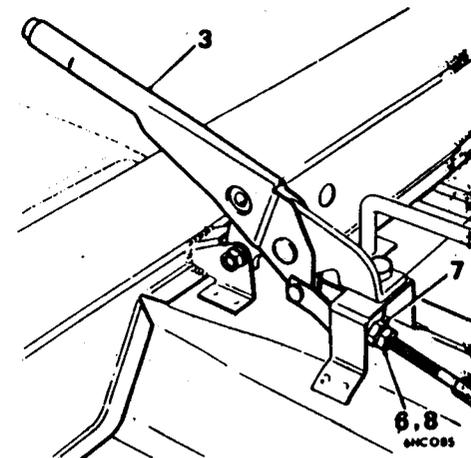
10. Fit new pedal bearings if necessary.
  - a Press the used bearings from the tube.
  - b Press a new bearing into each end of the tube and slightly below the end face.
  - c Check the shaft is a free fit in the bearing.
11. Lightly lubricate the pedal shaft.
12. Reverse the procedure in 1 to 9.

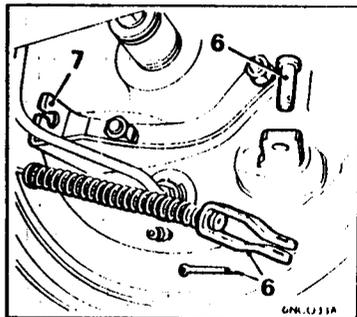
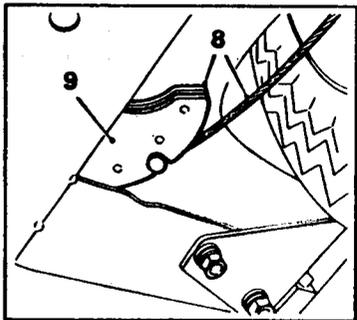
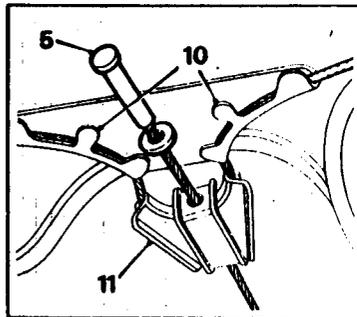
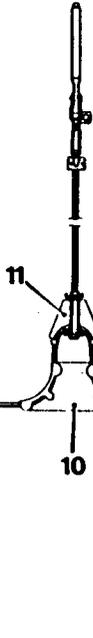
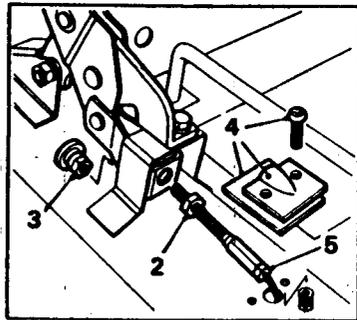
## HAND BRAKE CABLE

Adjust 70.35.10

### Adjusting

1. Block the front wheels, raise the rear of the vehicle and support both sides.
2. Adjust the rear brakes, see 70.25.03.
3. Pull the handbrake lever on until the third tooth on the ratchet is heard to engage.
4. Check for braking effect on the rear wheels; the adjustment is correct if each wheel can only just be rotated by heavy hand pressure.
5. If adjustment is required, tilt the front seats forward and pull back the floor covering.
6. Slacken the cable locknut.
7. Turn the adjusting nut in the required direction until the correct tension is achieved.
8. Tighten the locknut.
9. Check the handbrake operation, release the handbrake to the OFF position and check that both rear road wheels rotate freely.





## HANDBRAKE CABLE

### Remove and refit

Front cable 1 to 5

70.35.14

Rear cable 1 to 11

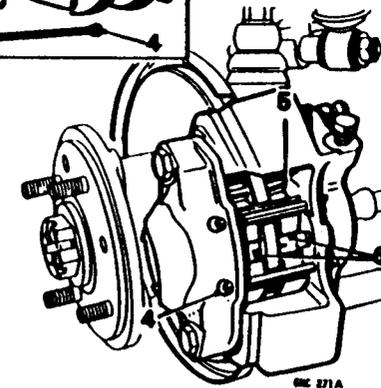
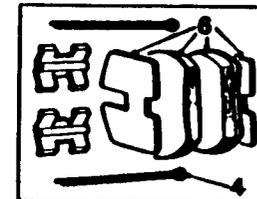
70.35.15

### Removing

1. Tilt the front seats forward and fold back the rear floor covering. **Turbo only:** Remove the centre console, see 72.25.01.
2. Slacken the locknut.
3. Unscrew the front cable from the adjusting nut.
4. Remove the screws securing the front cable guide plate, remove the plate and sealing pad.
5. Pull the front cable through the floor and disconnect the front cable from the compensator assembly.
6. Remove the split pins and clevis pins to release the rear cable from the back plate levers.
7. Release the rear cable from the abutment brackets.
8. Lever back the flange at the sector corners where it retains the rear cable.
9. Release the rear cable from the sectors.
10. Lever back the retaining tags at the sub frame guide plate.
11. Remove the rear cable and compensator assembly.

### Refitting

12. Reverse the procedure in 1 to 11 as necessary.
13. Adjust the hand brake cable, see 70.35.10.



## FRONT BRAKE PADS

### Remove and refit

70.40.02

**Service tool:** 18G 590

### Removing

1. Apply the hand brake and slacken the front road wheel nuts.
2. Raise the vehicle at the front and support.
3. Remove the road wheel.
4. Remove and discard the split pins.
5. Remove the anti-rattle springs.
6. Extract the used brake pads and anti-squeak shims.

### Inspecting

7. Clean the dust from the calipers. **WARNING: Do not use an airline to blow lining dust, asbestos dust can be a serious health hazard if inhaled. Use methylated spirit or de-natured alcohol to wash dust from components. Do not use any petroleum-base fluids.**

- a Ensure that the piston dust covers are in good condition.
- b Examine the brake disc; if worn on one side, one piston may be seized. Overhaul the caliper, see 70.55.13.

Rotate the disc by hand, remove all scale and rust from around the edge of the disc with a scraper.

- c Scrape the pad locating surfaces in the caliper free of rust.

#### Refitting

8. Press the pistons back into their bores - use 18G 590 over the centre of the pistons. **Turbo only:** Use a suitable hardwood block to retain the pistons as they are retracted.
9. Reverse the procedure in 1 to 6, use new split pins. Tighten the road wheel nuts, see 'TORQUE WRENCH SETTINGS'.

### FRONT BRAKE SHOES

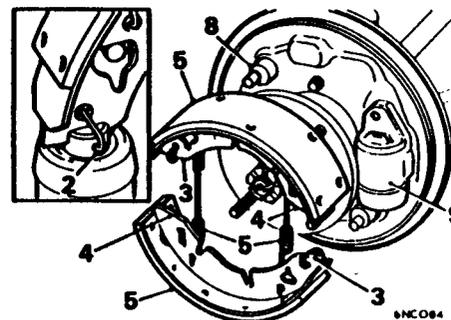
Remove and refit 70.40.02

#### Removing

1. Remove the brake drum, see 70.10.02.
2. Release the brake shoe steady springs from the wheel cylinder pistons.
3. Lever the leading edges of the brake shoes from the wheel cylinders.
4. Lever the trailing edges of the brake shoes from the brake shoe adjusters.
5. Remove both shoes and return springs.
6. Retain the wheel cylinder pistons with a clamp or elastic band.

#### Refitting

7. Wash all dust from backplate assemblies and drums with brake cleaning fluid or denatured alcohol, allow to dry.  
**WARNING: Do not use an airline to blow lining dust, asbestos dust can be a serious health hazard if inhaled. Use methylated spirit or denatured alcohol to wash dust from components. Do not use any petroleum-based fluids.**
8. Check the adjusters for easy working; lubricate moving parts if necessary.
9. Check the wheel cylinders for freedom of movement on their backplates and for signs of leakage, see 70.60.02.
10. Fit the return springs into the correct holes in the shoes.
11. Lever the shoes into position in the adjusters and wheel cylinders.
12. Refit the brake shoe steady springs.
13. Refit the brake drum, see 70.10.02.



### REAR BRAKE SHOES

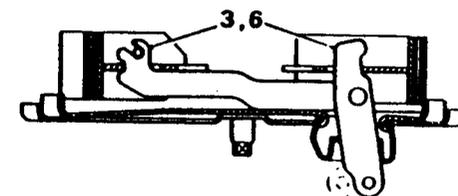
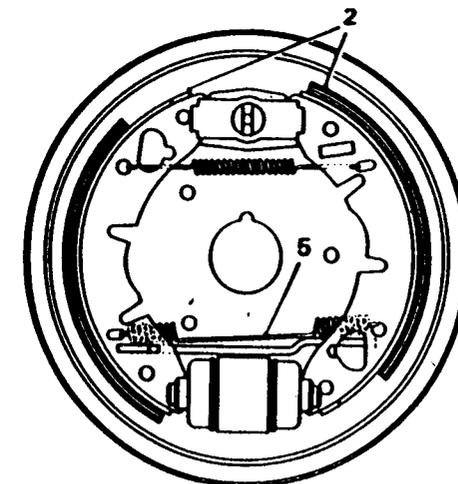
Remove and refit 70.40.03

#### Removing

1. Remove the rear brake drum see 70.10.03.
2. Release the brake shoes from the adjuster and then from the wheel cylinder.
3. Disengage the hand brake levers and remove the brake shoes. Retain the wheel cylinder pistons with a clamp or elastic band.

#### Refitting

4. Wash all brake dust from the drum and backplate using denatured alcohol, allow to dry.  
**WARNING: Do not use an airline to blow lining dust, asbestos dust can be a serious health hazard if inhaled. Use methylated spirit or denatured alcohol to wash dust from components. Do not use any petroleum-based fluids.**
5. Position the shoes as illustrated and fit the bottom pull-off spring ensuring the connecting wire is to the bottom.
6. Locate the hand brake levers and fit the shoes onto the wheel cylinder.



7. Fit the top pull-off spring and lift the shoes onto the adjuster.
8. Refit the brake drum, see 70.10.03.
9. Adjust the brake shoes, see 70.35.08.

### FRONT BRAKE CALIPER

Remove and refit 70.55.02

#### Removing

- WARNING: Do not use an airline to blow lining dust, asbestos dust can be a serious health hazard if inhaled. Use methylated spirits or denatured alcohol to wash dust from components. Do not use any petroleum based fluids.**
1. Slacken the front road wheel nuts.

2. Jack up and support the front of the vehicle and remove the road wheel.
3. Remove the brake pads, see 70.40.02
4. Disconnect the front hoses to the brake pipes. Cap the pipes and hoses to prevent fluid loss.
5. Remove the retaining bolts and lift the caliper from the swivel hub.

#### Refitting

6. Reverse the procedure in 1 to 5, noting: Tighten the caliper to swivel hub bolts, see 'TORQUE WRENCH SETTINGS'.
7. Bleed the braking system, see 70.25.02.

## FRONT BRAKE CALIPER

Overhaul - Not Turbo 70.55.13

Service tool: 18G 590

#### Removing

**WARNING: Do not use an airline to blow lining dust, asbestos dust can be a serious health hazard if inhaled. Use methylated spirits or denatured alcohol to wash dust from components.**

**Do not use any petroleum based fluids.**

1. Slacken the front road wheel nuts, jack up and remove the road wheel.
2. Withdraw the brake pads and anti-squeal shims.
3. Unscrew the two securing bolts and detach the caliper from the swivel hub.
4. Clean the outside of the calipers.
5. Clamp the piston in the mounting half, using tool 18G 590.
6. Apply the brake pedal gently to force the outer piston almost from its bore.
7. Withdraw the piston, dust seal and fluid seal.

#### Fitting

**WARNING: Absolute cleanliness must be observed at all times. Use only clean brake fluid for cleaning internal components. Lubricate all components with clean brake fluid prior to assembly and assemble using the fingers only.**

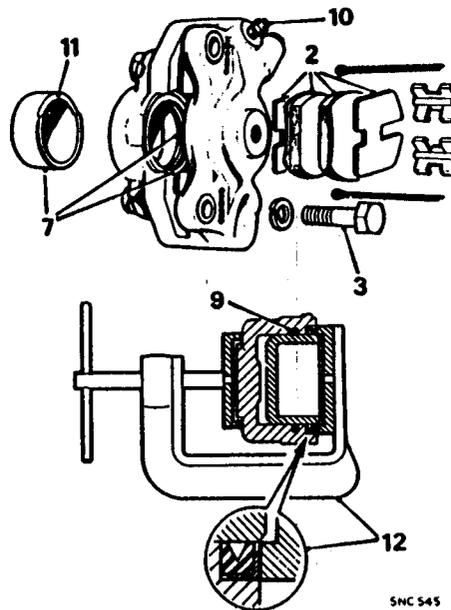
8. Check the bore, if scored or showing signs of wear, renew the unit.
9. Lubricate the seals with brake fluid, and fit the piston seal.
10. Slacken the bleed screw.
11. Lubricate the piston and insert it into the bore with the cut-away at the top. Press the piston in using tool 18G 590 until 8 mm (0.32 in) remains protruding.
12. Fit a new dust seal into the retainer, fit the seal and retainer onto the piston. Press the piston and seal into the caliper.
13. Retighten the bleed screw.
14. Clamp the piston in the outer half of the caliper and repeat operations 6 to 13 on the other piston.
15. Refit the caliper and tighten the caliper to swivel hub bolts, see 'TORQUE WRENCH SETTINGS'.
16. Fit the brake pads.
17. Bleed the braking system, see 70.25.02.

## FRONT BRAKE CALIPER

Overhaul - Turbo only 70.55.13

Service tool: 18G 590

**WARNING: Absolute cleanliness must be observed at all times. Use only clean brake fluid for cleaning internal components. Lubricate all components with clean brake fluid prior to assembly and assemble using the fingers only.**



2. Thoroughly clean the exterior of the caliper using methylated spirits or denatured alcohol. **WARNING: Do not use an airline for cleaning purposes, asbestos dust can be a serious health hazard if inhaled.**
3. Remove the split pins and anti-rattle springs.
4. Withdraw the brake pads.
5. Remove all three bleed nipples.
6. Apply low air pressure to each of the bleed nipple holes and expel the pistons in turn, keeping them in their proper order.
7. Using a blunt screwdriver and taking care not to damage the grooves or cylinder bore, prise the wiper seals and retainers from their bores.
8. Carefully remove the fluid seal from each bore.

#### Inspection

9. Thoroughly clean each piston and bore. Renew a piston if the sealing surface is corroded. Renew a caliper if any bore shows signs of wear, corrosion or damage. Discard all seals.

#### Reassembling

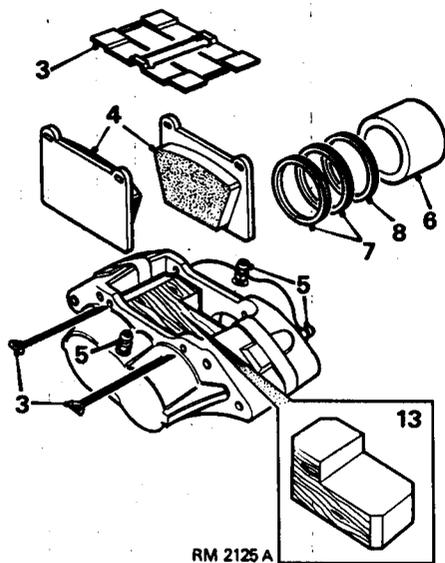
Service tool: 18G 590

10. Coat new fluid seals with clean brake fluid and insert them into their bores. The edge of each seal furthest from the mouth of the bore is held proud by the sectional shape of the groove.
11. Coat new wiper seals with clean brake fluid. Fit each seal into its retainer and press into place using 18G 590.
12. Smear each piston with disc brake lubricant and push each piston into its respective bore leaving approximately 0.15 in (4 mm) protruding.

#### Dismantling

1. Remove the caliper, see 70.55.02

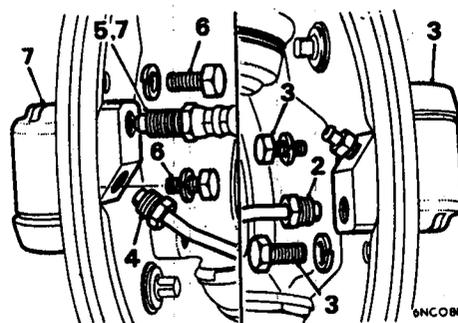
13. Use a suitable block of hardwood to retain three of the pistons in their bores
14. Fit the brake caliper, see 70.55.02
15. Fit the brake pads, anti-rattle springs and new split pins, see 70.40.02



2. Disconnect the bridge pipe from the rear cylinder and plug the pipe to prevent fluid loss.
3. Remove the retaining bolts and withdraw the rear cylinder and gasket.
4. Disconnect the bridge pipe from the forward cylinder.
5. Slacken the brake hose at the wheel cylinder.
6. Remove the retaining bolts and pull the wheel cylinder through the backplate.
7. Disconnect the wheel cylinder from the brake hose, plug the hose and remove the wheel cylinder and gasket.

#### Refitting

8. Reverse the procedure in 1 to 7 as necessary.
9. Bleed the braking system, see 70.20.02.



## FRONT WHEEL CYLINDERS

Remove and refit 70.60.02

Forward cylinder 1, 4 to 7

Rear cylinder 1 to 3

#### Removing

1. Remove the front brake shoes, see 70.40.02.

## FRONT WHEEL CYLINDER

Overhaul 70.60.11

#### Dismantling

1. Remove the front wheel cylinders, see 70.60.02.
2. Remove the dust cover.
3. Withdraw the piston assembly.
4. Remove the piston seal.

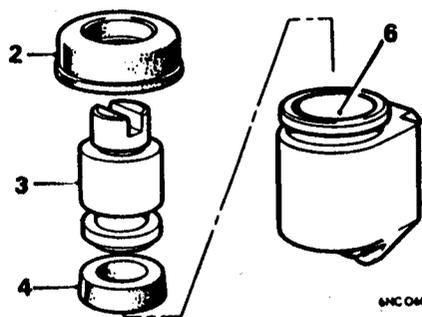
#### Inspection

5. Clean all components in brake cleaning fluid or denatured alcohol.
6. Examine the wheel cylinder bore, if damaged renew the unit.

#### Reassembling

**WARNING: Absolute cleanliness must be observed at all times. Use only clean brake fluid for cleaning internal components. Lubricate all components with clean brake fluid prior to assembly and assemble using the fingers only.**

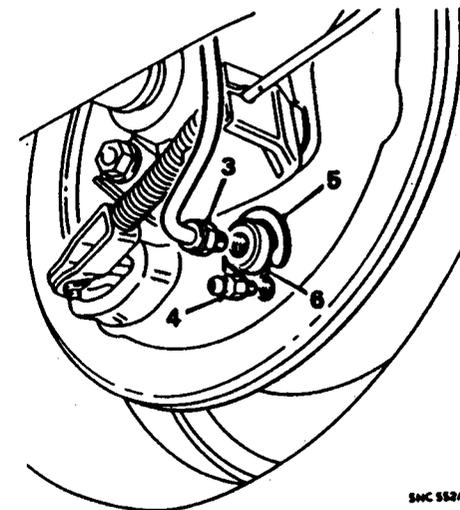
7. Lubricate all components before reassembling.
8. Reverse the procedure in 1 to 4.



3. Disconnect the brake hose from the wheel cylinder and plug the hose.
4. Remove the bleed screw.
5. Remove the wheel cylinder retaining circlip.
6. Remove the wheel cylinder and gasket.

#### Refitting

7. Reverse the procedure in 2 to 5, using a new circlip.
8. Refit the rear brake shoes, see 70.40.03.
9. Bleed the braking system, see 70.25.02.

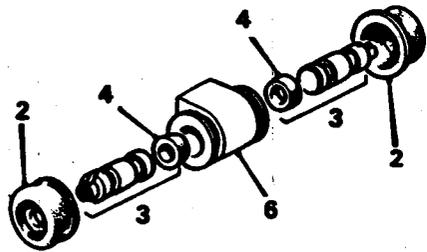


## REAR WHEEL CYLINDER

Remove and refit 70.60.18

#### Removing

1. Remove the rear brake shoes, see 70.40.03.
2. Slacken the brake pipe where it connects to the brake hose.



SNC 551A

## REAR WHEEL CYLINDER

Overhaul 70.60.26

### Dismantling

1. Remove the rear wheel cylinder, see 70.60.18
2. Remove the dust covers.
3. Withdraw the pistons.
4. Remove the seals from the pistons.

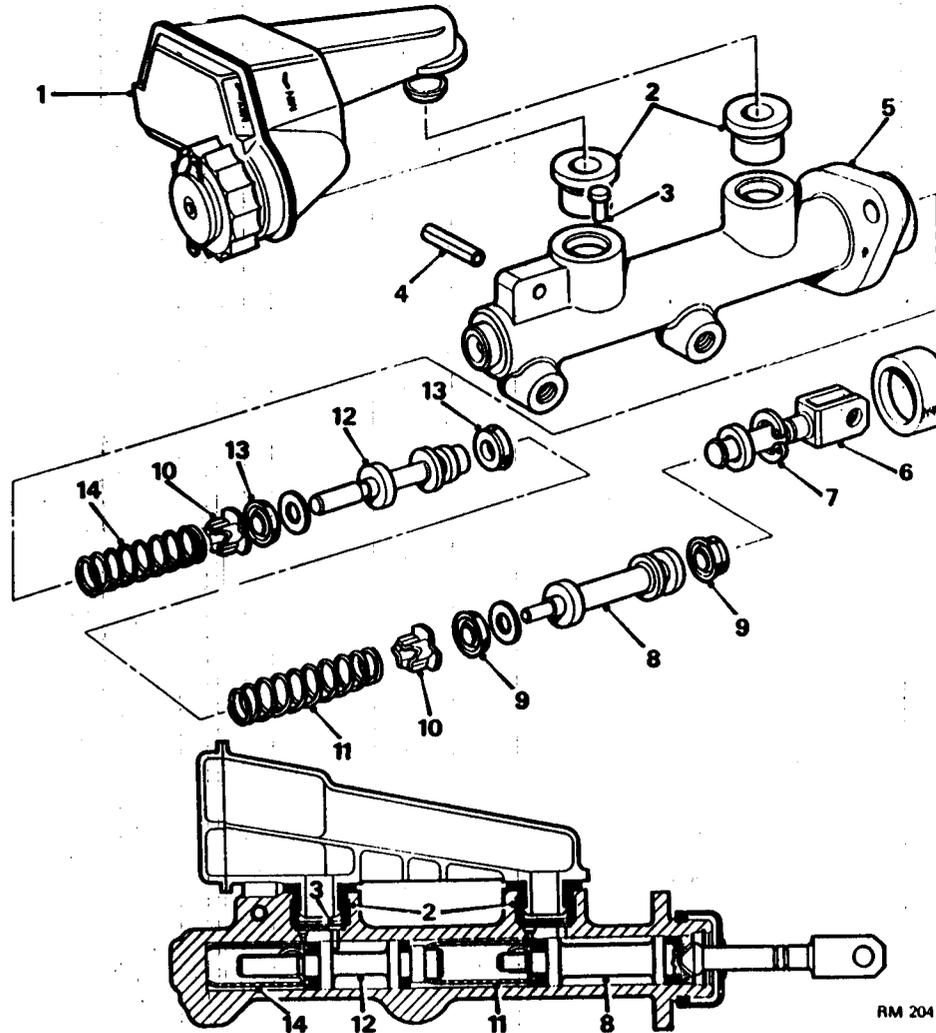
### Inspection

5. Clean all components in brake cleaning fluid or denatured alcohol.
6. Examine the wheel cylinder bore; if scored or damaged renew the unit.

### Reassembling

**WARNING: Absolute cleanliness must be observed at all times. Use only clean brake fluid for cleaning internal components. Lubricate all components with clean brake fluid prior to assembly and assemble using the fingers only.**

7. Lubricate all components before assembly.
8. Reverse the procedure in 1 to 4.



MASTER CYLINDER—WITH LOW FLUID LEVEL SENSOR

- |   |                           |    |                        |
|---|---------------------------|----|------------------------|
| 1 | Reservoir                 | 8  | Primary piston         |
| 2 | Rubber seals              | 9  | Primary piston seals   |
| 3 | Secondary piston stop pin | 10 | Spring retaining clip  |
| 4 | Roll pin                  | 11 | Long spring            |
| 5 | Cylinder body             | 12 | Secondary piston       |
| 6 | Push rod                  | 13 | Secondary piston seals |
| 7 | Circlip                   | 14 | Short spring           |

## DESCRIPTION - 1984 on 70.00.01

The braking system utilises a tandem master cylinder to supply two independent circuits, the primary circuit operating the front disc brakes and the secondary circuit operating the rear drum brakes. A pressure reducing valve, which is fed from both primary and secondary circuits from the master cylinder, serves to control the fluid pressure to the rear brakes to reduce the possibility of the rear wheels locking up.

In the event of failure or fluid loss from one circuit, the other will continue to operate but with increased pedal travel. The master cylinder is mounted vertically and is fitted with a translucent reservoir which enables the fluid level to be checked without removing the filler cap. Two separate compartments within the reservoir supply each circuit. The cap itself is fitted with a low fluid level warning sensor which illuminates a lamp on the dash should the fluid level drop below the 'MIN' mark.

## TANDEM BRAKE MASTER CYLINDER (with low fluid level sensor)

Remove and refit 70.30.08

Overhaul 70.30.09

Service tool: 18G 1112

### Removing

1. Attach a bleed tube to the bleed screw on one of the front brake calipers, open the bleed screw and operate the brake pedal until the fluid ceases to flow. Tighten the bleed screw and discard the fluid.
2. Attach a bleed tube to one of the rear brakes and repeat the operation until the reservoir is empty. Tighten the bleed screw and discard the fluid.
3. Disconnect the heater air intake flexible tube from the heater and the wheel arch and remove the clevis pin securing the push rod to the brake pedal.
4. Disconnect the wiring connectors from the terminals on the reservoir filler cap, disconnect the hydraulic pipes from the master cylinder and plug the ends of the pipes to prevent the entry of dirt.
5. Remove the master cylinder securing nuts and remove the master cylinder from the vehicle.

### Overhauling

**WARNING: Absolute cleanliness must be observed at all times. Use only clean brake fluid for cleaning internal components. Lubricate all components with clean brake fluid prior to assembly and assemble using the fingers only.**

6. Drain any remaining fluid from the cylinder and reservoir, refit the reservoir cap and plug the pipe connections. Thoroughly clean the exterior of the assembly.
7. Mount the cylinder assembly in a soft jawed vice with the reservoir uppermost, remove the roll pin securing the reservoir to the cylinder and carefully withdraw the reservoir from the cylinder. Remove the two rubber seals.

8. Depress the push rod fully into the master cylinder against the stop and remove the secondary piston stop pin from the feed port using long nosed pliers.
9. Pull back the sealing boot over the push rod, depress the push rod and remove the circlip from the cylinder bore using tool 18G 1112. Remove the push rod assembly.
10. Withdraw the primary piston and spring from the cylinder bore and push out the secondary piston and spring using a controlled air supply to the hole from which the stop pin was removed.
11. Pull off the piston springs and the spring retainers from the pistons and remove the piston seals and washers.
12. Thoroughly clean all parts with new brake fluid and dry with a lint free cloth.
13. Examine the cylinder bore, if ridged, scored or showing any signs of corrosion it must be renewed. Renew all seals and any worn or damaged parts.

**Note: Scrupulous cleanliness is essential. Ensure the hands are free of grease and dirt and lubricate all parts except the outermost piston seal with new brake fluid before reassembly.**

14. Locate a new piston washer and one of the two thicker piston seals, lipped side facing out, over the secondary piston nose and against the drilled piston head. Fit the thinner seal, lipped side facing out, into the groove at the other end of the piston.

15. Push the spring retainer over the secondary piston nose and push the shorter spring firmly over the retainer. Insert the secondary piston and spring assembly into the cylinder bore taking care not to damage or turn back the seal lip.
16. Locate a new piston washer and the second of the two piston seals lipped side facing out over the primary piston nose and against the drilled piston head. Lubricate the remaining thick piston seal with silicone grease and fit it, lipped side facing inwards towards the other seal, into the groove in the piston. Push the spring retainer over the piston nose then the longer spring firmly over the retainer. Insert the primary piston and spring into the cylinder bore taking care not to damage or turn back the lips of the seals.
17. Position the push rod and stop washer into the cylinder bore and depress the push rod sufficiently to allow the circlip to be fitted in the groove using tool 18G 1112. Ease the new rubber sealing boot over the push rod fork end, lubricate the inside of the boot with Rubberlube and fit the boot over the end of the cylinder.
18. Depress the push rod fully into the master cylinder against the stop and insert the secondary piston stop pin into the hole in the feed port.
19. Fit the two feed port rubber seals making sure they are lipped securely into position, locate the reservoir feed tubes into the seals and push the reservoir firmly into position. Fit the reservoir securing roll pin.

### Refitting

20. Renew the master cylinder to bulk-head sealing gasket if necessary, fit the master cylinder and tighten the nuts to the correct torque. Reconnect and tighten the hydraulic pipes.
21. Fit the clevis pin connecting the push rod to the brake pedal and fit a new split pin. Reconnect the heater air intake flexible tube.
22. Fill the master cylinder with the recommended brake fluid, fit the reservoir filler cap and reconnect the wiring to the terminals on the cap. Check that the float mechanism is operating by depressing the small plunger in the centre of the cap.
23. Bleed the brakes, see 70.25.02.

### DESCRIPTION - 1989 Model year on 70.00.01

The braking system utilises a servo-assisted tandem master cylinder supplying two independent circuits. The primary circuit operates the front brakes and the secondary circuit operates the rear. On Turbo models, the primary system operates the rear drum brakes and one pair of pistons in each of the four piston calipers on the front disc brakes. The secondary system operates the remaining pair of pistons in each of the front brake calipers. A pressure reducing valve, fed from both primary and secondary circuits, controls the fluid pressure applied to the rear brakes thereby reducing the possibility of the rear wheels 'locking up' during heavy braking. In the event of either the primary or secondary circuits failing, the other circuit will continue to operate but with increased pedal travel and a reduction in braking efficiency. With the engine stationary, the servo will be inoperative

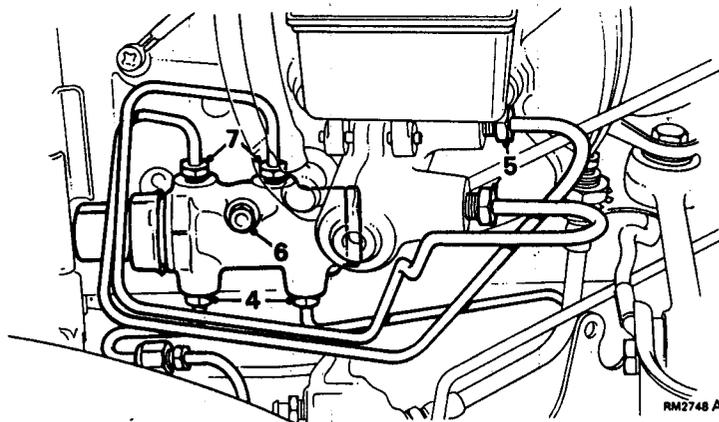
after two or three applications of the brake pedal and greatly increased effort will be required at the pedal to apply the brakes. The master cylinder is mounted directly on to the front of the servo and incorporates a translucent reservoir which enables the fluid level to be checked without removing the filler cap. Two separate compartments within the reservoir supply each circuit. The filler cap is fitted with a low fluid level sensor which illuminates a warning light on the fascia should the fluid fall to an unacceptable level.

### PRESSURE REDUCING VALVE - 1989 Model year on

Remove and refit 70.25.21

#### Removing

1. Disconnect the multi-connector and the feed tube from the windscreen washer pump.
2. Remove the windscreen washer bottle.
3. **Turbo only:** Remove the bolts securing the clutch slave cylinder and move the cylinder aside. Recover the plates and spacer.
4. Disconnect the brake pipes from beneath the valve; plug or tape the ends of the pipes to prevent the ingress of dirt.
5. Position a suitable receptacle beneath the master cylinder and disconnect the brake pipes from the cylinder. Plug the ports in the cylinder and the ends of the pipes.
6. Remove the bolt securing the valve and withdraw the valve together with the brake pipes.
7. Note the fitted position of the pipes and with the valve held in a soft jawed vice, remove the pipes.



#### Refitting

8. With the valve held in a soft jawed vice, connect the brake pipes.  
**CAUTION:** Ensure that the pipes are in their correct fitted positions; **DO NOT over-tighten the unions.**
9. Fit the valve ensuring that it is mounted horizontally.
10. Connect the brake pipes to the master cylinder, **DO NOT over-tighten the unions.**
11. Connect the brake pipes beneath the valve, **DO NOT over-tighten the unions.**
12. **Turbo only:** Fit the clutch slave cylinder plates, spacer and the slave cylinder.
13. Refit the windscreen washer bottle; connect the multi-plug and the washer pump feed tube.
14. Bleed the brake hydraulic system, see 70.25.02.

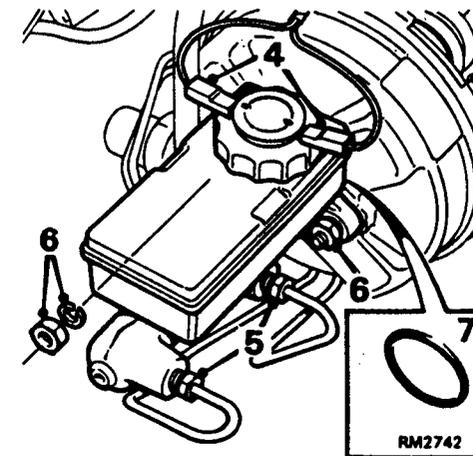
### TANDEM BRAKE MASTER CYLINDER - 1989 Model year on

Remove and refit 70.30.08

#### Removing

1. Attach a bleed tube to the front and rear brake bleed screws on the right hand side of the car.
2. Open the bleed screws and operate the brake pedal until the master cylinder reservoir is empty.
3. Tighten the bleed screws; discard the fluid drained from the system.
4. Disconnect the Lucar connectors from the reservoir filler cap.
5. Disconnect the brake pipes from the master cylinder, plug or tape the ends of the pipes to prevent the ingress of dirt.
6. Remove the nuts and washers securing the master cylinder to the servo; withdraw the cylinder.
7. Remove and discard the 'O' ring from the servo recess in the cylinder. Refitting

8. Smear a new 'O' ring with clean brake fluid and locate it in the recess in the master cylinder.
9. Fit the cylinder to the servo ensuring that the push rod is correctly located. Tighten the nuts to the figure given in 'TORQUE WRENCH SETTINGS'.
10. Connect the brake pipes to the master cylinder, **DO NOT over-tighten the unions.**
11. Connect the Lucar connectors to the reservoir filler cap.
12. Bleed the brake hydraulic system, see 70.25.02.
13. Check that the float mechanism is operating by depressing the plunger in the middle of the cap.
14. Release the handbrake and chock the wheels to prevent the vehicle from rolling. Switch on the ignition, unscrew the reservoir filler cap and raise the cap slightly. With the cap raised, check that the low fluid level warning light is illuminated.
15. Refit the cap, switch off the ignition and remove the chocks from the wheels.



## TANDEM BRAKE MASTER CYLINDER - 1989 Model year on

Overhaul 70.30.09

Service tool: 18G 1112

### Dismantling

1. Remove the brake master cylinder, see 70.30.08
2. Drain any surplus brake fluid from the reservoir and refit the cap.
3. Plug the pipe connections and thoroughly clean the exterior of the cylinder - use denatured alcohol (methylated spirits) or clean brake fluid.
4. Grip the cylinder body in a soft jawed vice with the reservoir uppermost.
5. Using a suitably sized, flat ended punch, drive out the Sel-lok pin retaining the reservoir to the cylinder body.
6. Detach the reservoir.
7. Remove the reservoir sealing washers.
8. Extract the metal seating washers.
9. Push the primary piston in as far as possible and using a pair of long nosed pliers, remove the secondary piston stop pin from the recess in the cylinder body.
10. Position the cylinder vertically in the vice with the primary piston uppermost.
11. Remove and discard the 'O' ring from the recess in the cylinder body.
12. Depress the primary piston and using tool 18G 1112, remove the circlip; withdraw the primary piston assembly and spring.
13. Remove the spring.
14. Carefully expand the spring retainer and slide it off the piston rod.

15. Apply low air pressure to the recess from where the secondary piston stop pin was removed and expel the secondary piston assembly and spring.
16. Remove the spring.
17. Carefully expand the spring retainer and slide it off the piston rod.
18. Remove the rubber seals, washers and plastic bearing from the pistons.

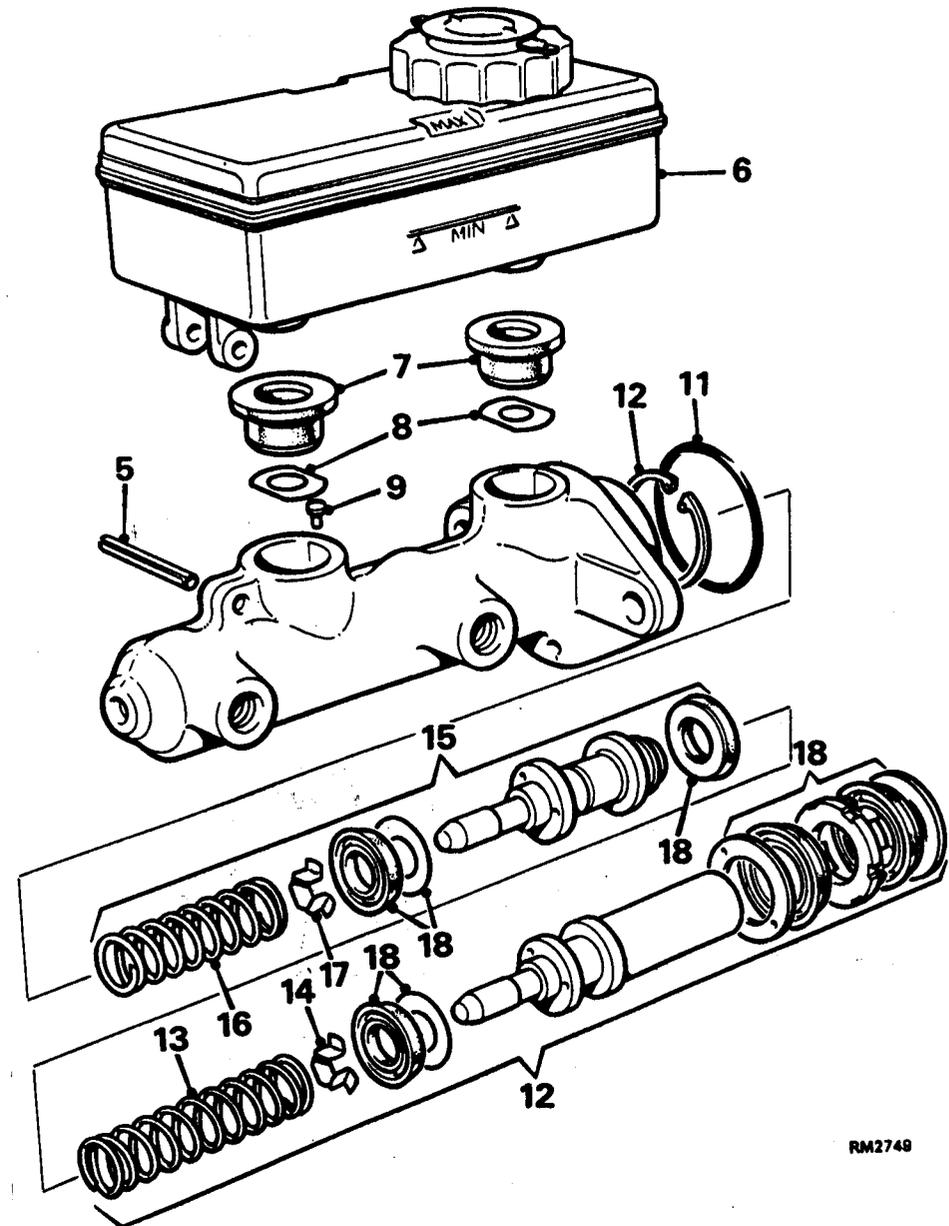
### Inspection

19. Clean all components with clean brake fluid and dry with lint free cloth.
20. Examine the cylinder bore - if rigid or damaged, renew the cylinder assembly. Renew all worn, damaged or suspect parts.

### Reassembling

**WARNING: Scrupulous cleanliness must be observed during reassembly. Dip all components in clean brake fluid and assemble using fingers only.**

21. Fit new washers, new seals and the bearing to the pistons.
22. Fit the spring retainers to the primary and secondary pistons ensuring that each retainer is located behind the machined shoulder on the pistons.
23. Fit the springs to the retainers noting that the thicker of the two springs is attached to the secondary piston retainer.
24. Insert the secondary piston assembly into the cylinder bore taking care not to turn back the lip of the piston seal.
25. Using a soft metal drift, push the secondary piston down the cylinder bore; hold the piston down and insert the stop pin.



RM2749

26. Insert the primary piston assembly into the cylinder bore; push the piston down and using tool 18G 1112, fit the circlip.
27. Fit the metal seating washers in the cylinder recesses.
28. Fit the reservoir sealing washers.
29. Fit the reservoir ensuring that the securing pin holes in the cylinder and reservoir are aligned.
30. Secure the reservoir to the cylinder with the Sel-lok pin.
31. Fit a new 'O' ring to the recess in the cylinder body.
32. Refit the master cylinder, see 70.30.08.

### BRAKE SERVO - 1989 Model year on

Remove and refit 70.50.01

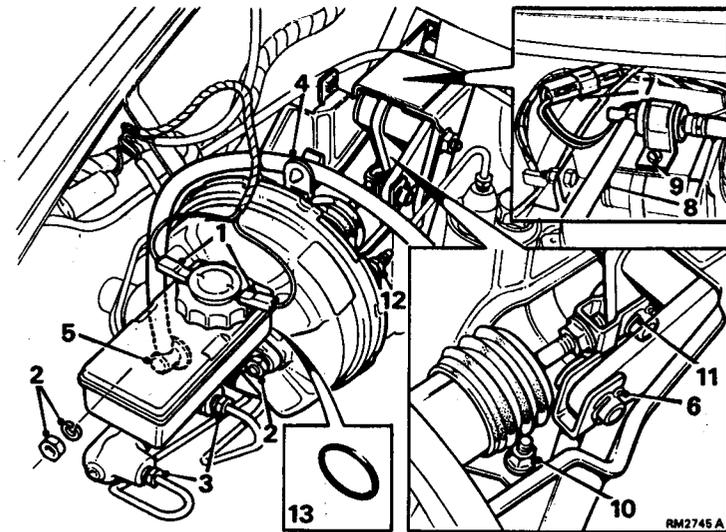
#### Removing

1. Disconnect the Lucar connectors from the reservoir filler cap.
2. Remove the nuts and washers securing the master cylinder to the servo.
3. Position a suitable receptacle beneath the master cylinder, slacken the brake pipe union nuts and withdraw the master cylinder from the servo. Immediately tighten the union nuts to prevent excess loss of fluid.
4. Release the servo hose from the retaining clip.
5. Disconnect the hose from the servo.
6. Remove and discard the split pin retaining the brake push rod clevis pin; withdraw the clevis pin and release the clevis from the brake pedal.
7. **Turbo only:** Disconnect the Lucar connectors and remove the ballast resistor.

8. Disconnect the hoses from the anti run-on valve; plug the hoses to prevent the ingress of dirt.
9. Remove the bolt securing the anti run-on valve to the servo mounting bracket.
10. **All models:** Remove the nuts, bolts and washers securing the servo mounting bracket; withdraw the servo and bracket assembly.
11. Remove and discard the split pin retaining the push rod yoke clevis pin.
12. Remove the nuts and washers securing the servo to the mounting bracket; withdraw the servo.
13. Remove and discard the 'O' ring from the recess in the master cylinder.

#### Refitting

14. Lubricate a new 'O' ring with clean brake fluid and fit it to the master cylinder.
15. Lubricate the master cylinder push rod with clean brake fluid.
16. Reverse the procedure in 1 to 12; use new split pins.
17. Bleed the hydraulic system, see 70.25.02.



## SIDE/REAR SPOILER

### Remove and refit - Turbo only

Left hand 76.10.72

Right hand 76.10.73

### Removing

1. Raise the rear of the car and support it on stands.
2. Remove the left or right hand rear road wheel as appropriate.
3. Open the front door on the appropriate side.
4. Carefully ease the draught welt from the front sill flange.
5. Drill out the pop rivets securing the front/side spoiler to the sill flange.
6. Drill out the pop rivets securing the front/side spoiler to the brackets below the sill.
7. Pull the front/side spoiler away from the front of the rear wheel arch and insert a suitable piece of packing between the spoiler and body.
8. Carefully drill out the pop rivets securing the front/side to rear portions of the spoiler together.
9. Drill out the pop rivets securing the lower edge of the rear of the side/rear spoiler to the brackets.
10. Drill out the pop rivets securing the side/rear spoiler to the sill, rear wheel arch flange and rear body flange.
11. Support the side/rear spoiler, and drill out the pop rivets securing the side/rear spoilers together.
12. Carefully withdraw the side/rear spoiler.

### Refitting

13. Thoroughly clean the bodywork in the area covered by the side/rear spoiler. Apply suitable protective wax to the body area and brackets to be covered by the side/rear spoiler.
14. Ensure that the edge finisher is properly secured to the side/rear spoiler; secure edge finisher if necessary using a suitable waterproof adhesive.
15. Reverse the procedure given in 1 to 12.

## FRONT/SIDE SPOILER

### Remove and refit - Turbo only

Left hand 76.10.75

Right hand 76.10.76

### Removing

1. Raise the front of the car and support it on stands.
2. Remove the left or right hand front road wheel as appropriate.
3. Disconnect the battery.
4. Remove the nut securing the left or right hand fog/driving lamp to the spoiler as appropriate; withdraw the lamp and tie it aside.
5. Open the front door on the appropriate side.
6. Carefully ease the draught welt from the front sill flange.
7. Drill out the pop rivets securing the spoiler to the front of the car.
8. Pull the right hand spoiler away from the left hand spoiler and carefully drill out the pop rivets securing the spoilers together.
9. Drill out the pop rivets securing the front/side spoiler to the wheel arch, sill flange and brackets; withdraw the spoiler.

### Refitting

10. Thoroughly clean the bodywork in the area covered by the front/side spoiler. Apply suitable protective wax to the body area and brackets to be covered by the front/side spoiler.
11. Ensure that edge finisher is properly secured to the front/side spoiler; secure edge finisher if necessary using a suitable waterproof adhesive.
12. Reverse the procedure given in 1 to 9.
13. Check the fog/driving lamps for correct operation.

## REAR QUARTER TRIM PAD

Remove and refit 76.13.13

### Removing

1. Remove the striker plate cover from the 'B' post.
2. Remove the companion box floor cover.
3. Release the trim pad from the body flange.
4. Release the trim pad from the seat squab and remove the trim pad.

### Refitting

5. Reverse the procedure in 1 to 4.

## BONNET

Remove and refit 76.16.01

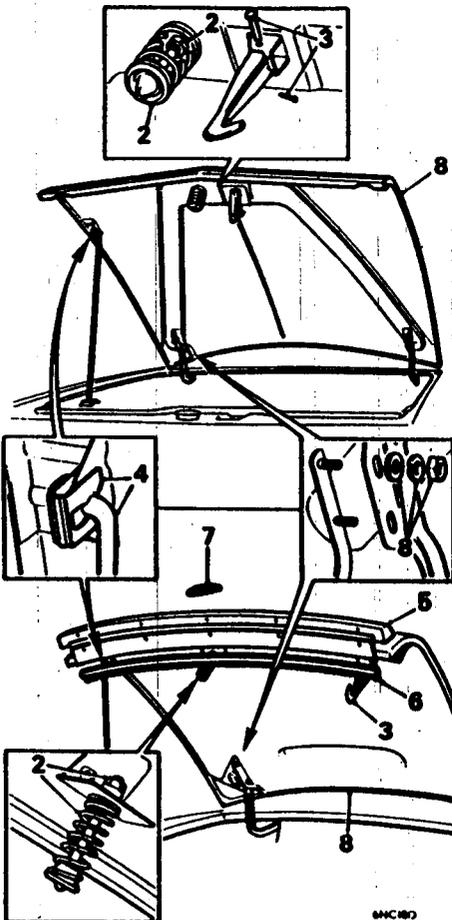
### Removing

1. Support the bonnet in the fully open position.
2. Slacken the locknut and remove the lock pin assembly.
3. Remove the split pin and clevis pin to release the bonnet safety catch and spring.
4. Remove the bonnet stay retaining clip and remove the stay.

5. 850 and 1000: Remove the screws retaining the bonnet finisher and remove the finisher.
6. 850 and 1000: Remove the bonnet sealing rubber.
7. 850 and 1000: Remove the badge retainers and remove the badge from the bonnet.
8. Remove the nuts, plain and spring washers to release the bonnet from its hinges.

### Refitting

9. Reverse the procedure in 1 to 7, aligning the bonnet to the body.



## BONNET LOCK

Remove and refit 850 and 1000 76.16.21

### Removing

1. Open the bonnet.
2. Remove the ignition shield.
3. Disconnect the slider catch return spring.
4. Remove the two screws securing the lock assembly.
5. Lower the lock assembly clear of the wiring harness.
6. Remove the lock assembly from the bonnet locking platform.

### Refitting

7. Reverse the procedure in 1 to 6.

## BONNET LOCK

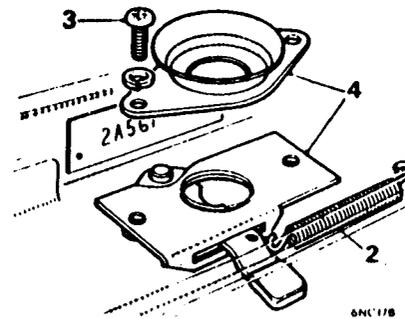
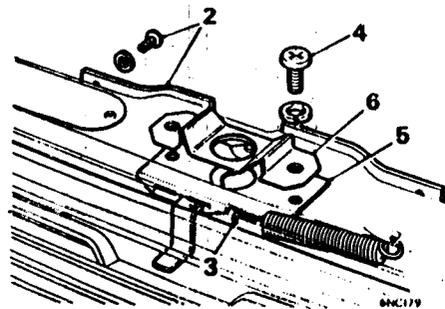
Remove and refit - Clubman and 1275 GT 76.16.21

### Removing

1. Open the bonnet.
2. Release the locking lever return spring from the bonnet locking platform.
3. Remove lock assembly securing screws.
4. Remove the bonnet lock and the locating cup.

### Refitting

5. Reverse the procedure in 1 to 4.



## LUGGAGE COMPARTMENT LID HANDLE AND LOCK ASSEMBLY

Remove and refit 76.19.17

### Removing

1. Remove the lock assembly retaining screws and remove the lock assembly.
2. Remove the nuts and washers to release the turn lock and private lock from the luggage compartment lid.
3. Remove the lock assembly joint washer.

### Refitting

4. Reverse the procedure in 1 to 3.

## LUGGAGE COMPARTMENT LID

Remove and refit 76.19.01

### Removing

1. Remove the rear number plate lamp, see 86.40.86.
2. Remove the number plate retaining nuts and bolts and remove the number plate.
3. Remove the luggage compartment lock, see 76.19.17.
4. Remove the badge(s) retainers and remove the badge(s).
5. Release the sealing rubber from the retaining clips and remove the rubber.
6. Remove the screws retaining the stays to the luggage compartment lid.
7. Remove the luggage compartment lid retaining nuts.
8. Remove the luggage compartment lid and the hinge joint washers.

### Refitting

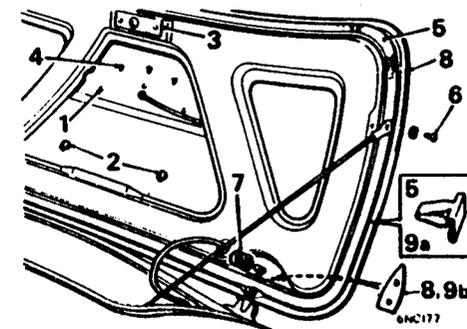
9. Reverse the procedure in 1 to 8, noting:
  - a New sealing rubber retaining clips should be used.
  - b Fit new joint washers to the hinges.

## LUGGAGE COMPARTMENT LID PRIVATE LOCK

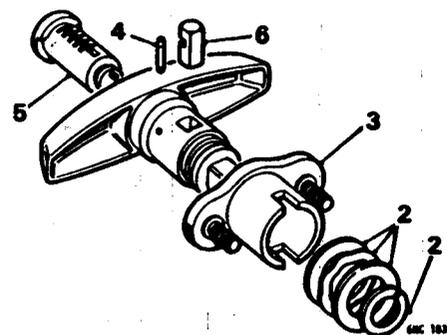
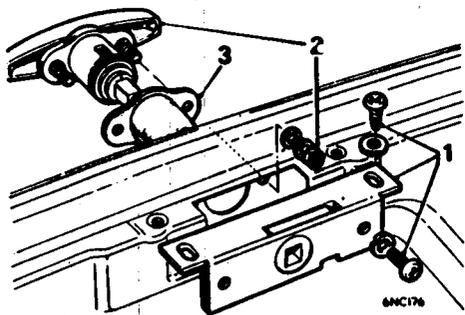
Remove and refit 76.19.19

### Removing

1. Remove the luggage compartment lid handle and lock assembly, see 76.19.17.



2. Remove the spring clip, two flat washers and one wavy washer.
3. Remove the handle yoke.
4. Remove the private lock barrel retaining pin.
5. Remove the private lock from the lock body.



6. Remove the locking pin

#### Refitting

7. Reverse the procedure in 1 to 6, noting: Position the pin on the end of the private lock in the slot of the locking pin.

### CONSOLE

Remove and refit - Not Turbo 76.25.01

#### Removing

1. Remove the screws retaining the console.
2. Remove the radio knobs and finishers.
3. Unscrew the wing nuts from the radio.

4. Move the console back, select fourth gear and remove the screws retaining the radio.
5. Push the radio clear of the console.
6. Disconnect the harness from the clock and the cigar lighter.
7. Disconnect the speaker plug from the radio.
8. Release the gear lever grommet.
9. Remove the console assembly.
10. Release the clamp securing the clock and remove the clock.
11. Unscrew the cigar lighter body (centre) and remove it from the console.
12. Unclip and remove the grille.
13. Remove the screws retaining the speaker and remove the speaker.

#### Refitting

14. Fit the speaker, cigar lighter and clock to the console.
15. Position the console and connect the cigar lighter and clock. Connect the speaker plug to the radio.
16. Pull the radio forward, locate the fixing holes and fit theretaining screws.
17. Select neutral gear.
18. Fit the console retaining screws.
19. Fit the wing nuts to the radio.
20. Fit the finishers and knobs to the radio.

### CENTRE CONSOLE

Remove and refit - Turbo only 76.25.01

1. Disconnect the battery.
2. Unscrew the gear lever knob and apply the handbrake.
3. Remove the radio, see 86.50.03
4. Carefully pull back the driver's and passenger's footwell carpets.
5. Remove the four screws (two per side) securing the centre console to the floor panel.

6. Note the fitted locations and disconnect the wiring harness connections.
7. Raise the centre console and turn it through 90°.
8. Withdraw the centre console.

#### Refitting

9. Reverse the procedure in 1 to 8.

### DOOR ASSEMBLY

Remove and refit - Saloon and Estate - 1 to 3 76.28.01

Hinges - remove and refit - 1 to 4 76.28.42

#### Removing

1. Remove the split pin and clevis pin from the door check strap.
2. Remove the four nuts and two washer plates from the inside wheel arch.
3. Remove the door assembly from the body, noting the door alignment shims.
4. Remove the securing screws and remove the hinges from the door assembly.

#### Refitting

5. Reverse the procedure in 1 to 4, as necessary noting: If the door to hinge adjustment is insufficient for correct door alignment, shims may be fitted between the hinges and the door.

### TAILBOARD

Remove and refit 76.28.36

Hinges - remove and refit 76.28.38

#### Removing

1. Remove the number plate lamp cover retaining screw.
2. Remove the lamp cover and glass.

3. Disconnect the lamp wiring.
4. Withdraw the wiring from the lamp and then remove the wiring from the tailboard.
5. Remove the number plate securing screws and remove the number plate assembly.
6. Remove the screws retaining the tailboard stays to the tailboard.
7. Remove the screws retaining the tailboard hinges to the body.
8. Remove the tailboard from the body.
9. Remove the hinge retaining screws and remove the hinges from the tailboard.

#### Refitting

10. Reverse the procedure in 1 to 9 as necessary.

### DOOR GLASS

Remove and refit - Saloon and Estate - 1 to 12 76.31.01

Regulator - remove and refit 1 to 6 76.31.45

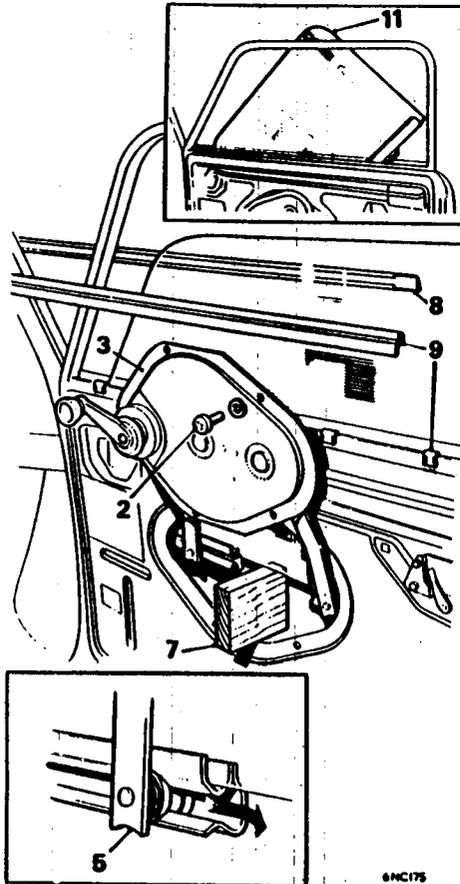
#### Removing

1. Remove the door trim pad, see 76.34.01.
2. Remove the four screws retaining the regulator; a tab on the front end of the regulator locates inside the door aperture.
3. Lever the regulator from the sealastic sealer.
4. Refit the handle to the regulator and wind the regulator arms to the top of their travel.
5. Slide the regulator forwards and disconnect the rear arm from the door glass channel, then slide the regulator rearwards and disconnect the front arm from the door glass channel.

6. Remove the regulator from the door.
7. Support the door glass with a block of wood placed in the regulator mechanism aperture.
8. Pull the door glass outer sealing strip upwards to release the strip from the clips on the door outer sill.
9. Release the window finisher from the retaining clips on the door inner sill.
10. Remove the support block.
11. Lift the rear of the door glass and withdraw the glass from the outer side of the door.
12. Cushion the glass and, using a block of wood to prevent damage to the lifting channel, drive the channel off the glass noting the fitted position.

#### Refitting

13. Cushion the glass and drive the lifting channel onto the glass, using a block of wood to prevent damage to the channel.
14. Reverse the procedure in 7 to 11.
15. Apply the sealer strip into the channel of the regulator aperture and position the door glass so that the rear end of the bottom channel is just visible in the aperture.
16. Locate and push the regulator arm into the front channel, then enter the outer arm into the rear channel. Use the regulator handle and wind the regulator upwards into its fitted position, insert the locating tab into the regulator aperture and refit the securing screws.
17. Remove the regulator handle and refit the door trim pad, see 76.34.01.



### DOOR GLASS

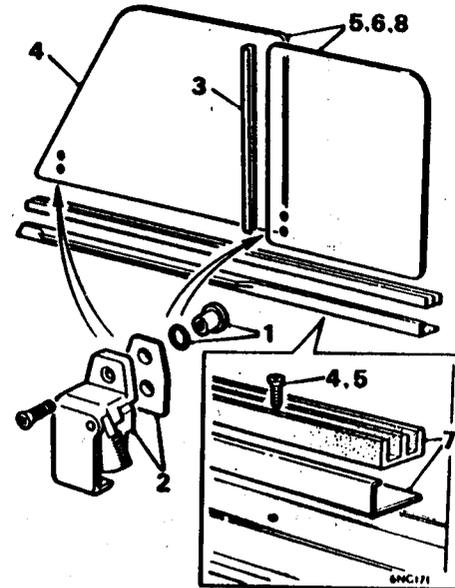
Remove and refit - Van and Pick-up

76.31.01

#### Removing

1. Remove the retaining screw, boss and washer from the door glass catches.
2. Remove the catches and sealing rubbers.
3. Remove the channel weather strip.

4. Slide the front door glass rearward and remove the retaining screw from the lower channel.
5. Slide the door glasses forward and remove the retaining screws from the lower channel.

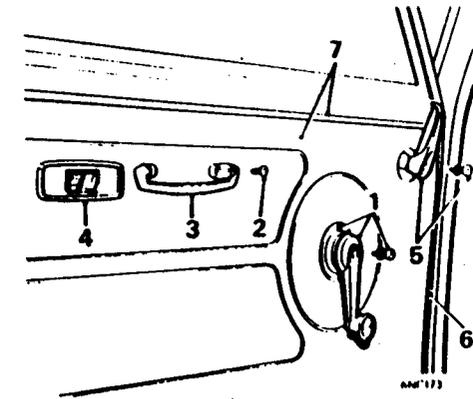


6. Slide the door glasses to the centre of the window.
7. Withdraw the lower channel, door glass catch strip and window glasses from the door.
8. Remove the door glasses from the lower channel.

#### Refitting

9. Reverse the procedure in 1 to 8, noting:
  - a. If the door glasses have been broken remove all broken glass from the channels.
  - b. Fit the door glasses to the lower channel, then fit the door glasses into the upper channel

at the same time fitting the lower channel and door glass catch strip to the recess in the door.



### DOOR TRIM PAD

Remove and refit - Saloon and Estate

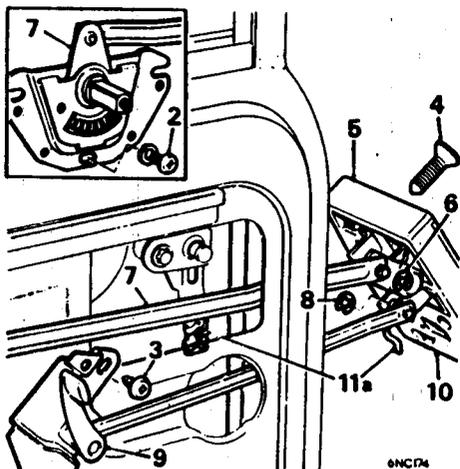
76.34.01

#### Removing

1. Remove the glass regulator handle and escutcheon.
2. Remove the door pull retaining screws.
3. Remove the door pull and brackets.
4. Lever the lock control escutcheon from the two holes in the door lock handle plate.
5. Remove the retaining screw and remove the door lock interior handle.
6. Lever the trim pad from the retainers at the sides and lower edge.
7. Pull the trim pad from the retaining flange at the top and remove the trim pad.

### Refitting

- Reverse the procedure in 1 to 6



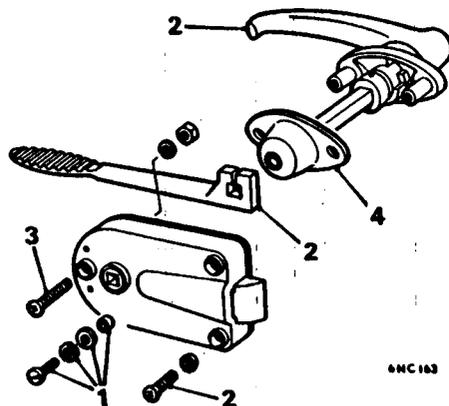
### DOOR LOCK

Remove and refit  
- Saloon and Estate - 1 to 10 76.37.12

Remote control  
- remove and refit 1 to 7 76.37.31

### Removing

- Remove the door trim pad, see 76.34.01.
- Remove the screws securing the lock remote control to the door panel.
- Remove the screws securing the lock control to the door panel.
- Remove the door lock securing screws.
- Pull the door lock from the door.
- Remove the lock remote control retaining clip.
- Pull the lock remote control from the inner door panel.



- Remove the clip retaining the lock control to the door lock.
- Pull the lock control from the inner door panel.
- Remove the door lock.

### Refitting

- Reverse the procedure in 1 to 10 as necessary noting:
  - When refitting the door lock into the aperture in the door, engage the handle lock operating crank with the retaining clip on the private lock.

### DOOR LOCK

Remove and refit  
- Van and Pick-up 76.37.12

Handle - remove and refit 76.58.01

### Removing

- Remove the handle retaining screw, washers and spacer.
- Withdraw the outside handle from the lock and inside door handle.
- Remove the door lock retaining screws.
- Remove the door lock and seal.

### Refitting

- Reverse the procedure in 1 to 4 as applicable.

### TAIL DOOR LOCK

Remove and refit 1 to 4 76.37.16

Private lock - remove and refit, 1 to 3 and 5 to 12 76.37.42

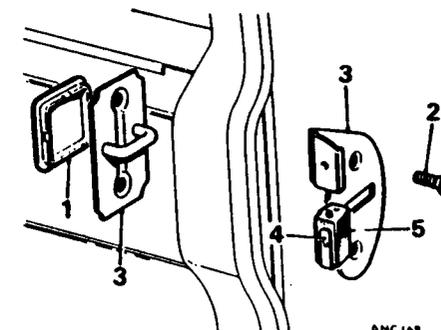
Handle - remove and refit, 1 to 3 and 5 to 8 76.58.05

### Removing

- Remove the tail door lock retaining screws.
- Disengage the lock assembly from the door handle.
- Lift the lock assembly to clear the lower guide plate and lower the lock to clear the upper guide plate.
- Slacken the door lock rods locking nuts and then remove the rods from the lock assembly.
- Remove the door seal retaining clips from the hole in the door panel.
- Remove the tail door handle retaining nuts and washers.
- Remove the tail door handle assembly.
- Remove the tail door handle joint washer.
- Remove the retaining circlip, cover, spring washer, and brass washers.
- Remove the handle yoke.
- Remove the private lock retaining pin.
- Remove the private lock and locking pin.

### Refitting

- Reverse the procedure in 1 to 12, as necessary noting: The cranked rod is fitted at the top with the crank to the right.



### DOOR LOCK STRIKER PLATE

Remove and refit  
- Saloon and Estate 76.37.23

### Removing

- Remove the striker plate cover from the 'B' post.
- Remove the striker lock retaining screws.
- Remove the striker plate and striker lock.
- Release the lug from the striker plate and remove the seal and retaining clip from the striker plate.
- Remove the rubber from the retaining clip.

### Refitting

- Reverse the procedure in 1 to 5.

### DOOR CHECK STRAP

Remove and refit  
- Saloon and Estate 76.40.27

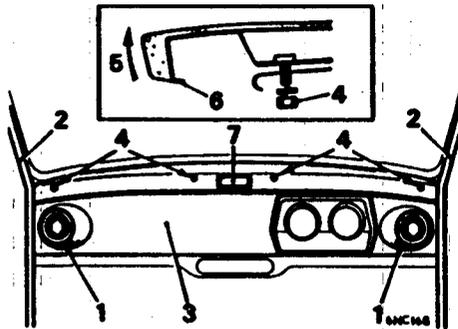
### Removing

- Clubman and 1275 GT: Remove the fresh air valve assembly, see 80.10.35.
- Clubman and 1275 GT: Pull the door seal from the 'A' post flange where it retains the fascia liner.

3. 850 and 1000: Remove the screws securing the fascia liner to the body.
4. Fold back the fascia liner and manoeuvre to give access to the check strap aperture.
5. Remove the split pin and clevis pin securing the check strap to the door.
6. Remove the check strap from the body.

#### Refitting

7. Reverse the procedure in 1 to 6 as applicable.



### FASCIA TOP RAIL COVER

Remove and refit **76.46.04**

#### Removing

1. Remove the fresh air valve assemblies, see 80.10.35. **Turbo only:** Remove the fascia panel, see 76.46.23 and the windscreen glass, see 76.81.01.
2. Release the door seal from the 'A' post to clear the fascia top rail cover.
3. **Not Turbo:** Remove the left-hand fascia liner.
4. Remove the four nuts retaining the fascia top rail cover.

5. Lift the front of the fascia cover to release the four studs.
6. Remove the fascia top rail cover.
7. Remove the ash tray (if fitted) from the fascia top rail cover.

#### Refitting

8. Reverse the procedure in 1 to 7.

### FASCIA PANEL

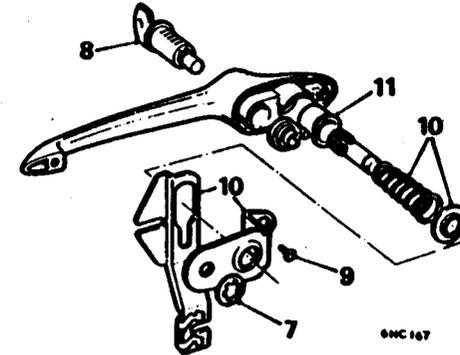
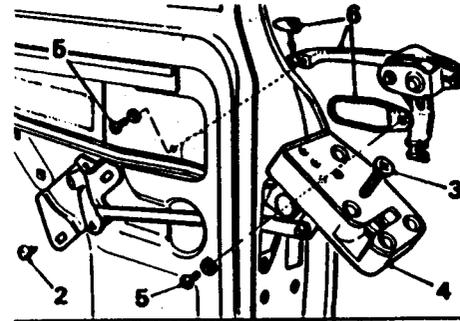
Remove and refit - Turbo only **76.46.23**

#### Removing

1. Disconnect the battery.
2. Open the glove box.
3. From inside the glovebox, remove the screw securing the fascia panel to the bracket.
4. From below the parcel shelf on the driver's side, remove the screw securing the fascia panel to the shelf.
5. Carefully pull the fascia clear to gain access to the harness connectors and speedometer cable.
6. Disconnect the speedometer cable.
7. Note the fitted position of the harness multi-plugs; disconnect the multi-plugs from the panel lamps and instruments.
8. Unscrew the knurled nut securing the earth lead to the vacuum gauge stud.
9. Disconnect the pipe from the vacuum gauge; withdraw the fascia panel.

#### Refitting

10. Reverse the procedure in 1 to 9.
11. Check instruments and panel lamps for correct operation.



### FRONT GRILLE

Remove and refit **76.55.03**

#### Removing

1. Remove the screws securing the grille to the aperture.
2. Withdraw the grille.

#### Refitting

3. Position the grille over the aperture, ensure that it is centrally located; fit and tighten the screws.

### DOOR OUTSIDE HANDLE

#### Remove and refit

- Saloon and Estate - 1 to 7 **76.58.01**

#### Private lock

- remove and refit - 1 to 9 **76.37.39**

#### Push button

- remove and refit - 1 to 12 **6.58.12**

#### Removing

1. Remove the door trim pad, see 76.34.01.
2. Remove the screws securing the lock control to the door.
3. Remove the screws retaining the door lock.
4. Pull the door lock from the door.
5. Pull the door lock up and remove the screws securing the outside handle to the door.
6. Remove the outside handle and gaskets.
7. Remove the clip from the door private lock.
8. Insert the key into the private lock and withdraw it from the outside handle.
9. Remove the screw from the retaining plate.
10. Remove the retaining plate, private lock operating link, washer and spring.
11. Remove the push button.

#### Refitting

12. Reverse the procedure in 1 to 11 as necessary.

### HEADLINING

Remove and refit - Not Turbo Models

**76.64.01**

#### Removing

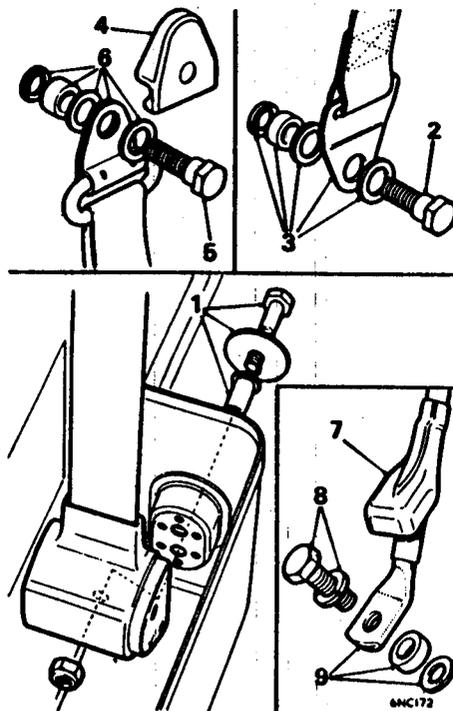
1. Disconnect the battery.
2. Remove the interior roof lamp, see 86.45.02.

3. Remove both front seats and the rear seat squab (to give increased access).
4. Remove the sun visors and driving mirror.
5. Remove the windscreen glass and sealing rubber, see 76.81.01.
6. Remove the heated back light glass and sealing rubber, see 76.81.11.
7. 850: Remove the quarter-light glass, see 76.81.20.
8. 1000, Clubman and 1275 GT: Remove the quarter vent glass, see 76.81.19.

9. Remove the quarter vent glass sealing rubber.
10. Release the door seals from around the top of the door apertures.
11. The headlining is secured with adhesive to the roof cant rail and on the outside flanges of the front and rear screens, door and quarter-light apertures. Release the stuck down areas of the lining.
12. Pull the lining towards the front and disengage the lining support rails from the roof cant rails.
13. Remove the support rails from the liner.

#### Refitting

14. Before refitting or renewing the liner remove the old adhesive from the body.
15. Refit the support rails: the rails are colour coded and should be fitted in the following order starting at the front: Nos. 1 (red), 2, 3 (white), 4 (black), 5 (blue), and 6 (yellow).
16. Lay out the lining and apply a 4 in. (100 mm) wide strip of Dunlop adhesive (S914 or S1022) around the edge of the lining.
17. Apply adhesive to the roof cant-rails and to all exterior aperture flanges to which the lining is to be secured.



18. Start at the front and engage the liner support rails into the locators in the cant rails.
19. Stretch out the lining front to rear and keeping the lining taut, commence sticking the lining to the front and rear screen aperture flanges and then simultaneously to the roof cant rails.
20. Continue cutting and sticking the lining to the door and quarter light exterior flanges and trim off excess material as required.
21. Reverse the procedure in 1 to 10.

## HEADLINING

### Remove and refit - Turbo only 76.64.01

#### Removing

1. Disconnect the battery.
2. Remove the sun roof glass, see 76.82.05.
3. Remove the caps from the sun roof seal retaining screws; remove the screws.
4. Remove the internal finisher.
5. Carefully release the head lining from the foam sealing strip around the sun roof aperture.
6. Remove the sun visors.
7. Remove the windscreen glass and sealing rubber, see 76.81.01

8. Remove the quarter vent glass and sealing rubbers, see 76.81.19 and 76.81.20.
9. Remove the heated back light and sealing rubber, see 76.81.11.
10. Remove the interior lamp, see 86.45.02.
11. Carefully remove the headlining from the car.  
**CAUTION:** As the old headlining is to be used as a template for the roof glass aperture, care should be taken to ensure that it is removed in one piece.

#### Refitting

12. Place the old headlining on top of the new and carefully mark the position of the sun roof aperture.
13. Position the headlining inside the car and secure it to the foam strip around the sun roof aperture.
14. Ensuring that the headlining does not move, carefully cut out the sun roof aperture.
15. Align and fit the internal finisher, secure it with two screws.
16. Check the alignment of the headlining and finisher; fit the remaining finisher securing screws. Fit the screw caps.
17. Fit the interior lamp, see 86.45.02
18. Fit the heated backlight and sealing rubber, see 76.81.11
19. Fit the quarter vent glass and sealing rubber, see 76.81.19 and 76.81.20
20. Fit the windscreen glass and sealing rubber, see 76.81.01
21. Fit the sun visors.
22. Fit the sun roof glass, see 76.82.05
23. Connect the battery.

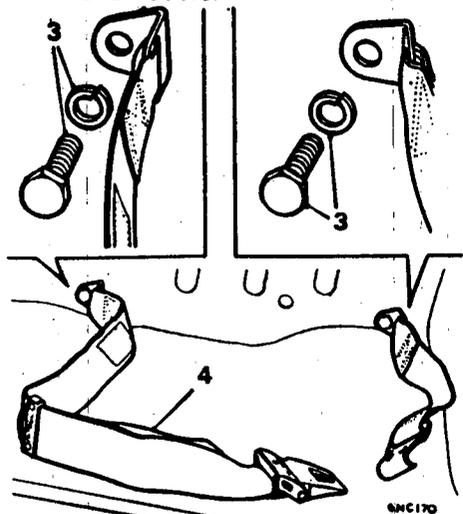
## HEADLINING

Front - remove and refit - Estate 76.64.10

Rear - remove and refit - Estate 76.64.11

### Removing

1. Disconnect the battery.
2. Remove the interior roof lamp, see 86.45.02.
3. Mark the position of the rear edge of the front liner on the roof cant rail.
4. Grip the outer edges of the liner and pull it backwards and inwards to withdraw the liner.
5. Remove the trim liner from over the tail doors.



6. Mark the position of the front edge of the rear liner on the roof cant rail.
7. Pull the rear liner forward and inwards to withdraw the liner.

### Refitting

8. Reverse the procedure in 1 to 7.

## REAR SEAT SQUAB

Remove and refit - Saloon 76.70.38

### Removing

1. Open the luggage compartment lid and remove the two screws securing the squab to the rear parcel shelf.
2. Pull the rear seat cushion forward.
3. Pull the rear seat squab upwards to clear the back panel flange and to release the retaining pegs.
4. Remove the rear squab from the vehicle.

### Refitting

5. Reverse the procedure in 1 to 4.

## FRONT SEAT BELTS

Remove and refit - Reflex type 76.73.10

**WARNING:** When seat belts have been in use in a vehicle which has been involved in an accident with a severe impact, the complete belt assemblies must be renewed, including the centre stalks.

### Removing

1. Remove the nut and bolt securing the reel to the companion box, noting the large flat washer and sleeve.
2. Remove the lower belt bracket securing screw.
3. Detach the belt bracket together with the two nylon washers, spacer, and fibre washer.
4. Remove the plastic cover from the upper belt bracket mounting.
5. Remove the upper belt bracket securing bolt.
6. Detach the belt bracket together with the two nylon washers, spacer, and fibre washer.
7. Pull the rubber cover up the stalk.
8. Remove the stalk securing screw and spring washer.

9. Remove the stalk, spacer and fibre washer.

### Refitting

10. Reverse the procedure in 1 to 9 noting:  
Tighten the belt fixing bolts to 24 Nm, 18 lbf ft, 2.5 kgf m.

## REAR SEAT BELTS

Remove and refit 76.73.18

### Removing

1. Remove the rear seat squab, see 76.70.38.
2. Remove the rear seat cushion.
3. Remove the belt bracket retaining screws and spring washers.

### Refitting

4. Reverse the procedure in 1 to 3, noting:
  - a. The longer section of the belt is fitted to the fixing point nearest the centre of the vehicle.
  - b. Torque tighten the retaining screw to 34 Nm, 25 lbf ft, 3.5 kgf m.

## WINDSCREEN, BACK-LIGHT, QUARTER-LIGHT TAIL DOOR GLASS

Remove and refit

Windscreen 76.81.01

Back-light 76.81.10

Heated back-light 76.81.11

Quarter-light 76.81.20

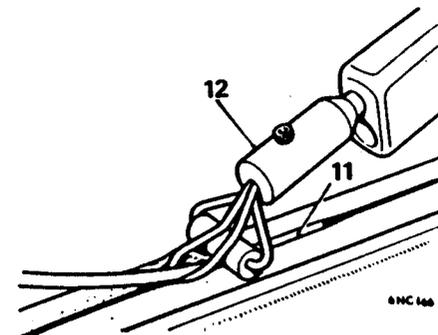
Tail door 76.31.20

*Service tool: 18G 468, 18G 468 B*

### Removing

1. Remove the windscreen wiper arms.

2. Prise up the end of the finisher strip and carefully withdraw it from the rubber seal.
3. From inside the car, commencing at a top corner, press the glass and ease it from the rubber seal. Special care is required if a laminated screen is fitted.
4. Disconnect the earth and supply leads to the heated back-light, when fitted.



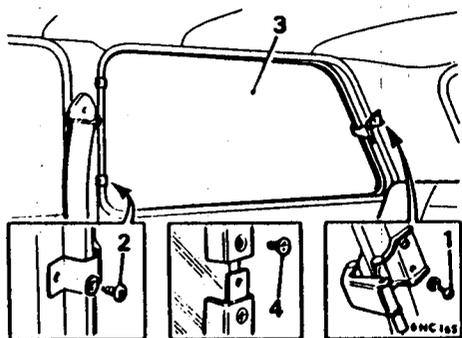
### Inspection

5. Remove any glass particles from the rubber channels and examine the rubbers for cuts and other damage.
6. Check the aperture for distortion or damage to the body flange.
7. If the windscreen has broken, ensure that all particles of glass are removed from the demister ducts, tubes and apertures.

### Refitting

8. Fit the rubber to the glass.
9. Insert a cord into the body flange groove of the seal.
10. With the glass and rubber held against the aperture, use the cord to pull the rubber lip over the body flange. Apply pressure against the outside of the glass to ensure the seals settle correctly into the body flange.

11. Thread the end of the finisher strip through the eye of 18G 468 B and under the roller.
12. Insert the eye of the tool into the seal groove at one of the top corners and push the tool round the entire length of the seal, feeding the finisher into the channel as the eyelet opens it and using the roller to bed the finisher and rubber.
13. Reconnect the heated back-light feed and earth return wires.
14. Check that the heated back-light operates.



## QUARTER VENT GLASS

**Remove and refit** 76.81.19

### Removing

1. Remove the screws securing the quarter vent window catch to the 'C' post.
2. Remove the screws securing the quarter vent hinges to the 'B' post.
3. Remove the quarter vent glass from the window aperture.
4. Remove the screw securing the two halves of the window finisher and remove the finisher.

### Refitting

5. Reverse the procedure in 1 to 4.

## SIDE SCREEN WINDOW

**Fixed - remove and refit**  
- Estate 76.81.26

**Sliding - remove and refit**  
- Estate 76.81.27

### Removing

1. Remove the cant rail trim pad.
2. Remove the screw retaining the fixed window locking peg and remove the peg.
3. Remove the screws retaining the upper glazing channel to the body.
4. Remove the screws retaining the front glazing channel and remove the channel.
5. Remove the screws retaining the rear glazing channel and remove the channel.
6. Slide the window glasses to the front of the vehicle.
7. Pull down the rear of the upper glazing channel to release the channel from the window frame.
8. Slide the window glasses and upper glazing channel rearwards to release the front of the upper glazing channel from the window frame.
9. Remove the window glasses and upper glazing channel.
10. Remove the lower glazing channel.

### Refitting

11. Reverse the procedure in 1 to 10.

## SUN ROOF GLASS

**Remove and refit - Turbo only** 76.82.05

### Removing

1. Fully open the sun roof.  
**CAUTION: Ensure that the glass is adequately supported and is not allowed to fall on to the bodywork.**
2. Release the retaining pins.
3. Remove the glass.

### Refitting

4. Reverse the procedure in 1 to 3.

## SUN ROOF GLASS SEAL

**Remove and refit - Turbo only** 76.82.15

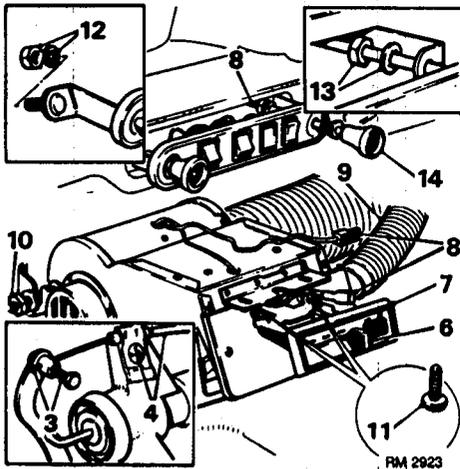
### Removing

1. Remove the sun roof glass, see 76.82.05
2. Remove the caps from the sun roof seal retaining screws; remove the screws.
3. Remove the internal finisher.
4. Carefully release the headlining from the foam sealing strip around the sun roof aperture.
5. Remove the foam sealing strips.
6. Release the outer seal from the adhesive securing it to the aperture; withdraw the seal.

### Refitting

7. Remove all traces of adhesive from the seal location.
8. Apply Dunlop adhesive S914 to the seal location.
9. Align and fit the seal.
10. Attach the foam strips to the edge of the sun roof aperture.
11. Attach the headlining to the foam strips.
12. Align and fit the internal finisher; secure it with two screws.
13. Check the alignment of the finisher, fit the remaining screws and screw caps.
14. Fit the sun roof glass, see 76.82.05.





## HEATER WATER VALVE CONTROL CABLE

**Remove and refit** 80.10.07

### Removing

1. Disconnect the battery.
2. Remove the centre console (if fitted), SEE 76.25.01
3. Slacken the trunnion screw securing the inner cable to the heater water valve, release the cable.
4. Release the outer cable from the clip.
5. **Turbo only:** Remove the screws securing the switch and clock panel to the heater unit. Move the panel aside.
6. **All Models:** Remove the heater air distribution control knob.
7. Release the panel from the mounting bracket.
8. Note the fitted position of the terminals and disconnect the harness from the heater fan switch.
9. Disconnect the demister tubes from the heater unit.

10. Slacken, but do not remove the nut securing the rear of the heater unit to the bulkhead.
11. Remove the two screws securing the heater unit to the fascia rail and lower the heater unit.
12. Remove the switch panel retaining nuts and pull the panel forwards from the dash.
13. Unscrew the cable retaining nut, note the lock washer.
14. Withdraw the cable assembly through the bulkhead grommet: recover the bracket from behind the panel.

### Refitting

15. Reverse the procedure given in 1 to 14.
16. Ensure that the lever on the water valve moves through its full range of travel when the control knob is operated; adjust the the outer cable if necessary in order to achieve this.

## HEATER FAN SWITCH

**Remove and refit - Turbo only** 80.10.22

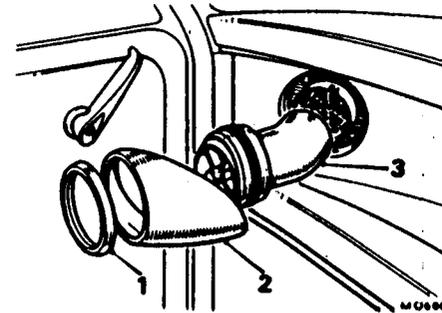
### Removing

1. Disconnect the battery.
2. Remove the screws securing the switch and clock panel to the heater unit. Move the panel aside.
3. Remove the heater air distribution control knob.
4. Release the panel from the bracket.
5. Note the fitted position of the Lucar connectors, disconnect the wires from the switch.
6. Depress the retaining clips and withdraw the switch.

### Refitting

7. Reverse the procedure given in 1 to 6.

8. Test that the heater fan motor operates correctly when the switch is operated.



## FRESH AIR VALVE ASSEMBLY

**Remove and refit** 80.10.35

### Removing

1. Unscrew the fresh air valve retaining ring.
2. Remove the binnacle from the valve.
3. Turn the air valve anti-clockwise and withdraw it.

### Refitting

4. Reverse the procedure in 1 to 3.

## DEMISTER TUBE

**Remove and refit - Turbo only**

**Left hand** 80.15.01

**Right hand** 80.15.15

### Removing

1. Disconnect the battery.
2. Remove the fascia, see 76.46.23
3. Disconnect the demister tube from the heater unit and duct; withdraw the tube.

### Refitting

4. Reverse operations 1 to 3

## DEMISTER DUCTS

**Remove and refit**  
- Clubman and 1275 GT 80.15.02

### Removing

1. Remove the fresh air valve assemblies, see 80.10.35.
2. Remove the fascia top rail cover, see 76.46.04.
3. Pull the demister tubes from the demister ducts.
4. Remove the two tapping screws securing the ducts to the fascia top rail.
5. Remove the demister ducts.

### Refitting

6. Reverse the procedure in 1 to 5.

## DEMISTER DUCTS

**Remove and refit - Turbo only**

**Left hand** 80.15.03

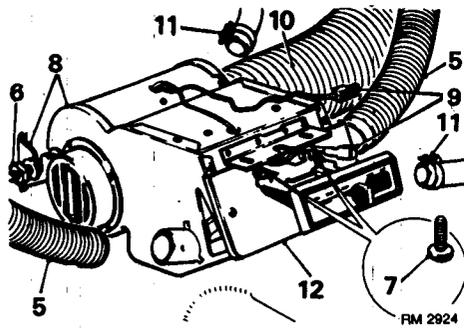
**Right hand** 80.15.08

### Removing

1. Disconnect the battery.
2. Remove the fascia, see 76.46.23
3. Remove the windscreen glass, see 76.81.01.
4. Remove the nuts securing the top fascia rail; lift off the rail.
5. Disconnect the demister tube from the duct.
6. Remove the two self-tapping screws securing the demister duct; remove the duct.

### Refitting

7. Reverse the procedure given in 1 to 6.



## HEATER UNIT

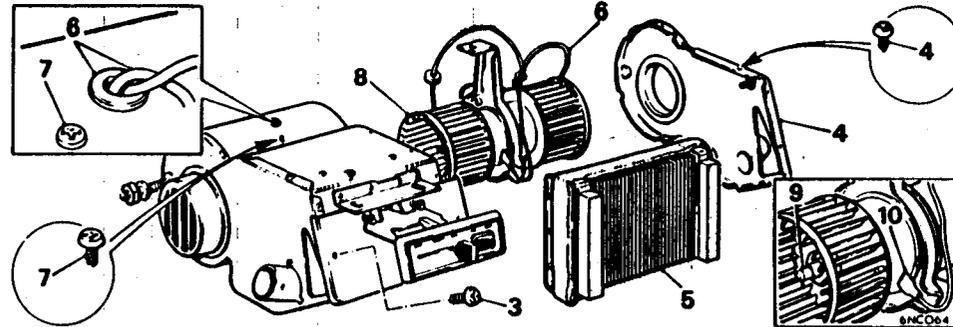
Remove and refit

80.20.01

### Removing

If a console is fitted, remove the console, see 76.25.01.

1. Disconnect the battery.
2. Drain the cooling system, see 26.10.01.
3. **Turbo only:** Remove the screws securing the switch and clock panel to the heater unit.
4. Remove the air distribution control panel knob, release the panel from the bracket.
5. **All Models:** Pull off the demister duct tubes from the outlets on the heater body.
6. Slacken the securing nut at the back of the heater.
7. Remove the two screws securing the heater to the parcel rail.
8. Lower the heater and release it from the rear mounting brackets.
9. Disconnect the fan motor switch wires.
10. Disconnect the air intake tube from the heater body.
11. Slacken the clips on the heater hoses, disconnect the hoses from the pipes and plug the hoses to prevent water damage to the carpets.



12. Remove the heater unit from the vehicle.

### Refitting

13. Reverse the procedure in 1 to 12.

## HEATER MATRIX

Remove and refit 1 to 5

80.20.29

Heater fan motor 1 to 4,  
and 6 to 10

88.20.15

### Removing

1. Remove the heater unit, see 80.20.01.
2. Disconnect the wire from the heater fan motor switch.
3. Remove the three screws from the heater control mounting plate.
4. Remove the screws securing the right-hand casing to the main body and remove the casing.
5. Withdraw the heater matrix from the main casing.
6. Pull the fan motor wires and grommet through the main casing.
7. Remove the screws securing the motor assembly to the casing.

8. Withdraw the motor assembly from the casings.
9. Remove the fans from the motor spindles.
10. Disconnect the wires from the fan motor.

### Refitting

11. Reverse the procedure in 1 to 10, noting:  
Engage the flap on its hinge pins before closing the casings.

## HEATER BLOWER ASSEMBLY

Remove and refit - Mini 1000 Canada  
(1978 model on)

80.20.12

### Removing

1. Raise the bonnet
2. From beneath the R/H front wing, remove the two nuts retaining the heater motor assembly.
3. Remove the bolt retaining the bracket to the bonnet locking platform.
4. Lift off the heater motor assembly, detach the inlet and outlet trunking and disconnect the fan motor wiring.

### Refitting

5. Reverse the procedure in 1 to 4.

## HEATER FAN MOTOR

Remove and refit - Mini 1000 Canada  
(1978 model on)

80.20.15

### Removing

If a console is fitted, remove the console retaining screws and the fascia glovebox retaining screws to enable the console and glovebox to be moved as necessary.

1. Raise the bonnet.
2. Disconnect the fan motor wiring at the connector.
3. Remove the three screws securing the motor unit to the blower housing.
4. Lift out the motor assembly.
5. Carefully lever or use the hands to pull the fan rotor off the motor spindle.

### Refitting

6. Fit the fan rotor onto the replacement unit; the end of the fan rotor hub should be just level with the end of the spindle.
7. Reverse the procedure in 1 to 4.

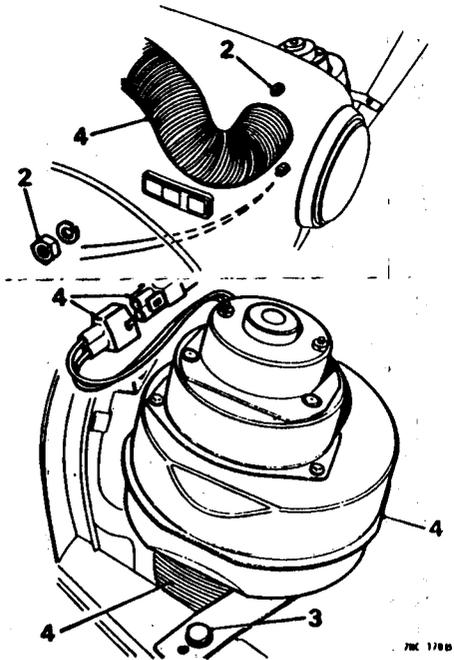
## HEATER VALVE - 1989 Model year

Remove and refit

80.10.16

### Removing

1. **Not Turbo:** Disconnect the bottom hose and partially drain the coolant.  
**Turbo only:** Remove the front grille, see 76.55.03. Disconnect the auxiliary radiator hose at the radiator and partially drain the coolant.  
*Note: Conserve coolant if anti-freeze is in use.*

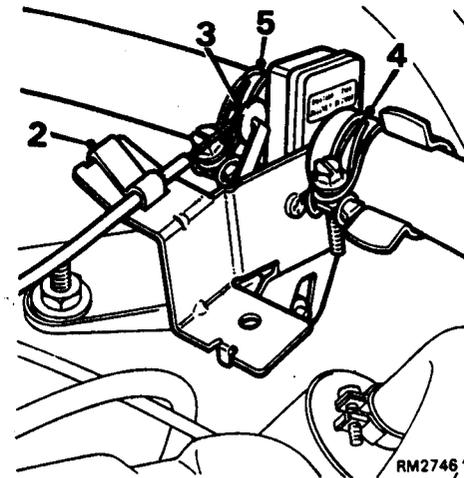
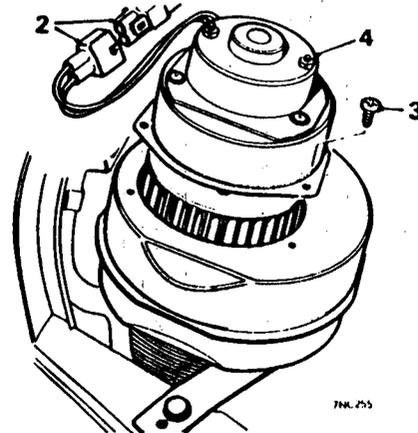
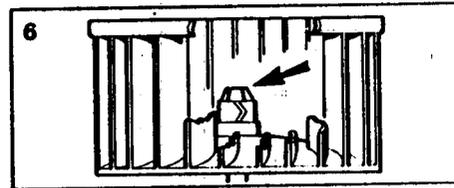


2. Release the clip securing the water valve outer cable.
3. Disconnect the inner cable from the water valve lever.
4. Slacken the clip securing the coolant hose and disconnect the hose from the water valve.

5. Slacken the hose clip and withdraw the water valve.

#### Refitting

6. Reverse the procedure given in 2 to 5.
7. Top-up the cooling system.
8. Check that water valve lever can move through its full range of travel; adjust the outer cable if necessary in order to achieve this.



#### COOLANT HOSE - ENGINE TO HEATER WATER VALVE - 1989 Model year on

Remove and refit - Not Turbo 80.25.08

#### Removing

1. Disconnect the bottom hose and partially drain the coolant.  
*Note: Conserve coolant if anti-freeze is in use.*
2. Remove the rocker cover securing nut and release the hose clip.
3. Slacken the hose clips and release the hose from the engine and heater water valve.

#### Refitting

4. Reverse the procedure given in 1 to 3.

#### COOLANT HOSE - HEATER WATER VALVE TO HEATER - 1989 Model year on

Remove and refit

80.25.09

#### Removing

1. **Not Turbo:** Disconnect the bottom hose and partially drain the coolant.  
**Turbo only:** Remove the grille, see 76.55.03. Disconnect the auxiliary radiator hose at the radiator and partially drain the coolant  
*Note: Conserve coolant if anti-freeze is in use.*
2. **Turbo only:** Remove the console, see 76.25.01 and the screws securing the clock and switch panel to the heater unit.
3. Remove the air distribution knob, disconnect the heater fan switch and move the panel aside.
4. **All Models:** Slacken the hose clip and disconnect the heater hose from the water valve.
5. Slacken the securing nut at the back of the heater.
6. Remove the two screws securing the heater to the parcel shelf rail.
7. Position a suitable receptacle beneath the heater.
8. Lower the heater and release it from the rear mounting bracket.
9. Slacken the hose clip and disconnect the hose from the heater.
10. Release the hose from behind the electrical harness.

#### Refitting

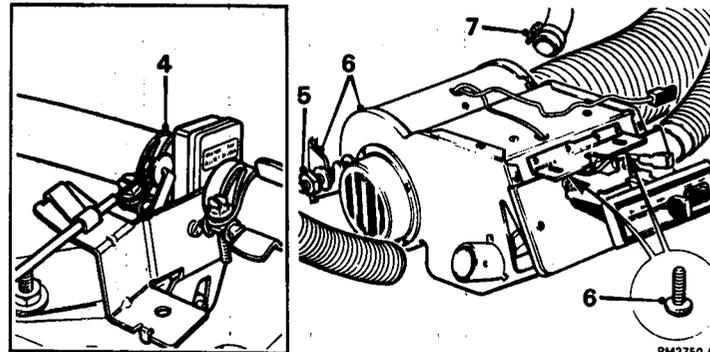
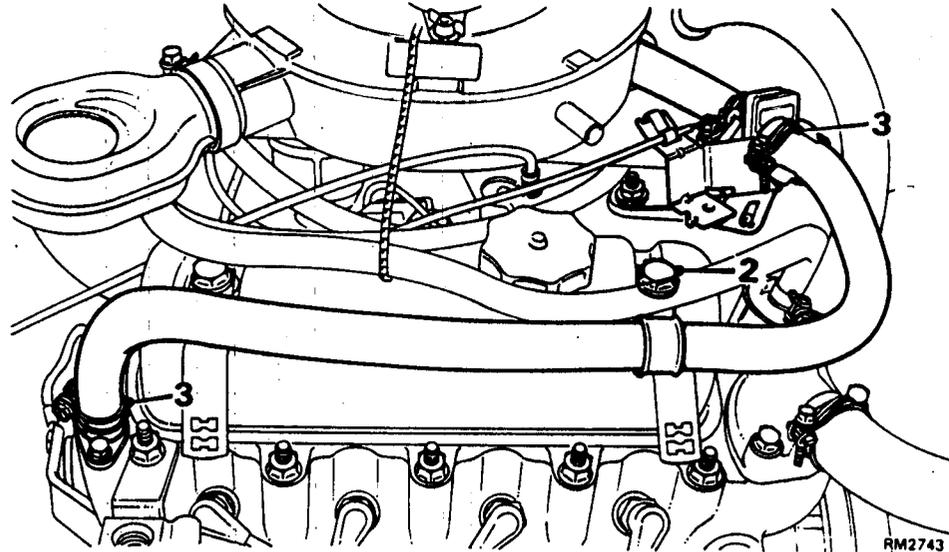
11. Reverse the procedure given in 2 to 10.
12. Top-up the cooling system.

## COOLANT HOSE - ENGINE TO HEATER

Remove and refit - Turbo only 80.25.10

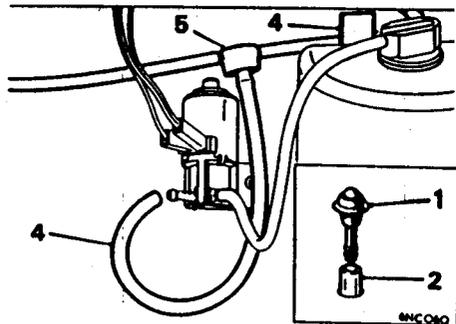
### Removing

1. Disconnect the battery.
2. Remove the front grille, see 76.55.03
3. Disconnect the auxiliary radiator hose at the radiator and partially drain the coolant.
4. Remove the console, see 76.25.01.
5. Remove the screws securing the clock and switch panel to the heater unit.
6. Remove the heater air distribution knob, release the panel from the bracket and disconnect the heater fan switch.
7. Disconnect the demister tubes from the heater unit.
8. Slacken the securing nut at the rear of the heater.
9. Remove the two screws securing the heater to the parcel rail.
10. Lower the heater and release it from the rear mounting bracket.
11. Position a suitable container to collect the coolant.
12. Disconnect the engine to heater coolant hose from the heater.
13. Release the hose from behind the electrical harness
14. Disconnect the hose from the inlet manifold 'Tee' piece.
15. Withdraw the hose through the bulkhead.



### Refitting

16. Reverse the procedure given in 4 to 15
17. Connect the auxiliary radiator hose to the radiator.
18. Top-up the coolant.
19. Fit the front grille, see 76.55.03
20. Connect the battery.



## WASHER JETS

Remove and refit 1 and 2 84.10.09

Washer tubes 2 to 5 84.10.15

### Removing

1. Lift the lip of the jet and carefully prise the jet out of the body.
2. Disconnect the washer tube from the jet.
3. Raise the bonnet.
4. Disconnect the delivery tube from the pump and release the tube from the body clips.
5. Disconnect the tubes from the 'T' piece.

### Refitting

6. Reverse the procedure in 1 to 5 as necessary.

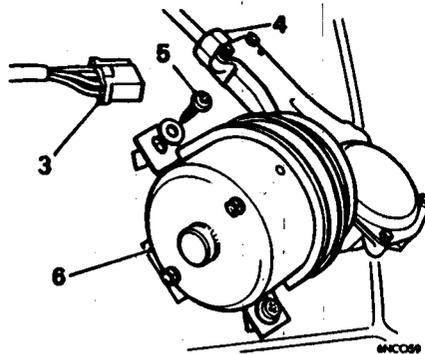
## WIPER MOTOR AND DRIVE

Remove and refit 84.15.09

### Removing

1. Disconnect the battery. **Turbo only:** Slacken the clips securing the turbocharger inlet hose to the air cleaner and connector; move the hose aside.
2. Remove the wiper arms.
3. Disconnect the wiring connector from the motor.

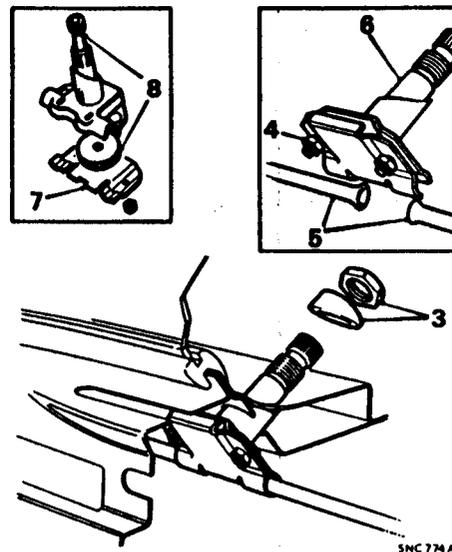
4. Unscrew the outer casing retaining nut from the motor ferrule.



5. Remove the motor strap securing screws.
6. Withdraw the motor assembly complete with the cable rack.

### Refitting

7. Smear the cable rack with Ragosine Listate Grease.
8. Push the cable rack into the outer casing, ensuring the rack engages the wheelbox gear teeth, and position the motor retaining strap and mounting pad.
9. Reverse the procedure in 1 to 5 and check wiper operation.



## WIPER MOTOR DRIVE AND WHEELBOXES

Remove and refit 84.15.10

### Removing

1. Remove the wiper motor and drive, see 84.15.09.
2. Remove the bulkhead insulation.
3. Unscrew the retaining nut and remove the spacer from each wheelbox.
4. Slacken the nuts clamping the wheelbox plates.
5. Release the outer casings from the wheelboxes.
6. Remove the wheelbox assemblies.
7. Remove the cover plates.

### Refitting

8. Check the condition of the wheel teeth and the cable rack. Renew a wheel and spindle, wheelbox assembly or cable rack as necessary.

9. Grease the wheel and spindle and refit the wheel boxes to the top panel.
10. Align the outer casings and tighten the wheelbox covers.
11. Ensure that the motor to wheelbox outer casing is positioned correctly and is not kinked or flattened. Bend radius on the outer casing must not be less than 230 mm (9 in). Test the cable rack in the outer casing if excessive friction is suspected: Remove the rack cable from the motor. Use a spring balance to check that the pull required to withdraw the cable rack from the casing and wheelbox does not exceed 2.7 kgf (6 lbf).
12. Reverse the procedure in 1 and 2.

## WIPER MOTOR

Overhaul 84.15.18

### Dismantling

**Note:** To change brushes only, follow procedures 1 to 4.

1. Remove the wiper motor and drive, see 84.15.09.
2. Note the alignment marks on the yoke and gearbox for reassembly.
3. Unscrew the two through-bolts and remove the yoke and armature assembly. **CAUTION:** The yoke must be kept clear of metallic particles which will be attracted to the pole-piece.
4. Note the colour and position of the wiring. Withdraw the brushes from the insulating plate and disconnect the leads from the switch assembly. Cable colours: R = Red, U = Blue, Y = Yellow.
5. Unscrew the four gearbox cover retaining screws and remove the cover.

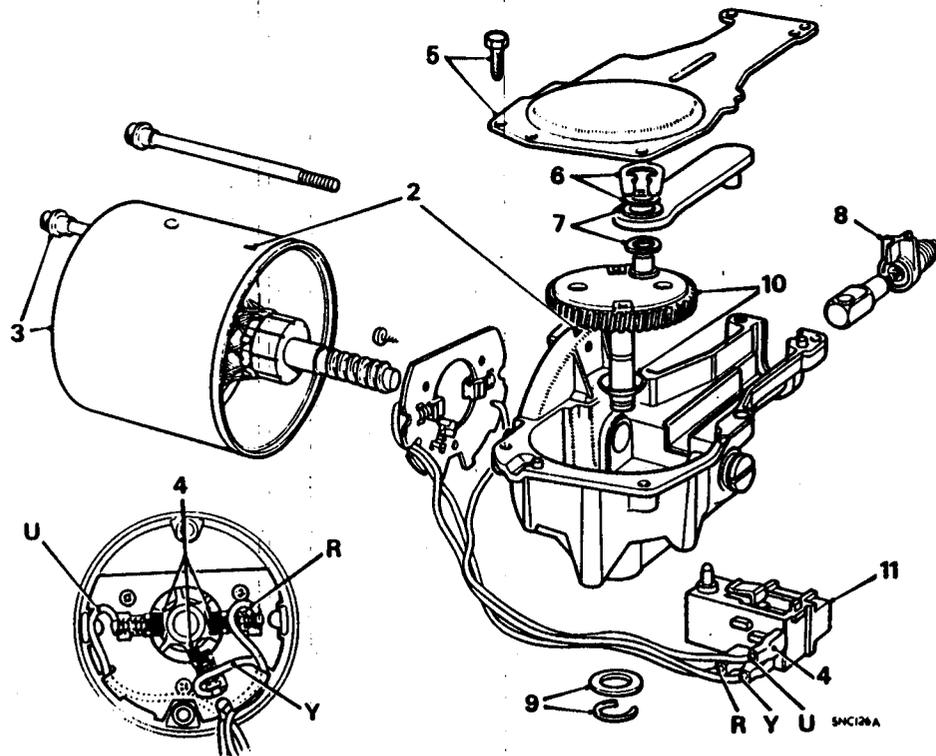
6. Remove the circlip and flat washer securing the connecting rod to the crankpin.
7. Withdraw the connecting rod and the flat washer fitted under it.
8. Withdraw the cable rack with cross-head and outer casing ferrule.
9. Remove the circlip and washer securing the shaft and gear.
10. Clean any burrs from the gear shaft and withdraw the gear, taking care not to lose the dished washer fitted under it.
11. Switch assembly: Pull outwards and down to release the retaining clip.

#### Inspection

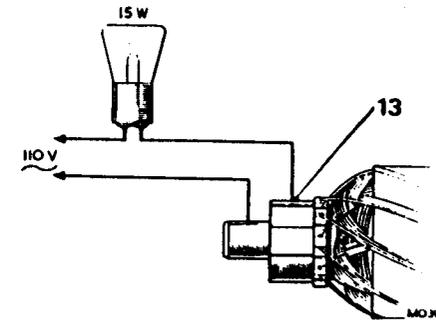
12. Examine the brushes. If the main brushes (diametrically opposite) are worn to 0.19 in (4.8 mm) or if the narrow section of the third brush is worn to the full width of the brush, the brushes must be renewed. Renew the brush gear assembly if the springs are not satisfactory.
13. Test the armature for insulation and open or short-circuits. Use a test lamp (110 volts, 15 watts). Renew the armature if faulty.
14. Examine the gear wheel for damage or excessive wear. Renew if necessary.

#### Reassembling

15. Reverse the procedure in 1 to 11.
16. Use Ragosine Listate Grease to lubricate the gear wheel teeth, armature shaft worm gear, connecting rod and pin, cross-head slide, cable rack, and wheelbox gear wheels.



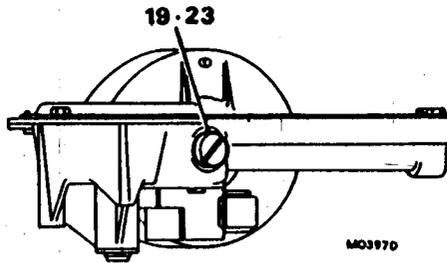
17. Use Shell Turbo 41 oil to lubricate the bearing bushes, armature shaft bearing journals (sparingly), gear wheel shaft and crankpin, felt washer in the yoke bearing (thoroughly soak), and the wheelbox spindles.
18. Tighten the yoke fixing bolts to 14 lbf in (0.16 kgf m).
19. If a replacement armature is being fitted, slacken the thrust screw to provide end-float for fitting the yoke.
20. Fit the dished washer beneath the gear wheel with its concave side towards the gear wheel.



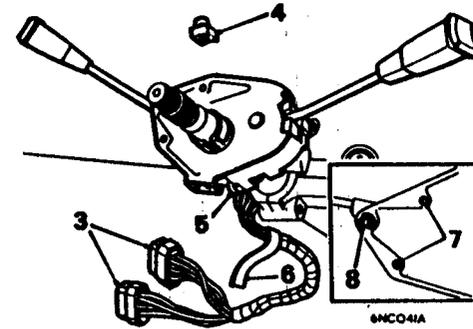
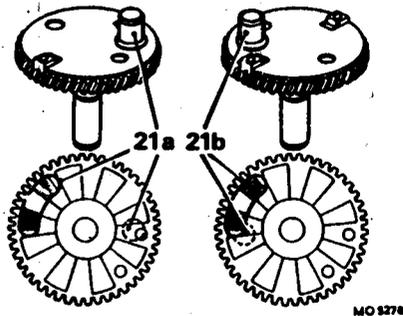
21. When fitting the gear wheel, ensure that the relationship of the crankpin and ramp is correct for the parking condition required:
  - a R.H.D. cars: cable rack extended with the crankpin adjacent to the cam.
  - b L.H.D. cars: cable rack retracted with the crankpin opposite to the cam.
22. Ensure that the larger of the two washers if fitted to the crankpin beneath the connecting rod.

#### DATA

Wiper motor	Lucas 14WA	
Type	Low speed	
Running current (rack disconnected)	1.5 amp	High speed
Wiper speed (after 60 seconds)	45 to 52 rev/min	2.5 amp
Armature end-float	0.002 to 0.008 in	60 to 80 rev/min
Brush spring tension	5 to 7 ozf	(0.05 to 0.2 mm)
Minimum brush length	0.18 in (4.7 mm)	(140 to 200 gf)
Maximum pull to move rack in tubes	6 lbf (2.7 kgf)	



23. Armature end-float: Hold the yoke vertical with the adjuster screw uppermost. Carefully screw in the adjuster until resistance is felt, and screw back for a quarter-turn. This will give the required end-float.



### WINDSCREEN WIPER/WASHER SWITCH

Remove and refit 84.15.34

#### Removing

1. Remove the steering wheel, see 57.60.01.
2. Remove the steering column cowl securing screws, separate the two halves and remove them from the column.
3. Disconnect the wiring multi-connectors from the main harness.
4. Remove the direction indicator cancelling ring drive block.
5. Slacken the switch clamp screw and withdraw the switch from the column.
6. Remove the insulating tape to separate the electrical harnesses of the two switches.
7. Drill out the two rivets securing the wiper/washer switch to the mounting plate.
8. Remove the screw to release the wiper/washer switch from the mounting plate.

#### Refitting

9. Reverse the procedure in 1 to 8

### REAR SCREEN WASHER RESERVOIR

Remove and refit - Turbo only 84.30.01

#### Removing

1. Open the boot lid.
2. Release the reservoir retaining strap.
3. Withdraw the reservoir and empty the contents into a suitable container.
4. Carefully prise the washer tube off the reservoir.
5. Withdraw the reservoir.

#### Refitting

6. Reverse the procedure given in 4 and 5.  
*Note: If the washer tube proves difficult to connect to the reservoir, immerse the end of the tube in hot water for a few seconds and then connect it to the reservoir.*
7. Position the reservoir and fit the retaining strap.
8. Fill the reservoir and check the operation of the washers.

### REAR SCREEN WASHER PUMP

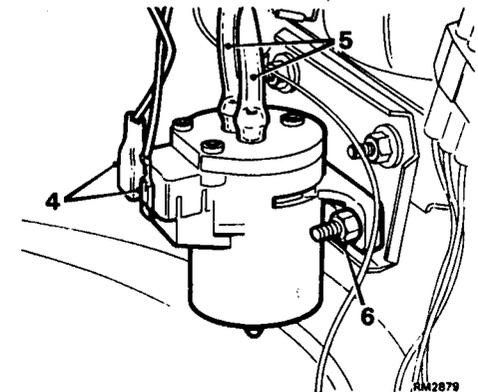
Remove and refit - Turbo only 84.30.21

#### Removing

1. Disconnect the battery.
2. Open the boot and remove the boot board.
3. Release the clips securing the right hand boot side board; withdraw the board.
4. Note the fitted position of the harness terminals; disconnect the harness from the washer pump.
5. Carefully prise the washer tubes off the pump; plug the inlet hose to prevent loss of washer fluid.
6. Remove the nuts securing the pump to the mounting bracket; withdraw the pump.

#### Refitting

7. Connect the washer tubes to the pump.  
*Note: If the tubes prove difficult to connect, immerse the ends of the tubes in hot water for a few seconds then connect them to the pump.*
8. Fit the pump to the mounting bracket; fit and tighten the nuts.
9. Connect the Lucas to the pump.
10. Connect the battery.
11. Switch on the ignition and check the pump operation.  
*CAUTION: If pump runs but washers do not spray, check the following.*
  - a. Sufficient quantity of fluid in the reservoir.
  - b. Washer jet is not clogged.
  - c. Feed pipe from the reservoir is connected to the inlet side of the pump and the feed pipe from the pump to the jets is connected to the outlet side of the pump.



## REAR SCREEN WIPER MOTOR AND DRIVE

Remove and refit - Turbo only 84.35.12

### Removing

1. Disconnect the battery.
2. Remove the wiper arm - see **MAINTENANCE**.
3. Disconnect the harness at the fixing stud.
4. Remove the mounting strap securing nut.
5. Withdraw the motor slightly and unscrew the outer casing retaining nut from the motor ferrule.
6. Withdraw the motor complete with the cable rack.

### Refitting

7. Smear the cable rack with Ragosine Listate Grease.
8. Push the cable rack into the outer casing ensuring the rack engages the wheelbox gear teeth.
9. Reverse the procedure given in 3 to 5.
10. Operate the motor, switch it off to position the wiper arm spindle in the 'PARK' position.
11. Fit the wiper arm ensuring that, when fitted, it is in the 'PARK' position.
12. Check the motor for correct operation.

**CAUTION:** Do not allow the wiper blade to operate on a dry screen.

## REAR SCREEN WIPER/WASHER SWITCH

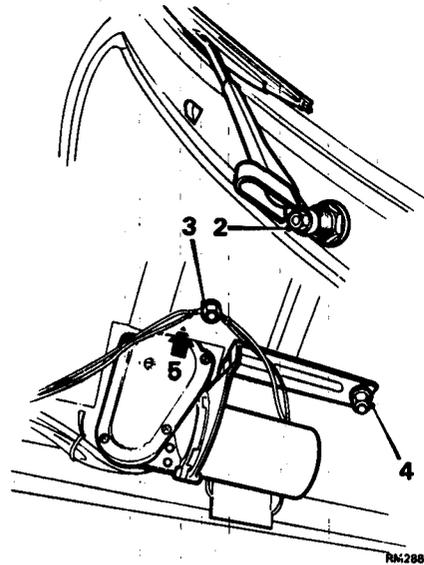
Remove and refit - Turbo only 84.35.33

### Removing

1. Disconnect the battery.
2. Remove the air distribution knob.
3. Remove the screws securing the switch and clock panel.

8. Switch on the ignition and operate the switch. Check the wiper/washer for correct operation.

**CAUTION:** Do not allow the wiper blade to operate on a dry screen.



4. Release the switch panel from the mounting bracket.
5. Note the fitted position of the harness connectors and disconnect them from the switch.
6. Depress the retaining clips and withdraw the switch.

### Refitting

7. Reverse the procedure given in 1 to 6.

## SERVICE PRECAUTIONS 86.01.01

### Polarity

Ensure that the correct battery polarity is maintained at all times: reversed battery or charger connections will damage the alternator rectifiers.

### Battery connections

The battery must never be disconnected while the engine is running.

### Testing semi-conductor devices

Never use an ohmmeter of the type incorporating a hand-driven generator for checking the rectifiers or the transistors.

## ALTERNATOR - ALL TYPES

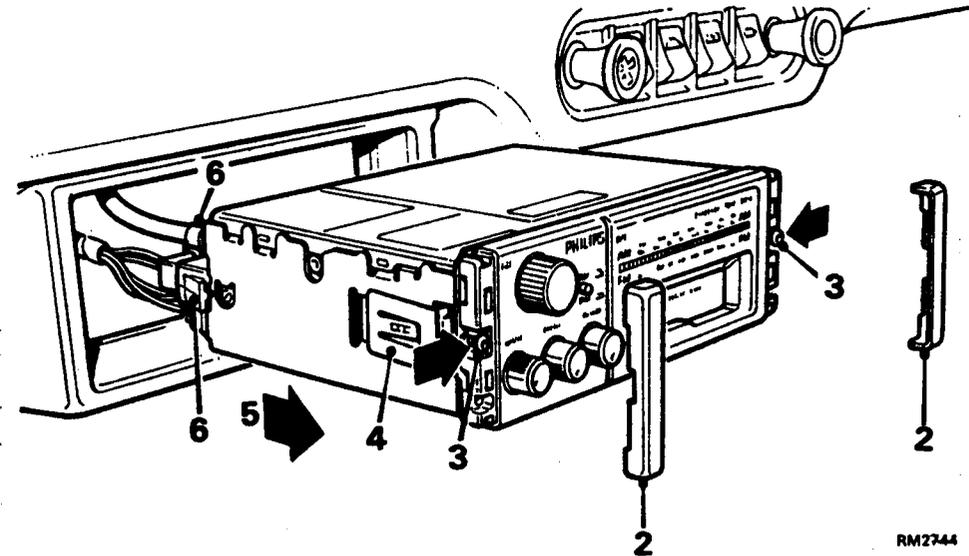
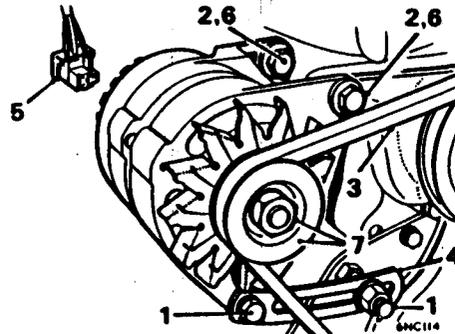
### Remove and refit 86.10.02

#### Removing

1. Clubman and 1275 GT and Turbo Models: Release the three retaining clips and remove the ignition shield.
2. Slacken the alternator adjusting link nut and set screw.
3. Slacken the two upper bolts and nuts retaining the alternator.
4. Release the drive belt from the alternator pulley.
5. Remove the adjusting link from the alternator.
6. Release the spring clip and disconnect the multi connector plug from the alternator.
7. Remove the two retaining nuts and bolts and remove the alternator.
8. Hold the alternator pulley in a soft-jawed vice and remove the pulley retaining nut and pulley from the alternator.

#### Refitting

9. Fit the pulley to the new alternator and tighten the retaining nut, see 'TORQUE WRENCH SETTINGS'.
10. Reverse the procedure in 1 to 7.
11. Adjust the drive belt tension, see 'MAINTENANCE'.



## RADIO - 1989 Model year on

### Remove and refit - Not Turbo 86.50.03

Service tool: SMD 4091

#### Removing

1. Disconnect the battery.
2. Carefully prise the side finishers from either side of the radio mounting.
3. Slacken the securing screws.
4. Release the radio securing clips by pressing the screws inwards.
5. Reach behind the radio and push it forwards until it can be withdrawn from the panel.
6. Disconnect the multi-plugs and aerial lead.

#### Refitting

7. Connect the multi-plugs and the aerial to the radio.
8. Slide the radio into the panel aperture ensuring that the wiring harness and aerial lead is not trapped.
9. Push the radio rearwards until the securing clips are fully engaged.
10. Reverse the procedure given in 1 to 3.

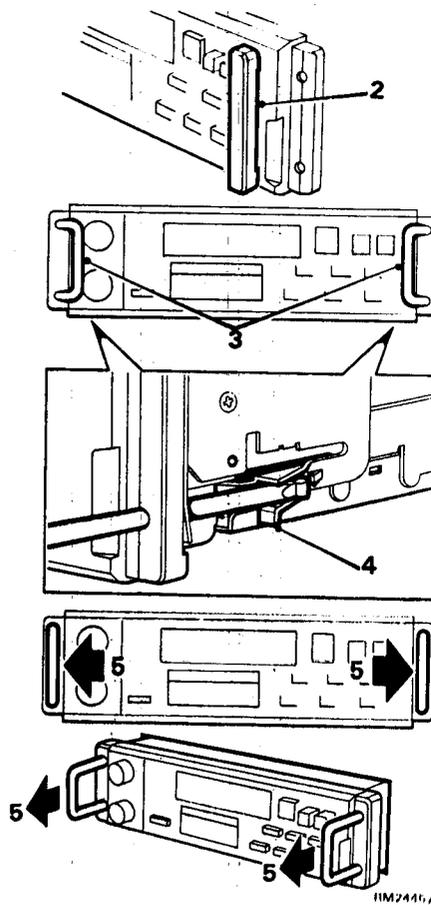
## RADIO/CASSETTE PLAYER

Remove and refit - Turbo only 86.50.03

Service tool: SMD 4091

### Removing

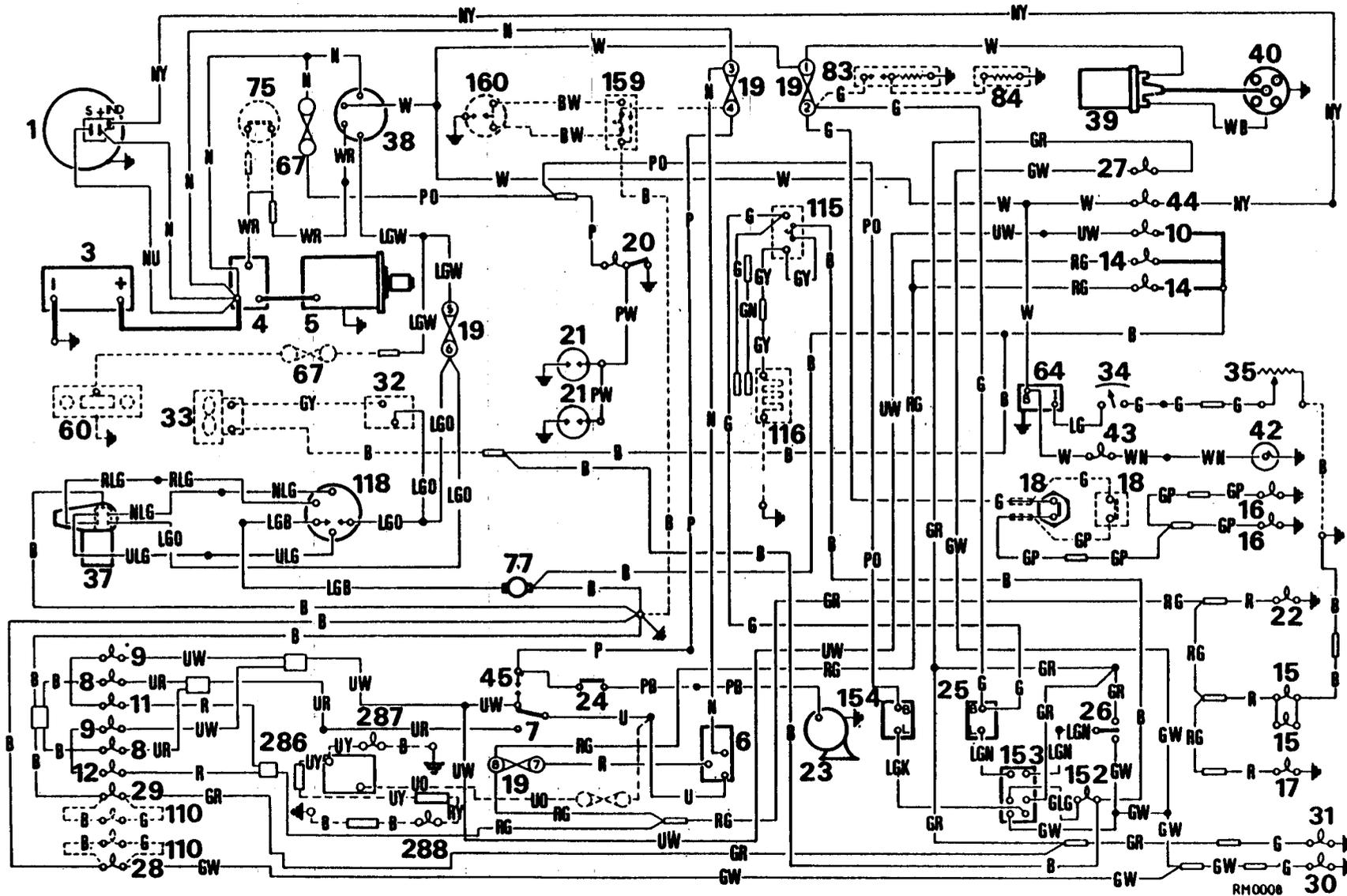
1. Disconnect the battery.
2. Carefully prise the side finishers (if fitted) from either side of the radio mounting.
3. Hold both halves of SMD 4091 with the probes of the tool aligned with the holes at each end of the radio.
4. Incline the probes outwards slightly and insert them into the holes.
5. Push the probes in until they are felt to positively engage with the retaining clips.
6. Press the ends of the tool outwards to compress the clips at the same time gently pulling the radio from the mounting.
7. Withdraw the radio until access to the aerial connection and multi-plug is obtained.
8. Disconnect the aerial and multi-plug connector.
9. Withdraw the radio.



### Refitting

10. Ensure that the foam rubber support pads are in position.
11. Connect the aerial and multi-plug connector to the radio.
12. Insert the aerial into the fascia aperture.
13. Keeping the radio square to the aperture push it into place until the retaining clips are engaged.  
**CAUTION:** Ensure that the aerial lead or harness wires are not trapped between the radio and the aperture.
14. Fit the side finishers.
15. Connect the battery and test the radio and cassette player for correct operation.

WIRING DIAGRAM - MINI 850 SALOON, VAN, AND PICK-UP - 1976 0N



## KEY TO THE WIRING DIAGRAM

- |                                    |  |  |  |
|------------------------------------|--|--|--|
| 1. Alternator                      | 21 Interior lamp switch (door)           | 37 Windscreen wiper motor                                    | 110 Direction indicator repeater lamps (when fitted) |
| 3 Battery                          | 22 Tail lamp - L.H.                      | 38 Ignition start switch                                     | 115 Heated rear screen switch                        |
| 4 Starter motor solenoid           | 23 Horn                                  | 39 Ignition coil   | 116 Heated rear screen                               |
| 5 Starter motor                    | 24 Horn-push                             | 40 Distributor   | 118 Combined windscreen washer and wiper switch      |
| 6 Lighting switch                  | 25 Direction indicator flasher unit      | 42 Oil pressure switch                                       | 152 Hazard warning lamp                              |
| 7 Headlamp dip switch              | 26 Direction indicator switch            | 43 Oil pressure warning light                                | 153 Hazard warning switch                            |
| 8 Headlamp dip beam                | 27 Direction indicator warning lamp      | 44 No charge warning lamp                                    | 154 Hazard warning flasher unit                      |
| 9 Headlamp main beam               | 28 Front direction indicator lamp - R.H. | 45 Headlamp flash switch                                     | 159 Brake failure test switch and warning lamp       |
| 10 Main beam warning lamp          | 29 Front direction indicator lamp - L.H. | 60 Radio (when fitted)                                       | 160 Brake pressure differential switch               |
| 11 Sidelamp - R.H.                 | 30 Rear direction indicator lamp - R.H.  | 64 Voltage stabilizer  | 286 Rear fog-guard switch (when fitted)              |
| 12 Sidelamp - L.H.                 | 31 Rear direction indicator lamp - L.H.  | 67 Line fuse   | 287 Rear fog-guard warning lamp (when fitted)        |
| 14 Panel illumination lamps        | 32 Heater switch                         | 75 Automatic gearbox ignition inhibitor switch (when fitted) | 288 Rear fog-guard lamp (when fitted)                |
| 15 Number-plate illumination lamps | 33 Heater motor                          | 77 Windscreen washer motor                                   |  |
| 16 Stop lamps                      | 34 Fuel level indicator                  | 83 Induction heater and thermostat (when fitted)             |  |
| 17 Tail lamp - R.H.                | 35 Fuel level indicator tank unit        | 84 Suction chamber heater (when fitted)                      |  |
| 18 Stop lamp switch (hydraulic)    |  |  |  |
| 19 Fuse box                        |  |  |  |
| 20 Interior lamp                   |  |  |  |

## CABLE COLOUR CODE

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

When a cable has two colour code letters the first denotes the main colour and the second denotes the tracer colour.



## KEY TO THE WIRING DIAGRAM

- |                                    |  |  |  |
|------------------------------------|--|--|--|
| 1. Alternator                      | 21 Interior lamp switch (door)           | 37 Windscreen wiper motor                        | 84 Suction chamber heater (when fitted)              |
| 3 Battery                          | 22 Tail lamp - L.H.                      | 38 Ignition start switch                         | 110 Direction indicator repeater lamps (when fitted) |
| 4 Starter motor solenoid           | 23 Horn                                  | 39 Ignition coil                                 | 115 Heated rear screen switch                        |
| 5 Starter motor                    | 24 Horn-push                             | 40 Distributor                                   | 116 Heated rear screen                               |
| 6 Lighting switch                  | 25 Direction indicator flasher unit      | 44 No charge warning lamp                        | 118 Combined windscreen washer and wiper switch      |
| 7 Headlamp dip switch              | 26 Direction indicator switch            | 45 Headlamp flash switch                         | 152 Hazard warning lamp                              |
| 8 Headlamp dip beam                | 27 Direction indicator warning lamp      | 46 Water temperature indicator                   | 153 Hazard warning switch                            |
| 9 Headlamp main beam               | 28 Front direction indicator lamp - R.H. | 47 Water temperature transmitter                 | 154 Hazard warning flasher unit                      |
| 10 Main beam warning lamp          | 29 Front direction indicator lamp - L.H. | 49 Reverse lamp switch (when fitted)             | 159 Brake failure test switch and warning lamp       |
| 11 Sidelamp - R.H.                 | 30 Rear direction indicator lamp - R.H.  | 50 Reverse lamp (when fitted)                    | 160 Brake pressure differential switch               |
| 12 Sidelamp - L.H.                 | 31 Rear direction indicator lamp - L.H.  | 60 Radio (when fitted)                           | 286 Rear fog-guard switch (when fitted)              |
| 14 Panel illumination lamps        | 32 Heater switch                         | 64 Voltage stabilizer                            | 287 Rear fog-guard warning lamp (when fitted)        |
| 15 Number plate illumination lamps | 33 Heater motor                          | 67 Line fuse                                     | 288 Rear fog-guard lamp (when fitted)                |
| 16 Stop lamps                      | 34 Fuel level indicator                  | 75 Automatic gearbox ignition inhibitor switch   |  |
| 17 Tail lamp - R.H.                | 35 Fuel level indicator tank unit        | 77 Windscreen washer motor                       |  |
| 18 Stop lamp switch (hydraulic)    |  | 83 Induction heater and thermostat (when fitted) |  |
| 18 Stop lamp switch (mechanical)   |  |  |  |
| 19 Fuse Box                        |  |  |  |
| 20 Interior lamp                   |  |  |  |

## CABLE COLOUR CODE

B	Black	N	Brown	U	Blue
G	Green	O	Orange	W	White
K	Pink	P	Purple	Y	Yellow
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## KEY TO THE WIRING DIAGRAM

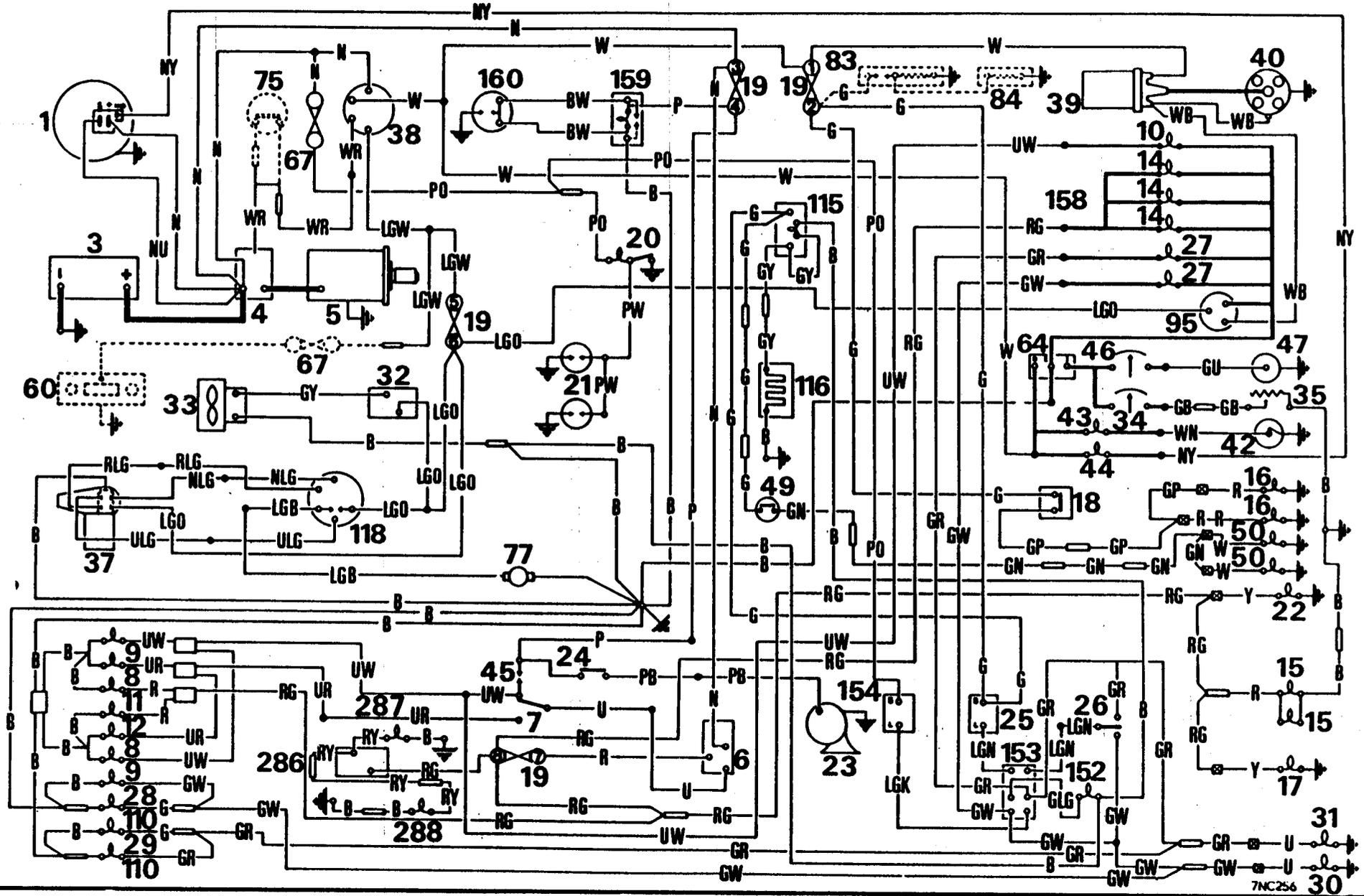
- |  |   |   |
|--|---|---|
| <ul style="list-style-type: none"> <li>1. Alternator</li> <li>3 Battery</li> <li>4 Starter motor solenoid</li> <li>5 Starter motor</li> <li>6 Lighting switch</li> <li>7 Headlamp dip switch</li> <li>8 Headlamp dip beam</li> <li>9 Headlamp main beam</li> <li>10 Main beam warning lamp</li> <li>11 Sidelamp - R.H.</li> <li>12 Sidelamp - L.H.</li> <li>14 Panel illumination lamps</li> <li>15 Number-plate illumination lamps</li> <li>16 Stop lamps</li> <li>17 Tail lamp - R.H.</li> <li>18 Stop lamp switch (hydraulic)</li> <li>18 Stop lamp switch (mechanical)</li> <li>19 Fuse box</li> <li>20 Interior lamp</li> <li>21 Interior lamp switch (door)</li> </ul> | <ul style="list-style-type: none"> <li>22 Tail lamp - L.H.</li> <li>23 Horn</li> <li>24 Horn push</li> <li>25 Direction indicator flasher unit</li> <li>26 Direction indicator switch</li> <li>27 Direction indicator warning lamp</li> <li>28 Front direction indicator lamp - R.H.</li> <li>29 Front direction indicator lamp - L.H.</li> <li>30 Rear direction indicator lamp - R.H.</li> <li>31 Rear direction indicator lamp - L.H.</li> <li>32 Heater switch</li> <li>33 Heater motor</li> <li>34 Fuel level indicator</li> <li>35 Fuel level indicator tank unit</li> <li>37 Windscreen wiper motor</li> <li>38 Ignition/start switch</li> </ul> | <ul style="list-style-type: none"> <li>39 Ignition coil</li> <li>40 Distributor</li> <li>41 Oil pressure switch</li> <li>42 Oil pressure warning lamp</li> <li>43 No charge warning lamp</li> <li>44 Headlamp flash switch</li> <li>45 Water temperature indicator</li> <li>46 Water temperature transmitter</li> <li>47 Reverse lamp switch (when fitted)</li> <li>49 Reverse lamp (when fitted)</li> <li>50 Radio (when fitted)</li> <li>60 Voltage stabilizer</li> <li>64 Line fuse</li> <li>67 Windscreen washer motor</li> <li>77 Induction heater and thermostat (when fitted)</li> <li>83 Suction chamber heater (when fitted)</li> <li>84 Tachometer</li> </ul> |
|  |   | <ul style="list-style-type: none"> <li>95 Direction indicator repeater lamps (when fitted)</li> <li>110 Heated rear screen switch</li> <li>115 Heated rear screen</li> <li>116 Combined windscreen washer and wiper switch</li> <li>118 Hazard warning lamp</li> <li>152 Hazard warning switch</li> <li>153 Hazard warning flasher unit</li> <li>154 Printed circuit instrument panel</li> <li>158 Brake failure test switch and warning lamp</li> <li>159 Brake pressure differential switch</li> <li>160 Rear fog-guard switch (when fitted)</li> <li>286 Rear fog-guard warning lamp (when fitted)</li> <li>288 Rear fog-guard lamp (when fitted)</li> </ul>         |

## CABLE COLOUR CODE

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

When a cable has two colour code letters the first denotes the main colour and the second denotes the tracer colour.

WIRING DIAGRAM - MINI SPECIAL - 1977-78



## KEY TO THE WIRING DIAGRAM

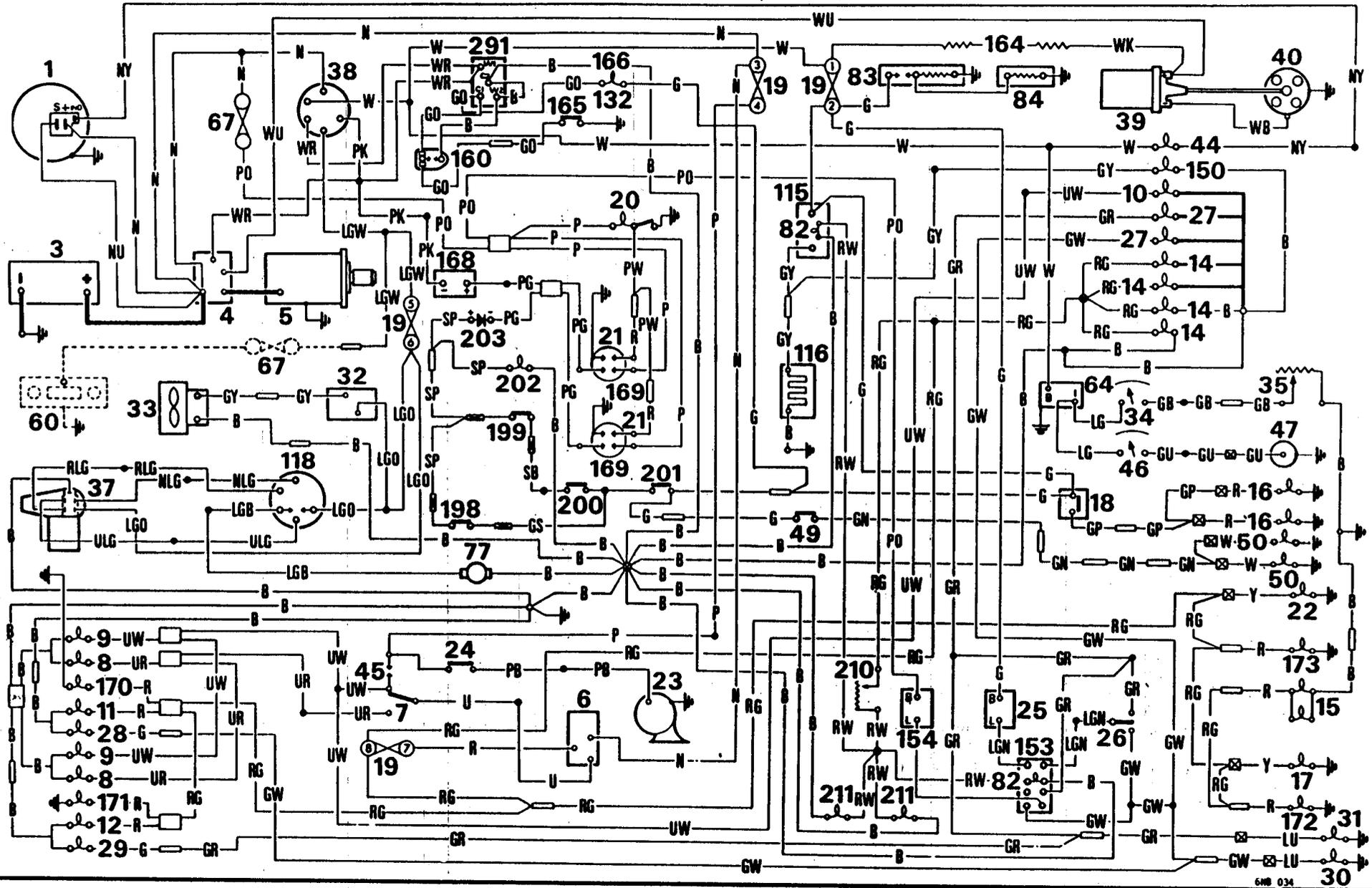
- |   |  |   |
|---|--|---|
| <ul style="list-style-type: none"> <li>1. Alternator</li> <li>3 Battery</li> <li>4 Starter motor solenoid</li> <li>5 Starter motor</li> <li>6 Lighting switch</li> <li>7 Headlamp dip switch</li> <li>8 Headlamp dip beam</li> <li>9 Headlamp main beam</li> <li>10 Main beam warning lamp</li> <li>11 Sidelamp - R.H.</li> <li>12 Sidelamp - L.H.</li> <li>14 Panel illumination lamps</li> <li>15 Number-plate illumination lamps</li> <li>16 Stop lamps</li> <li>17 Tail lamps - R.H.</li> <li>18 Stop lamp switch (hydraulic)</li> <li>18 Stop lamp switch (mechanical)</li> <li>19 Fuse box</li> <li>20 Interior lamp</li> </ul> | <ul style="list-style-type: none"> <li>21 Interior lamp switch (door)</li> <li>22 Tail lamp - L.H.</li> <li>23 Horn</li> <li>24 Horn push</li> <li>25 Direction indicator flasher unit</li> <li>26 Direction indicator switch</li> <li>27 Direction indicator warning lamp</li> <li>28 Front direction indicator lamp - R.H.</li> <li>29 Front direction indicator lamp - L.H.</li> <li>30 Rear direction indicator lamp - R.H.</li> <li>31 Rear direction indicator lamp - L.H.</li> <li>32 Heater switch</li> <li>33 Heater motor</li> <li>34 Fuel level indicator</li> <li>35 Fuel level indicator tank unit</li> </ul> | <ul style="list-style-type: none"> <li>37 Windscreen wiper motor</li> <li>38 Ignition/start switch</li> <li>39 Ignition coil</li> <li>40 Distributor</li> <li>44 No charge warning lamp</li> <li>45 Headlamp flash switch</li> <li>46 Water temperature indicator</li> <li>47 Water temperature transmitter</li> <li>49 Reverse lamp switch</li> <li>50 Reverse lamp</li> <li>60 Radio (when fitted)</li> <li>64 Voltage stabilizer</li> <li>67 Line fuse</li> <li>75 Automatic gearbox ignition inhibitor switch</li> <li>77 Windscreen washer motor</li> <li>83 Induction heater and thermostat (when fitted)</li> </ul>  |
|   |  | <ul style="list-style-type: none"> <li>84 Suction chamber heater (when fitted)</li> <li>110 Direction indicator repeater lamps (when fitted)</li> <li>115 Heated rear screen switch</li> <li>116 Heated rear screen</li> <li>118 Combined windscreen washer and wiper switch</li> <li>152 Hazard warning lamp</li> <li>153 Hazard warning switch</li> <li>154 Hazard warning flasher unit</li> <li>159 Brake failure test switch and warning lamp</li> <li>160 Brake pressure differential switch</li> <li>286 Rear fog-guard switch (when fitted)</li> <li>287 Rear fog-guard warning lamp (when fitted)</li> <li>288 Rear fog-guard lamp (when fitted)</li> </ul> |

## CABLE COLOUR CODE

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

When a cable has two colour code letters the first denotes the main colour and the second denotes the tracer colour.

WIRING DIAGRAM - MINI 1000 (Canada) - 1977 on



## KEY TO THE WIRING DIAGRAM

- |                                    |  |  |  |
|------------------------------------|--|--|--|
| 1. Alternator                      | 25 Direction indicator flasher unit      | 49 Reverse lamp switch                               | 159 Brake failure test switch and warning lamp |
| 3 Battery                          | 26 Direction indicator switch            | 50 Reverse lamp                                      | 160 Brake pressure differential switch         |
| 4 Starter motor solenoid           | 27 Direction indicator warning lamp      | 60 Radio (when fitted)                               | 164 Resistive cable                            |
| 5 Starter motor                    | 28 Front direction indicator lamp - R.H. | 64 Voltage stabilizer                                | 165 Handbrake switch                           |
| 6 Lighting switch                  | 29 Front direction indicator lamp - L.H. | 67 Line fuse   | 188 Handbrake warning lamp                     |
| 7 Headlamp dip switch              | 30 Rear direction indicator lamp - R.H.  | 77 Windscreen washer motor                           | 168 Ignition key warning buzzer                |
| 8 Headlamp dip beam                | 31 Rear direction indicator lamp - L.H.  | 82 Switch illumination lamp                          | 169 Buzzer door switch                         |
| 9 Headlamp main beam               | 32 Heater switch                         | 83 Induction heater and thermostat (when fitted)     | 170 R.H. front side-marker lamp                |
| 10 Main beam warning lamp          | 33 Heater motor                          | 84 Suction chamber heater (when fitted)              | 171 L.H. front side-marker lamp                |
| 11 Sidelamp - R.H.                 | 34 Fuel level indicator                  | 110 Direction indicator repeater lamps (when fitted) | 172 R.H. rear side-marker lamp                 |
| 12 Sidelamp - L.H.                 | 35 Fuel level indicator tank unit        | 115 Heater rear screen switch                        | 173 L.H. rear side-marker lamp                 |
| 14 Panel illumination lamps        | 37 Windscreen wiper motor                | 116 Heated rear screen                               | 198 Driver's seat belt switch                  |
| 15 Number-plate illumination lamps | 38 Ignition/start switch                 | 118 Combined windscreen washer and wiper switch      | 199 Passenger's seat belt switch               |
| 16 Stop lamps                      | 39 Ignition coil                         | 132 Brake warning lamp                               | 200 Passenger seat switch                      |
| 17 Tail lamp - R.H.                | 40 Distributor                           | 150 Heated rear screen warning lamp                  | 201 Seat belt warning gearbox switch           |
| 18 Stop lamp switch (hydraulic)    | 44 No charge warning lamp                | 152 Hazard warning lamp                              | 202 Seat belt warning light                    |
| 18 Stop lamp switch (mechanical)   | 45 Headlamp flash switch                 | 153 Hazard warning switch                            | 203 Blocking diode - seat belt warning         |
| 19 Fuse box                        | 46 Water temperature indicator           | 154 Hazard warning flasher unit                      | 210 Panel illumination rheostat                |
| 20 Interior lamp                   | 47 Water temperature transmitter         | 158 Printed circuit instrument panel                 | 211 Heater control illumination                |
| 21 Interior lamp switch (door)     |  |  | 291 Brake warning relay                        |
| 22 Tail lamp - L.H.                |  |  |  |
| 23 Horn                            |  |  |  |
| 24 Horn-push                       |  |  |  |

## CABLE COLOUR CODE

B	Black	N	Brown	U	Blue
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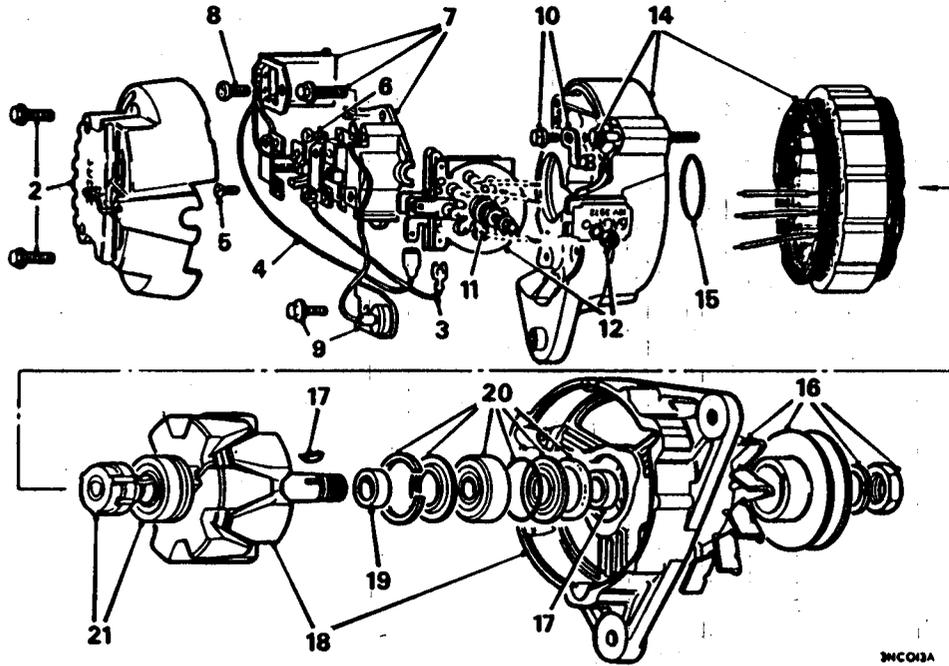
## KEY TO THE WIRING DIAGRAM

- |                                    |  |  |   |
|------------------------------------|--|--|---|
| 1. Alternator                      | 22 Tail lamp -L.H.                       | 39 Ignition coil                                 | 110 Direction indication repeater lamps (when fitted) |
| 3 Battery                          | 23 Horn                                  | 40 Distributor                                   | 115 Heated rear screen switch                         |
| 4 Starter motor solenoid           | 24 Horn-push                             | 44 No charge warning lamp                        | 116 Heated rear screen                                |
| 5 Starter motor                    | 25 Direction indicator flasher unit      | 45 Headlamp flash switch                         | 118 Combined windscreen washer and wiper switch       |
| 6 Lighting switch                  | 26 Direction indicator switch            | 46 Water temperature indicator                   | 152 Hazard warning lamp                               |
| 7 Headlamp dip switch              | 27 Direction indicator warning lamp      | 47 Water temperature transmitter                 | 153 Hazard warning switch                             |
| 8 Headlamp dip beam                | 28 Front Direction indicator lamp - R.H. | 49 Reverse lamp switch                           | 154 Hazard warning flasher unit                       |
| 9 Headlamp main beam               | 29 Front direction indicator lamp - L.H. | 50 Reverse lamp                                  | 159 Brake failure test switch and warning lamp        |
| 10 Main beam warning lamp          | 30 Rear direction indicator lamp - R.H.  | 56 Clock (when fitted)                           | 160 Brake pressure differential switch                |
| 11 Sidelamp - R.H.                 | 31 Rear direction indicator lamp - L.H.  | 57 Cigar lighter (when fitted)                   | 208 Cigar lighter illumination                        |
| 12 Sidelamp - L.H.                 | 32 Heater switch                         | 60 Radio (when fitted)                           | 286 Rear fog-guard switch (when fitted)               |
| 14 Panel illumination lamps        | 33 Heater motor                          | 64 Voltage stabilizer                            | 287 Rear fog-guard warning lamp (when fitted)         |
| 15 Number-plate illumination lamps | 34 Fuel level indicator                  | 67 Line fuse                                     | 288 Rear fog-guard lamp (when fitted)                 |
| 16 Stop lamps                      | 35 Fuel level indicator tank unit        | 75 Automatic gearbox ignition inhibitor switch   | 314 Clock illumination                                |
| 17 Tail lamps - R.H.               | 37 Windscreen wiper motor                | 77 Windscreen washer motor                       |   |
| 18 Stop lamp switch (hydraulic)    | 38 Ignition/start switch                 | 83 Induction heater and thermostat (when fitted) |   |
| 18 Stop lamp switch (mechanical)   |  | 84 Suction chamber heater (when fitted)          |   |
| 19 Fuse box                        |  |  |   |
| 20 Interior lamp                   |  |  |   |
| 21 Interior lamp switch (door)     |  |  |   |

## CABLE COLOUR CODE

B	Black	N	Brown	U	Blue
G	Green	O	Orange	W	White
K	Pink	P	Purple	Y	Yellow
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3MCO3A

## ALTERNATOR - 16ACR

Overhaul 86.10.08

### Dismantling

1. Remove the alternator, see 86.10.02.
2. Remove the two set bolts to release the end cover from the alternator.
3. Detach the cable from the terminal blade on the outer of the three rectifier plates.
4. Detach the cable from the terminal blade between the middle and inner of the three rectifier plates.
5. Remove the four screws to release the tow brush assemblies from the brush holder.

6. Remove the screw to release the surge protection device cable from the brush holder.
7. Remove the three set bolts to release the brush holder and regulator assembly from the slip-ring end bracket. Note the leaf spring fitted at the side of the inner brush.
8. Remove the screw to release the regulator assembly from the brush holder.
9. Remove the set bolt securing the surge protection device to the slip-ring end bracket.
10. Remove the set bolt securing the rectifier earthing link to the slip-ring end bracket.

11. Using a pair of pliers as a thermal shunt to avoid over heating the diodes, unsolder each of the three stator cables in turn from the rectifier.
12. Slacken the nut to release the rectifier assembly from the slip-ring end bracket.
13. Mark the drive-end bracket, the stator lamination pack, and the slip-ring end bracket to assist reassembly.
14. Remove the three through-bolts and withdraw the slip-ring end bracket and the stator lamination pack.
15. Remove the 'O' ring from inside the slip-ring end bracket.
16. Remove the nut and withdraw the pulley and fan from the rotor shaft.
17. Remove the pulley key and withdraw the distance piece from the rotor shaft.
18. Press the rotor out of the drive-end bracket bearing.

19. Withdraw the distance piece from the drive end of the rotor.
20. Remove the circlip to release the bearing, bearing cover plates, 'O' ring, and felt washers from the drive-end bracket.

### Inspection

21. Check the bearings for wear and roughness; if necessary, repack the bearings with Shell Alvania RA grease. To renew the slip-ring end bearing, unsolder the two field connections from the slip-ring and withdraw the slip-ring and the bearing from the rotor shaft. Reassemble, ensuring that the shielded side of the bearing faces the slip-ring assembly. Use Fry's H.T.3 solder to remake the field connections to the slip-ring.
22. Clean the surfaces of the slip-ring, removing any evidence of burning with very fine glass paper.

## DATA

### Rotor windings:

Resistance at 20°C (68°F): 16ACR ..... 4.33 ohms ±5%

Current flow ..... 3 amperes

### Resistance or current flow test

equipment ..... Ohmmeter or ammeter in series with 12-volt d.c. supply

Insulation test equipment ..... 110-volt a.c. supply and 15-watt test lamp

### Stator winding:

Continuity test equipment ..... 12-volt d.c. supply and 36-watt test lamp

Insulation test equipment ..... 110-volt a.c. supply and 15-watt test lamp

Diode test equipment ..... 12-volt d.c. supply and 1.5-watt test lamp

23. Check the insulation of the field windings, connecting the test equipment (see DATA) between one of the slip-rings and one of the motor lobes.
24. Check the field windings against the specification given in DATA, connecting the test equipment (see DATA) between the slip-rings.
25. Check the stator windings for continuity, connecting the test equipment (see DATA) between any two of the stator cables, then repeating the test using the third cable in place of one of the first two.
26. Check the stator winding insulation, connecting the test equipment (see DATA) between any one of the three stator cables and the stator lamination pack.
27. Check the nine rectifying diodes, connecting the test equipment (see DATA) between each diode pin and its associated heatsink in the rectifier pack in turn, and then reverse the test equipment connections. Current should flow in one direction only. Renew the rectifier assembly if a diode is faulty.
28. Check the brush spring pressure and the brush length against the specification given in 'GENERAL SPECIFICATION DATA'.

#### Reassembling

29. Reverse the procedure in 2 to 20 noting:
  - a Support the inner track of the bearing when refitting the rotor to the drive-end bracket.
  - b Use 'M' grade 45-55 tin-lead solder to re-make the stator to rectifier pack connections, using a pair of pliers as a thermal shunt to avoid overheating of the diodes.

- c Tighten the alternator pulley nut to 34 Nm, 25 lbf ft, 3.47 kgf m.
30. Mount the alternator on the test bench and check its output against the specification given in 'GENERAL SPECIFICATION DATA'.
31. Refit the alternator, see 86.10.02.

## DISTRIBUTOR

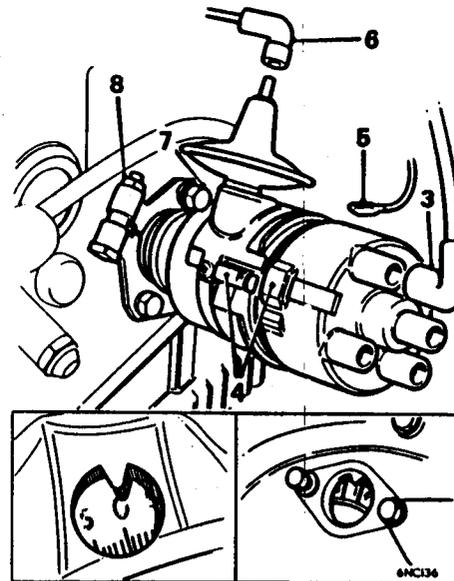
Remove and refit - Not Turbo 86.35.20

### Removing

1. 850 and 1000: Remove the distributor shield from the bonnet lock platform.
2. Clubman and 1275 GT: Release the three clips and remove the ignition shield.
3. Disconnect the high tension cables from the distributor cap.
4. Remove the distributor cap.
5. Disconnect the low tension cable at the lucar connector.
6. Disconnect the vacuum pipe from the vacuum timing control unit.
7. Slacken one of the screws securing the retaining plate to the cylinder block (clamp plate type); or remove the screw securing the retaining plate ('C' plate type).
8. Slacken the clamp bolt (clamp plate type), or remove the retaining plate ('C' plate type), and withdraw the distributor.

### Refitting

9. Offer up the distributor to the engine with the vacuum timing control unit in the position illustrated, and rotate the distributor shaft until the distributor driving dog engages the slots in the distributor gear. The slots in the driving gear and the lugs on the driving dog are offset and can only engage each other in one position.



10. Manual gearbox models: Remove the cover from the timing hole in the clutch/flywheel housing, remove the spark plugs, engage top gear and push the car forward to rotate the flywheel to the correct static setting see 'ENGINE TUNING DATA' as indicated by the pointer cast in the timing hole.
11. Automatic gearbox models: Remove the rubber grommets from the converter cover, turn the converter starter ring gear in the direction of engine rotation with a screw driver through the small aperture to the correct static setting, see 'ENGINE TUNING DATA' as indicated by the pointer 64cast in the timing hole.
12. Rotate the distributor body until the contact breaker points are just beginning to pen, and lightly tighten the clamp bolt (clamp plate type), or retaining screw ('C' plate type).

13. Reverse the procedure in 1 to 6, fitting the spark plug leads into their respective sockets in the distributor cap.
14. Start the engine and, using strobelight equipment in conjunction with the timing marks set the ignition timing to the specification given in 'ENGINE TUNING DATA'. Rotate the distributor body to obtain an approximate timing setting, then tighten the securing plate to the cylinder block bolt. Set the ignition timing accurately, using the micrometer adjusting nut.
15. Connect the vacuum advance pipe to the distributor.

## DISTRIBUTOR - LUCAS 65DM4

Remove and refit - Turbo only 86.35.20

### Removing

1. Disconnect the battery.
2. Release the clips and remove the ignition shield.
3. Note the fitted position of the H.T. leads and disconnect the leads from the spark plugs.
4. Remove the distributor cap.
5. Remove the cover from the timing hole in the clutch/flywheel housing or remove the rocker cover, see 12.29.42.
6. Turn the engine until No. 1 piston is at T.D.C. (firing). The rotor arm should now be pointing to No. 1 segment in the distributor cap.
 

*Note: If the rocker cover is removed both numbers 1 and 2 rocker arms will be on the 'rock' when piston is at T.D.C.*
7. Suitably mark the distributor body to cylinder block alignment for reference.
8. Disconnect the vacuum pipe from the vacuum unit and the multi-plug from the amplifier unit.

- Release the distributor clamp bolt and noting the position of the rotor arm and vacuum unit stub pipe, withdraw the distributor.

#### Refitting

- Check that the timing mark on the flywheel is still in the correct position.
- Apply a smear of clean oil to the 'O' ring on the distributor body.
- Insert the distributor into its location at the same time turning the rotor arm towards No. 1 segment.
- As the distributor is pushed fully home, ensure that the drive dog engages in the slot in the distributor shaft.
- Turn the distributor body until the reference marks made during removal are aligned.
- Check that the rotor arm is still in the correct position and tighten the distributor clamp bolt.
- Connect the amplifier unit multi-plug.
- Fit the distributor cap and leads, connect the battery.
- Check ignition timing, - see **ENGINE TUNING DATA**
- Connect the vacuum pipe to the vacuum unit.
- Fit the ignition shield.

### DISTRIBUTOR - LUCAS 45D4/59D4

Overhaul - Not Turbo 86.35.26

#### Dismantling

- Remove the distributor from the engine, see 86.35.20.
- Remove the distributor cap and rotor arm. Extract the felt pad from the cam.

- Remove the two vacuum unit retaining screws, tilt the unit to disengage the operating arm and remove the vacuum unit.
- Push the low tension lead and grommet into the inside of the body.
- Remove the base plate securing screws. Lever the slotted segment of the base plate from its retaining groove and lift out the base plate assembly.
- Drive out the parallel pin retaining the drive dog.
- Remove the drive dog and thrust washer.
- Remove the shaft complete with automatic advance mechanism, steel washer and spacer.
- Push the contact spring inwards and detach the low tension connector from the spring loop.
- Remove the screw to release the earth lead and condenser.
- Remove the securing screw and lift off the contact set.

#### DATA

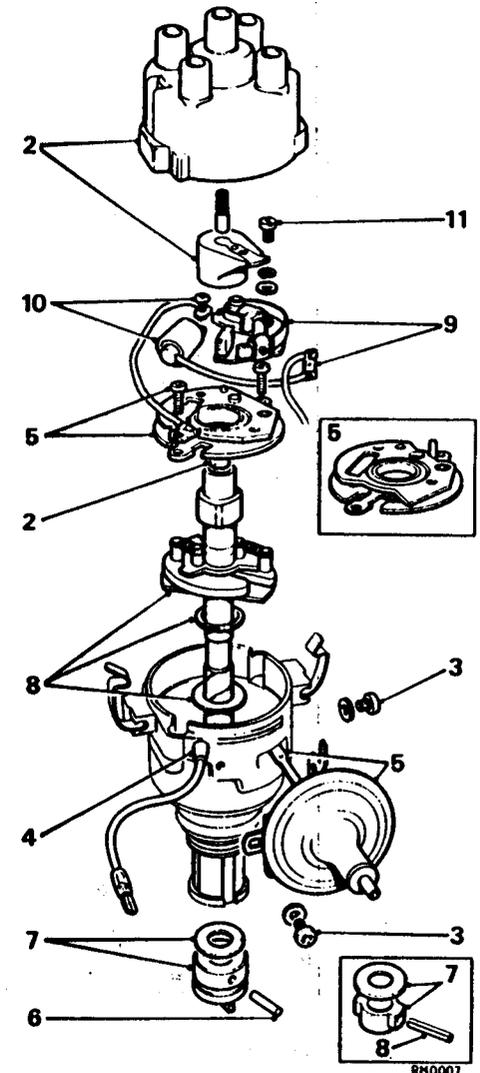
Contact breaker gap .....	0.014 to 0.016 in (0.35 to 0.40 mm)-0.019 (0.48 mm) for a new contact breaker set to allow for bedding-in of the contact breaker heel.
Contact breaker spring tension (measured at contacts) .....	18 to 24 ozf (510 to 680 gf)
Drill size for drive dog retaining pin hole .....	1/8 in (3.175 mm), 3/16 in (4.75 mm) depending on type of drive dog fitted.

#### Inspection

- Do not dismantle the advance mechanism beyond removing the control springs. If any of the moving parts or the cam are worn or damaged, renew the complete shaft assembly.
- Check the fit of the shaft in its bearing; if the bearing allows excessive side play, renew the complete distributor.
- Check the base plate assembly; if the spring between the plates is damaged or if the plates do not move freely, renew the assembly.
- Check the distributor cap for signs of tracking or cracks and check that the pick-up brush moves freely in its holder.
- Check the rotor arm for damage, electrode security, and burning or tracking.

#### Reassembling

- Reverse the procedure in 1 to 11, noting:
  - Lubricate the contact pivot post with Retinax 'A' or equivalent grease.
  - Ensure that the spacer and steel washer are fitted on the shaft and lubricate the shaft with Rocol MP (Molypad).



- c Fit the thrust washer with its raised pips towards the drive dog.
- d Fit the drive dog so that the driving tongues are parallel with the rotor arm electrode and to the left of its centre line when the rotor arm points upwards as shown.  
*Note: If a new shaft is fitted it must be drilled (see DATA) through the hole in the drive dog. During drilling, push the shaft from the cam end, pressing the drive dog and washer against the body shank.*
- e Secure the pin in the drive dog by ring-punching the holes. If the shaft is new, tap the drive end to flatten the washer pips and ensure the correct end-float.
- f Position the base plate assembly so that the two downward pointing prongs will straddle the screw hole below the cap clip. Press the base plate into the body until it engages the undercut.
- g Set the contact points gap, see 'MAINTENANCE'.

18. Refit the distributor, see 86.35.20.

## DISTRIBUTOR - LUCAS 65DM4

Overhaul - Turbo only 86.35.26

Service tool: 18G 1004

### Dismantling

1. Remove the distributor, see 86.35.20.
2. Pull the rotor arm off the shaft.
3. Scribe suitable alignment marks between the upper housing and the distributor body.

4. Remove the screws and lift the upper housing from the distributor body, recover the thrust washer.
5. Remove the screw securing the vacuum unit to the upper housing.
6. Release the actuating arm from the stator; withdraw the vacuum unit.
7. Remove the stator from the upper housing; recover the thrust washer.
8. Using 18G 1004, remove the circlip retaining the pick-up coil.  
**WARNING: The amplifier unit contains beryllia and must not be opened.**
9. Remove the screws securing the amplifier unit; withdraw the amplifier.
10. Withdraw the connector and gasket.
11. Remove the pick-up coil and clamp ring.  
**CAUTION: Do not attempt to remove the reluctor or centrifugal advance assembly from the shaft.**
12. Using a suitable punch, drive out the pin securing the drive dog.
13. Remove the drive dog and tag washer.
14. Withdraw the shaft from the distributor body, recover the internal thrust washer.
15. Remove and discard the 'O' ring.

### Inspection

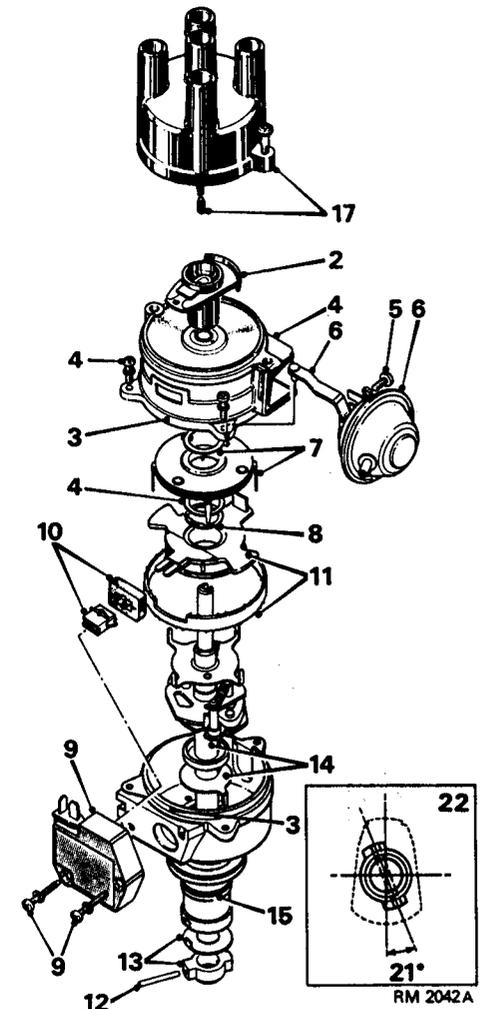
16. Renew any component showing signs of wear, damage or tracking.
17. Check the distributor cap for signs of damage or tracking and the central electrode for wear and freedom of movement.
18. Check the shaft and drive dog for wear and burring.  
**CAUTION: If shaft is to be renewed, a shaft complete with reluctor and centrifugal advance must be fitted..**

19. Check the bushes in the distributor body for wear and scoring and the thrust washers for wear or damage.

### Reassembling

Service tool: 18G 1004

20. Lubricate the bushes, shaft bearing surface and centrifugal advance unit with Shell Turbo T100 oil or equivalent.
21. Locate the tags of the thrust washers in the distributor body, fit the shaft.
22. Fit the drive dog and retain it with the pin.  
*Note: If a new shaft has been fitted, fit the rotor arm and use the original shaft as a reference point to drill a 0.125 in (3.20 mm) diameter hole for the drive dog pin at 21° to the rotor arm.*
23. Fit the clamp ring and pick-up coil, use 18G 1004 to fit the circlip.
24. Fit the connector and gasket to the pick-up coil.
25. Smear the mating face of the amplifier unit with heat conducting silicone grease; fit the amplifier unit.
26. Fit the vacuum unit to the upper housing and secure it with the screw.
27. Fit the thrust washer and stator pack to the upper housing ensuring that the peg on the vacuum unit actuating arm engages with one of the holes in the stator.
28. Fit the thrust washer to the shaft.
29. Fit the upper housing together with stator pack to the distributor body.



30. Tighten the securing screws evenly, rotating the shaft whilst they are being tightened.
31. Fit the rotor arm.
32. Smear a new 'O' ring with clean engine oil and fit it to the distributor body.
33. Fit the distributor, see 86.35.20.

## DISTRIBUTOR - Ducellier

Overhaul 86.35.26

Service tool: 18G 1308

**CAUTION:** Contact breaker, dwell angle and vacuum advance adjustment must be carried out with the aid of electronic test equipment.

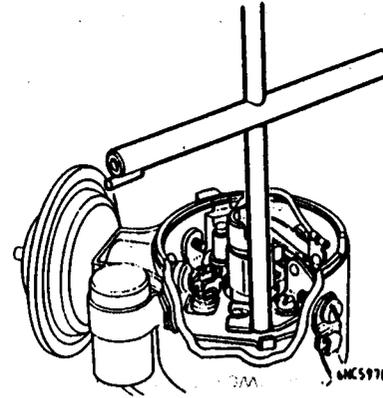
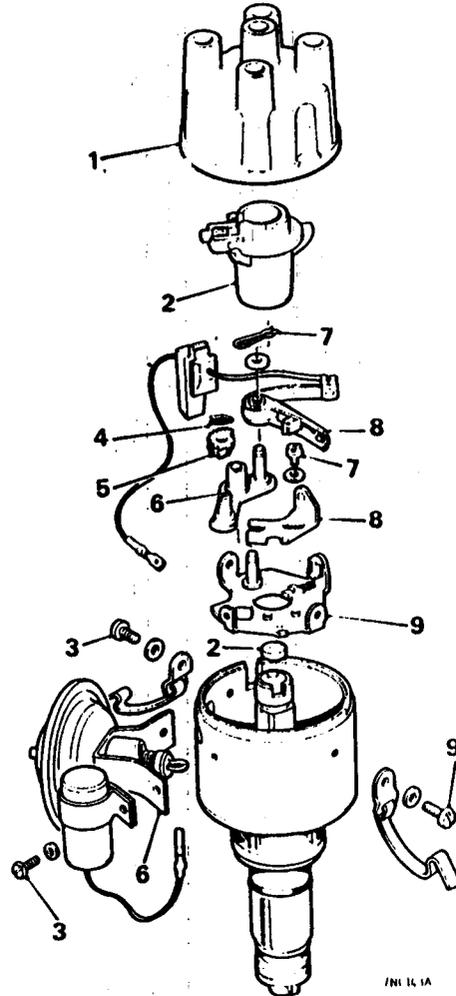
### Dismantling

1. Release the retaining clips and remove the distributor cover.
2. Remove the rotor arm and extract the felt pad from the cam.
3. Remove the two screws retaining the condenser and vacuum unit.
4. Release the clip from the eccentric 'D' post.
5. Mark the position of the serrated cam in relation to the spring seat of the vacuum operated link.
6. Disengage the vacuum operating link and serrated cam from the eccentric 'D' post and remove the vacuum unit.
7. Release the retaining clip and remove the locking screw securing the contact breaker.
8. Remove the contact breaker set.
9. Remove the remaining base plate securing screw, lift out the base plate taking care to retain the nylon pressure pad and spring.

### Inspection

**Note:** The distributor drive dog is loosely retained on the distributor drive shaft, the 'float' allowing for misalignment.

10. Examine the advance mechanism of the cam, check the shaft for excessive side play. If any of these parts are damaged or worn, renew the complete distributor.
11. Examine all other components for damage or excessive wear, and renew where necessary.



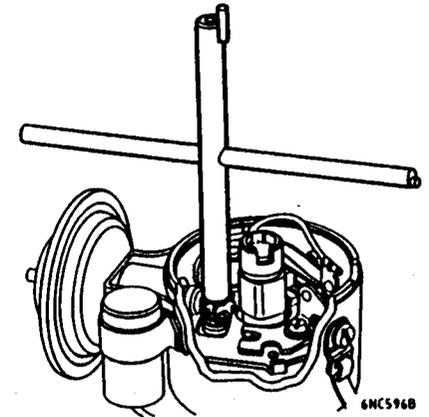
12. Check the distributor cover for signs of tracking or cracks and check that the pick-up brush moves freely in its holder.
13. Check the rotor arm for damage, electrode security, and burning or tracking.

### Reassembling

14. Using Retinax 'A' or equivalent grease:
  - a Lubricate the centrifugal weight pivot posts.
  - b Lightly smear the cam, pressure pad and contact pivot post.
15. Reverse the procedure in 1 to 9.
16. Set the contact breaker points gap to 0.015 in (0.4 mm).
17. The dwell angle must be checked at idle speed with the vacuum pipe disconnected, see DATA. If adjustment is necessary, slacken the contact locking screw and use service tool 18G 1308.
18. To check the dwell variation increase the engine speed to 2,000 rev/min and note the dwell angle with the vacuum pipe disconnected. The variation should remain within the tolerance given, see DATA. Variation outside this toler-

ance indicates a mechanical fault in the distributor. Connect the vacuum pipe, increase the engine speed again to 2,000 rev/min and release the throttle, check the dwell variation, see DATA, which can be adjusted by rotation of the eccentric post using service tool 18G 1308. Setting the dwell for minimum variation may alter the basic dwell setting and this must be re-checked at idle speed.

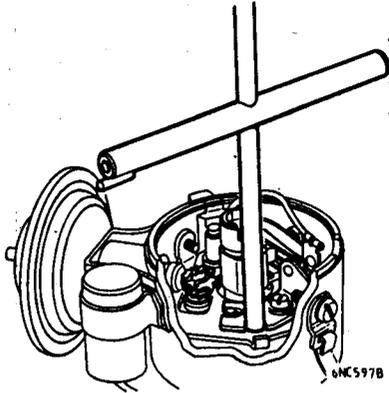
19. If the vacuum unit has been renewed or the distributor dismantled, the vacuum advance must be checked.



Run the engine at idle speed with a vacuum pump connected to the unit. Using a timing light, slowly increase the vacuum and note the point at which vacuum advance starts. Compare this figure with that given in DATA. Adjustment of the serrated cam, one tooth at a time, using service tool 18G 1308, will alter the point at which vacuum advance starts.

## DATA

Rotation .....	Anti-clockwise at rotor end
Contact points gap (datum figure only) .....	0.015 in (0.4 mm)
Dwell angle .....	57° ± 2° 30'
Vacuum advance starts .....	6 in (152 mm) Hg
Vacuum advance max .....	16° at 14 in (356 mm) Hg
No centrifugal advance below .....	800 rev/min



### HEADLAMP ASSEMBLY

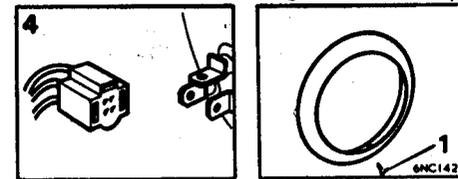
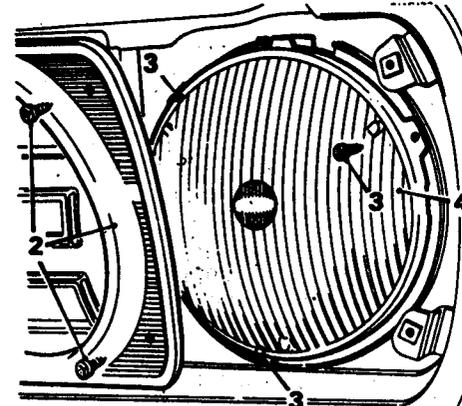
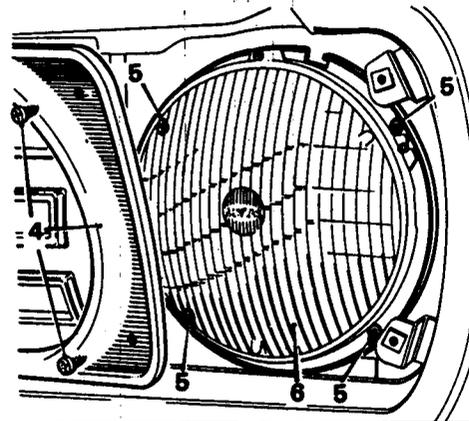
Remove and refit **86.40.02**

#### Removing

1. Raise the bonnet
2. Disconnect the headlamp wiring at the snap connectors and pull the wiring through the wing valance.
3. 850 and 1000: Remove the screw retaining the head lamp rim.
4. Clubman and 1275 GT: Remove the four screws and detach the headlamp grille surround.
5. Drill out the four pop rivets securing the headlamp assembly to the body.
6. Withdraw the assembly from the body.

#### Refitting

7. Reverse the procedure in 1 to 6 using new pop rivets or small nuts and bolts.



### SEALED BEAM UNIT

Remove and Refit **86.40.09**

#### Removing

1. 850 and 1000: Remove the screw and remove the headlamp rim.
2. Clubman and 1275 GT: Remove the screws retaining the headlamp finisher and remove the finisher.
3. Remove the sealed beam retainer securing screws and remove the retainer.
4. Withdraw the sealed beam unit and disconnect the multi connector plug.

#### Refitting

5. Reverse the procedure in 1 to 4.

### HEADLAMP PILOT BULB

Remove and refit **86.40.11**

#### Removing

1. Remove the screw retaining the headlamp rim and remove the rim.
2. Remove the screws securing the headlamp retainer and remove the retainer.
3. Release the pilot lamp bulb holder.
4. Withdraw the bulb.

#### Refitting

5. Reverse the procedure in 1 to 4

### FRONT SIDE AND FLASHER LAMP ASSEMBLY

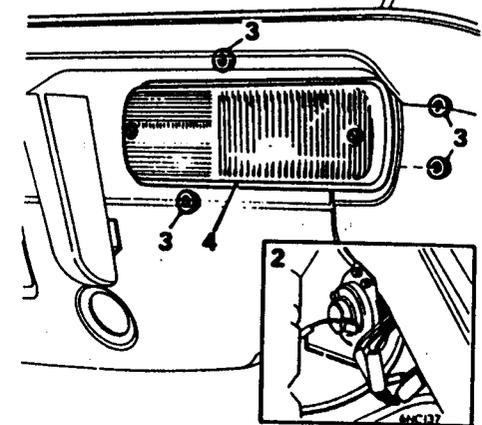
Remove and refit - Clubman and 1275 GT **86.40.26**

#### Removing

1. Raise the bonnet.
2. Disconnect the lamp wiring at the snap connectors.
3. Remove the retaining nuts from under the wing.
4. Remove the lamp and gasket from the body apertures.

#### Refitting

5. Reverse the procedure in 1 to 4.



## HEADLAMP BULB

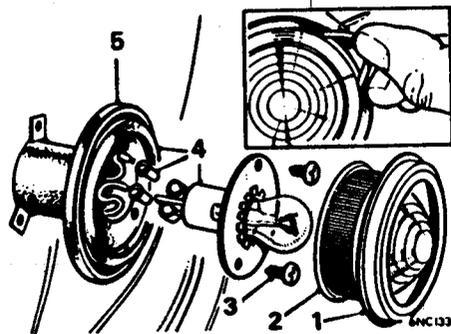
Remove and refit - Turbo only 86.40.27

### Removing

1. Remove the screw retaining the headlamp rim and remove the rim.
2. Remove the screws securing the headlamp retainer and remove the retainer.
3. Disconnect the multi-plug from the headlamp bulb.
4. Carefully pull back the rubber cover from the headlamp bulb.
5. Remove the pilot lamp bulb holder.
6. Withdraw the headlamp unit.
7. Release the spring clip retaining headlamp bulb; withdraw the bulb.

### Refitting

8. Reverse the procedure given in 1 to 7. Ensure that the replacement bulb is of the correct wattage.



## FRONT FLASHER LAMP

Remove and refit - 1000  
(UK models)

86.40.40

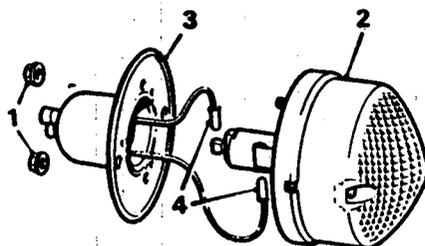
### Removing

1. Fold back the body rubber flange and remove the chrome ring.

2. Remove the lamp lens from the body rubber
3. Remove the screws retaining the lamp to the body and pull the lamp from the body.
4. Slide the body rubber down the lamp wiring and disconnect the wiring from the lamp.
5. Remove the body rubber from the lamp wiring.

### Refitting

6. Reverse the procedure in 1 to 5.



## FRONT FLASHER LAMP

Remove and refit - 1000  
(export models)

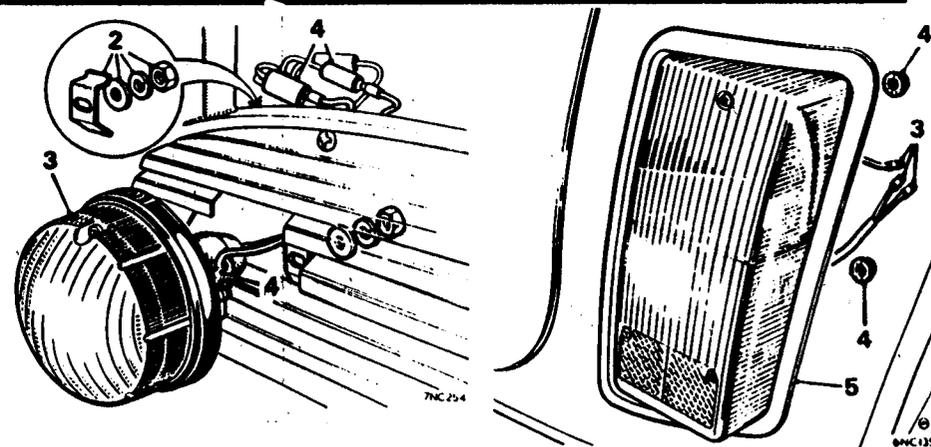
86.40.40

### Removing

1. Remove the retaining nuts from inside the wing.
2. Pull the lamp assembly forward out of the body aperture.
3. Slide the rubber seal up the lamp wiring.
4. Disconnect the lamp wiring and remove the lamp assembly.

### Refitting

5. Reverse the procedure in 1 to 4.



## FRONT FLASHER LAMP

Remove and refit - (1000 Canada -  
1978 on) 86.40.40

Service tool: 2 B.A. short box spanner

### Removing

#### Left-hand lamp

1. Raise the bonnet.
2. Unscrew the two nuts retaining the flasher lamp to the front grille.
3. Withdraw the lamp out of the grille.
4. Disconnect the lamp wiring from the harness connectors behind the bonnet locking platform.

#### Right-hand lamp

5. Remove the heater blower assembly, see 80.20.12.
6. Detach the heater air intake trunking from behind the grille.
7. Repeat the procedure in 1 to 4.

### Refitting

8. Reverse the removing procedure as applicable; ensure that the wiring is clipped behind the bonnet locking platform.

## STOP TAIL AND FLASHER LAMP

Remove and refit - Saloon 86.40.70

### Removing

1. Open the luggage compartment lid. **Turbo only:** Remove the bottom and appropriate side boot boards
2. **Left-hand lamp:** Slacken the fuel tank strap securing bolt, remove the fuel filler cap and pull the fuel tank into the centre of the luggage compartment.
3. Disconnect the lamp wiring at the snap connectors
4. Remove the retaining nuts and washers.
5. Remove the lamp and gasket from the vehicle.

### Refitting

6. Reverse the procedure in 1 to 5.

## TAIL, STOP AND FLASHER LAMP

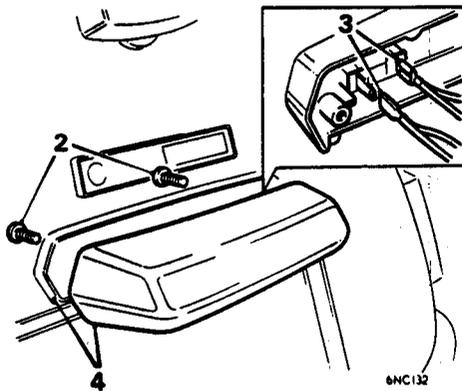
Remove and refit - Estate,  
Van and Pick-up 86.40.70

### Removing

1. Open the tail doors.
2. **Estate:** Remove the bottom three screws from the rear pillar liner and pull back the liner to give access to the lamp.
3. Disconnect the lamp wiring at the snap connectors.
4. Remove the retaining nuts and washers from the lamp.
5. Remove the lamp and gasket from the body.

### Refitting

6. Reverse the procedure in 1 to 5.



## NUMBER PLATE LAMP

Remove and refit - Saloon 86.40.86

### Removing

1. Open the luggage compartment lid.
2. Remove the three screws securing the lamp assembly to the luggage compartment lid.

3. Disconnect the lamp wiring from the terminals in the lamp.
4. Remove the lamp assembly and sealing rubber.

### Refitting

5. Reverse the procedure in 1 to 5.

## NUMBER PLATE LAMP

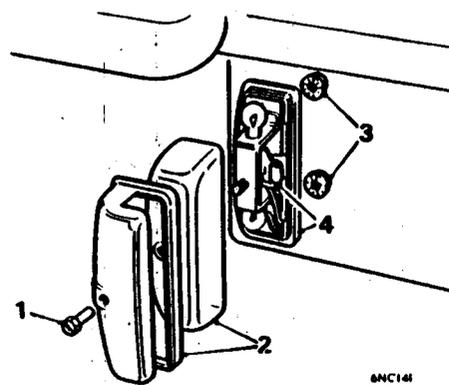
Remove and refit - Estate,  
Van and Pick-up 86.40.86

### Removing

1. Remove the sleeve nut securing the dome cover and lamp lens.
2. Remove the domed cover and lamp lens.
3. Remove the nuts retaining the lamp to the number plate.
4. Disconnect the lamp wiring and remove the lamp.

### Refitting

5. Reverse the procedure in 1 to 4.



## FOG/DRIVING LAMP BULB

Remove and refit - Turbo only 86.40.94

### Removing

1. Remove the lens retaining screw, release the lens.
2. Disconnect the cable from the bulb connector.
3. Release the bulb retainer and remove the bulb.

### Refitting

4. Reverse the procedure given in 1 to 3.

## FOG/DRIVING LAMP

Remove and refit - Turbo only 86.40.96

### Removing

1. Raise the front of the vehicle and support it on stands.
2. Remove the lens retaining screw, release the lens.
3. Disconnect the bulb and earth leads.
4. Remove the nut securing the driving lamp to the body.
5. Withdraw the lamp slightly and remove the wiring harness grommet from the lamp body, feed the leads out of the body.

### Refitting

6. Reverse the procedure given in 1 to 5.

## REAR FOG GUARD LAMP - RIGHTHAND

Remove and refit - Turbo only 86.40.99

### Removing

1. Raise the rear of the vehicle and support it on stands.
2. Open the boot lid and remove the bottom boot board.
3. Remove the right hand boot board.

4. Disconnect the fog guard lamp wiring harness at the snap connectors.
5. Attach a draw string to the lamp harness.
6. Remove the nuts securing the fog guard lamp to the body; prise the harness grommet out of the body.
7. Withdraw the lamp, at the same time, carefully pulling the harness through the body aperture.
8. Remove the draw string from the harness.

### Refitting

9. Reverse the procedure given in 1 to 8.

## REAR FOG GUARD LAMP - LEFT HAND

Remove and refit - Turbo only 86.41.15

### Removing

1. Raise the rear of the vehicle and support it on stands.
2. Open the boot lid and remove the bottom boot board.
3. Remove the spare wheel.
4. Remove the battery from the car.
5. Carefully release the carpet from the fuel tank.
6. Remove the fuel tank cover
7. Remove the fuel filler cap.
8. Remove the bolt securing the fuel tank retaining strap, release the strap and move the tank aside.

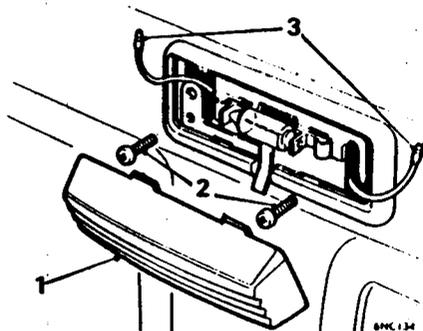
9. **WARNING:** Ensure that the fuel tank is supported in the upright position. Take all due precautions regarding sparks and naked lights.

10. Disconnect the fog guard lamp wiring harness at the snap connectors.
11. Attach a draw string to the lamp

- harness.
- Remove the nuts securing the fog guard lamp to the body; prise the harness grommet out of the body.
  - Withdraw the lamp, at the same time, carefully pulling the harness through the body aperture.
  - Remove the draw string from the harness.

#### Refitting

- Reverse the procedure given in 1 to 13



## ROOF LAMP

Remove and refit 86.45.02

#### Removing

- Press lightly together the sides of the lens to release it from the lamp body.
- Remove the two screws to release the lamp body from the roof.
- Disconnect the two wires from the lamp body.

#### Refitting

- Reverse the procedure in 1 to 3.

## PANEL/WARNING LAMP BULB

Remove and refit - Turbo only

Panel lamp bulb 86.45.31

Warning lamp bulb 86.45.61

#### Removing

- Remove the fascia panel, see 76.46.23.
- Remove the bulb holder from the instrument/lamp lens.
- Remove the bulb from the holder.

#### Refitting

- Reverse the procedure in 1 to 3, ensure that the replacement bulb is of the correct wattage.

## RADIO SPEAKER - REAR

Remove and refit - Turbo only 86.50.13

#### Removing

- Ensure that the radio/ignition is turned OFF.
- Carefully prise the grille from the parcel shelf.
- Remove the screws securing the speaker to the parcel shelf.
- Raise the speaker, note the fitted position of the leads.
- Disconnect the leads; withdraw the speaker.

#### Refitting

- Reverse the procedure given in 2 to 5.
- Turn on the radio and check that the speaker is operating.

## RADIO SPEAKER - FRONT

Remove and refit - Turbo only 86.50.15

#### Removing

- Ensure that the radio/ignition is switched OFF.
- Remove the screws securing the speaker.
- Withdraw the speaker, note the fitted position of the leads.
- Disconnect the leads; remove the speaker.

#### Refitting

- Reverse the procedure given in 2 to 4.
- Turn on the radio and check that the speaker is operating.

## RELAYS

Remove and refit - Turbo only

Fuel pump 86.55.48

Fog/Auxiliary driving lamps 86.55.51

#### Removing

- Remove the fascia panel, see 76.46.23
- Disconnect the multi-plug from the appropriate relay.

*Note: Relays can be identified by the colours of the wires attached to the multi-plugs.*

*Fuel pump relay wires: White/green; green; white/brown.*

*Fog/Auxiliary driving lamp relay wires: Black; purple; blue/yellow; blue/yellow.*

- Remove the bolt securing the relay to the scuttle; withdraw the relay.

#### Refitting

- Reverse the procedure given in 1 to 3.

## STARTER MOTOR - TYPE M35J

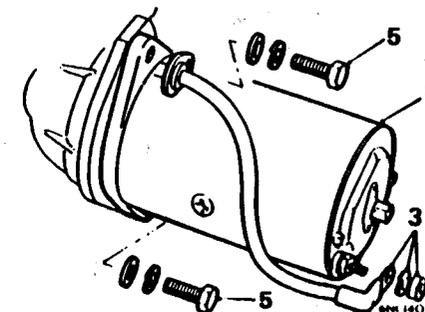
Remove and refit 86.60.01

#### Removing

- Disconnect the battery.
- Raise the bonnet, release the clips and remove the ignition shield (if fitted).
- Remove the terminal retaining nut and washer and detach the cable.
- Remove the nut securing the coil mounting bracket to the cylinder head and place the coil to one side.
- Remove the two bolts (lower one first) retaining the starter motor to the engine.
- Remove the starter motor from the engine.

#### Refitting

- Reverse the procedure in 1 to 6.



## STARTER MOTOR Lucas Type M35J (Inertia drive)

Overhaul 86.60.13

### Dismantling

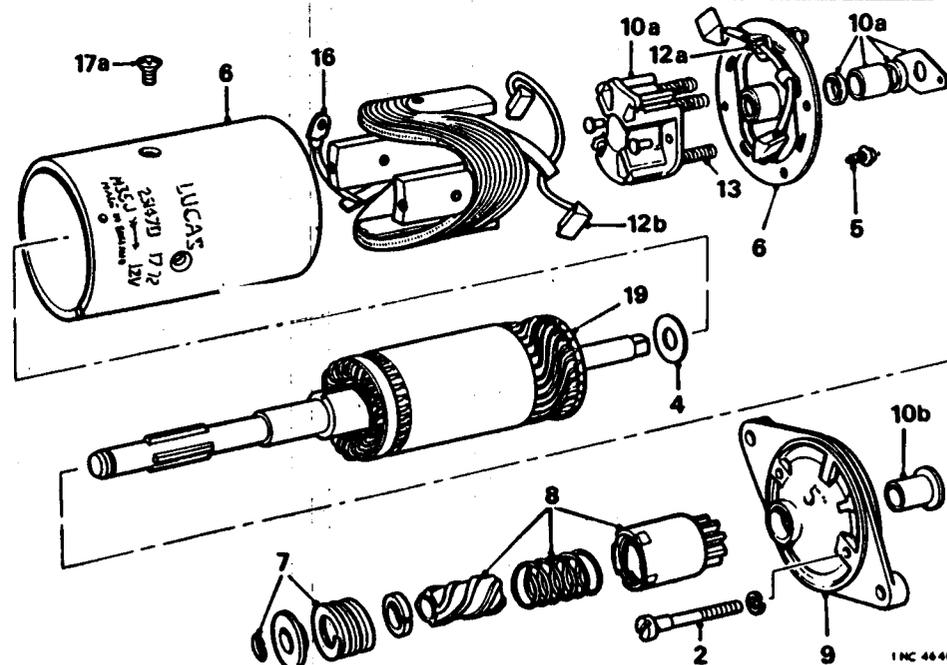
1. Remove the starter motor, see 86.60.01.
2. Remove the two screws to release the drive-end bracket.
3. Withdraw the drive-end bracket complete with the armature and drive.
4. Remove the thrust washer from the commutator end of the armature.
5. Remove the four screws retaining the commutator end bracket.
6. Detach the bracket from the yoke, disengage the field brushes from the brush holder and remove the bracket.
7. Compress the spring of the inertia drive and remove the retaining ring from the armature shaft.
8. Withdraw the drive assembly from the armature shaft.
9. Withdraw the drive-end bracket from the armature shaft.

### Inspection

10. Check for excessive side-play of the armature shaft in the bushes, renewing the bushes if necessary, noting:
  - a To remove the commutator end bracket bush unrevet the end plate and detach the plate, felt seal and brush box moulding. Screw a 1/2 in tap part-way into the bush and withdraw the bush from the bracket.
  - b Support the drive-end bracket and press out the bush.
  - c Prior to fitting, new bushes must either be immersed in new engine oil for a period of 24 hours, or immersed in new engine oil maintained at a

temperature of 100° C (212° F) for two hours, allowing the oil to cool before removing the bush.

- d Press new bushes into position, using a polished shouldered mandrel the same diameter as the bearing surface of the armature shaft. Do not ream the bushes after fitting.
11. Examine the drive components for wear and damage. Renew as necessary.
12. Check that the brushes move freely in the brush box moulding. Renew brushes that are worn to the dimension given in DATA, noting:
  - a Cut the end bracket brush flexibles from the terminal post. Make a groove in the head of the post sufficiently deep to accommodate the new brush flexibles. Solder the long and short brush flexibles into the terminal groove.
  - b Cut the field winding brush flexibles about 1/4 in (6.4 mm) from the joint of the field winding. Solder the new brush flexibles to the ends of the old brush flexibles. Ensure that the joint is adequately insulated.
13. Using a new brush, check the pressure of each brush spring in turn against the specification given in DATA, renewing the springs if necessary, noting:
  - a Extract the old springs using long-nosed pliers.
  - b Fully compress the new springs between first finger and thumb.
  - c Insert the spring horizontally in the brushbox moulding and finally locate in position.

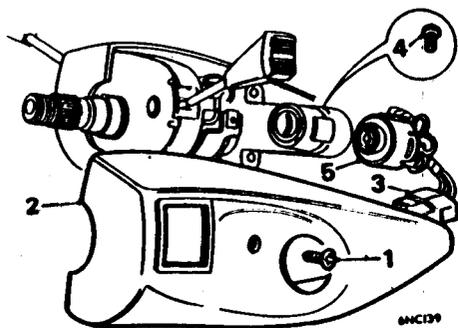


14. Check the insulation of the brush springs and terminal post by connecting the test equipment (see DATA) between each spring in turn and the commutator end bracket and then between the bracket and the terminal post.
15. Check the field winding continuity, connecting the test equipment (see DATA) between each field brush in turn and the yoke.
16. Remove the rivet securing the field winding connection to the yoke. Ensure that the connection is clear of the yoke and check the field winding insulation, connecting the test equipment (see DATA) between each brush in turn and the yoke.
17. If the field windings are still suspect, prove them by substitution:
  - a Slacken the four pole-shoe retaining screws. Remove the screws from one pair of diametrically opposite pole-shoes and remove the pole-shoes from the yoke. Slide the windings from beneath the remaining pole-shoes and withdraw them from the yoke.
  - b Loosely fit the new windings and the pole-shoes and position the insulation piece between the yoke and brush connection to the windings. Tighten the pole-shoe screws evenly.
  - c Rivet the field winding connection to the yoke.

18. Check the armature shaft. If the shaft is bent or distorted, the armature must be renewed.
19. Examine the commutator brush surface for burrs, pitting and wear. If necessary, skim the commutator in a lathe, ensuring that the finished thickness of the commutator copper is not less than the dimension given in DATA. After skimming, polish the commutator brush surface with a flat surface of very fine glass-paper. Do not undercut the insulation slots.
20. Check the armature insulation, connecting the test equipment (see DATA) between one of the commutator segments and the armature shaft.
21. Check the armature for short-circuited windings, using specialized armature testing (Growler) equipment. In the absence of this equipment a suspect armature should be checked by substitution.

#### Reassembling

22. Reverse the procedure in 2 to 9.
23. Mount the starter motor on a test bench and check its performance against the specification in DATA.
24. Refit the starter motor, see 86.60.01.



## IGNITION AND STARTER SWITCH

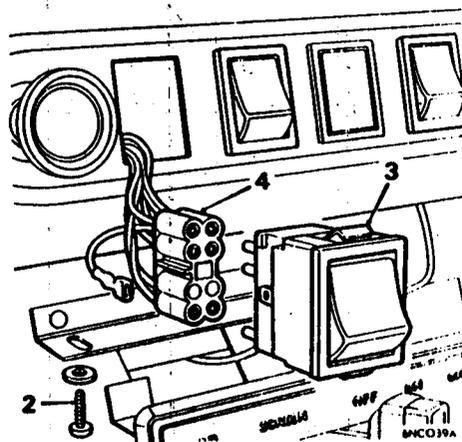
Remove and refit 86.65.03

#### Removing

1. Remove the two screws retaining the right-hand cowl to the steering column.
2. Remove the right-hand cowl.
3. Disconnect the wiring multi-connector plug.
4. Remove the ignition and starter switch retaining screw.
5. Withdraw the switch from the steering lock.

#### Refitting

6. Reverse the procedure in 1 to 5.



## PANEL SWITCH

Remove and refit - Not Turbo 86.65.06

#### Removing

1. Slacken the nut at the rear of the heater.
2. Remove the two heater retaining screws and lower the heater from the fascia.
3. Push the switch out of the switch panel.

4. Disconnect the multi-connector plug.

#### Refitting

5. Reverse the procedure in 1 to 4.

## PANEL SWITCH - HAZARD WARNING, HEATED REAR SCREEN AND BRAKE FAILURE WARNING

Remove and refit - Turbo only 86.65.12

#### Removing

1. Disconnect the battery.
2. Remove the centre console, see 76.25.01
3. Remove the screws securing the switch and clock panel to the heater unit.

## DATA

#### Armature:

Commutator copper minimum thickness .....	0.08 in (2.03 mm)
Insulation test equipment .....	110-volt a.c. supply and 15-watt test lamp

Minimum brush length .....	3/8 in (10 mm)
Brush spring pressure .....	28 ozf (0.8 kgf) when a brush protrudes 1/16 in (1.5 mm) from the brush box moulding

Brush spring and terminal post insulation test equipment .....	110-volt a.c. supply and 15-watt test lamp
--	--

#### Field windings:

Continuity test equipment .....	12-volt d.c. supply and 12-watt test lamp
Insulating test equipment .....	110-watt a.c. supply and 15-watt test lamp

Starter motor performance (obtained with a 12-volt 43 Ah (20-hour rate) battery in a 70 per cent charged condition at 20° C (68° F)):

Lock torque .....	9 Nm, 7 lbf ft, 0.97 kgf m with 350 to 375 amp
Torque at 1,000 rev/min .....	4.4 lbf ft (0.64 kgf m) with 260 to 275 amp
Light running current .....	65 amp at 8,000 to 10,000 rev/min

## PANEL SWITCH - FOG/AUXILIARY DRIVING LAMP AND REAR FOG GUARD LAMP

Remove and refit - Turbo only

Fog/Auxiliary driving lamp 86.65.35

Rear fog guard lamp 86.65.65

### Removing

1. Disconnect the battery.
2. Remove the screws securing the switch and clock panel to the heater unit.
3. Remove the air distribution knob, release the panel from the bracket.
4. Disconnect the multi-plug and Lucar connectors from the switch.
5. Depress the retaining clips; withdraw the switch.
4. Remove the air distribution knob, release the panel from the bracket.
5. Disconnect the Lucar connectors from the heater fan switch and move the panel aside.
6. Disconnect the demister tubes from the heater.
7. Slacken the nut securing the rear of the heater.
8. Remove the two screws securing the heater to the rail; lower the heater.
9. Depress the retaining clips; withdraw the switch.
10. Disconnect the multi-plug and Lucar connectors from the switch.

### Refitting

11. Reverse the procedure given in 1 to 10.
12. Test the appropriate unit for correct operation.

## BRAKE STOP LAMP SWITCH (Hydraulic Type)

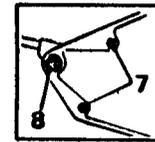
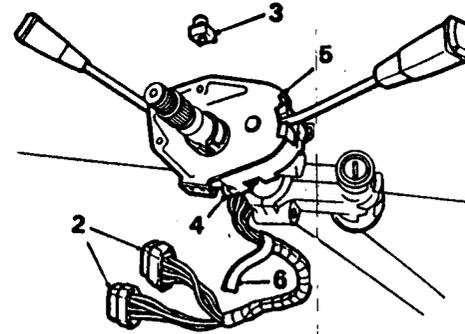
Remove and refit 86.65.51

### Removing

1. Open the bonnet.
2. Slide the rubber boot up the switch wiring.
3. Disconnect the wiring from the switch terminals.
4. Unscrew the switch from the bolt connector. Plug the hole in the connector to prevent leakage of brake fluid.

### Refitting

5. Reverse the procedure in 1 to 4.
6. Bleed the braking system, see 70.25.02



## DIRECTION INDICATOR/MAIN BEAM/HORN CONTROL SWITCH

Remove and refit 86.65.55

### Removing

1. Remove the steering wheel, see 57.60.01.
2. Disconnect the column switches multi-connector plugs.
3. Remove the direction indicator cancelling ring drive block.
4. Slacken the switch clamp screw.
5. Withdraw the switch from the column.
6. Remove the insulating tape to separate the electrical wiring harnesses of the two switches.
7. Drill out the two rivets securing the wiper/washer switch to the mounting plate.
8. Remove the screw and detach the wiper/washer switch from the direction indicator switch mounting plate.

### Refitting

9. Reverse the procedure in 1 to 8, as applicable, noting:
  - a Ensure that the striker dog on the nylon switch centre is in line with and adjacent to the direction indicator switch stalk.

## FUSE BOX

Remove and refit 86.70.01

### Removing

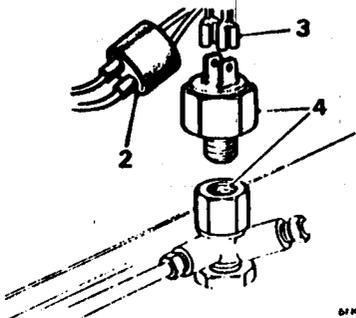
1. Disconnect the battery.
2. Pull off the fuse box cover and remove the spare fuses from the holders in the cover.
3. Remove the fuses from the fuse holders, noting the rating and location of the fuses.
  - Fuse 1-2 17/35A
  - Fuses 3-4 and 5-6 12/25A
  - Fuse 7-8 8/15A
4. Note the illustration showing the location and colour codes of the wiring connectors and disconnect the connectors from the fuse box terminals

### Cable colour code

G	Green	R	Red
N	Brown	W	White
O	Orange	LG	Light Green
P	Purple		

When a cable has two colour code letters the first denotes the main colour and the second denotes the tracer colour.

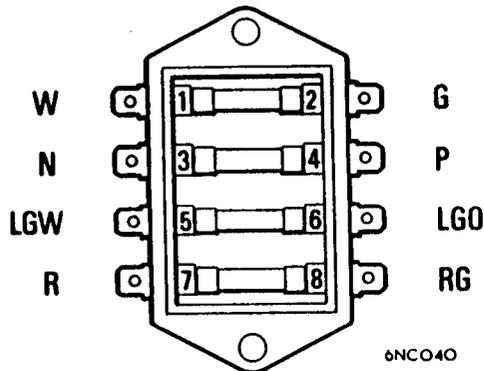
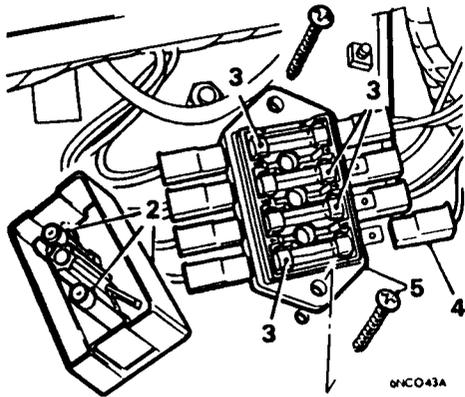
2. Remove the two retaining screws and remove the fusebox from the bulkhead.



86.70.01

### Refitting

- Reverse the procedure in 1 to 5, following the illustration to connect the wiring connectors to the terminals on the fuse box.



### FRONT HARNESS

#### Remove and refit - Clubman and 1275 GT

86.70.08

#### Removing

- Disconnect the battery.
- Open the bonnet and remove the ignition shield.
- Release the harness from the retaining clips on the front valance.
- Disconnect the wiring to the horn and front lamps.
- Disconnect the wiring multi-connector plug from the alternator.
- Disconnect the wiring to the oil pressure warning switch, coil, distributor, and temperature gauge transmitter.
- Release the harness from the clips on the wing valance.
- Disconnect the wiring to the solenoid.
- Disconnect the wiring to the brake stop lamp switch.
- Remove the screw to release the earth wires from the cross-member bracing plate.
- Disconnect the wiring from the fuse box.
- Remove the bulkhead insulation (when fitted).
- Release the harness from the 'P' clip and body clips on the bulkhead.
- Remove the air cleaner assembly, see 'MAINTENANCE'.
- Disconnect the wiring multi-connector plug from the windscreen wiper motor.
- Disconnect the wiring from the windscreen washer motor.
- Disconnect the wiring at the snap connectors to separate the front harness from the rear harness.
- Disconnect the multi-connector plug from the hazard flasher unit.

- Release the flasher unit from the securing clip on the instrument pack mounting bracket and disconnect the wiring.
- Slacken the heater rear retaining nut, remove the two retaining screws and lower the heater.
- Disconnect the heater switch feed wire.
- Disconnect the wiring multi-connector plug from the instrument pack.
- 1275 GT: Disconnect the tachometer wires.
- Disconnect the radio when fitted.
- Disconnect the wiring multi-connector plugs connecting the column switches to the front harness.
- Push the switches out of the switch panel and disconnect the multi-connector plugs.
- Fold back the left-hand dash liner at the instrument pack.
- Fold back the bulkhead insulation.
- Feed the harness up through the parcel shelf and out through the bulkhead.
- Feed the harness through the cross-member bracing plate and remove the harness from the vehicle.

#### Refitting

- Reverse the procedure in 1 to 30, as necessary.
- Check the operation of all electrical units.

### FRONT HARNESS

#### Remove and refit - 850, 1000 Van and Pick-up

86.70.08

#### Removing

- Disconnect the battery.
- Remove the horn from the bonnet lock platform.

- Release the harness from the clips on the bonnet lock platform.
- Remove the front flasher lamps, see 86.40.26.
- Pull the flasher lamp wiring through the inner wing.
- Disconnect the front headlamp wiring from the front harness at the snap connectors.
- Disconnect the wiring from the ignition coil and distributor.
- 1000: Disconnect the wire from the coolant temperature gauge transmitter.
- Disconnect the multi-connector plug from the alternator.
- 850, Van and Pick-up: Disconnect the wire from the oil pressure switch.
- Release the harness from the clips on the wing valance.
- Disconnect the wiring from the solenoid.
- Disconnect the wiring from the brake stop lamp switch.
- Remove the screw to release the earth wires from the cross-member bracing plate.
- Disconnect the wiring from the fusebox.
- Release the harness from the 'P' clip and body clips on the bulkhead.
- Remove the air cleaner assembly, see 'MAINTENANCE'.
- Disconnect the wiring from the direction indicator flasher unit.
- Disconnect the multi-connector plug from the hazard flasher unit.
- Disconnect the multi-connector plug from the windscreen wiper motor.
- Disconnect the front harness from the rear harness at the snap connectors.
- Disconnect the instrument wiring at the multi connector plug.

23. Disconnect the wiring from the windscreen washer motor.
24. Slacken the heater rear securing nut, remove the two retaining screws and lower the heater.
25. Disconnect the heater motor earth wire.
26. Disconnect the front harness from the column switches at the multi-connector plugs.
27. Push out the switches from the switch panel and disconnect the multi-connector plugs from the switches.
28. Disconnect the radio when fitted.
29. Disconnect the heater fan switch wire.
30. Push the bulkhead grommet into the engine compartment and then feed the harness through the aperture into the engine compartment.
31. Feed the harness through the cross member bracing plate and remove it from the vehicle.

#### Refitting

32. Reverse the procedure in 1 to 31.
33. Check the operation of all electrical units.

### FRONT HARNESS

**Remove and refit -  
Mini 1000 Canada**

**86.70.08**

#### Removing

1. Disconnect the battery.
2. Remove the horn from the bonnet lock platform.
3. Release the harness from the clips on the bonnet lock platform.
4. Disconnect the wiring to the side marker lamps at the snap connectors.
5. Disconnect the wiring to the front flasher lamps.

6. Disconnect the wiring to the headlamps.
7. Disconnect the wiring from the ignition coil, coolant temperature gauge transmitter, and distributor.
8. Disconnect the multi-connector plug from the alternator.
9. Release the harness from the clips on the wing valance.
10. Disconnect the wiring from the solenoid.
11. Remove the screw retaining the earth wires to the body.
12. Disconnect the multi-connector plug from the windscreen wiper motor.
13. Disconnect the connector plug from the pressure differential warning actuator.
14. Remove the air cleaner assembly, see 'MAINTENANCE'.
15. Disconnect the wiring from the fusebox.
16. Disconnect the multi-connector plug from the hazard flasher unit.
17. Disconnect the wiring from the direction indicator flasher unit.
18. Disconnect the wiring from the windscreen washer pump.
19. Release the harness from the 'P' clip and body clips on the bulkhead.
20. Disconnect the front harness from the rear harness at the snap connectors.
21. Disconnect the panel harness from the front harness at the two multi-connector plugs.
22. Slacken the heater rear securing nut, remove the two retaining screws and lower the heater.
23. Disconnect the heater fan switch wires.
24. Remove the illumination bulb holders from the heater control panel.
25. Disconnect the wiring to the heater fan motor.

26. Push out the switches from the switch panel and disconnect the multi-connector plugs from the switches.
27. Disconnect the radio when fitted.
28. Disconnect the wiring from the brake stop lamp switch.
29. Disconnect the seat belt harness from the front harness at the snap connectors.
30. Disconnect the front harness from the column switches at the multi-connector plugs.
31. Disconnect the wiring from the panel rheostat switch and release the seat belt warning light illumination bulb holder.
32. Feed the harness up through the parcel shelf, push out the bulkhead grommet and feed the harness out into the engine compartment.
33. Feed the harness through the cross-member bracing plate and remove the harness from the vehicle.

#### Refitting

34. Reverse the procedure in 1 to 33.
35. Check the operation of all electrical units.

### PANEL HARNESS

**Remove and refit - 850, 1000,  
Van and Pick-up**

**86.70.10**

#### Removing

1. Remove the air cleaner assembly, see 'MAINTENANCE'.
2. Remove the bulkhead insulation (if fitted).
3. Disconnect the multi-connector plug(s) connecting the panel harness to the front harness.
4. Release the bulb holders from the speedometer.

5. 1000: Release the bulbholder from the coolant temperature gauge and oil pressure gauge.
6. Disconnect the wiring from the voltage stabilizer.
7. Disconnect the wiring from the fuel gauge.
8. Remove the retaining nut and release the earth wire from the speedometer.
9. Withdraw the harness from the vehicle.
10. Mini 1000 Canada: Disconnect the wiring from the buzzer.

#### Refitting

11. Reverse the procedure in 1 to 10, as applicable.

### PANEL HARNESS

**Remove and refit - Turbo only 86.70.10**

#### Removing

1. Withdraw the fascia panel to obtain access to instruments, see 76.46.23.
2. Carefully identify and note fitted position of all connectors and multi-plugs.
3. Disconnect the Lucars and multi-plugs from the instruments and warning lamps.
4. Remove the earth lead from the vacuum gauge stud.
5. Release the strap securing the harness to the fascia; withdraw the harness.

#### Refitting

6. Reverse operations 1 to 5.

## REAR HARNESS - Saloon

Remove and refit 86.70.15

### Removing

1. Open the luggage compartment lid, disconnect the battery and remove the spare wheel.
2. Clubman and 1275 GT: Remove the fresh air valve assemblies, see 80.10.35.
3. Release the door seals and remove the dash liners.
4. Fold back the bulkhead insulation and parcel tray liner.
5. Remove the screws securing the door pillar switches, disconnect and pull the wiring through the grommets.
6. Disconnect the heated rear window earth wire at the lucar connector.
7. Feed the right-hand door pillar switch wiring behind the instrument panel.
8. Remove the roof lamp, see 86.45.02.
9. Disconnect the heated rear window feed wire.
10. Pull back the insulation from the bulkhead inside the engine compartment and disconnect the front harness from the rear harness.
11. Pull the rear harness through the bulkhead grommet into the interior of the vehicle.
12. Disconnect the wiring from the fuel gauge tank unit.
13. Remove the bolt retaining the fuel tank securing strap to the luggage compartment floor and release the earth wire.
14. Remove the fuel filler cap.
15. Manoeuvre the fuel tank into the spare wheel well and refit the filler cap.
16. Remove the fuel tank filler tube grommet from the body aperture.

17. Release the fuel tank gauge unit wiring from the clip inside the luggage compartment.
18. Disconnect the tail lamps, stop lamps, flashers and number plate wiring at the snap connectors.
19. Mini 1000 Canada: Disconnect the reversing lamp wiring.
20. Release the harness from the clips at the rear of the luggage compartment.
21. Securely attach draw cords to the heated rear window wire, the interior lamp wiring and the front of the rear harness, taping the joints to assist their passage through the body panelling into the luggage compartment.
22. Feed the harness up the 'A' post at the same time pulling it through into the luggage compartment.
23. Untape and disconnect the drawcords from the harness.

### Refitting

24. Reverse the procedure in 1 to 23 noting:
  - a Connect the draw cords to the appropriate wiring.
  - b From inside the luggage compartment, feed the harness up through the rear quarter panel, at the same time a second operator pulling the draw cord at the 'A' post to pull the wiring harness through onto the front parcel shelf.
  - c Using draw cords, pull the heated rear window and interior lamp wiring into position.
  - d Position the harness and secure where necessary with the retaining clips. Connect up the harness and wiring connections to the various units; check that all units are operating.

## REAR HARNESS

Remove and refit - Estate 86.70.15

### Removing

1. Disconnect the battery.
2. Open the bonnet, fold back the bulkhead insulation and disconnect the front harness from the rear harness.
3. Release the rear harness from the body clip on the bulkhead.
4. Remove the fresh air valve assemblies, see 80.10.35.
5. Remove the dash liners.
6. Remove the screws securing the door pillar switches, disconnect the wires from the switches and pull the wiring through the grommets.
7. Fold back the parcel tray liner and feed R.H. switch wiring across the dash.
8. Pull the harness through the bulkhead grommet into the vehicle.
9. Remove the roof lamp, see 86.45.02.
10. Release the front headliner, see 76.64.10.
11. Remove the screw to release the roof lamp earth wire.
12. Remove the screws to release the left-hand sliding window catch then release the quarter waist rail liner from its retaining clips.
13. Release the retaining clips and remove the left-hand rear quarter trim pad.
14. Release the retaining clips and remove the left-hand rear waist rail liner.
15. Remove the retaining screws to release the rear pillar liners.
16. Remove the left-hand luggage compartment trim pad.
17. Remove the luggage compartment carpet.

18. Release the two fasteners retaining the luggage compartment floor and remove the floor.
19. Remove the rear number plate lamp covers and lenses, disconnect the wires from the lamps.
20. Remove the rear number plate from its fixing brackets.
21. Disconnect wiring from the fuel tank gauge, unit and attach a draw cord to the wiring.
22. Slacken the fuel tank securing screws, pull the wire up through the hole in the luggage compartment floor and then remove the grommet from the wire.
23. Disconnect the wiring from the rear lamp assemblies at the snap connectors.
24. Attach a draw cord to the R.H. rear lamp wiring and pull the wiring through into the luggage compartment.
25. Release the harness from the clips on the rear cross panel and pull the wiring from the rear number plate lamps into the luggage compartment.
26. Release the harness from the clips on the body side panels.
27. Feed the harness along the body to the 'B' post.
28. Remove the grommet from the 'B' post.
29. Attach a draw cord to the harness at the fascia end.
30. Feed the harness up the 'A' post and pull it out from the 'B' post aperture.
31. Detach the drawcords from the harness and remove the harness from the vehicle.

### Refitting

32. Reverse the procedure in 1 to 31.
33. Check that all electrical units are operating.

## TRANSMISSION CONTROLLED SPARK ADVANCE

### Description

The transmission controlled spark advance system comprises a solenoid operated valve located in the vacuum signal line between the inlet manifold and the distributor vacuum advance capsule and an inhibitor switch mounted behind the gear-change remote control housing. The solenoid is controlled by the inhibitor switch which is operated by the gear selector and limits the operation of the system to 4th gear only. With the solenoid NOT energised the vacuum line to the advance capsule is vented to atmosphere and the manifold vacuum tapping sealed. With the solenoid energised by selection of 4th gear vacuum is applied to the advance capsule.

## TRANSMISSION CONTROLLED SPARK ADVANCE INHIBITOR SWITCH

**Renew** 86.35.47

**Check and adjust** 86.35.48

### Check

1. Chock the wheels, apply the hand and foot brakes and start the engine.
2. Increase the engine idle speed to 2,500 rev/min.
3. Disengage the clutch, select 4th gear and hold the clutch disengaged. If the transmission controlled spark advance system is working correctly, the engine speed should rise by 300 to 400 rev/min.

### Adjust

4. Raise the front of the car and support it on stands. Apply the hand-brake and position the gear lever in neutral.
5. Disconnect the leads from the inhibitor switch and fully slacken the switch locknut.
6. Connect a test lamp and battery to the switch terminals and if the lamp does not light, screw the switch out of the mounting bracket until the lamp lights.
7. Screw the switch into the mounting bracket until the test lamp goes out; screw the switch in a further 1 1/2 to 2 flats and lock it in this position.
8. Move the gear lever to each gear position in turn and check that the test lamp lights only when 4th gear is selected.
9. Remove the test lamp, connect the inhibitor switch leads and lower the car to the ground.

### Remove

10. Raise the front of the car and support it on stands. Apply the hand-brake and position the gear lever in neutral.
11. Disconnect the leads from the switch, slacken the switch locknut and unscrew the switch from the mounting bracket.

### Refit

12. Fit the switch to the mounting bracket, adjust the switch to the correct setting and tighten the locknut.
13. Connect the switch leads and lower the car to the ground.

## TRANSMISSION CONTROLLED SPARK ADVANCE SOLENOID VALVE

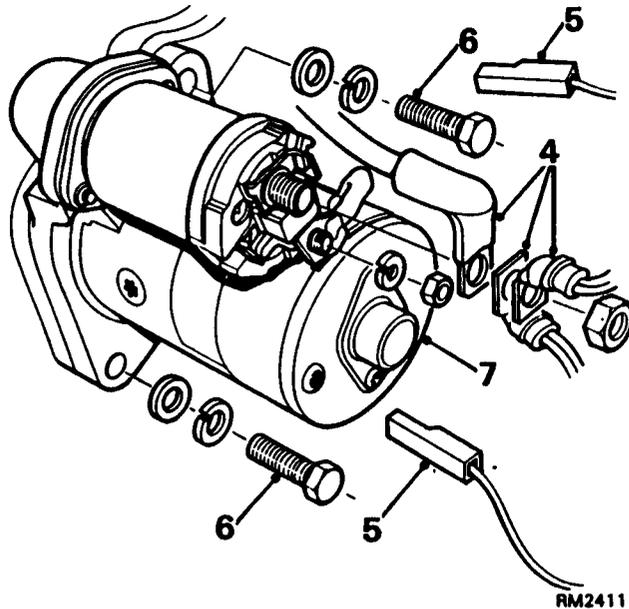
**Renew** 86.35.49

### Remove

1. Pull off the vacuum pipe connections from the solenoid valve.
2. Disconnect the lead from the solenoid, unscrew the mounting screw and remove the solenoid with its earth lead.
3. Release the solenoid from the mounting bracket.

### Refit

4. Fit the solenoid to its mounting bracket.
5. Secure the mounting bracket and solenoid earth lead to the bulkhead.
6. Fit the vacuum pipe connections to the solenoid valve.



RM2411

**STARTER MOTOR - TYPE M79  
(PRE-ENGAGED)**

**Remove and refit** 86.60.01

**Removing**

1. Disconnect the battery.
2. Raise the bonnet.
3. Release the horn and bracket and place them aside.
4. Release the leads from the solenoid main terminal.
5. Disconnect the leads from the solenoid push-on terminals.
6. Remove the starter securing bolts.
7. Remove the starter.

**Refitting**

8. Reverse the procedure in 1 to 7.

**STARTER MOTOR SOLENOID -  
TYPE M79 STARTER MOTOR  
(PRE-ENGAGED)**

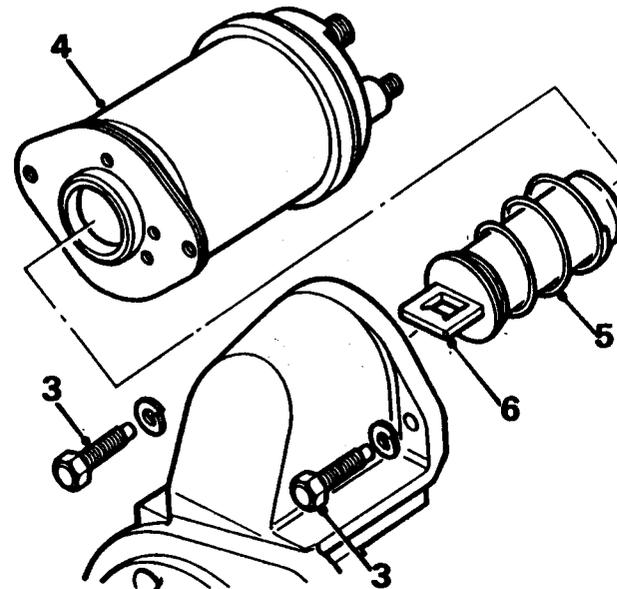
**Remove and refit** 86.60.08

**Removing**

1. Remove the starter motor, see 86.60.08
2. Release the starter lead from the solenoid.
3. Remove the solenoid securing screws.
4. Remove the solenoid body.
5. Remove the solenoid spring.
6. Unhook and remove the solenoid plunger.

**Refitting**

7. Reverse the procedure in 1 to 6.



RM2410

## DIM-DIP UNIT

Remove and refit

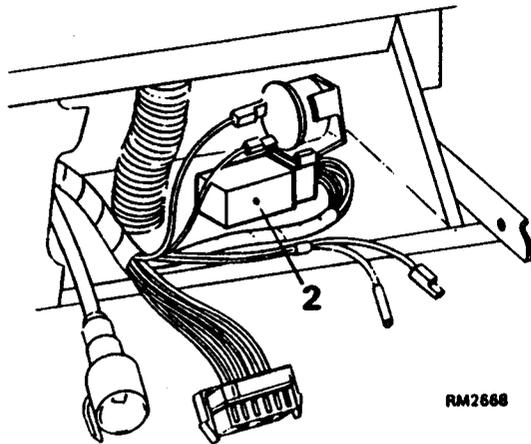
86.55.91

### Removing

1. Remove the instrument housing, see 88.20.13.
2. Disconnect the dim-dip unit from the harness connector.

### Refitting

3. Reverse operations 1 and 2.



## DIM-DIP RESISTOR

Remove and refit

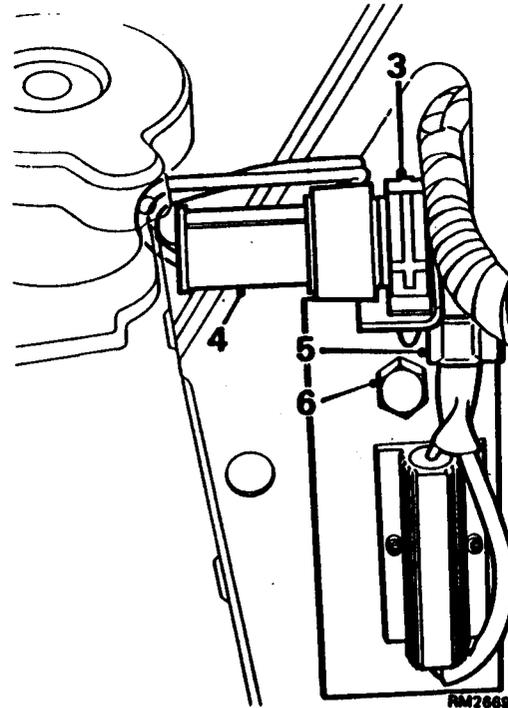
86.55.92

### Removing

1. Disconnect the battery.
2. Raise the bonnet.
3. Release the harness connector from the retaining clip.
4. Disconnect the resistor plug at the connector.
5. Release the resistor harness from the retaining clip.
6. Remove the bolt retaining the resistor and mounting plate; withdraw the resistor.

### Refitting

7. Reverse operations 1 to 6.







## KEY TO THE WIRING DIAGRAM - Models with single instrument pack - 1984 on

- |                                    |  |  |  |
|------------------------------------|--|--|--|
| 1. Alternator                      | 22 Tail lamp - L.H.                      | 38 Ignition/start switch                                     | 110 Direction indicator repeater lamps (when fitted)   |
| 3 Battery                          | 23 Horn                                  | 39 Ignition coil   | 115 Heated rear screen switch                          |
| 4 Starter motor solenoid           | 24 Horn-push                             | 40 Distributor   | 116 Heated rear screen                                 |
| 5 Starter motor                    | 25 Direction indicator flasher unit      | 42 Oil pressure switch                                       | 118 Combined windscreen washer and wiper switch        |
| 6 Lighting switch                  | 26 Direction indicator switch            | 43 Oil pressure warning lamp                                 | 152 Hazard warning lamp                                |
| 7 Headlamp dip switch              | 27 Direction indicator warning lamp      | 44 No charge warning lamp                                    | 153 Hazard warning switch                              |
| 8 Headlamp dip beam                | 28 Front direction indicator lamp - R.H. | 45 Headlamp flash switch                                     | 154 Hazard warning flasher unit                        |
| 9 Headlamp main beam               | 29 Front direction indicator lamp - L.H. | 49 Reverse lamp switch                                       | 159 Brake low fluid level warning lamp and test switch |
| 10 Main beam warning lamp          | 30 Rear direction indicator lamp - R.H.  | 50 Reverse lamp  | 164 Ballast resistor (cable)                           |
| 11 Sidelamp - R.H.                 | 31 Rear direction indicator lamp - L.H.  | 60 Radio (when fitted)                                       | 286 Rear fog-guard switch                              |
| 12 Sidelamp - L.H.                 | 32 Heater switch                         | 64 Voltage stabilizer  | 287 Rear fog-guard warning lamp                        |
| 14 Panel illumination lamps        | 33 Heater motor                          | 67 Line fuse   | 288 Rear fog-guard lamp                                |
| 15 Number-plate illumination lamps | 34 Fuel level indicator                  | 75 Automatic gearbox ignition inhibitor switch (when fitted) | 317 Brake fluid level sensor switch.                   |
| 16 Stop lamps                      | 35 Fuel level indicator tank unit        | 77 Windscreen washer motor                                   |  |
| 17 Tail lamp - R.H.                | 37 Windscreen wiper motor                | 83 Induction heater and thermostat (when fitted)             |  |
| 18 Stop lamp switch (mechanical)   |  | 84 Suction chamber heater (when fitted)                      |  |
| 19 Fuse box                        |  |  |  |
| 20 Interior lamp                   |  |  |  |
| 21 Interior lamp switch (door)     |  |  |  |

### CABLE COLOUR CODE

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

When a cable has two colour code letters the first denotes the main colour and the second denotes the tracer colour.



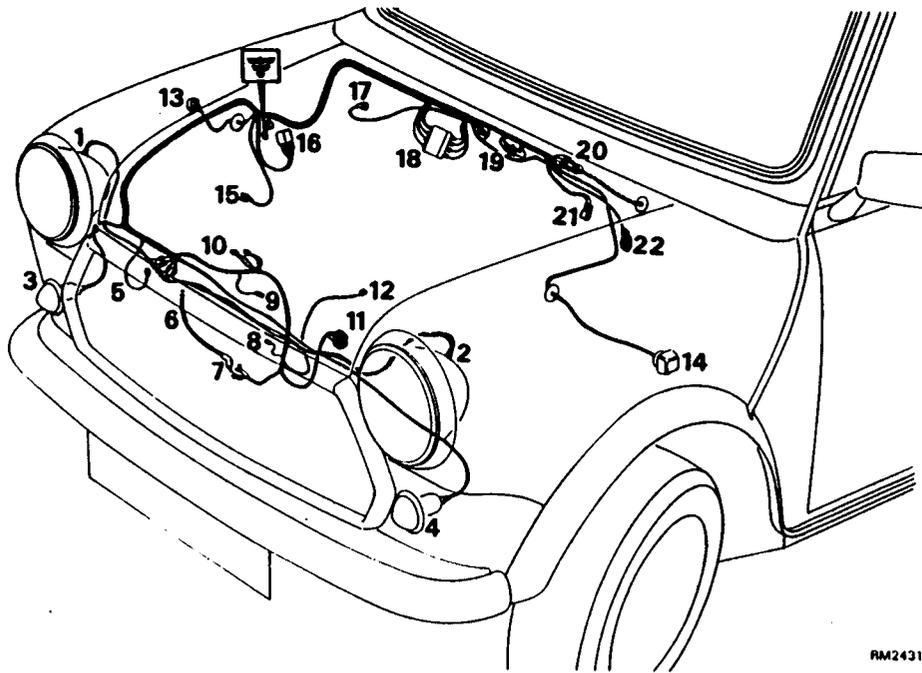
## KEY TO THE WIRING DIAGRAM - Models with instrument pack - 1984 on

- |                                    |   |   |   |
|------------------------------------|---|---|---|
| 1. Alternator                      | 23 Horn                                     | 40 Distributor  | 110 Direction indicator repeater lamps<br>(when fitted)   |
| 3 Battery                          | 24 Horn push                                | 42 Oil pressure switch  | 115 Heated rear screens switch                            |
| 4 Starter motor solenoid           | 25 Direction indicator flasher unit         | 43 Oil pressure warning lamp                                    | 116 Heated rear screen                                    |
| 5 Starter motor                    | 26 Direction indicator switch               | 44 No charge warning lamp                                       | 118 Combined windscreen washer and<br>wiper switch        |
| 6 Lighting switch                  | 27 Direction indicator warning lamp         | 45 Headlamp flash switch  | 152 Hazard warning lamp                                   |
| 7 Headlamp dip switch              | 28 Front direction indicator lamp -<br>R.H. | 46 Water temperature indicator                                  | 153 Hazard warning switch                                 |
| 8 Headlamp dip beam                | 29 Front direction indicator lamp -<br>L.H. | 47 Water temperature transmitter                                | 154 Hazard warning flasher unit                           |
| 9 Headlamp main beam               | 30 Rear direction indicator lamp -<br>R.H.  | 49 Reverse lamp switch  | 158 Printed circuit instrument panel                      |
| 10 Main beam warning lamp          | 31 Rear direction indicator lamp -<br>L.H.  | 50 Reverse lamp   | 159 Brake low fluid level warning<br>lamp and test switch |
| 11 Sidelamp - R.H.                 | 32 Heater switch                            | 60 Radio (when fitted)  | 164 Ballast resistor (cable)                              |
| 12 Sidelamp - L.H.                 | 33 Heater motor                             | 64 Voltage stabilizer   | 286 Rear fog-guard switch                                 |
| 14 Panel illumination lamps        | 34 Fuel level indicator                     | 67 Line fuse  | 287 Rear fog-guard warning lamp                           |
| 15 Number-plate illumination lamps | 35 Fuel level indicator tank unit           | 75 Automatic gearbox ignition<br>inhibitor switch (when fitted) | 288 Rear fog-guard lamp                                   |
| 16 Stop lamps                      | 37 Windscreen wiper motor                   | 77 Windscreen washer motor                                      | 317 Brake fluid level sensor switch                       |
| 17 Tail lamps - R.H.               | 38 Ignition/start switch                    | 83 Induction heater and thermostat<br>(when fitted)             | 336 Speakers (when fitted)                                |
| 18 Stop lamp switch (mechanical)   | 39 Ignition coil                            | 84 Suction chamber heater (when<br>fitted)                      |   |
| 19 Fuse box                        |   | 95 Tachometer (when fitted)                                     |   |
| 20 Interior lamp                   |   |   |   |
| 21 Interior lamp switch (door)     |   |   |   |
| 22 Tail lamp - L.H.                |   |   |   |

### CABLE COLOUR CODE

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

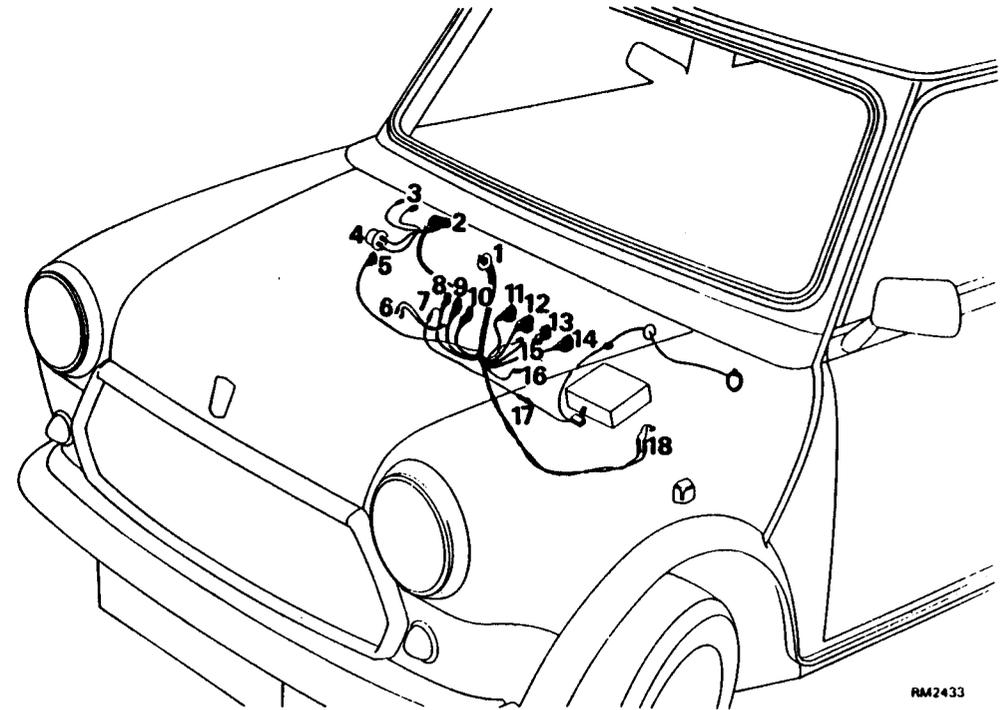
When a cable has two colour code letters the first denotes the main colour and the second denotes the tracer colour.



RM2431

**Engine bay harness - 1986 models on**

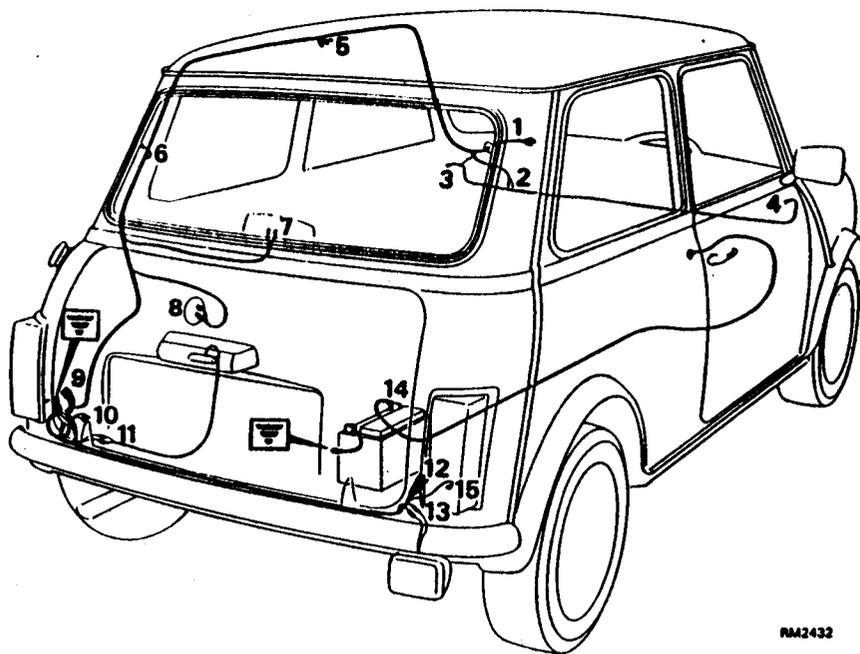
- |                                   |                                      |
|-----------------------------------|--------------------------------------|
| 1. R.H. headlamp                  | 13. R.H. side repeater               |
| 2. L.H. headlamp                  | 14. L.H. side repeater               |
| 3. R.H. front indicator lamp      | 15. Windscreen washer motor          |
| 4. L.H. front indicator lamp      | 16. Starter relay                    |
| 5. Horn                           | 17. Brake fluid switch               |
| 6. Battery lead to solenoid       | 18. Fuse box                         |
| 7. Solenoid                       | 19. Line fuses                       |
| 8. Distributor                    | 20. Main/body harness connectors     |
| 9. Oil pressure transmitter       | 21. Direction indicator flasher unit |
| 10. Coil                          | 22. Wiper motor                      |
| 11. Alternator                    |                                      |
| 12. Water temperature transmitter |                                      |



RM2433

**Fascia harness - 1986 models on**

- |  |  |
|--|--|
| 1. Harness entry through bulkhead                        | 10. Combined windscreen washer/wiper connector |
| 2. Instrument connector                                  | 11. Lighting switch                            |
| 3. Tachometer  | 12. Hazard switch                              |
| 4. Direction indicator unit                              | 13. Heated rear screen switch                  |
| 5. Rear fog-guard lamp switch                            | 14. Brake test switch                          |
| 6. Brake light switch                                    | 15. Heater motor switch                        |
| 7. Radio connector                                       | 16. Heater motor earth connector               |
| 8. Ignition switch connector                             | 17. In-line fuse - radio                       |
| 9. Combined direction indicator/horn/dipswitch connector | 18. Reverse switch connector                   |



RM2432

### Body harness - 1986 models on

- |                                |  |
|--------------------------------|--|
| 1. Main/body harness connector | 9. L.H. rear lamp  |
| 2. Radio connector             | 10. L.H. fog-guard lamp connector                          |
| 3. L.H. courtesy lamp switch   | 11. Number-plate lamp                                      |
| 4. R.H. courtesy lamp switch   | 12. R.H. rear lamp   |
| 5. Courtesy lamp               | 13. R.H. fog-guard lamp                                    |
| 6. Heated rear screen          | 14. Battery to starter solenoid lead                       |
| 7. Speaker                     | 15. Earth connector (on rear lamp body for fog-guard lamp) |
| 8. Petrol tank unit            |  |

## COMPONENT EARTH POINTS

Satisfactory operation of individual electrical components and systems relies on efficient earthing. When carrying out Fault Diagnosis you should check the relevant earth point fixing.

Components may be earthed directly via their external casing or fixings, or via a black cable connected to one of several major earth points located on the vehicle body.

The following chart details the major earth point number for individual components and should be used in conjunction with the associated earth point location illustration. Components are listed alphabetically by system.

### ENGINE AND IGNITION

	Earth point
Starter relay	1

### HEATING AND VENTILATION

	Earth point
Heater motor	1
Rear screen demister warning light	1

### WIPERS AND WASHERS

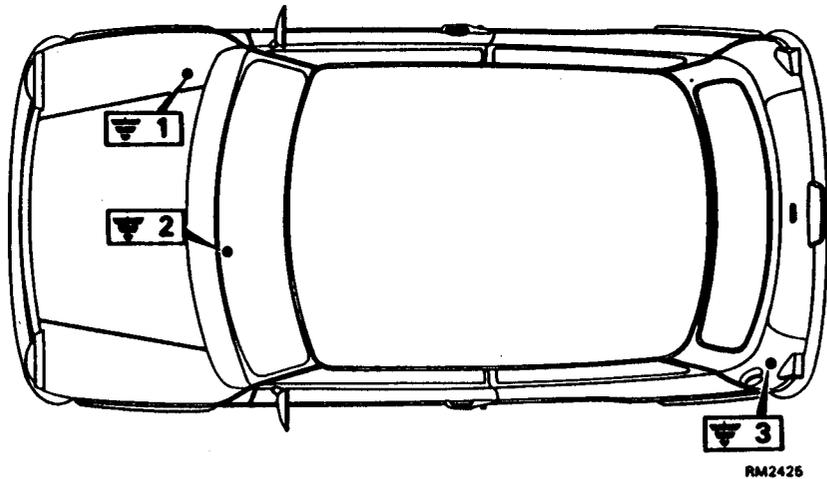
	Earth point
Windscreen washer pump	1
Windscreen wiper motor	1

## INSTRUMENTS

	Earth point
Brake fluid level switch	1
Direction indicator warning light	1
Fuel tank sender unit	3
Main beam warning light	1
Panel illumination	1
Radio/cassette player	2

## LIGHTS AND LIGHTING

	Earth point
Interior lamp	3
L.H. front direction indicator lamp	1
L.H. head lamp	1
L.H. rear fog-guard lamp	3
L.H. rear direction indicator lamp	3
L.H. repeater lamp	1
L.H. reversing lamp	3
L.H. side lamp	1
L.H. stop lamp	3
L.H. tail lamp	3
Number plate lamp	3
Rear fog-guard switch warning light	1
R.H. front direction indicator lamp	1
R.H. headlamp	1
R.H. rear fog-guard lamp	3
R.H. rear indicator lamp	3
R.H. repeater lamp	1
R.H. reversing lamp	3



- |                |   |
|----------------|---|
| R.H. side lamp | 1 |
| R.H. stop lamp | 3 |
| R.H. tail lamp | 3 |

#### Earth point locations - 1986 models on

1. Front R.H. inner wing
2. L.H. parcel shelf below trim panel
3. Rear L.H. wing behind trim panel

### BATTERY CHECKING

#### Battery code

The battery code referred to in the following Test Load Current and Charging Rate tables can be found on the label attached to the top of the battery.

If a battery is suspected, carry out the following tests:

**Test 1 - Open Circuit Voltage (O.C.V.)**  
Test Switch on the headlights for 15 seconds. This will remove any charge which may have been temporarily stored on the surface of the battery plates.

Measure the battery O.C.V. by connecting a voltmeter across the battery terminals. If the O.C.V. is below 12.5 volts, charge the battery at the recommended bench charge rate, following the given procedure.

If the O.C.V. is above 12.5 volts, leave the voltmeter connected and immobilise the ignition circuit. Crank the engine and check the battery voltage.

At temperatures above 5° C, the reading should be above 10.0 volts. Below 5° C, the reading should be approximately 9 volts. If the voltage is below this figure disconnect the battery earth, followed by the battery positive, remove the battery and carry out a high-rate discharge test.

#### Test 2 - High Rate Discharge Test

**Service tool:** Service Tool: SMD 4056,  
**Fast Check battery tester**

**Note:** Before carrying out this test, batteries must be allowed to stabilise for at least 24 hours after recharging.

Using tool SMD 4056, load the battery for 15 seconds at the test load current given for that battery.

If the battery voltage at 15 seconds is less than 9.6 volts or is falling rapidly, the battery is faulty and should be renewed.

### TEST LOAD CURRENT

Battery code	High rate discharge test load current
207 or 007	140 amps
209 or 009	170 amps
211 or 011	240 amps
105	100 amps
138	130 amps
164	170 amps
374	200 amps
389	250 amps

### BATTERY CHARGING

#### Precautions

Wear safety goggles and remove any personal effects likely to cause a short circuit.

Use a constant voltage charger so that the voltage during charging will not exceed the maximum allowable value.

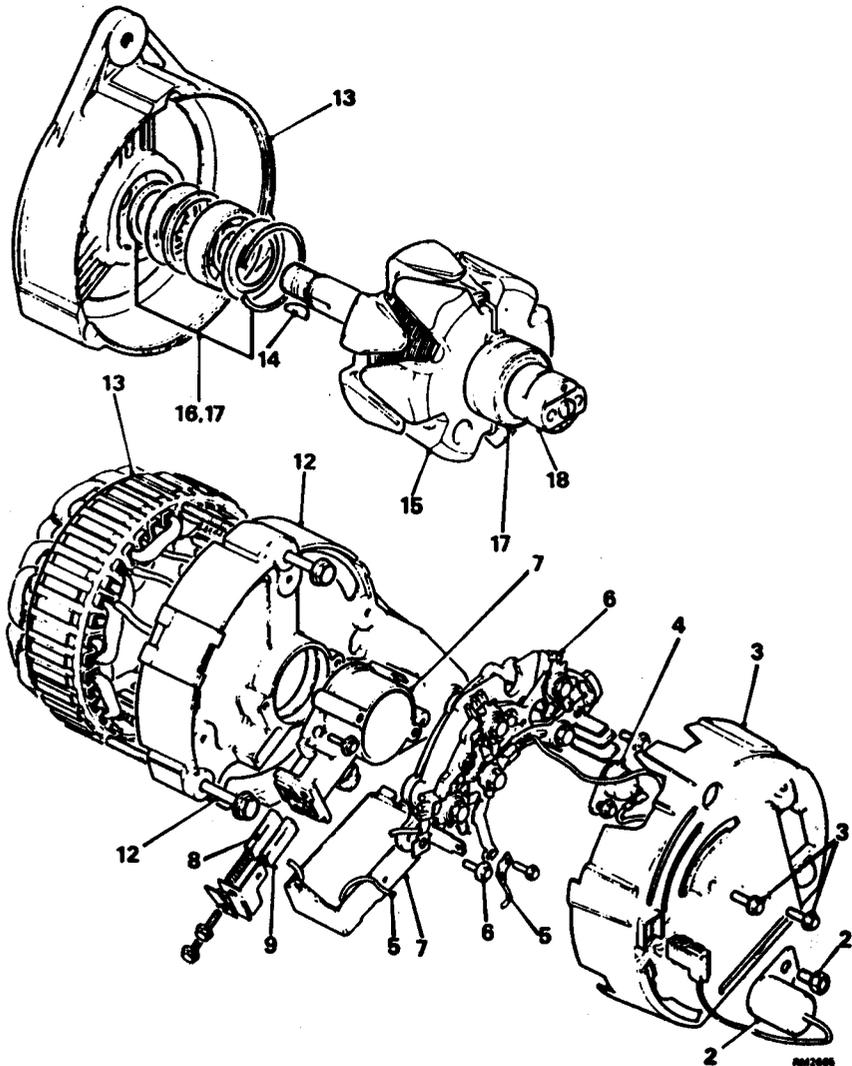
1. During charging and for 15 minutes afterwards, allow the flammable gases present to disperse. Avoid any naked flames near the charging area.

#### Procedure

2. First disconnect the battery earth, then the battery positive and remove the battery to a well-ventilated area.
3. Connect charger clips to battery (positive clip to positive terminal, negative clip to negative terminal).
4. Set the charging equipment to limit the maximum voltage to 16 volts, ensuring that the bench charge rate does not exceed the given value. Do not touch the battery or its connections during charging.  
**WARNING: Sealed batteries must not be boost charged as this will cause excessive gassing and electrolyte loss, and may result in premature failure of the battery.**
5. At the end of the given charging period, switch off the battery charger. Wait 15 minutes before reconnecting the battery to the vehicle; battery positive first, then the earth strap. Check the battery is properly secured in its mounting.
6. The O.C.V. of the battery must be at least 12.5 volts, after the battery has been left to stabilize for 24 hours.

### CHARGING RATE

Battery code	Bench charge rate
207 or 007	4 amps
209 or 009	5 amps
211 or 011	7 amps
105	3 amps
138	4 amps
164	5 amps
374	6 amps
389	7 amps



### CHARGING TIME

Open circuit voltage	Minimum charging period (hours)
12.50 - 12.64	2
12.30 - 12.49	4
12.10 - 12.29	6
11.90 - 12.09	8
11.70 - 11.89	10
10.50 - 11.69	12

### ALTERNATOR - TYPE A115

Overhaul 86.10.08

#### Dismantling

1. Remove the alternator, see 86.10.02
2. Disconnect the Lucar connector and remove the suppression capacitor.
3. Remove the cover securing screws; lift off the cover.
4. Disconnect the surge protection lead from the rectifier; remove the securing screw and withdraw the diode.

5. the the colours and locations of the regulator leads and disconnect them from the brushbox and rectifier.
6. Remove the regulator securing screw; withdraw the regulator.  
*Note: The regulator securing screw also retains the brush mounting plate.*
7. Remove the brushbox.
8. Withdraw the inner brush.
9. Remove the screw, withdraw the outer brush and remove the sealing pad.
10. Check the brush spring pressures and brush lengths against the figures given in 'GENERAL SPECIFICATION DATA'; renew brushes and springs if they are not within limits given.
11. Unsolder the stator output leads from the rectifier terminal tags, prise out the terminal ends, remove the securing screws and remove the rectifier from the rear end bracket.
12. Remove the fixing bolts and lift off the rear end bracket.

### DATA

#### Rotor windings:

Resistance at 20° C (68° F)	3.2 ohms ±5%
Current flow	3 amperes
Resistance or current flow test equipment	Ohmmeter or ammeter in series with 12 volt d.c. supply
Insulation test equipment	110 volt a.c. supply and 15-watt test lamp

#### Stator windings:

Continuity test equipment	12 volt d.c. supply and 36-watt test lamp
Insulation test equipment	110 volt a.c. supply and 15-watt test lamp

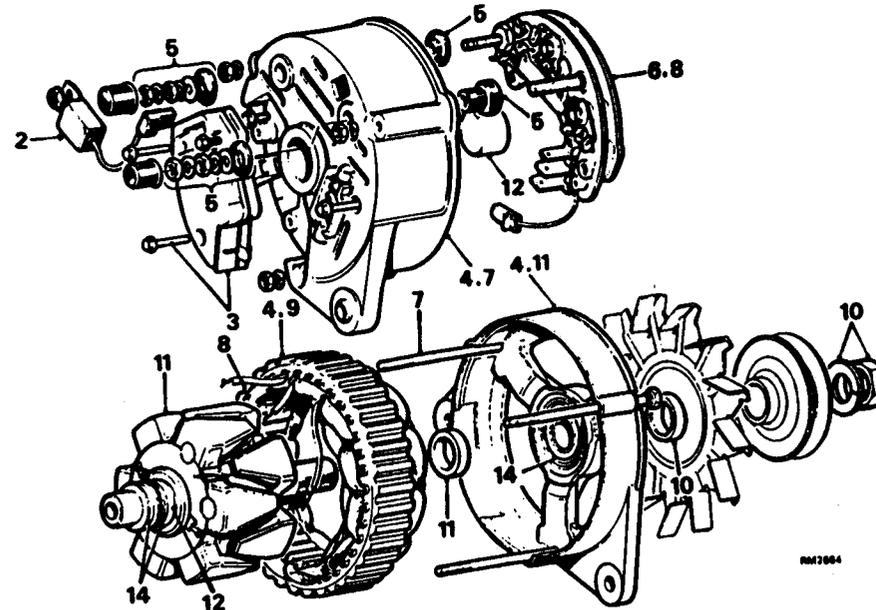
13. Note the fitted positions of the stator output leads and lift the stator from the front end bracket.
14. Remove the pulley securing nut, remove the pulley and fan and recover the Woodruff key.
15. Press the rotor out of the front end bracket bearing.
16. Remove the retaining plate, bearing, washer retainer and felt washer.

#### Inspection

17. Check front and rear bearings for roughness and wear. If necessary, repack unsealed bearings with Shell Alvania RA grease or equivalent.
18. Clean the surface of the slip rings with very fine glasspaper to remove any evidence of burning.
19. If the slip rings or rear bearing show signs of excessive wear, unsolder the connections and carefully prise the slip rings, one at a time from the shaft.

**CAUTION:** Care must be taken to avoid damaging the insulation covering the winding leads when removing or refitting the slip rings.

20. Reassemble the slip rings and bearing ensuring that the shielded side of the bearing faces the slip ring assembly. Use Fry's HT3 solder to remake the field connections to the slip rings.
21. Check the insulation of the field windings (see DATA), connect the test equipment between one of the slip rings and one of the rotor lobes.
22. Check the field windings against the information given in DATA; connecting the test equipment between the slip rings.



23. Check the stator windings for continuity (see DATA). Connect the test equipment between any two of the stator cables, then repeat the test using the third cable in place of the first two.
24. Check the stator winding insulation (see DATA), connecting the test equipment between any one of the three stator cables and the stator lamination pack.
25. Check the rectifying diodes (see DATA); connect the test equipment between each diode pin and its associated heatsink in turn, then reverse the connections. Current should flow in one direction only. Renew the rectifier assembly if a diode is faulty.

#### Reassembling

26. Reverse the procedure in 2 to 6 noting:
  - a Support the inner track of the bearing when fitting the rotor to the drive end bracket.
  - b Use 'M' grade 45-55 tin-lead solder to re-make the stator to rectifier pack connections, using a pair of pliers as a thermal shunt to avoid overheating of the diodes.
  - c Tighten the alternator pulley nut to 34 Nm, 25 lbf ft, 3.47 kgf m.
27. Mount the alternator on a test bench and check its output against the figure given in 'GENERAL SPECIFICATION DATA'.
28. Refit the alternator, see 86.10.02.

## ALTERNATOR - TYPE A127

Overhaul 86.10.08

1. Remove the alternator, see 86.10.02
2. Disconnect the Lucar connector and remove the suppression capacitor.
3. Remove the retaining screws, lift off the regulator and brushbox assembly and disconnect the Lucar connector.
4. Mark the fitted relationship of the end brackets and the stator.
5. Remove the nuts, washers and insulators from the stud terminals.
6. Remove the two screws securing the rectifier to the end bracket; withdraw the rectifier.
7. Remove the nuts from the through bolts and remove the slip ring end bracket from the stator.
8. Unsolder the stator output cables from the rectifier terminal tags. Note the fitted position and prise out the cable ends. Remove the rectifier from the stator.
9. Lift the stator from the drive end bracket.
10. Remove the pulley nut, spring washer, pulley, fan and spacer; use an 8 mm Allen key to hold the shaft against rotation.
11. Press the rotor shaft out of the drive end bracket and recover the spacer.

#### Inspection

12. Check front and rear bearings for roughness and wear. If necessary, repack unsealed bearings with Shell Alvania RA grease or equivalent.
- CAUTION:** The slip ring end bearing only may be renewed, the drive end bearing and bracket are renewed as an assembly.

13. Check the brush spring pressures and brush lengths against the figures given in 'GENERAL SPECIFICATION DATA'; renew brushes and springs if they are not within the limits given.

14. Clean the surface of the slip rings with very fine glasspaper to remove any evidence of burning.

15. If the slip rings show signs of excessive wear, unsolder the connections and carefully prise the slip rings, one at a time, from the shaft.

**CAUTION:** Care must be taken to avoid damaging the insulation covering the winding leads when removing or refitting the slip rings.

16. Reassemble the slip rings using Fry's HT3 solder to remake the field connections to the slip rings.

17. Assemble the rectifier to the stator; use 'M' grade 45-55 tin-lead solder to re-make the connections and a pair of pliers as a thermal shunt to avoid overheating of the diodes.

18. Check the insulation of the field windings (see DATA), connect the test equipment between one of the slip rings and one of the rotor lobes.

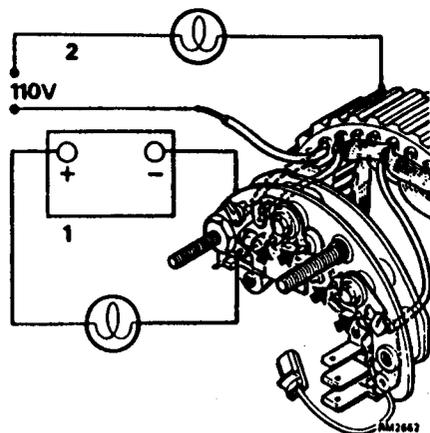
19. Check the field windings against the information given in DATA; connecting the test equipment between the slip rings.

1 Diode test - 12-volt battery and 1.5-watt bulb

2 Stator test - 110 volt d.c. and 15-watt bulb

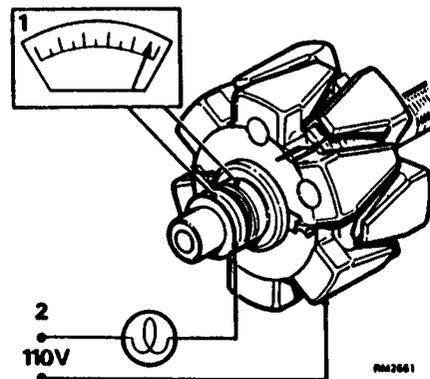
1 Resistance test - ohmmeter

2 Insulation test - 110 volt a.c. and 15-watt bulb



1 Diode test—12-volt battery and 1.5-watt bulb

2 Stator test—110 volt d.c. and 15-watt bulb



1 Resistance test—ohmmeter

2 Insulation test—110 volt a.c. and 15-watt bulb

20. Check the stator windings for continuity (see DATA). Connect the test equipment between any two of the stator cables, then repeat the test using the third cable in place of the first two.

21. Check the stator winding insulation (see DATA) connecting the test equipment between any one of the three stator cables and the stator lamination pack.

22. Check the rectifying diodes (see DATA); connect the test equipment between each diode pin and its associated heatsink in turn, then reverse the connections. Current should flow in one direction only. Renew the rectifier assembly if a diode is faulty.

#### Reassembling

23. Reverse the procedure in 2 to 11 noting:

a Support the inner track of the bearing when fitting the rotor to the drive end bracket.

b Tighten the alternator pulley nut to 34 N., 25lbf ft, 3.47 kgf m.

24. Mount the alternator on a test bench and check its output against the figure given in 'GENERAL SPECIFICATION DATA'.

25. Refit the alternator, see 86.10.02.

#### DATA

##### Rotor windings:

Resistance at 20° C (68° F) ..... 2.9 ohms

Resistance test equipment ..... Ohmmeter in series with 12-volt supply

Insulation test equipment ..... 110 volt a.c. supply and 15-watt test lamp

##### Stator windings:

Continuity test equipment ..... 12 volt d.c. supply and 36-watt test lamp

Insulation test equipment ..... 110 volt a.c. supply and 15-watt test lamp

Diode test equipment ..... 12 volt d.c. supply and 1.5-watt test lamp

## STARTER MOTOR - LUCAS TYPE M79

### Overhaul

86.60.13

### Dismantling

1. Remove the starter motor, see 86.60.01.
2. Disconnect the lead from the 'STA' terminal.
3. Remove the screws securing the solenoid, disengage the solenoid plunger from the engaging lever and withdraw the solenoid.
4. Remove the sealing cup and gasket.
5. Remove the circlip and washers.
6. Note the end bracket to yoke alignment marks and remove the screws securing the commutator end bracket; withdraw the end bracket.
7. Remove the brush springs and withdraw the earth brushes; lift the brushbox off the commutator.
8. Remove the pivot and packing piece from the drive end bracket.
9. Remove the retaining screws and remove the yoke assembly.
10. Remove the armature from the drive end bracket.

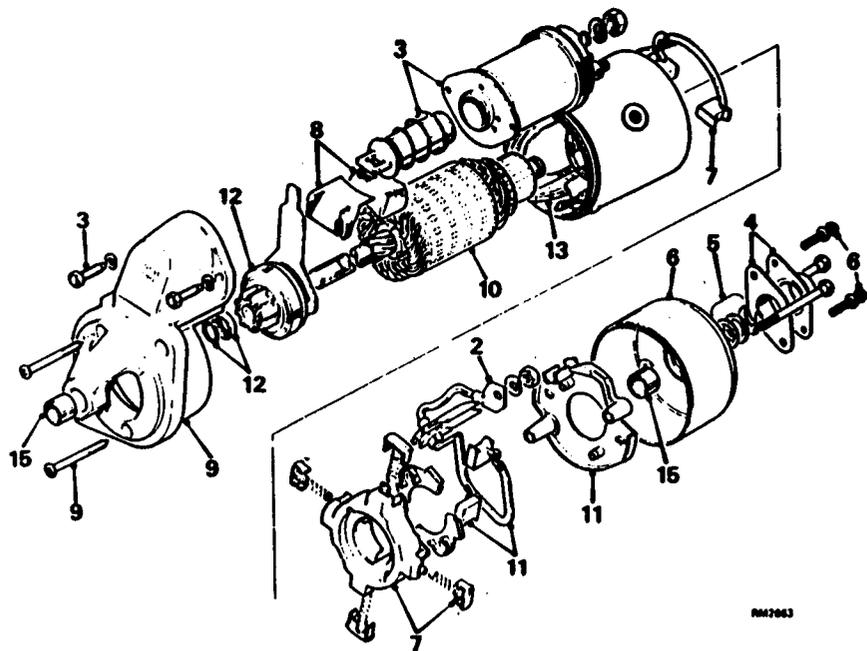
11. Remove the insulation plate and withdraw the positive brushes complete with bus bar.
12. Tap the thrust collar towards the pinion until the jump ring is exposed, then prise the jump ring from its groove and remove the ring, collar and drive assembly from the shaft.

#### Inspection

13. Inspect the taping of the field coils; check all joints for continuity and check the coils for signs of burning (faulty insulation).
14. When renewing field coils, use a new rivet to retain the yoke and tighten the pole shoe screws to the figure given in **DATA**.
15. Check for perceptible side play of the armature shaft in the bushes and for signs of contact with the magnets. Renew bushes or armature as necessary.

**Note:** New bushes must be soaked in Shell Turbo 41 oil or clean engine oil for thirty minutes before fitting. When fitted, the drive end bracket bush must be flush with the inside face of the bracket. The commutator end bracket bush can be extracted by using a suitable size tap and a press, operating in reverse.

16. Check the armature shaft for distortion; if the shaft is bent or distorted, it must be renewed.
17. Check the armature windings for short circuit by means of a growler. If a short circuit is indicated, armature must be renewed.



18. Using proprietary test equipment connected between one of the commutator segments and the armature shaft, check the armature insulation. Check the insulation of the field coils and brush boxes; renew any component which fails the test.
19. Check the commutator for burrs, pitting and wear. If necessary, skim the commutator ensuring that the finished diameter is not less than the dimension given in **DATA**. After skimming, polish the commutator with fine glass paper. **CAUTION:** Do not undercut the commutator segments.
20. Clean the commutator with a petrol moistened cloth and smear the shaft splines with Shell Retinax A grease or equivalent.

21. Check the solenoid windings for continuity. Measure the resistance between terminals '50' and 'STA' and compare with the figure given in **DATA**.

#### DATA

Pole shoe retaining screws	40 Nm, 29 lbf ft, 4.0 kgf m
Minimum brush lengths	0.15 in (3.5 mm)
Brush spring pressure	40 to 64 ozf (12 to 20 N)
Commutator minimum diameter	1.134 in (28.8 mm)
Resistance between terminals '50' and 'STA'	0.283 to 0.313 ohms

22. Measure the resistance between terminal '50' and the solenoid body and compare with the figure given in **DATA**. The solenoid must be renewed if figures obtained are not within the limits given.
23. With the solenoid plunger removed, check the continuity between the solenoid main contacts; the ohmmeter must read infinity.
24. Push the solenoid plunger into the solenoid and press the contacts closed; a reading of zero ohms must be obtained. Check that the plunger moves freely; renew the solenoid if the results are unsatisfactory.
25. Check the brush lengths against the figures given in **DATA** and renew them if they are not as specified.
26. Check the brush spring tension against the figure given in **DATA** and renew them if they are not as specified.
27. Check the drive assembly for signs of wear or damage; check that the pinion rotates in one direction only independently of the clutch body. Assembly must be renewed if unsatisfactory.

---

**Reassembling**

28. Reverse operations 2 to 12 noting:
  - a Ensure that drive assembly pivot and lever are smeared with Mobil 22 grease or equivalent prior to assembly.
  - b Check that reference marks on end bracket and yoke are in alignment when refitting the end bracket.
29. Mount the motor on a test bench and check its performance against the figures given in DATA.
30. Refit the starter motor, see 86.60.01.

## WIRING DIAGRAM - 1988 on

The wiring diagram is presented in a continuous rail format. All the circuits which make up the main wiring diagram for 1988 models onwards are positioned in two rows one above the other and are connected to each other by a common earth line representing the vehicle chassis.

The key to the wiring diagram includes grid references which give the location of components on the diagram. Please note the location of components on the diagram bears no relation to their location on the vehicle.

Interconnections from one circuit to another are identified by a number within a triangle. Outputs are shown within a triangle. Outputs are shown with the lead connected to the base of the triangle and inputs are shown with the lead connected to the apex. A chart giving the grid references where each connection point appears and the circuits associated with the connection points is included.

Supplementary circuits applicable to Turbo Models are covered separately. Interconnection points between the main wiring diagram and supplementary circuits are shown by a number within a triangle whilst interconnection points between supplementary circuits are shown by a number within a diamond.

Some circuits vary depending upon model or market requirements. In these cases more than one circuit for the same components is given.

## CABLE 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

Where a cable carries a tracer stripe, the predominant cable colour is given first and the tracer colour second, e.g. LGO The predominant cable is light green and the tracer colour is orange.

## SYMBOLS USED IN THE WIRING DIAGRAM

1. Fuse
2. Sealed joint
3. Connection point input
4. Connection point output
5. Earth connection



---

**Connection Chart**

<b>No.</b>	<b>Grid reference</b>	<b>Supplementary circuit connections</b>
1.	A1, C4	Alternator - Ignition/no charge warning lamp
2.	Not used	
3.	A1, A5	Ignition/start switch - radio/cassette player - single speaker
	A1, A6	Ignition/start switch - radio/cassette player - twin speakers
4.	A1, C4	Ignition/start switch - tachometer
	A1, B6	Ignition/start switch - windscreen wiper motor
5.	A1, A3	Ignition/start switch - reverse lamps, stop lamps, heated rear screen, vacuum solenoid valve.
	A1, A4	Ignition/start switch - dim/dip circuit
	A1, B2	Ignition/start switch - direction indicator circuit
6.	A1, C4	Ignition/start switch - voltage stabilizer
7	B1, A2	Starter solenoid relay - interior lamp circuit
	B1, B2	Starter solenoid relay - hazard warning circuit
8.	B1, A4	Starter solenoid relay - horn and headlamp flash circuit - UK markets only
	B1, B5	Starter solenoid relay - horn and headlamp flash circuit - non UK markets
9.	B1, A2	Starter solenoid relay - brake failure circuit
10.	B1, A4	Starter solenoid - main lighting switch - UK markets only
	B1, B3	Starter solenoid - main lighting switch - German only
	B1, B5	Starter solenoid - main lighting switch - non UK markets
11.	B1, A4	Starter solenoid relay - dim/dip circuit
12.	B1, B4	Ignition coil - tachometer
13.	C2, C3	Hazard warning circuit - direction indicator warning lamps
14.	C2, C4	Direction indicator circuit - direction indicator warning lamps
15.	A4, C4	Side lamp circuit - panel illumination lamps - UK markets only
	B3, C4	Side lamp circuit - panel illumination lamps - Germany only
	B5, C4	Side lamp circuit - panel illumination lamps - non UK markets
16.	A2, A4	Headlamp dip switch - fog rearguard circuit - UK markets only
	A2, B5	Headlamp dip switch - fog rearguard circuit - non UK markets
17.	A4, C4	Headlamp main beam circuit - UK markets only
	B5, C4	Headlamp main beam circuit - non UK markets
18.	A3, B6	Windscreen washer/wiper switch - heater motor

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# KEY TO THE WIRING DIAGRAM - 1988

ON

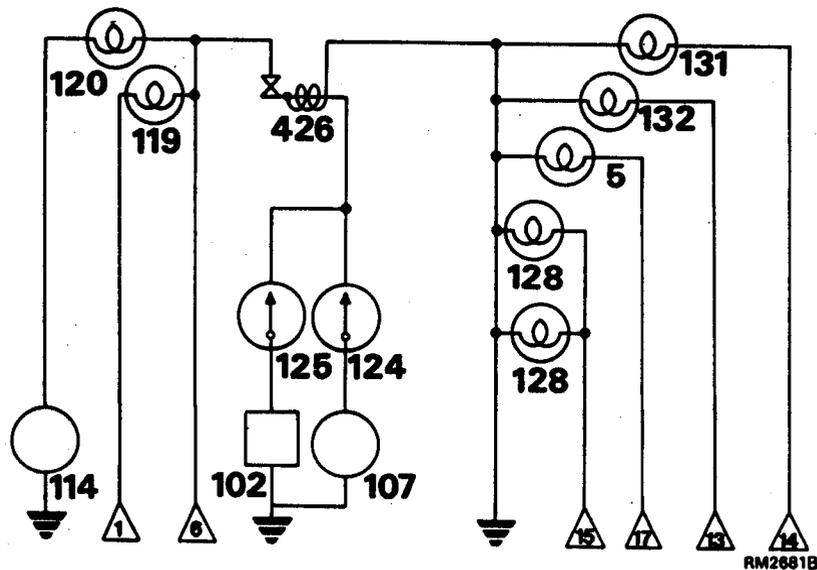
No. Description

Grid  
reference

1. Battery	A1	12. L.H. tail lamp - non U.K. markets	C5	105. Automatic transmission inhibitor switch	B1
2. Lighting switch - main - split lighting circuit - Germany only	B3	12. L.H. tail lamp - U.K. markets only	B4	107. Coolant thermistor	C4
2. Lighting switch - main - non U.K. markets	C5	13. Horn - U.K. markets only	A4	114. Oil pressure switch	C4
2. Lighting switch - U.K. markets only	A4	13. Horn - non U.K. markets	C5	115. Brake fluid level switch	A2
3. Headlamp dipswitch - non U.K. markets	C5	14. Horn switch - U.K. markets only	A4	119. Ignition warning light	C4
3. Headlamp dipswitch - U.K. markets only	A4	14. Horn switch - non U.K. markets	B5	120. Oil pressure warning light	B4
4. Headlamp dip beam - non UK markets	C5	15. Direction indicator switch	C2	123. Tachometer	B4
4. Headlamp dip beam - UK markets only	B4	16. R.H. front direction indicator lamp	C2	124. Coolant temperature gauge	B4
5. Headlamp main beam - non U.K. markets	C5	17. L.H. front direction indicator lamp	C2	125. Fuel gauge	B4
5. Headlamp main beam U.K. markets only	B4	18. Heater switch	A3	128. Panel lights	B4
6. R.H. sidelamp - Germany only	C3	19. Heater motor	A3	130. Main beam warning light	C4
6. R.H. sidelamp - non U.K. markets	C5	20. Windscreen wiper motor	C6	131. L.H. indicator warning light	C4
6. R.H. sidelamp - U.K. markets only	C5	21. Ignition switch	A1	132. R.H. indicator warning light	B4
7. L.H. sidelamp - Germany only	C3	22. Headlamp flash switch - U.K. markets only	A4	149. Interior light	A2
7. L.H. sidelamp - non U.K. markets	C5	22. Headlamp flash switch - non U.K. markets	C5	173. Radio - single speaker	A5
7. L.H. sidelamp - U.K. markets only	B4	23. Reverse lamp switch	A3	173. Radio/cassette player	A5
8. Number plate illumination lamps - Germany only	C3	24. Rear fog lamp switch	A2	174. R.H./single front door speaker	B5
8. Number plate illumination lamps - non U.K. markets	C5	27. Direction indicator unit	B2	175. L.H. front door speaker	B5
8. Number plate illumination lamps - U.K. markets only	B4	27. Hazard warning unit	B2	265. L.H. stop light	B3
9. R.H. tail lamp - Germany only	C3	29. Windscreen washer motor	B2	266. R.H. stop light	B3
9. R.H. tail lamp - Non U.K. markets	C5	31. Heated rear window switch	C6	284. Fusebox	A1, A4, B1, C3, C5
9. R.H. tail lamp - U.K. markets only	B4	32. Heated rear window element	A3	288. Rear fog lamp	B2
10. Stop lamp switch	A3	33. Hazard warning light	B3	293. Dim/dip relay	A4/A5
12. L.H. tail lamp - Germany only	C3	34. Hazard warning switch	C2	344. L.H. reversing lamp	B3
		57. L.H. side repeater lamp	C2	345. R.H. reversing lamp	B3
		58. R.H. side repeater lamp	C2	391. Distributor	A1
		59. R.H. front door switch	B2	399. Fog rearguard warning light	A2
		60. L.H. front door switch	B2	419. In-line fuse	A2, A5, B1, C3
		66. Wash/wipe switch	C6	424. R.H. rear direction indicator light	C2
		68. Dim/dip resistor	A4	425. L.H. rear direction indicator light	C3
		80. Alternator	A1	426. Voltage stabilizer	B4
		81. Starter motor/solenoid	A1	427. Heated rear window warning light	B3
		82. Starter relay	A1	428. Brake failure light test switch	A2
		83. Ignition coil	A1	429. Emission control valve switch	A3
		100. Ballast resistor	A1	430. Vacuum solenoid valve	B3
		102. Fuel tank sender unit	C4		



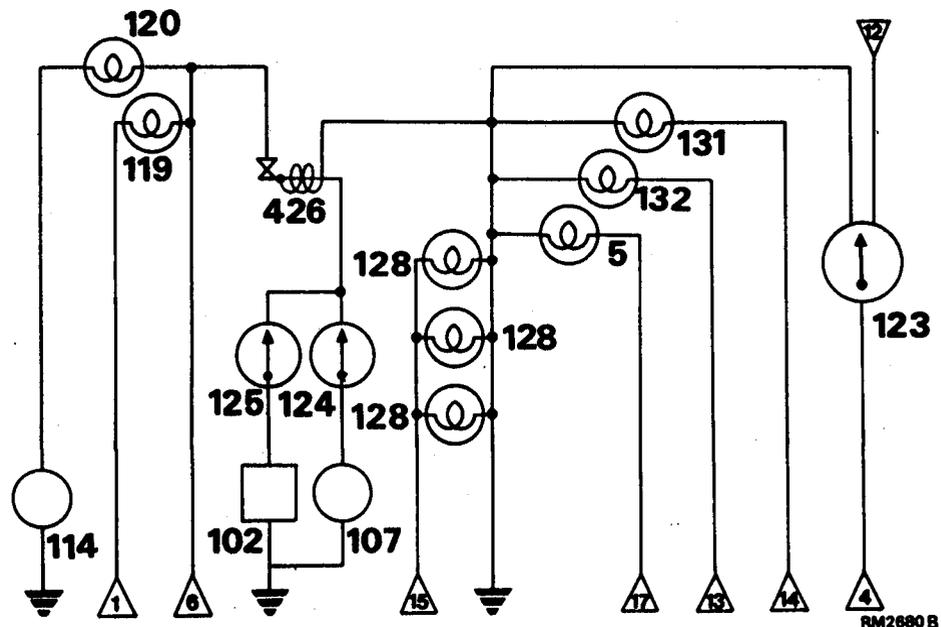




RM2681B

**Twin gauge instrument pack with integral voltage stabiliser**

- 5 Main beam warning light
- 102 Fuel tank sender unit
- 107 Coolant temperature transducer
- 114 Oil pressure switch
- 119 Ignition warning light
- 120 Oil pressure warning light
- 124 Coolant temperature gauge
- 125 Fuel gauge
- 128 Panel illumination lights
- 131 L.H. direction indicator warning lights
- 132 R.H. direction indicator warning lights
- 426 Voltage stabiliser



RM2680 B

**Triple gauge instrument pack with integral voltage stabiliser**

- 5 Main beam warning light
- 102 Fuel tank sender unit
- 107 Coolant temperature transducer
- 114 Oil pressure switch
- 119 Ignition warning light
- 120 Oil pressure warning light
- 123 Tachometer
- 124 Coolant temperature gauge
- 125 Fuel gauge
- 128 Panel illumination lights
- 131 L.H. direction indicator warning lights
- 132 R.H. direction indicator warning lights
- 426 Voltage stabiliser

Interconnection points to the main wiring diagram are shown by a number within a triangle whilst interconnection points between supplementary circuits are shown by a number within a diamond.

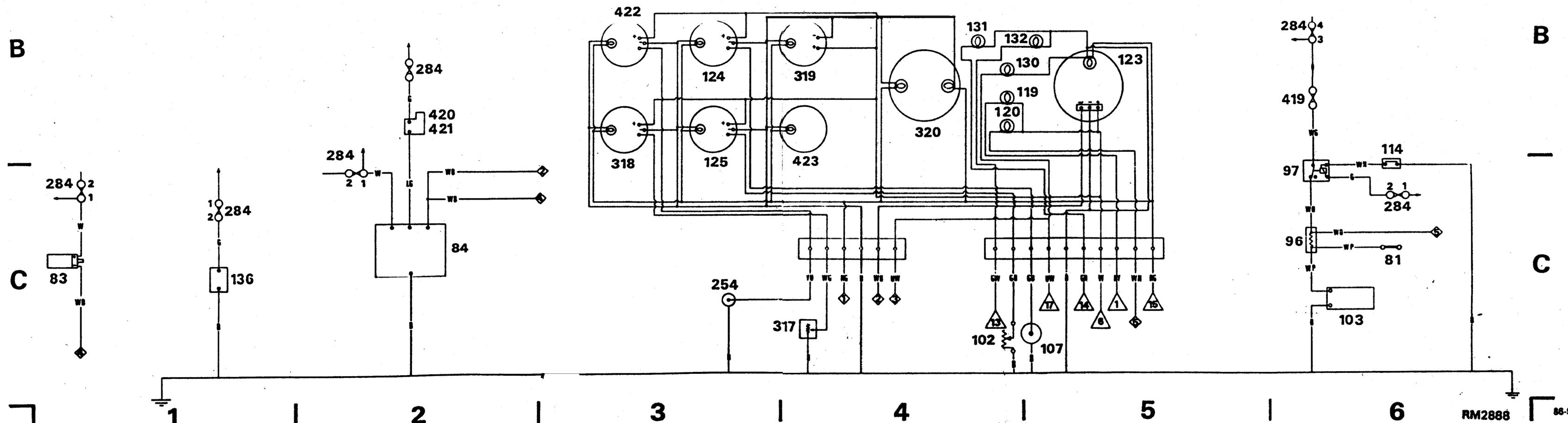
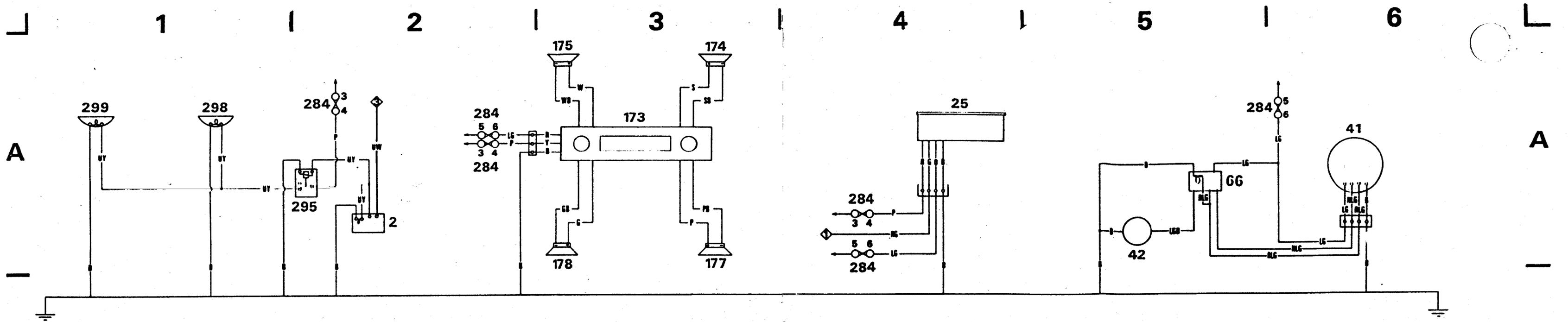
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**Connection Chart - Turbo Models**

<b>No.</b>	<b>Grid reference</b>	<b>Supplementary to Main Wiring Diagram Connections.</b>
1.	C5	Alternator - Ignition/no charge warning lamp
6.	C5	Lighting switch - Panel warning lamps
13	C4	Hazard warning circuit - Direction indicator warning lamps.
14	C5	Direction indicator circuit - Direction indicator warning lamps.
15	C5	Side lamp circuit - Panel illumination lamps.
17	C5	Headlamp main beam circuit - Main beam warning lamp.

## KEY TO SUPPLEMENTARY WIRING DIAGRAM - TURBO MODELS

No.	Description	Grid reference
2.	Lighting switch	A2
25.	Clock	A4
41.	Rear wiper motor	A6
42.	Rear washer pump	A5
66.	Rear wash/wipe switch	A5
81.	Starter solenoid	C6
83.	Ignition coil	C1
84.	E.C.U.	C2
96.	In-line resistor	C6
97.	Fuel pump relay	C6
102.	Fuel tank sender unit	C4
103.	Fuel pump	C6
107.	Coolant thermistor	C4
114.	Oil pressure switch	B6
119.	Ignition warning lamp	B4
120.	Oil pressure warning lamp	B4
123.	Tachometer	B5
124.	Coolant temperature gauge	B3
125.	Fuel gauge	B3
130.	Main beam warning lamp	B4
131.	L.H. direction indicator warning lamp	B4
132.	R.H. direction indicator warning lamp	B4
136.	Carburettor vent valve	C1
173.	Radio/cassette player	A3
174.	R.H. front door speaker	A3
175.	L.H. front door speaker	A3
177.	R.H. rear door speaker	A3
178.	L.H. rear door speaker	A3
254.	Oil temperature sensor	C3
284.	Fuse (fusebox)	A2, A4, A6, B2, B6, C1, C6
295.	Lighting relay	A2
298.	R.H. Driving/Fog lamp	A1
299.	L.H. Driving/Fog lamp	A1
317.	Oil pressure transducer	C4
318.	Oil pressure gauge	B3
319.	Voltage gauge	B4
320.	Speedometer	B4
419.	Line fuse - 15A	B6
420.	Pressure reducing valve	B2
421.	Pressure reducing valve solenoid	B2
422.	Oil temperature gauge	B3
423.	Boost gauge	B4



## CLOCK

Remove and refit - Turbo only 88.15.07

### Removing

1. Disconnect the battery.
2. Remove the screws securing the clock and switch panel to the heater unit.
3. Remove the heater air distribution knob and release the panel from the bracket.
4. Disconnect the multi-plug from the clock.
5. Release the clock from the panel; recover the retaining plate.

### Refitting

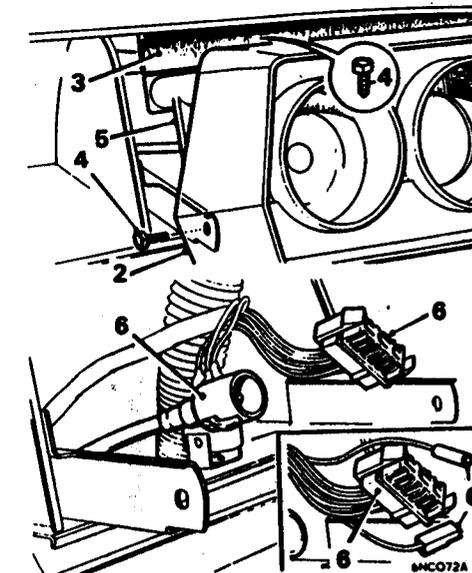
6. Reverse operations 1 to 5.
7. Ensure that clock is operating and set to the correct time.

## INSTRUMENT HOUSING (Twin and Triple Instrument Pack)

Remove and refit 88.20.13

### Removing

1. Disconnect the battery earth cable.
2. Holding both ends of the instrument nacelle, pull it away from the instrument pack.
3. Remove the plastic trim strip to obtain access to upper screws retaining the instrument pack.
4. Remove the four screws retaining the instrument pack.
5. Ease the instrument pack outwards, press in the speedometer cable release lever and disconnect the cable from the instrument.
6. Disconnect the multi-connector plug and the two wiring connectors from the tachometer.
7. Remove the instrument pack and tachometer unit as an assembly; take care not to damage the printed circuit retaining the two units

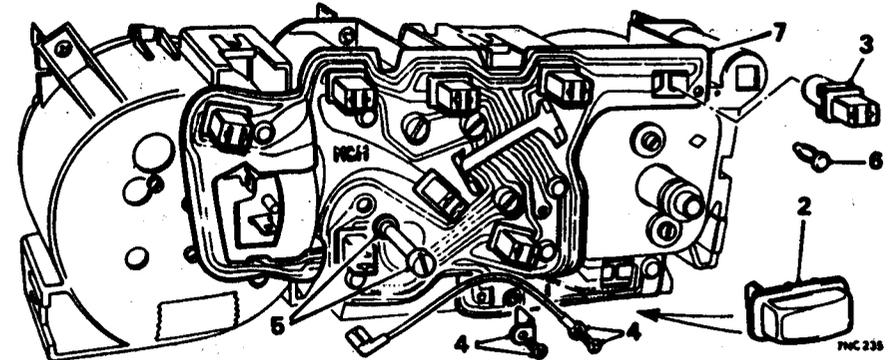


together.

**CAUTION:** To avoid damage to the damping mechanism, instrument packs or gauges fitted with integral voltage stabilisers must never be left face downwards.

### Refitting

8. Reverse the procedure in 1 to 7, noting the following:
  - a. Ensure that the speedometer cable is fully engaged in the instrument.
  - b. Engage the instrument nacelle onto the instrument pack clips before pushing it fully home.



## PRINTED CIRCUIT (Twin and Triple Instrument Pack with externally Mounted Voltage Stabiliser)

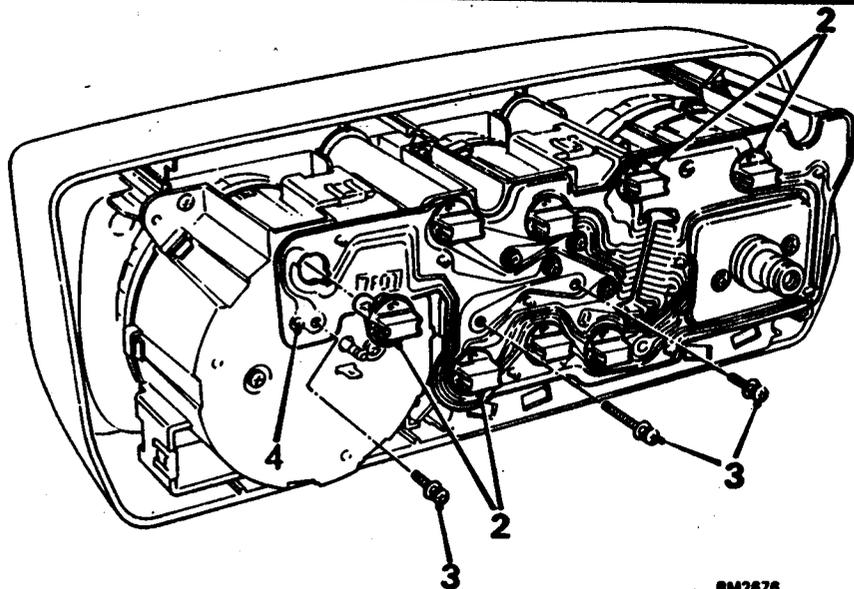
Remove and refit 88.20.19

### Removing

1. Remove the instrument housing, see 88.20.13.
2. Remove the voltage stabilizer.
3. Withdraw the warning lamp and panel lamp bulb holders from the instrument pack.
4. Remove the three screws and the voltage stabilizer tag connections; note the tachometer wire connection.
5. Remove the four sleeve screws and washers retaining the fuel and temperature gauge units.
6. Carefully prise up and remove the plastic retaining pegs.
7. Remove the printed circuit.

### Refitting

8. Reverse the procedure in 2 to 7.
9. Refit the instrument housing, see 88.20.13



RM2676

### PRINTED CIRCUIT (Twin and Triple Instrument Pack with Integral Voltage Stabilizer)

Remove and refit 88.20.19

#### Removing

1. Remove the instrument housing, see 88.20.13
2. Withdraw the warning lamp and panel lamp bulb holders from the instrument pack.
3. Noting their fitted positions, withdraw the long and short screws securing the printed circuit to the instrument pack.
4. Carefully prise the printed circuit off the locating pegs.

#### Refitting

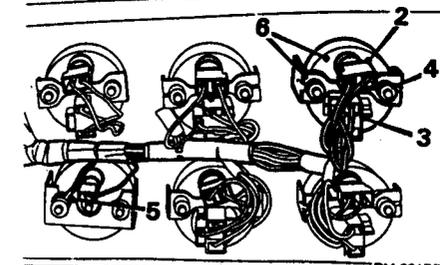
5. Reverse the procedure in 1 to 4.
6. Refit the instrument housing, see 88.20.13

### AUXILIARY GAUGE

Remove and refit - Turbo only 88.25.01

#### Removing

1. Withdraw the fascia panel to obtain access to the instruments, see 76.46.23.
2. Disconnect the multi-plug from the instrument illumination lamp.
3. Disconnect the multi-plug from the instrument.
4. Remove the knurled nut securing the instrument retaining strap.
5. Release the earth lead from the stud - vacuum gauge only.
6. Remove the retaining strap; withdraw the instrument from the panel.



RM 2917

#### Refitting

7. Reverse operations 1 to 6.
8. Road/roller test and check the gauge(s) for correct operation.

### COOLANT TEMPERATURE GAUGE

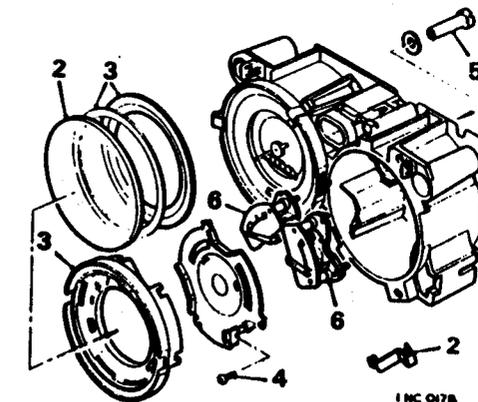
(Twin and Triple Instrument Pack  
with Externally Mounted Voltage  
Stabiliser)

Remove and refit 88.25.14

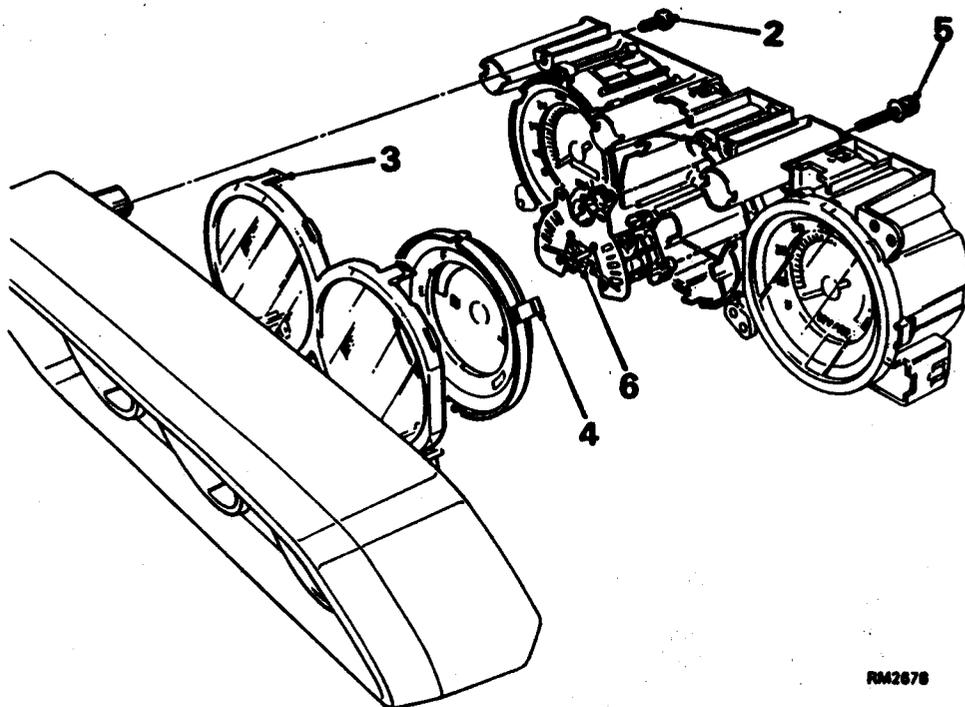
Fuel gauge 88.25.26

#### Removing

1. Remove the instrument housing, see 88.20.13.
2. remove the clips retaining the instrument glass and remove the glass.
3. Remove the sealing ring, slip-ring and lift out the printed face plate.
4. Remove the three small screws and remove the instruments face plate.
5. Remove the relevant two screws from the back of the instrument pack to release a gauge.
6. Remove the fuel or temperature gauge as applicable.



INC 0178



### COOLANT TEMPERATURE AND FUEL GAUGES (Twin and Triple Instrument Pack with Integral Voltage Stabiliser)

Remove and refit 88.25.14

#### Removing

1. Remove the instrument housing, see 88.20.13.
2. Remove the screws securing the instrument pack to the housing.
3. Depress each of the transparent spring clips in turn and carefully withdraw the lens.

**Note:** The tachometer lens is separate on triple instrument packs and need not be removed.

4. Depress each of the black spring clips in turn and withdraw the instrument face plate.
5. Remove the four screws and washers securing the gauge unit to the instrument pack; withdraw the unit.

#### Refitting

6. Prior to fitting, check the condition of the gauge wiring paying particular attention to the voltage stabiliser wire.
7. Reverse the procedure in 1 to 5.
8. Refit the instrument housing, see 88.20.13.

### FUEL GAUGE

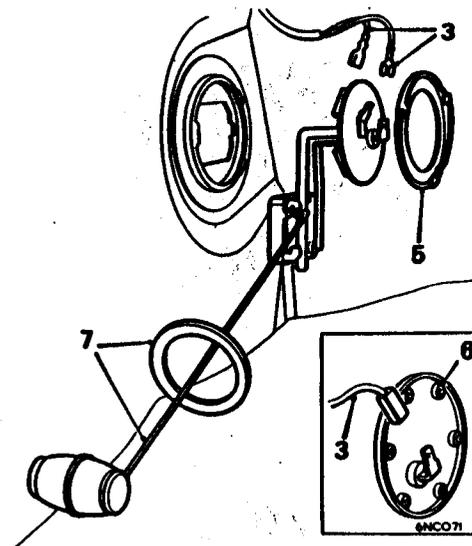
Remove and refit - 850 and 1000 88.25.26

#### Removing

1. Remove the speedometer, see 88.30.01.
2. Remove the two screws retaining the fuel gauge to the speedometer.
3. Remove the fuel gauge.

#### Refitting

4. Reverse the procedure in 1 to 3.



### FUEL GAUGE TANK UNIT

Remove and refit - Saloon 1, 3, 5 and 7 Estate 1 to 4, 6 and 7 88.25.32

**Service tool:** 18G 1001

#### Removing

1. Pump or syphon the fuel out of the fuel tank.

2. Raise the rear of the vehicle and support both sides.
3. Disconnect the wires from the gauge unit.
4. Remove the fuel tank, see 19.55.01 (Not Saloon).
5. Using tool 18G 1001 unscrew the fuel tank gauge unit locking ring.
6. Estate, Van, Pick-up: Remove the screws securing the fuel tank gauge unit.
7. Remove the fuel tank gauge unit and sealing ring.

#### Refitting

8. Reverse the procedure in 1 to 7, as applicable, fitting a new sealing ring or joint washer.

## SPEEDOMETER

Remove and refit - 850

88.30.01

### Removing

1. Remove the air cleaner assembly, see 'MAINTENANCE'.
2. Remove the sound insulation from the speedometer aperture.
3. Unscrew the knurled nut and disconnect the speedometer cable.
4. Disconnect the wires from the voltage stabilizer and fuel gauge.
5. Remove the bulb holders from the speedometer.
6. Disconnect the earth wire.
7. Remove the two screws securing the speedometer to the instrument cowl.
8. Remove the speedometer from the vehicle through the aperture in the bulkhead.

### Refitting

9. Reverse the procedure in 1 to 8.

## SPEEDOMETER

(Twin and Triple Instrument Pack with Externally Mounted Voltage Stabiliser)

Remove and refit - 100

88.30.01

Oil pressure gauge 1 to 11

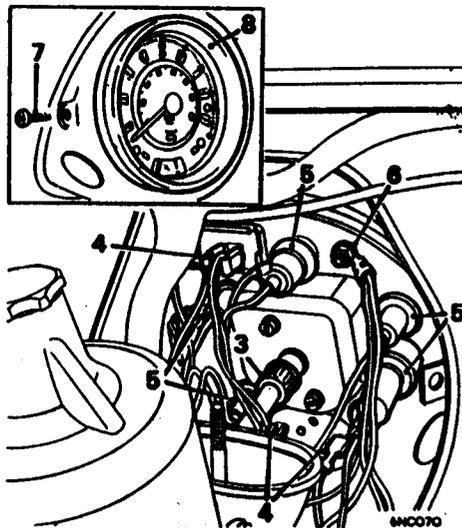
88.25.01

Coolant temperature gauge 1 to 9 and 11

88.25.14

### Removing

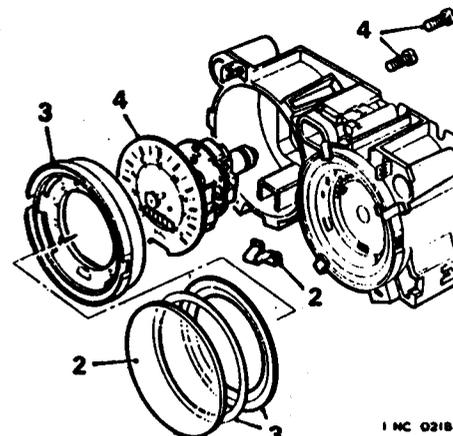
1. Remove the dash liners.
2. Fold back the parcel tray cover at the instrument housing.
3. Slacken the heater rear securing nut, remove the two retaining screws and lower the heater.
4. Remove the instrument housing securing screws.
5. Remove the air cleaner assembly, see 'MAINTENANCE'.
6. Disconnect the speedometer cable.



7. Remove the clip retaining the oil pressure gauge pipe to the bulkhead.
8. Pull the instrument housing forward and disconnect the wires and bulb holders from the gauges.
9. Disconnect the gauge earth wire.
10. Disconnect the oil pressure gauge pipe.
11. Remove the knurled nut and bridge piece and withdraw the gauge from the instrument housing.
12. Disconnect the wires and bulb holders from the speedometer.
13. Disconnect the speedometer earth wire.
14. Remove the instrument housing from the fascia.
15. Remove the two screws securing the speedometer to the housing.
16. Withdraw the speedometer and sealing ring.

### Refitting

17. Reverse the procedure in 1 to 16 as necessary.



## SPEEDOMETER

Remove and refit - Clubman, 1275 GT and 'Special'

88.30.01

### Removing

1. Remove the instrument housing, see 88.20.13.
2. Remove the clips and lift out the instrument glass.
3. Remove the sealing ring, slip-ring, and printed face plate.
4. Remove the two screws from the back of the instrument pack and lift out the speedometer.

### Refitting

5. Reverse the procedure in 2 to 4.
6. Refit the instrument housing, see 88.20.13.

## SPEEDOMETER/TACHOMETER

Remove and refit - Turbo only

Speedometer

88.30.01

Tachometer

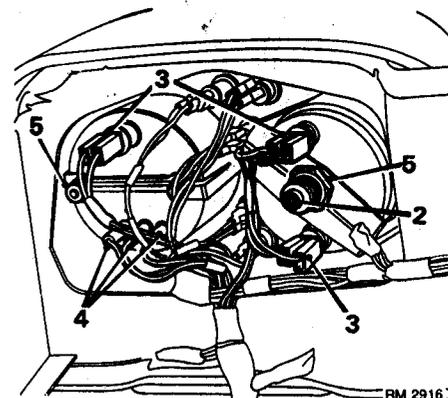
88.30.21

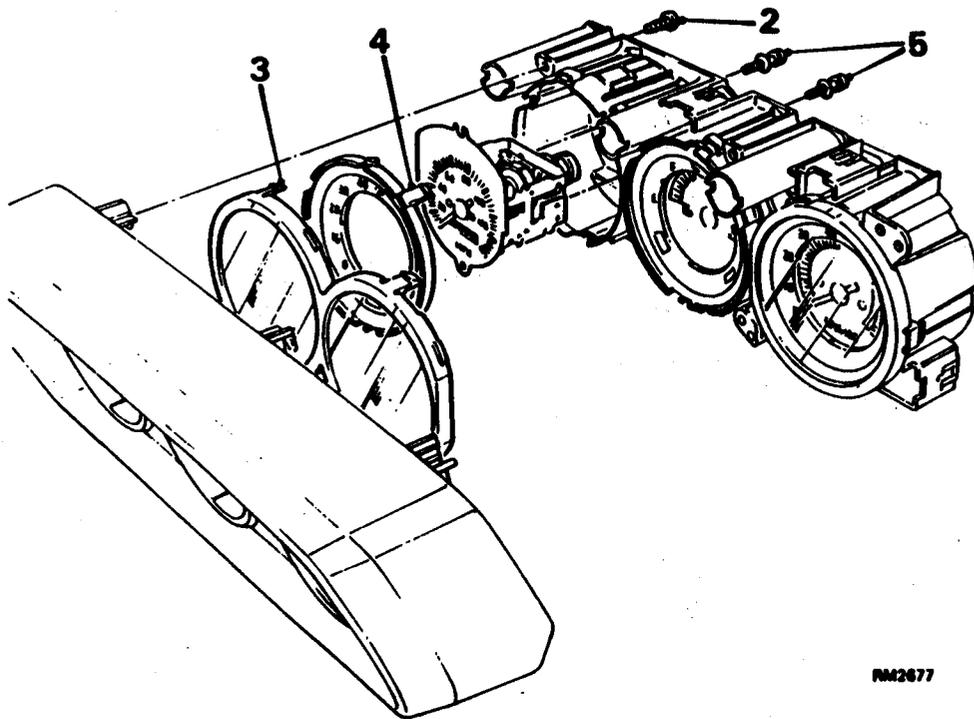
### Removing

1. Withdraw the fascia panel to obtain access to instruments, see 76.46.23.
2. Disconnect the speedometer cable - speedometer only.
3. Disconnect the multi-plug from the instrument illumination lamp.
4. Note the fitted positions and remove the three connectors from the tachometer.
5. Remove the knurled nut(s) securing the instrument retaining strap.
6. Release the retaining strap; withdraw the instrument from the panel.

### Refitting

7. Reverse the procedure in 1 to 6.
8. Road test the car and check the speedometer/tachometer for correct operation.





RM2677

**SPEEDOMETER  
(Twin and Triple Instrument Pack  
with Integral Voltage Stabiliser)**

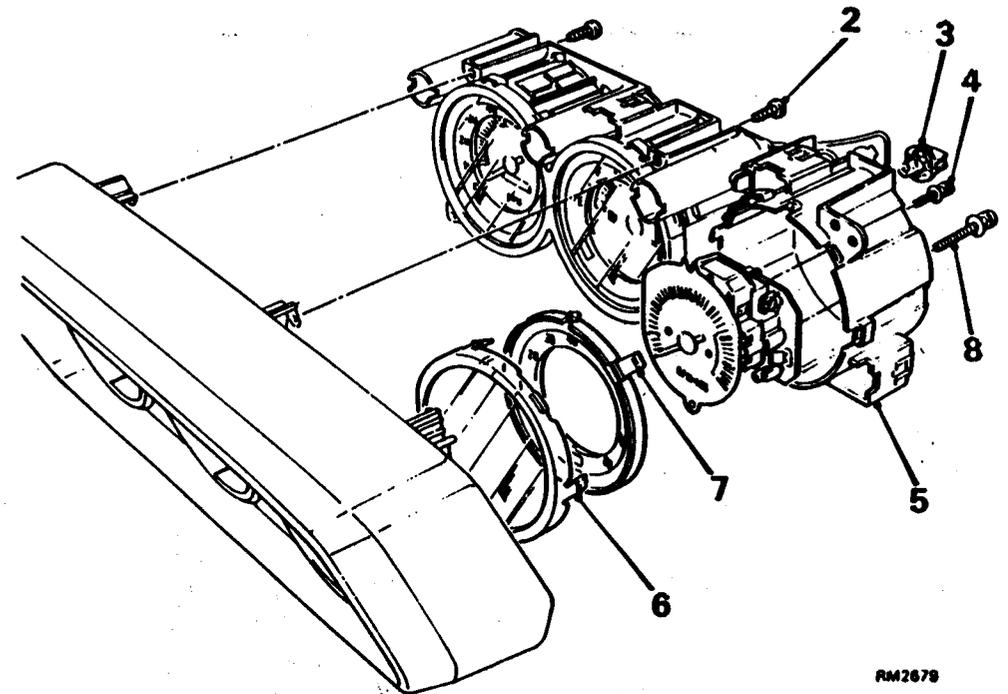
Remove and refit 88.30.01

**Removing**

1. Remove the instrument housing, see 88.20.13.
2. Remove the screws securing the instrument pack to the housing.
3. Depress each of the transparent spring clips in turn and carefully withdraw the lens.

*Note: The tachometer lens is separate on triple instrument packs and need not be removed.*

4. Depress each of the black spring clips in turn and withdraw the instrument face plate.



RM2678

**TACHOMETER  
(Triple Instrument Pack with  
Integral Voltage Stabiliser)**

Remove and refit 88.30.21

**Removing**

1. Remove the instrument housing, see 88.20.13.
2. Remove the screws securing the instrument pack to the housing.
3. Remove the panel lamp bulb holder from the rear of the tachometer housing.
4. Remove the screw and washers securing the printed circuit to the tachometer housing.
5. Slide the tachometer housing from the instrument pack.

5. Remove the screws and washers securing the speedometer to the instrument pack; withdraw the speedometer.

*CAUTION: Damage to the damping mechanism will result if the speedometer is left laying face downwards.*

**Refitting**

6. Reverse the procedure in 1 to 5.
7. Refit the instrument housing, see 88.20.13.

6. Depress each of the transparent spring clips in turn and carefully withdraw the lens.
7. Depress each of the black spring clips in turn and withdraw the instrument face plate.
8. Remove the screws and washers securing the tachometer to the housing; withdraw the unit.

#### Refitting

9. Reverse the procedure in 1 to 8.
10. Refit the instrument housing, see 88.20.13.

### SPEEDOMETER CABLE ASSEMBLY

Remove and refit  
- 850 and 1000

88.30.06

#### Removing

1. Remove the air cleaner assembly, see 'MAINTENANCE'.
2. Unscrew the knurled nut and disconnect the speedometer cable from the drive pinion on the gearbox.
3. Unscrew the knurled nut and disconnect the speedometer cable from the speedometer.
4. Release the speedometer cable from the retaining clip on the bulkhead.
5. Remove the speedometer cable from the engine compartment.

#### Refitting

6. Reverse the procedure in 1 to 5.

### SPEEDOMETER CABLE ASSEMBLY

Remove and refit - Clubman,  
1275 GT and 'Special'

88.30.06

#### Removing

1. Remove the instrument housing, see 88.20.13.
2. Pull the cable through the bulkhead into the engine compartment.
3. Unscrew the knurled nut and disconnect the speedometer cable from the drive pinion on the gearbox.
4. Release the speedometer cable from the retaining clip on the bulkhead and withdraw the speedometer cable from the vehicle.

#### Refitting

5. Reverse the procedure in 2 to 4.
6. Refit the instrument housing, see 88.20.13.

### SPEEDOMETER CABLE

Remove and refit - Turbo only

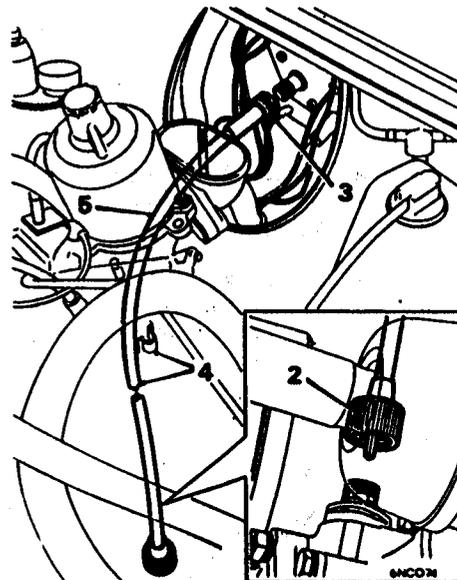
88.30.06

#### Removing

1. Withdraw the fascia panel to obtain access, see 76.46.23.
2. Raise the front of the vehicle and support it on stands.
3. Remove the left hand front road wheel.
4. Unscrew the knurled nut and disconnect the cable from the gearbox.
5. Release the speedometer cable grommet from the bulkhead.
6. Disconnect the cable from the speedometer.
7. From inside the car, feed the cable through the bulkhead.
8. Note the run of the cable in the vicinity of the turbocharger; withdraw the cable.

#### Refitting

9. Reverse the procedure in 1 to 8; ensure that the cable is routed correctly and that it is not kinked or twisted.
10. Road test the car and check the speedometer for correct operation.



### TACHOMETER (Triple Instrument Pack with Externally Mounted Voltage Stabiliser)

Remove and refit - 1275 GT  
and 'Special'

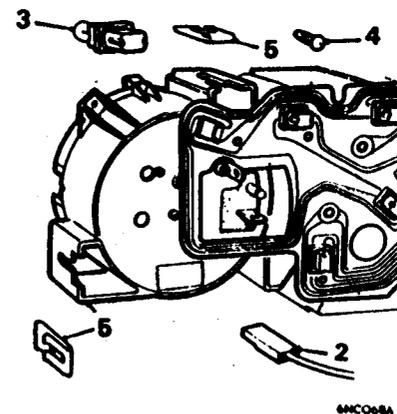
88.30.21

#### Removing

1. Remove the instrument housing, see 88.20.13.
2. Disconnect the voltage stabiliser wire.
3. Remove the bulb holder.
4. Carefully prise up the printed circuit retaining pegs to release the circuit from the tachometer.
5. Remove the spring clips from the tachometer casing to fit onto the replacement unit.

#### Refitting

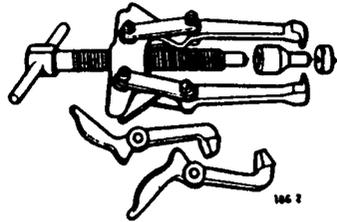
6. Reverse the procedure in 2 to 5.
7. Refit the instrument housing, see 88.20.13.



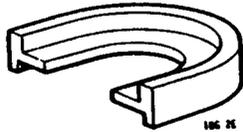
## SERVICE TOOLS

All Service Tools mentioned in this Manual must be obtained direct from the tool manufacturers:

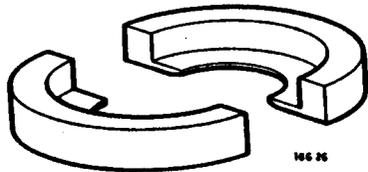
Messrs V L Churchill & Co Ltd  
P O Box No 3  
London Road  
Daventry  
Northants NN11 4NF  
England



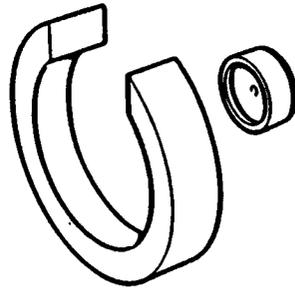
**18G 2**  
Pulley Remover - Basic Tool



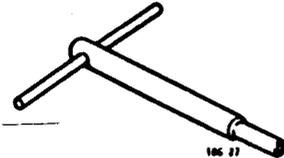
**18G 2E**  
Steering Wheel Remover - Adaptor



**18G 2G**  
Differential Shaft Bearing Remover  
Adaptor



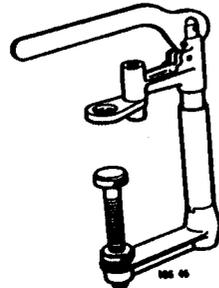
**18G 2-2**  
Steering Wheel Remover Adaptor



**18G 27**  
Valve Seat Cutter and Pilot Handle



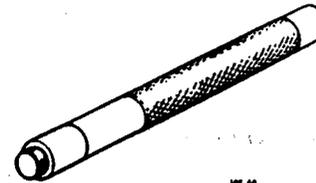
**18G 29**  
Valve Grinding-in Tool



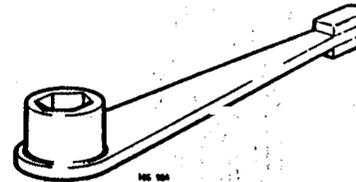
**18G 45**  
Valve Spring Compressor



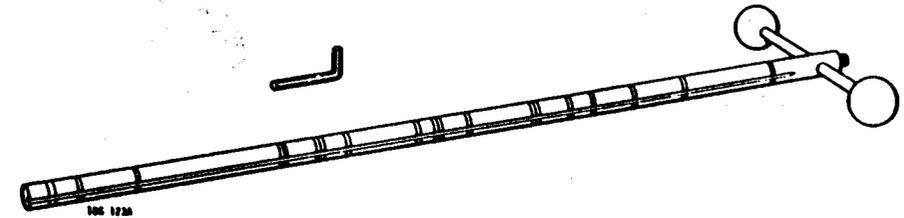
**18G 55A**  
Piston Ring Compressor



**18G 69**  
Oil Pump Release Valve Grinding-in  
Tool



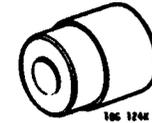
**18G 98A**  
Starting Nut Spanner



**18G 124A**  
Camshaft Liner Remover/Replacer -  
Basic Tool



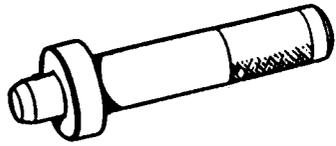
**18G 124B**  
Camshaft Liner Remover/Replacer - Ad-  
aptor



**18G 124K**  
Camshaft Liner Remover/Replacer - Ad-  
aptor



**18G 124M**  
Camshaft Liner Remover/Replacer - Ad-  
aptor



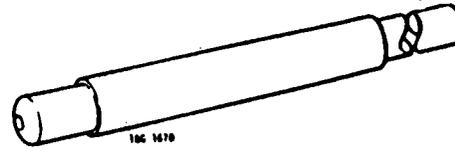
18G 134

**18G 134**  
Bearings and Oil Seal Replacer - Basic Tool



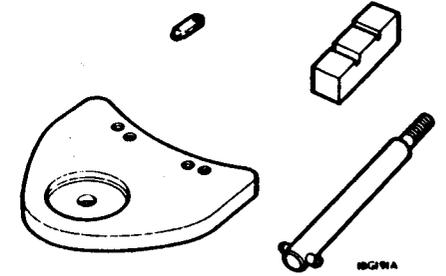
18G 167

**18G 167**  
Valve Seat Finishing Cutter



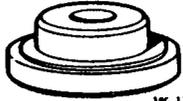
18G 167D

**18G 167D**  
Valve Seat Cutter Pilot



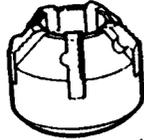
18G 191A

**18G 191A**  
Input Gear Setting Plate



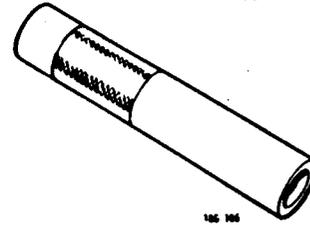
18G 134BC

**18G 134BC**  
Crankshaft Primary Gear Oil Seal Replacer - Adaptor



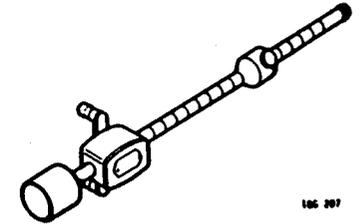
18G 167A

**18G 167A**  
Valve Seat Glaze Breaker



18G 186

**18G 186**  
Third Motion Shaft Bearing Replacer



18G 207

**18G 207**  
Bearing Preload Gauge



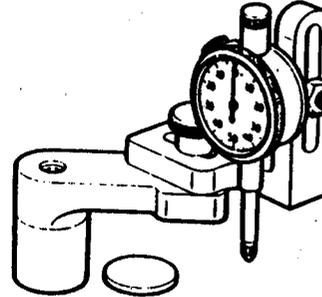
18G 134BD

**18G 134BD**  
Timing Case Oil Seal Replacer - Adaptor



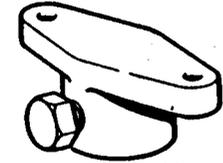
18G 167B

**18G 167B**  
Valve Seat Narrowing Cutter - I



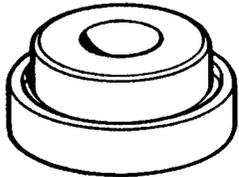
18G 191

**18G 191**  
Input Gear Setting Gauge



18G 207A

**18G 207A**  
Steering Rack Pinion Preload Adaptor



18G 134DO

**18G 134DO**  
Swivel Hub Oil Seal Replacer - Adaptor



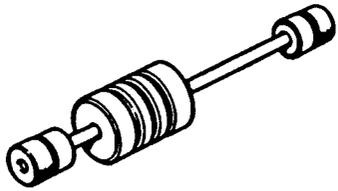
18G 167C

**18G 167C**  
Valve Seat Narrowing Cutter - Top



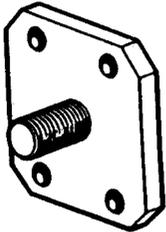
18G 257

**18G 257**  
Circlip Pliers - Large



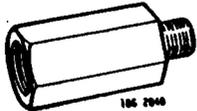
18G

**18G 284**  
Impulse Extractor - Basic Tool



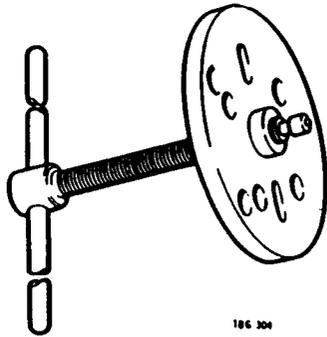
18G 284-4

**18G 284-4**  
Differential Driving Flange Remover - Adaptor (Automatic Gearbox)



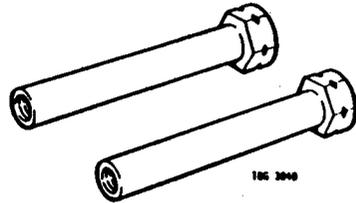
18G 284B

**18G 284B**  
First Motion Shaft Remover



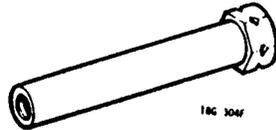
18G 304

**18G 304**  
Front and Rear Hub Remover - Basic Tool



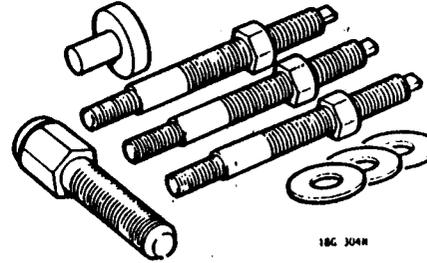
18G 304B

**18G 304B**  
Hub Remover Bolts - Adaptor 7/16" UNF



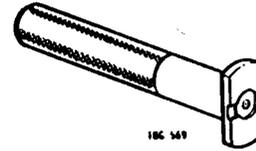
18G 304F

**18G 304F**  
Hub Remover Bolts - Adaptor 3/8" UNF



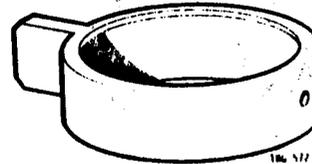
18G 304N

**18G 304N**  
Flywheel and Clutch Remover - Adaptors



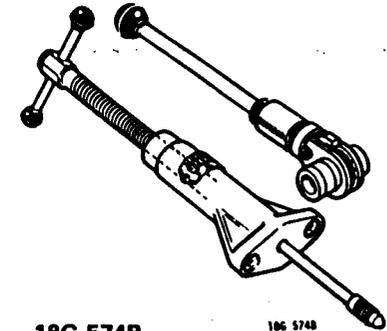
18G 569

**18G 569**  
First Motion Shaft Bearing Circlip Gauge



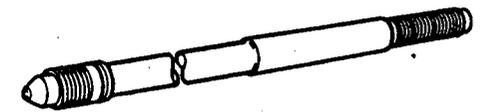
18G 572

**18G 572**  
Synchromesh Unit Assembly Ring

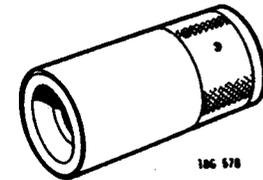


18G 574B

**18G 574B**  
Suspension Rubber Spring Compressor

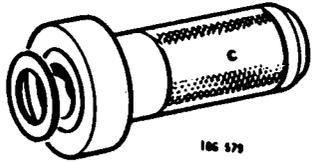


**18G 574-1**  
Suspension Rubber Spring Compressor Adaptor (14mm thread)



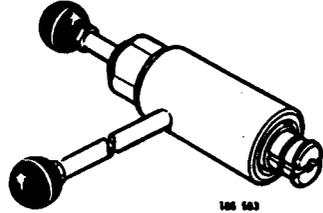
18G 578

**18G 578**  
Differential Bearing Replacer



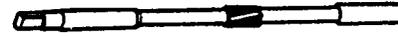
18G 579

**18G 579**  
First and Third Motion Shaft Replacer



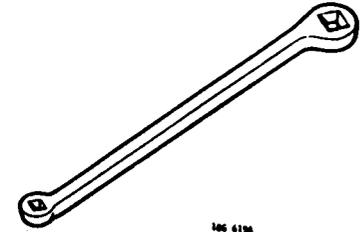
18G 583

**18G 583**  
Rear Radius Arm Bush Remover



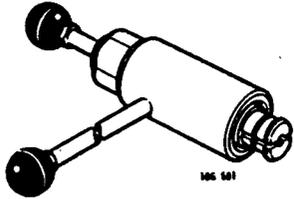
18G 588

**18G 588**  
Rear Radius Arm Bush Reamer



18G 619A

**18G 619A**  
Brake Adjusting Spanner



18G 581

**18G 581**  
Front Suspension and Idler Gear Needle Bearing Remover



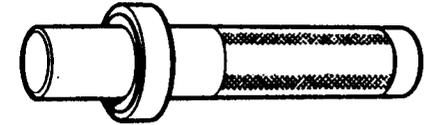
18G 583B

**18G 583B**  
Rear Radius Arm Needle Bearing Remover - Adaptor



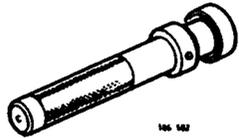
18G 588A

**18G 588A**  
Rear Radius Arm Bush Reamer Guide



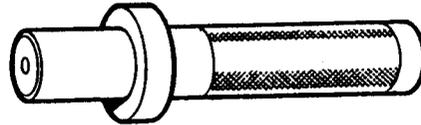
18G 620

**18G 620**  
Rear Radius Arm Needle Bearing Replacer



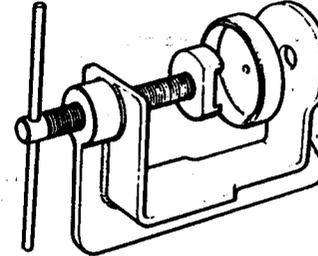
18G 582

**18G 582**  
Front Suspension and Idler Gear Bearing Replacer



18G 584

**18G 584**  
Rear Radius Arm Bush Replacer



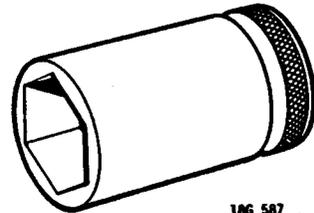
18G 590

**18G 590**  
Disc Brake Resetting Tool



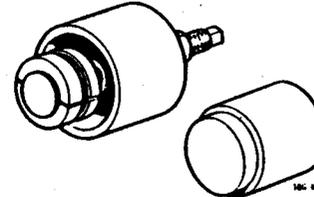
18G 677C

**18G 677C**  
Pressure Test Equipment-Adaptor



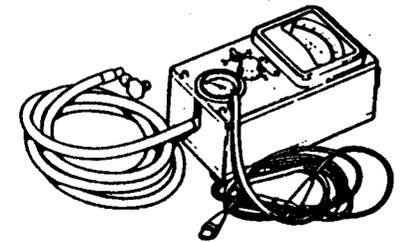
18G 587

**18G 587**  
Swivel Hub Ball - Pin Socket



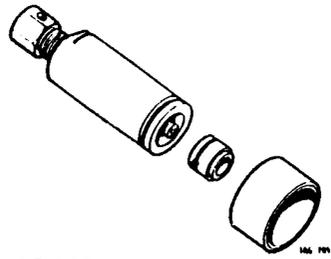
18G 617C

**18G 617C**  
Flywheel Housing Bearing (First Motion Shaft) Outer Race Remover/ Replacer

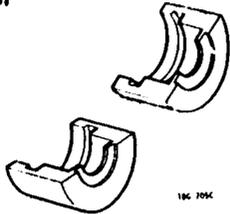


18G 677ZC

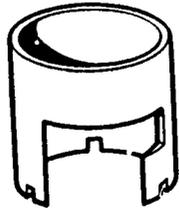
**18G 677ZC**  
Pressure Test Equipment



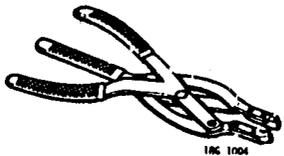
**18G 705**  
Bearing Race Centre Remover - Basic Tool



**18G 705C**  
Bearing Race Centre Remover - Adaptor



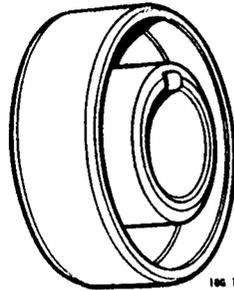
**18G 1001A**  
Petrol Gauge Tank Attachment Spanner



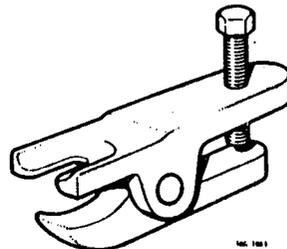
**18G 1004**  
Circlip Pliers - Small



**18G 1043**  
Crankshaft Primary Gear Oil Seal Protector



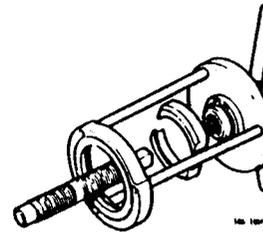
**18G 1044**  
Engine Front Cover Centralizer



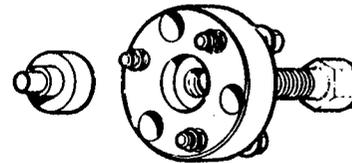
**18G 1063**  
Steering Arm and Swivel Hub Ball Pin Remover



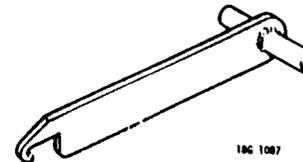
**18G 1068A**  
Converter Housing Oil Seal Replacer Adaptor



**18G 1068B**  
Remover Replacer - Basic Tool



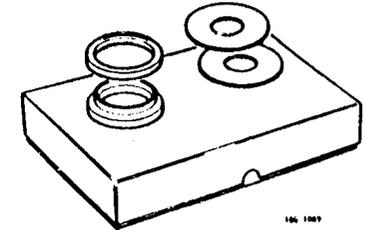
**18G 1086**  
Converter Remover



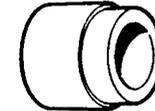
**18G 1087**  
Converter Housing Oil Seal Remover



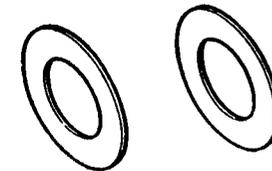
**18G 1088**  
Converter Output Gear Holding Tool



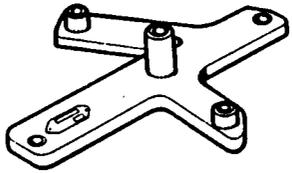
**18G 1089**  
Idler and Input Gear Gauge Kit



**18G 1089A**  
Input Gear Gauge Kit - Adaptor

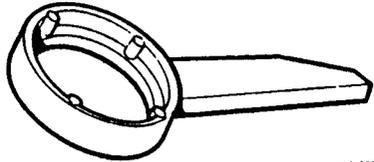


**18G 1089-1**  
Idler Gear Gauge Kit Adaptor



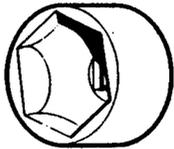
18G 1094

**18G 1094**  
Oil Pump Pipes Positioning Fixture



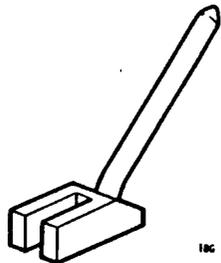
18G 1095

**18G 1095**  
Top and Reverse Clutch Hub Holding Tool



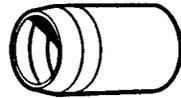
18G 1096

**18G 1096**  
Forward Clutch Hub Nut Socket



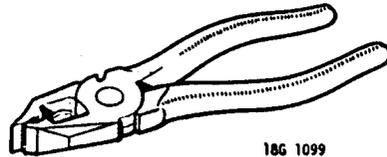
18G 1097

**18G 1097**  
Forward Clutch Retainer



18G 1098

**18G 1098**  
Converter Output Gear Oil Seal Protector



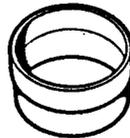
18G 1099

**18G 1099**  
Birfield Joint Boot Retaining Clip Pliers



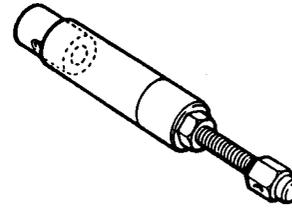
18G 1102

**18G 1102**  
Forward Clutch Piston Seal Replacer



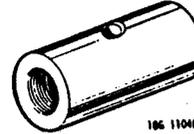
18G 1103

**18G 1103**  
Reverse Clutch Piston Seal Replacer



18G 1104

**18G 1104**  
Front Hub and Drive Flange Assembly Replacer



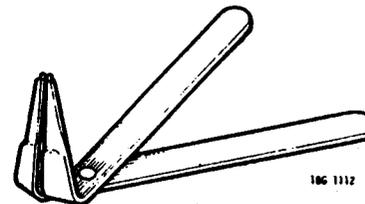
18G 1104B

**18G 1104B**  
Front Hub Replacer - Adaptor



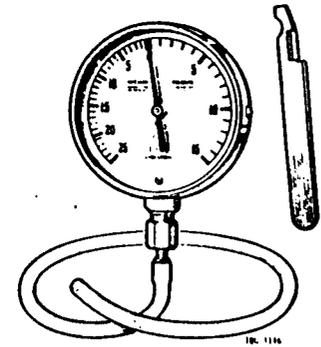
18G 1106

**18G 1106**  
Governor Housing Centralizer



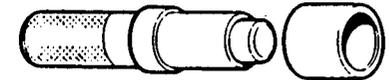
18G 1112

**18G 1112**  
Circlip Pliers



18G 1116

**18G 1116**  
Fuel Pump Test



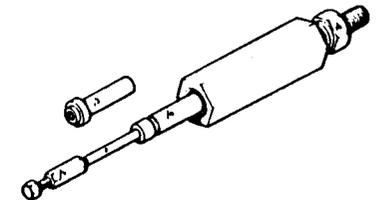
18G 1126

**18G 1126**  
Idler Gear Bearing Replacer



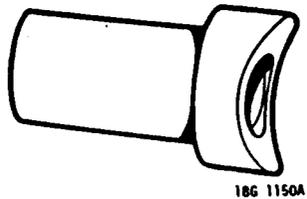
18G 1127

**18G 1127**  
Third Motion Shaft Bearing Replacer

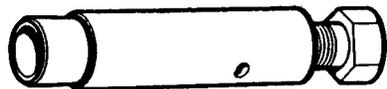


18G 1150

**18G 1150**  
Gudgeon Pin Remover and Replacer  
Basic Tool



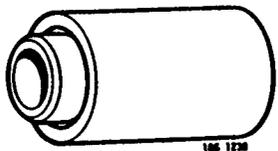
18G 1150A  
Gudgeon Pin Remover/Replacer - Adaptor



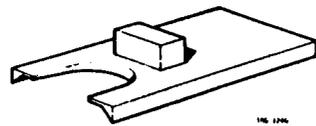
18G 1191  
Steering Column Upper Bush Remover/Replacer



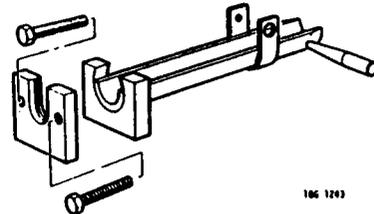
18G 1236  
Selector Shaft Seal Protector and Replacer



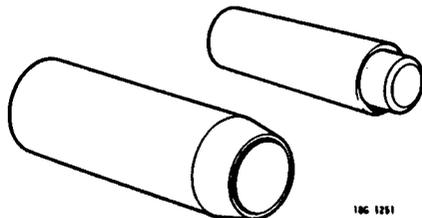
18G 1238  
Differential End Cover Seal Replacer



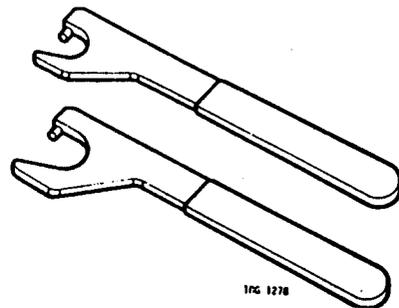
18G 1240  
Drive Shaft Assembly Remover



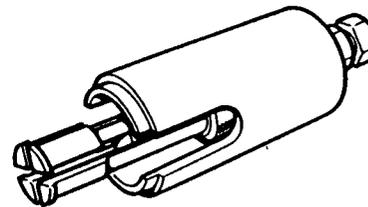
18G 1243  
Separator Drive Shaft From Inboard Joint



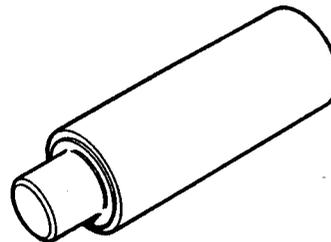
18G 1251  
Inboard Joint Boot Retaining Clip Fitting Tool



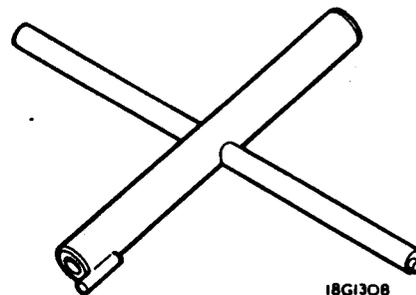
18G 1278  
Steering Rack Ball Joint Spanners



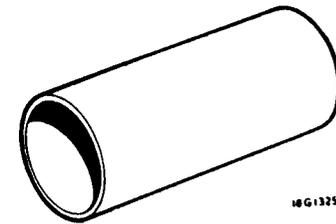
18G 1288  
Idler Gear Bearing Remover



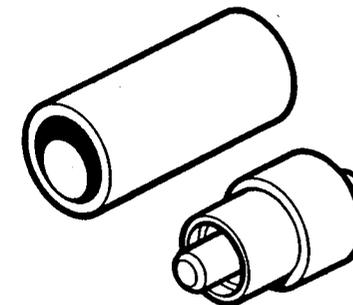
18G 1289  
Idler Gear Bearing Replacer



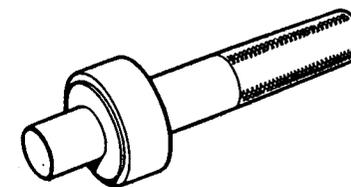
18G 1308  
Ducellier Distributor Adjustment Tool



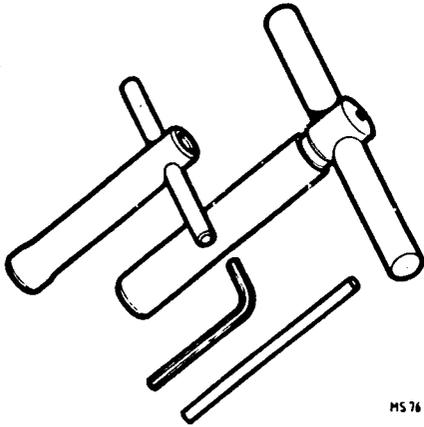
18G 1325  
Clutch Throw-out Bearing Retaining Ring Replacer



18G 1330  
Hub Bearing Replacer

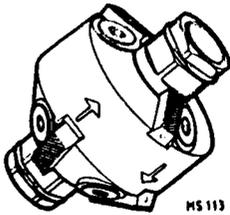


18G 1338  
Idler Gear Bearing and Sleeve Assembly Replacer



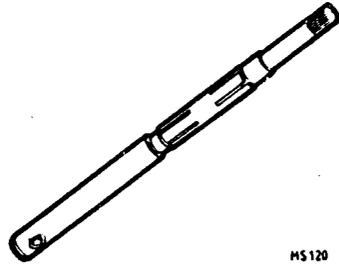
MS 76

**MS 76**  
Basic Handle Set 100-8 Tee Wrench  
(use with MS 113 R and MS120-7). 503  
Tee Wrench (use with all remaining  
cutters). 245 Puller Pin. 240 Hexagon  
Key Wrench 5/64 in



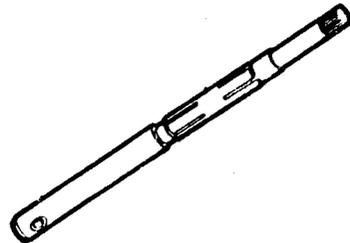
MS 113

**MS 113R**  
Adjustable Cutter - All engines except  
1275 GT



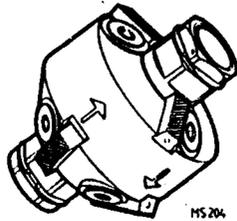
MS 120

**MS 120-7**  
Expandable Pilot - All engines except  
1275 GT



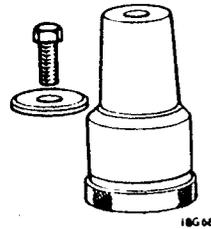
MS 150

**MS 150-7**  
Expandable Pilot - 1275 GT engine only



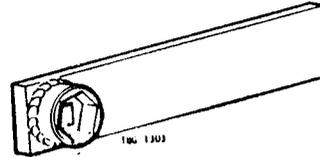
MS 204

**MS 204**  
Adjustable Cutter - 1275 GT engine  
only



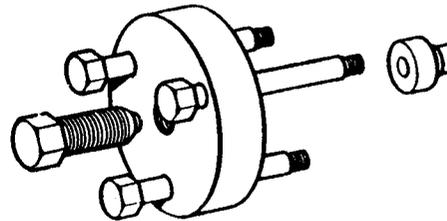
18G 684

**18G 684**  
Clutch Centralizer



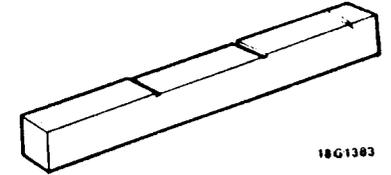
18G 1303

**18G 1303**  
Crankshaft nut spanner



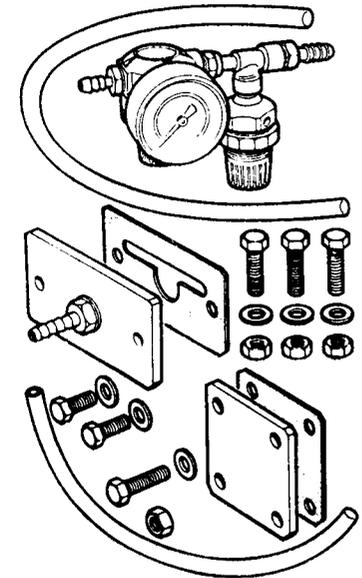
18G 1381

**18G 1381**  
Flywheel and clutch remover



18G 1383

**18G 1383**  
Idler gear thrust washer gauge



18G 1462

**18G 1462**  
Pressure test equipment