BY APPOINTMENT TO
HER MAJESTY QUEEN ELIZABETH II
MANUFACTURERS OF DAIMLER AND JAGUAR CARS
JAGUAR CARS LIMITED COVENTRY ENGLAND

BY APPOINTMENT TO
HER MAJESTY QUEEN ELIZABETH
THE QUEEN MOTHER
MANUFACTURERS OF DAIMLER AND JAGUAR CARS
JAGUAR CARS LIMITED COVENTRY ENGLAND

BY APPOINTMENT TO
HIS ROYAL HIGHNESS THE PRINCE OF WALES
MANUFACTURERS OF DAIMLER AND JAGUAR CARS
JAGUAR CARS LIMITED COVENTRY

SERIES III
SERVICE MANUAL

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Introduction

The Service Manual covers the Jaguar and Daimler Series III range of vehicles. It is primarily designed to assist skilled technicians in the efficient repair and maintenance of Jaguar vehicles.

Using the appropriate service tools and carrying out the procedures will enable the operations to be completed within the time stated in the 'Repair Operations Times'.

The Service Manual has been produced in one loose leaf book; this allows pages to be updated periodically when modifications and improvements occur.

The table of contents following this introduction lists the major components and systems together with the section in which they are contained. Each section starts with a list of operations in alphebetical order.

Operation Numbering

A master index of numbered operations has been compiled for universal application to all vehicles manufactured by Jaguar Cars Limited, and therefore, because of the different specifications of various models, continuity of the numbering sequence is not maintained throughout this manual.

Each operation described in this manual is allocated a number from the master index and cross-refers with an identical number in the 'Repair Operation Times'. The number consists of six digits arranged in three pairs.

Each operation is laid out in the sequence required to complete the operation in the minimum time, as specified in the 'Repair Operation Times'.

Service Tools

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. A list of all necessary tools is included in Section 11.

References

References to the left or right-hand side of the vehicle are made when viewing from the rear. With the engine and gearbox assembly removed, the timing cover end of the engine is referred to as the front. A key to abbreviations and symbols is given in Section 01.

REPAIRS AND REPLACEMENTS

When service parts are required it is essential that only genuine Jaguar/Daimler replacements are used.

Attention is particularly drawn to the following points concerning repairs and the fitting of replacement parts and accessories.

1. Safety features embodied in the vehicle may be impaired if other than genuine parts are fitted. In certain territories, legislation prohibits the fitting of parts not to the vehicle manufacturer's specification.
2. Torque wrench setting figures given in this Service Manual must be strictly adhered.
3. Locking devices, where specified, must be fitted. If the efficiency of the locking device is impaired during removal, it must be replaced.
4. Owners purchasing accessories while travelling abroad, should ensure that the accessory and its fitted location on the vehicle, conform to mandatory requirements exisiting in their country of origin.
5. The vehicle warranty may be invalidated by the fitting of other than genuine Jaguar parts. All Jaguar replacements have the full backing of the factory warranty.
6. Jaguar/Daimler Dealers are obliged to supply only genuine service parts.

SPECIFICATION

Purchasers are advised that the specification details set out in this manual apply to a range of vehicles and not to any one. For the specification of a particular vehicle, purchasers should consult a Jaguar/Daimler dealer.

The Manufacturers reserve the right to vary their specifications with or without notice, and at such times and in such a manner as they think fit. Major as well as minor changes may be involved in accordance with the Manufacturer's policy of constant product improvement.

Whilst every effort is made to ensure the accuracy of the particulars contained in this Manual, neither the Manufacturer or the Dealer, by whom this Manual is supplied, shall in any circumstances be held liable for any inaccuracy or the consequences thereof.

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STANDARDIZED ABBREVIATIONS AND SYMBOLS IN THIS MANUAL

Abbreviation or Symbol	Term
A	Ampere
A.B.D.C.	After bottom dead centre
a.c.	Alternating current
A.F.	Across flats (bolt/nut size)
Ah	Ampere hour
A.T.D.C.	After top dead centre
Atm	Atmospheres
Auto	Automatic transmission
B.A.	British Association (screw thread)
B.B.D.C.	Before bottom dead centre
B.D.C.	Bottom dead centre
b.h.p	Brake horse-power
b.m.e.p.	Brake mean effective pressure
B.S.	British Standards
B.S.F.	British Standard Fine (screw thread)
B.S.P.	British Standard Pipe (thread)
B.S.W.	British Standard Whitworth (screw thread)
B.T.D.C.	Before top dead centre
C	Centigrade (Celsius)
cm	Centimetres
cm^2	Square centimetres
cm^3	Cubic centimetres
c/min	Cycles per minute
CO	Carbon monoxide
cwt	Hundredweight
d.c.	Direct current
deg.	Degree (angle or temperature)
dia.	Diameter
DIN	Deutsche Industrie Norm (Standard)
E.C.U.	Electronic Control Unit
E.G.R.	Exhaust Gas Recirculation
F	Fahrenheit
F.I.	Fuel Injection
Fig	Figure (illustration)
ft	Feet
ft/min	Feet per minute
g	Grammes (mass)
gal	Imperial gallons
gf	Grammes (force)
h.c.	High compression
hp	Horse-power
h.t.	High tension (electrical)
i.dia.	Internal diameter
i.f.s.	Independent front suspension
in	Inches
in^2	Square Inches
in^3	Cubic inches
inHg	Inches of mercury
kg	Kilogrammes (mass)
kgf/cm^2	Kilogrammes per square centimetre
kgf m	Kilogrammes metres
km	Kilometres
km/h	Kilometres per hour
kPa	Kilopascals
k.p.i.	King pin inclination
kV	Kilovolts
kW	Kilowatts
lb	Pounds (mass)
lbf	Pounds (force)
lbf ft	Pounds feet (torque)
lbf/ft^2	Pounds per square foot
lbf in	Pounds inches (torque)
lbf/in^2	Pounds per square inch
l.c.	Low compression
L.H.	Left-hand

Abbreviation or Symbol	Term
L.H.Stg	Left-hand steering
L.H. Thd.	Left-hand thread
l.t.	Low tension (electrical)
M	Metric (screw thread)
m	Metres
max.	Maximum
MES	Miniature Edison Screw
min.	Minimum
mm	Millimetres
mmHg	Millimetres of mercury
m.p.g.	Miles per gallon
m.p.h.	Miles per hour
N	Newton
Nm	Newton metres
No.	Numbers
Nox	Oxides of nitrogen
N.P.T.F.	American Standard Taper Pipe (thread)
O_2	Oxygen
O/D	Overdrive
o.dia.	Outside diameter
oz	Ounces (mass)
ozf	Ounces (force)
ozf in	Ounces inch (torque)
para.	Paragraph
Part no.	Part numer
PAS	Power assisted steering
pt	Imperial pints
r	Radius
ref.	Reference
rev/min	Revolutions per minute
R.H.	Right-hand
R.H.Stg.	Right-hand steering
S.A.E.	Society of Automotive Engineers
S.C.	Single carburetters
sp. gr.	Specific gravity
Std.	Standard
s.w.g.	Standard wire gauge
Synchro	Synchronizer Synchromesh
T.C.	Twin caburetters
T.D.C.	Top dead centre
t.p.i.	Threads per inch
U.N.C.	Unified Coarse (screw thread)
U.N.F.	Unifed Fine (screw thread)
U.K.	United Kingdom
U.S. gal	Gallons (US)
U.S. pt	Pints (US)
V	Volts
W	Watts
1st	First
2nd	Second
3rd	Third
4th	Fourth
5th	Fifth
°	Degree (angle or temperature)
∞	Infinity
′	Minute (angle)
−	Minus (tolerance)
%	Percentage
+	Plus (tolerance)
+ ve	Positive (electrical)
− ve	Negative (electrical)
±	Plus or minus (tolerance)
″	Second (angle)
Ω	Ohms

ENGINE DATA — 3.4 LITRE

General Data	Number of cylinders	6 (in line)		
	Bore	83,0 mm		3.2677 in
	Stroke	106,0 mm		4.1732 in
	Cubic capacity	3441,2 cm^3		210 in^3
Cylinder Block	Material	Chromium cast iron		
	Type of cylinder liner	Dry (used for salvage only)		
	Material (liners)	Cast iron		
	Liner interference fit	0,064 to 0,0114 mm		0.0025 to 0.0045 in
	Bore diameters after honing: Piston Grade	Maximum	Minimum	Maximum Minimum
	F	82,997 mm	82,989 mm	3.2676 in 3.2673 in
	G	83,007 mm	83,000 mm	3.2680 in 3.2677 in
	H	83,017 mm	83,010 mm	3.2684 in 3.2681 in

NOTE: 'S' grade pistons are 82,995 to 83,020 mm (3.2675 to 3.2685 in) diameter across bottom of skirt at right angles to gudgeon pins. Honed diameter of bore for these pistons must be 0,018 to 0,133 mm (0.0007 to 0,.0013 in) greater than measured diameter of piston at this position.

	Outside diameter of liners	86,220 to 86,246 mm	3.3945 to 3.3955 in
	Line bore for main bearings	74,08 to 74,09 mm	2.9165 to 2.9170 in
Cylinder Head	Material	Aluminium alloy	
	Valve seat angle: Inlet	45°	
	Exhaust	45°	
Crankshaft	Material	BS 970–709M 40/T (EN 19 T) or BS 970–605M 36/T (EN 16 T)	
	Number of main bearings	7	
	Main bearing type	Vandervell VP2C	
	Journal diameter	69,855 to 69,842 mm	2.7502 to 2.7497 in
	Journal length, over 2,4 mm (0.095 in) radii:		
	Front	39,675 ± 0,254 mm	1.562 ± 0.010 in
	Centre	34,938 to 34,950 mm	1.3755 to 1.3760 in
	Intermediate	30,912 to 31, 013 mm	1.217 to 1.221 in
	Rear	42,4 mm	1.67 in
	Thrust taken	Centre bearing thrust washers	
	Thrust washer thickness	2,311 to 2,362 mm or 2,413 to 2.464 mm	0.091 to 0.093 in or 0.095 to 0.097 in
	Permissible end-float	0,10 to 0,15 mm	0.004 to 0.006 in
	Width of main bearing: Front	34,544 to 34,925 mm	1.360 to 1.375 in
	Centre	28,321 to 28,702 mm	1.115 to 1.130 in
	Rear	34,544 to 34,925 mm	1.360 to 1.375 in
	Intermediate	25,019 to 24,400 mm	0.985 to 1.00 in
	Diametrical clearance	0,020 to 0,064 mm	0.0008 to 0.025 in
	Crankpins: Diameter	52,987 to 52,974 mm	2.0861 to 2.0865 in
	Length	30,142 to 30,193 mm	1.1867 to 1.1887 in
	Regrind undersizes	0,51 mm	0.020 in
	Minimum diameter for regrind	−0,51 mm	−0.020 in
Connecting Rods	Length between centres	196,85 mm	7.75 in
	Big-end bearing type	Vandervell VP2C	
	Bore for big-end bearing	56,718 to 56,731 mm	2.2330 to 2.2335 in
	Width of big-end bearing	24,38 to 24,77 mm	0.960 to 0.975 in
	Big-end diametrical clearance	0,025 to 0,069 mm	0.0010 to 0.0027 in
	Big-end side clearance	0,132 to 0,234 mm	0.052 to 0.0092 in
	Small-end bush material	Vandervell VP10	
	Bore for small-end bush	25,387 to 25,413 mm	0.9995 to 1.0005 in
	Width of small-end bush	26,92 to 27,43 mm	1.06 to 1.08 in
	Bore diameter of small-end bush	22,231 to 22,235 mm	0.87525 to 0.87540 in

GENERAL SPECIFICATION

Pistons	Type	Solid skirt	
	Skirt clearance (measured midway down bore across bottom of piston skirt)	0,018 to 0,033 mm	0.0007 to 0.0013 in
Piston Rings	Number of compression rings	2	
	Number of oil control rings	1	
	Top compression ring width	1,562 to 1,588 mm	0.0615 to 0.0625 in
	Second compression ring width	1,961 to 1,986 mm	0.0772 to 0.0782 in
	Oil control ring width	Self expanding ring	
	Top compression ring thickness	3,150 to 3,302 mm	0.124 to 0.130 in
	Second compression ring thickness	3,150 to 3,302 mm	0.124 to 0.130 in
	Side clearance of top compression ring in groove	0,038 to 0,089 mm	0.0015 to 0.0035 in
	Side clearance of second compression ring in groove	0,038 to 0,089 mm	0.0015 to 0.0035 in
	Side clearance of oil control ring in groove	Self expanding ring; groove width 4,008 to 4,034 mm	0.1578 to 0.1588 in
	Top compression ring gap in bore	0,33 to 0,46 mm	0.013 to 0.018 in
	Second compression ring gap in bore	0,23 to 0,36 mm	0.009 to 0.014 in
Gudgeon Pins	Type	Fully floating	
	Length	71,882 to 72,263 mm	2.830 to 2.845 in
	Outside diameter: Marked Red	22,228 to 22,230 mm	0.8751 to 0.8752 in
	Marked Green	22,225 to 22,228 mm	0.8750 to 0.8751 in
Camshafts	Number of journals	4 per shaft	
	Number of bearings	4 per shaft (8 half bearings)	
	Type of bearings	White metal steel-backed, Vandervell	
	Journal diameter	25,375 to 25,387 mm	0.999 to 0.9995 in
	Diametrical clearance	0,013 to 0,056 mm	0.0005 to 0.0022 in
	Thrust taken	Front end shafts	
Valves and Valve Springs	Inlet valve material	Silico chrome steel	
	Exhaust valve material	Austenitic steel	
	Inlet valve head diameter	44,32 to 44,58 mm	1.745 to 1.755 in
	Exhaust valve head diameter	41,15 to 41,40 mm	1.620 to 1.630 in
	Valve stem diameter: Inlet and exhaust	7,87 to 7,94 mm	0.310 to 0.3125 in
	Valve lift	9,53 mm	0.375 in
	Inlet valve clearance	0,305 to 0,356 mm	0.012 to 0.014 in
	Exhaust valve clearance	0,305 to 0,356 mm	0.012 to 0.014 in
	Outer valve spring free length	53,42 mm	2.103 in
	Inner valve spring free length	44,04 mm	1.734 in
Valve Guides and Seats	Valve guide material	Cast iron (Brico Alloy 2 or BS. 1452/12)	
	Inlet valve guide length	47,24 mm	1.86 in
	Exhaust valve guide length	49,53 mm	1.95 in
	Outside diameter (both guides):		
	Standard	12,725 to 12,751 mm	0.501 to 0.502 in
	First oversize	12,776 to 12,802 mm	0.503 to 0.504 in
	Second oversize	12,852 to 12,878 mm	0.506 to 0.507 in
	Third oversize	12,979 to 13,005 mm	0.511 to 0.512 in
	Interference fit in cylinder head	0,013 to 0,056 mm	0.0005 to 0.0022 in
	Valve seat material	Sintered iron (Brico AO25/M)	
	Inlet valve seat outside diameter: Standard	47,041 to 47,054 mm	1.852 to 1.8525 in
	Interference fit in cylinder head	0,0762 mm	0.003 in
	Exhaust valve seat outside diameter: Standard	43,066 to 43,078 mm	1.6955 to 1 6960 in
	Interference fit in cylinder head	0,0762 mm	0.003 in
Tappets	Tappet material	Chilled cast iron	
	Outside diameter of tappet	34,895 to 34,905 mm	1.3738 to 1.3742 in
	Tappet guide interference fit	0,185 to 0,221 mm	0.0073 to 0.0087 in
	Diametrical clearance of tappet in guide	0,020 to 0,048 mm	0.0008 to 0.0019 in

Lubricating System

Oil pump	Hobourn-Eaton rotor-type	
Oil filter	Full-flow, renewable element or disposable canister	

Timing Chains and Sprockets

Type	Duplex	
Pitch	9,5 mm	3/8 in
Number of pitches: Lower chain	82	
Upper chain	100	
Crankshaft sprocket: Teeth	21	
Intermediate sprocket (outer): Teeth	28	
Intermediate sprocket (inner): Teeth	20	
Camshaft sprockets: Teeth	30	

4.2 LITRE ENGINE

General Data

Number of cylinders	6 (in line)	
Bore	92,07 mm	3.625 in
Stroke	106 mm	4,173 in
Cubic capacity	4235 cm^3	258.43 in^3

Cylinder Block

Material (cylinder block)	Chromium cast iron			
Type of cylinder liner (early cars only)	Interference fit, dry liner			
Material (liners)	Brivadium			
Liner interference fit	0,076 to 0,127 mm		0.003 to 0.005 in	
Bore diameters after honing: Piston Grade	Maximum	Minimum	Maximum	Minimum
F	92,083 mm	92,075 mm	3.6253 in	3.6250 in
G	92,093 mm	92,085 mm	3.6257 in	3.6254 in
H	92,103 mm	92,095 mm	3.6261 in	3.6258 in

NOTE: 'S' grade pistons are 92,080 to 92,105 mm (3.6252 to 3.6262 in) diameter across bottom of skirt at right angles to gudgeon pins. Honed diameter of bore for these pistons must be 0,018 to 0,033 mm (0.0007 to 0.0013 in) greater than measured diameter of piston at this position.

Outside diameter of liners	95,66 mm max. 95,63 mm min.	3.766 in max. 3.765 in min.
Line bore for main bearings	74,08 to 74,09 mm	2.9165 to 2.9170 in

Cylinder Head

Material	Aluminium alloy	
Valve seat angle: Inlet	45°	
Exhaust	45°	

Crankshaft (C41200)

Material	En 16, 18 or 111	
Number of main bearings	7	
Main bearing type	Vandervell VP2C	
Journal diameter	69,85 to 69,86 mm	2.7500 to 2.7505 in
Journal length (over 3/32 in radii): Front	39,69 ± 0,254 mm	1.562 ± 0.10 in
Centre	34,925 $^{+0.025}_{-0.013}$ mm	1.375 $^{+0.001}_{-0.0005}$ in
Intermediate	30,96 ± 0,051 mm	1.2188 ± 0.002 in
Rear	42,86 mm	1.6875 in
Thrust taken	Centre main bearing cap, half washers	
Thrust washer thickness	2,31 to 2,36 mm	0.091 to 0.093 in
Permissible end-float	0,10 to 0.15 mm	0.004 to 0.006 in
Width of main bearing: Front	34,54 to 34,93 mm	1.360 to 1.375 in
Centre	28,32 to 28,70 mm	1.115 to 1.130 in
Intermediate	24,81 to 25,40 mm	0.985 to 1.00 in
Rear	34,54 to 34,93 mm	1.360 to 1.375 in
Diametrical clearance	0,0203 to 0,0635 mm	0.0008 to 0.0025 in
Crankpins: Diameter	52,984 to 53,00 mm	2.0860 to 2.0866 in
Length	30,158 to 30,181 mm	1.1873 to 1.1882 in
Regrind undersize	0,51 mm	0.020 in
Minimum diameter for regrind	− 0,51 mm	− 0.02 in

Crankshaft (EAC 5742)	As (C41200) except:		
	Journal diameter	69,84 mm to 69,85 mm	2.7497 to 2.7502 in
	Crankpins: Diameter	52,964 mm to 52,976 mm	2.0852 to 2.0857 in
Connecting Rods	Length between centres	196,85 mm	7.75 in
	Big-end bearing type	Vandervell VP2C	
	Bore for big-end bearing	56,72 to 56,73 mm	2.2330 to 2.2335 in
	Width of big-end bearing	24,38 to 24,77 mm	0.960 to 0.975 in
	Big-end diametrical clearance	0,025 to 0,069 mm	0.0010 to 0.0027 in
	Big-end side clearance	0,147 to 0,221 mm	0.0058 to 0.0087 in
	Small-end bush material	Vandervell VP10	
	Bore for small-end bush	25,4 ± 0,013 mm	1.0 ± 0.0005 in
	Width of small-end bush	26,92 to 27,43 mm	1.060 to 1.080 in
	Bore diameter of small-end bush	22,23 $^{+0.0038}_{-0.000}$ mm	0.87525 $^{+0.00015}_{-0.000}$ in
Pistons	Type	Solid skirt	
	Skirt clearance (measured midway down bore across bottom of piston skirt)	0,018 to 0,033 mm	0.0007 to 0.0013 in
Piston Rings	Number of compression rings	2	
	Number of oil control rings	1	
	Top compression ring width	2 mm nominal	0.0781 in nominal
	Second compression ring width	2 mm nominal	0.0781 in nominal
	Oil control ring width	Self expanding	
	Top compression ring thickness	4,35 to 4,60 mm	0.171 to 0.188 in
	Second compression ring thickness	4,35 to 4,60 mm	0.171 to 0.188 in
	Side clearance of top compression ring in groove	0,038 to 0,089 mm	0.0015 to 0.0035 in
	Side clearance of second compression ring in groove	0,038 to 0,089 mm	0.0015 to 0.0035 in
	Side clearance of oil control ring in groove	Self expanding	
Prior to Vin No. 8L 103481	Top compression ring gap in bore	0,38 to 0,51 mm	0.015 to 0.020 in
	Second compression ring gap in bore	0,23 to 0,35 mm	0.009 to 0.014 in
	Oil control ring gap in bore	0,38 to 1,14 mm	0.015 to 0.045 in
From Vin No. 8L 103481	Top ring	0,38 to 0,51 mm	0.015 to 0.020 in
	2nd ring	0,41 to 0,66 mm	0.016 to 0.026 in
	Oil control ring	0,31 to 0,61 mm	0.012 to 0.024 in
Gudgeon Pins	Type	Fully-floating	
	Length	75,95 to 76,2 mm	2.990 to 3.000 in
	Outside diameter: Marked Red	22,228 to 22,230 mm	0.8751 to 0.8752 in
	Marked Green	22,225 to 22,228 mm	0.8750 to 0.8751 in
Camshafts	Number of journals	4 per shaft	
	Number of bearings	4 per shaft (8 half bearings)	
	Type of bearings	White metal steel-backed, Vandervell	
	Journal diameter	25,387 to 25,375 mm	0.9995 to 0.9990 in
	Diametrical clearance	0,013 to 0,051 mm	0.0005 to 0.002 in
	Thrust taken	Front end of shafts	
Valves and Valve Springs	Inlet valve material	Silico chrome steel	
	Exhaust valve material	Austenitic steel	
	Inlet valve head diameter	47,50 to 47,75 mm	1.870 to 1.880 in
	Exhaust valve head diameter	41,15 to 41,40 mm	1.620 to 1.630 in
	Valve stem diameter: Inlet and exhaust	7,87 to 7,94 mm	0.310 to 0.3125 in
	Valve lift	9,53 mm	0.375 in
	Inlet valve clearance	0,305 to 0,356 mm	0.012 to 0.014 in
	Exhaust valve clearance	0,305 to 0,356 mm	0.012 to 0.014 in
	Outer valve spring free length	49,21 to 50,80	1.938 to 2.00 in
	Inner valve spring free length	42,07 to 43,66 mm	1.656 to 1.719 in

4.2 litre (cont)

Valve Guides and Seats	Valve guide material	Cast iron (Brico Alloy 2 or BS.1452/12	
	Inlet valve guide length	47,24 mm	1.86 in
	Exhaust valve guide length	49,53 mm	1.95 in
	Outside diameter (both guides):		
	Standard	12,725 to 12,751 mm	0.501 to 0.502 in
	First oversize	12,776 to 12,802 mm	0.503 to 0.504 in
	Second oversize	12,852 to 12,878 mm	0.506 to 0.507 in
	Third oversize	12,979 to 13,005 mm	0.511 to 0.512 in
	Interference fit in cylinder head	0,013 to 0,056 mm	0.0005 to 0.0022 in
	Valve seat material	Sintered iron (Brico AO25/M)	
	Inlet valve seat outside diameter: Standard	47,041 to 47,054 mm	1.852 to 1.8525 in
	Interference fit in cylinder head	0,0762 mm	0.003 in
	Exhaust valve seat outside diameter: Standard	43,066 to 43,078 mm	1.6955 to 1.6960 in
	Interference fit in cylinder head	0,0762 mm	0.003 in
Tappets	Tappet material	Chilled cast iron	
	Outside diameter of tappet	34,895 to 34,905 mm	1.3738 to 1.3742 in
	Tappet guide interference fit	0,185 to 0,221 mm	0.0073 to 0.0087 in
	Diametrical clearance of tappet in guide	0,020 to 0,048 mm	0.0008 to 0.0019 in
Lubricating System	Oil pump	Hobourn-Eaton rotor-type	
	Oil filter	Full-flow, renewable element	
	Min pressure — hot @ 3000 rev/min	2,8 kg/cm^2	40 lb/in^2
Timing Chains and Sprockets	Type	Duplex	
	Pitch	9,5 mm	⅜ in
	Number of pitches: Lower chain	82	
	Upper chain	100	
	Crankshaft sprocket: Teeth	21	
	Intermediate sprocket (outer): Teeth	28	
	Intermediate sprocket (inner): Teeth	20	
	Camshaft sprockets: Teeth	30	

ENGINE DATA — 5.3 LITRE

General Data	Number of cylinders	12	
	Stroke	70 mm	2.756 in
	Bore	90 mm	3.543 in
	Cubic capacity	5343 cm^3	326.0 in^3
	Ignition timing: Initial static setting, to start engine only		
	'A' Emission spec.	9° ± 1° B.T.D.C.	
	'B' Emission spec.	4° ± 1° B.T.D.C.	

GENERAL SPECIFICATION

Cylinder Block	Material (cylinder block)	Aluminium alloy	
	Angle of cylinders	60° Vee	
	Type of cylinder liner	Slip fit, wet liner	
	Material (liners)	Cast iron	
	Nominal size of bore after honing:		
	Grade 'A'—Red	89,98 mm	3.543 in
	Grade 'B'—Green	90,01 mm	3.544 in
	Outside diameter of liner—both grades	97,99 mm + 0.02 mm −0.00 mm	3.858 in + 0.001 in −0.00 in
	Main line bore for main bearings	80,429 to 80,434 mm	3.1665 to 3.1667 in
Cylinder Heads	Material	Aluminium alloy	
	Valve seat angle: Inlet	44½°	
	Exhaust	44½°	
Crankshaft	Material	Manganese molybdenum steel	
	Number of main bearings	7	
	Main bearing type	Vandervell V.P.3	
	Journal diameter	76,218 to 76,231 mm	3.0007 to 3.0012 in)
	Journal length: Front	29,72 to 29,97 mm	1.170 to 1.180 in
	Centre	36,20 to 36,22 mm	1.425 to 1.426 in
	Intermediate	30,43 to 30,53 mm	1.198 to 1.202 in
	Rear	36,20 to 36,22 mm	1.425 to 1.426 in
	Thrust taken	Centre bearing thrust washers	
	Thrust washer thickness	2,57 to 2,62 mm	0.101 to 0.103 in
	Permissible end-float	0,10 to 0,28 mm	0.004 to 0.011 in
	Width of main bearing: Front	24,40 to 24,65 mm	0.963 to 0.973 in
	Centre	30,2 to 30,5 mm	1.190 to 1.200 in
	Intermediate	24,40 to 24,65 mm	0.963 to 0.973 in
	Rear	30,2 to 30,5 mm	1.190 to 1.200 in
	Diametrical clearance: all bearings	0,04 to 0,07 mm	0.0015 to 0.003 in
	Crankpin diameter	58,40 to 58,42 mm	2.2994 to 2.3000 in
	Crankpin length	43,15 to 43,20 mm	1.699 to 1.701 in
Connecting Rods	Length between centres	151,4 mm +0,12 mm −0,00 mm	5.96 in +0.005 in −0.000 in
	Big-end bearing material	VP2C	
	Bore for big-end bearing	62,0 mm +0,15 mm −0,00 mm	2.441 in +0.006 in −0.000 in
	Width of big-end bearing	18,3 to 18,5 mm	0.720 to 0.730 in
	Big-end diametrical clearance	0,04 to 0,09 mm	0.0015 to 0.0034 in
	Big-end side clearance	0,17 to 0,33 mm	0.007 to 0.013 in
	Small-end bush material	VP.10	
	Bore for small-end bush	26,98 mm +0,025 mm −0,00 mm	1.062 in +0.001 in −0.000 in.
	Width of small-end bush	26,2 to 26,7 mm	1.03 to 1.05 in
	Bore diameter of small-end bush	23,813 to 23,818 mm	0.9375 to 0.9377 in
Pistons	Type	Solid skirt	
	Skirt clearance (measured midway down bore across bottom of piston skirt)	0,03 to 0,04 mm	0.0012 to 0.0017 in
Piston Rings	Number of compression rings	2	
	Number of oil control rings	1	
	Top compression ring thickness	3,81 to 4,06 mm	0.150 to 0.160 in
	Second compression ring thickness	3,81 to 4,06 mm	0.150 to 0.160 in
	Oil control ring width	Self expanding	
	Width of oil control ring rails	2,62 ± 0.07 mm	0.103 ± 0.003 in
	Top compression ring width	1,58 to 1,60 mm	0.062 to 0.063 in
	Second compression ring width	1,96 to 1,98 mm	0.077 to 0.078 in
	Side clearance of top compression ring in groove	0,07 mm	0.0029 in
	Side clearance of second compression ring in groove	0,09 mm	0.0034 in
	Side clearance of oil control rings in groove	0,14 to 0,17 mm	0.0055 to 0.0065 in
	Top compression ring gap in bore	0,36 to 0,51 mm	0.014 to 0.020 in
	Second compression ring gap in bore	0,25 to 0,38 mm	0.010 to 0.015 in
	Gap of oil control ring rails in bore	0,38 to 1,14 mm	0.015 to 0.045 in

Gudgeon Pins	Type	Fully floating	
	Length	79,25 to 79,38 mm	3.120 to 3.125 in
	Outside diameter: Grade 'A' Red	23,81 mm	0.9375 in
	Grade 'B' Green	23,76 mm	0.9373 in
Camshafts	Number of journals	7 per shaft	
	Number of bearings	7 per shaft (14 half bearings)	
	Type of bearings	Aluminium alloy—camshafts run direct in caps and tappet block	
	Journal diameter: All journals	26,93 mm +0.013 mm −0,000 mm	1.0615 in +0.0005 −0.000 in
	Diametrical clearance	0,03 to 0,07 mm	0.001 to 0.003 in
	Thrust taken	Front end of shafts	
Jackshaft	Number of bearings	3	
	Diametrical clearance in block	0,013 to 0,076 mm	0.0005 to 0.0003 in
	Thrust taken	Front end of shaft	
	Permissible end-float	0,13 mm	0.005 in
	Line bore of front bearing	31,78 to 31,80 mm	1.251 to 1.252 in
	Line bore of centre and rear bearing	30,23 to 30,25 mm	1.190 to 1.191 in
Valves and Valve Springs	Inlet valve material	Silico chrome steel	
	Exhaust valve material	Austenitic steel	
	Inlet valve head diameter (except HE)	41,22 to 41,32 mm	1.623 to 1.627 in
	Inlet valve head diameter HE	41,15 to 41,40 mm	1.620 to 1.630 in
	Exhaust valve head diameter (except HE)	34,5 to 34,6 mm	1.358 to 1.362 in
	Exhaust valve head diameter HE	34,32 to 34,6 mm	1.355 to 1.365 in
	Valve stem diameter: Inlet and exhaust	7,854 to 7,866 mm	0.3092 to 0.3093 in
	Valve lift	9,5 mm	0.375 in
	Inlet valve clearance (except HE)	0,305 to 0,356 mm	0.012 to 0.014 in
	Inlet valve clearance HE	0,254 to 0,305 mm	0.010 to 0.012 in
	Exhaust valve clearance (except HE)	0,305 to 0,356 mm	0.012 to 0.014 in
	Exhaust valve clearance HE	0.254 to 0.305 mm	0.010 to 0.012 in
	Outer valve spring free length	53,4 mm	2.103 in
	Inner valve spring free length	44,0 mm	1.734 in
Valve Guides and Seats	Valve guide material	Cast iron	
	Inlet valve guide length	48,5 mm	1.910 in
	Exhaust valve guide length (except HE)	54,0 mm	2.125 in
	Exhaust valve guide length HE	43.82 mm	1.725 in
	Inlet valve guide outside diameter	As exhaust valve guide	
	Exhaust valve guide outside diameter:		
	Standard	12,75 to 12,72 mm	0.502 to 0.501 in
	First oversize (2 grooves)	12,88 to 12,85 mm	0.507 to 0.506 in
	Second oversize (3 grooves)	13,01 to 12,98 mm	0.512 to 0.511 in
	Inlet valve guide finished bore	7,90 to 7,92 mm	0.311 to 0.312 in
	Exhaust valve guide finished bore	7,90 to 7,92 mm	0.311 to 0.312 in
	Maximum clearance between valve stem and guide	0,05 to 0,06 mm	0.0020 to 0.0023 in
	Interference fit in cylinder head	0,05 to 0,15 mm	0.002 to 0.006 in
	Valve seat insert material	Sintered iron	
Service Replacements	Inlet valve seat insert outside diameter (except HE)	44,30 mm $^{+0.01}_{-0.00}$ mm	1.744 in $^{+0.0005}_{-0.0000}$ in
	Inlet valve seat insert HE diameter	42,93 mm $^{+0.01}_{-0.00}$ mm	1.6901 in $^{+0.0005}_{-0.0000}$ in
	Exhaust valve seat insert outside diameter	38,17 mm $^{+0.01}_{-0.00}$ mm	1.503 in $^{+0.0005}_{-0.0000}$ in
	Inlet valve seat inside diameter (except HE)	35,56 mm $^{+0.17}_{-0.00}$ mm to 39,74 mm $^{+0.25}_{-0.00}$ mm	1.400 in $^{+0.003}_{-0.000}$ in to 1.565 in $^{+0.010}_{-0.000}$ in
	Inlet valve seat inside diameter HE	35,56 mm $^{+0.17}_{-0.00}$ mm to 39,95 mm $^{+0.25}_{-0.00}$	1.400 $^{+0.0005}_{-0.0000}$ in 1.573 $^{+0.010}_{-0.000}$ in
	Exhaust valve seat inside diameter (except HE)	30,1 mm $^{+0.07}_{-0.00}$ mm to 33,4 mm $^{+0.12}_{-0.00}$ mm	1.185 in $^{+0.003}_{-0.000}$ in to 1.315 in $^{+0.005}_{-0.000}$ in
	Exhaust valve seat inside diameter HE	30,45 mm $^{+0.07}_{-0.00}$ mm to 33,51 mm $^{+0.25}_{-0.00}$ mm	1.199 in $^{+0.003}_{-0.000}$ in to 1.280 in $^{+0.010}_{-0.000}$ in
Tappets and Tappet Guides	Tappet material	Cast iron (chilled)	
	Outside diameter of tappet	34,87 to 34,90 mm	1.373 to 1.374 in
	Diametrical clearance	0,02 to 0,04 mm	0.001 to 0.002 in

GENERAL SPECIFICATION

Lubricating System	Oil pump	Epicyclic gear type	
	Oil pump gears:		
	Driving gear outside diameter:		
	Diametrical clearance	0,127 to 0,305 mm	0.005 to 0.012 in
	Radial clearance	0,065 to 0,152 mm	0.0025 to 0.006 in
	Driven gear outside diameter:		
	Diametrical clearance	0,178 to 0,254 mm	0.007 to 0.010 in
	Radial clearance	0,09 to 0,13 mm	0.0035 to 0.005 in
	Driven gear internal diameter:		
	Diametrical clearance	0,28 to 0,46 mm	0.011 to 0.018 in
	Radial clearance	0,14 to 0,23 mm	0.0055 to 0.009 in
	Side clearance: driving and driven gear	0,115 to 0,165 mm	0.0045 to 0.0065 in
	Oil filter type	Full flow, disposable canister	
	Oil pressure min. @ 3000 rev/min	2,8 kg/cm^2	40 lb/in^2
Timing Chain and Sprockets	Type of chain	Duplex endless	
	Pitch	9,5 mm	0.375 in
	Number of pitches	180	
	Camshaft sprockets: Number of teeth (each)	42	
	Crankshaft sprocket: Number of teeth	21	
	Jackshaft sprocket: Number of teeth	21	

TORQUE WRENCH SETTINGS

For the Torque wrench settings refer to the front of the relevant section.

GENERAL SPECIFICATION DATA—6 Cylinder Cars

Engine	See Engine Tuning Data	Section 05
Final Drive Unit	Type	Hypoid with normal differential; Powr Lok differential available as optional extra
	Pre 1982 MY Ratio: Standard	3.31:1 (43/13)
	1982 MY on Alternative	3.07:1 (43/14)
Final Drive Ratios— 1982 MY cars	3.4L — all cars	3.54:1 (46/13)
	4.2L — manual transmission cars	3.31:1 (43/13)
	4.2L — automatic transmission cars — not NAS	3.058:1 (52/17) Vin. 326917
	4.2L — automatic transmission cars — NAS only	2.88:1 (49/17) 1982 model year
Automatic Gearbox	Make and type	Borg-Warner Model 66
	Ratios: First gear	2.39 :1
	Second gear	1.45 :1
	Third gear	1.00 :1
	Reverse	2.09 :1
	Torque converter	2.3 :1 maximum
Manual Gearbox	Type	Five speed with baulk-ring synchromesh on all forward gears
	Ratios: First gear	3.321 :1
	Second gear	2.087 :1
	Third gear	1.396 :1
	Fourth gear	1.0 :1
	Fifth gear	0.883 :1
	Reverse	3.428 :1
Cooling System	Water pump: Type	Centrifugal
	Drive	Belt
	Number of cooling fans	One 12 bladed, driven through Holset coupling
	Cooling system and control	Thermostat
	Auxilary cooling—certain markets	1 or 2 electric fans blowing air through radiator; controlled by a sensor in the radiator
	Thermostat opening temperature	88°C 190°F
	Filler cap: Pressure rating	1,05 kgf/cm² 15 lbf/in²
	Make	A.C. Delco

Fuel Injection Equipment 'A' Emissions—4.2 litre cars for North American and Japanese Markets

Make and type	Lucas/Bosch Jetronic 'L'
Airflow meter reference number	73172A
Extra air valve reference number	73174A
Deceleration valve reference number	54739484A
Electronic control unit reference number	83524A

Fuel Injection Equipment 'B' Emissions—4.2 litre cars for all markets except North America and Japan

Make and type	Lucas/Bosch Jetronic 'L'
Airflow meter reference number	73171A
Extra air valve reference number	73193A
Deceleration valve reference number	54739875
Vacuum switch reference number	175-549A
Electronic control unit reference number	83525A

Fuel System		
Pumps	Make and type: 3.4 litre carburetter cars	Electrical, two A.C. Delco 'Vega' submerged
	4.2 litre cars	Electrical, Lucas 73175A roller cell pump with integral relief valve and non-return valve

GENERAL SPECIFICATION DATA—6 Cylinder Cars

Braking System	Front brakes, make and type	Girling; ventilated discs, bridge-type calipers	
	Rear brakes, make and type	Girling, damped discs, bridge-type calipers incorporating handbrake friction pads	
	Handbrake: Type	Mechanical, operating on rear discs	
	Disc diameter: Front	284 mm	11.18 in
	Rear	263,5 mm	10.375 in
	Disc thickness: Front	24,13 mm	0.95 in
	Rear	12,7 mm	0.50 in
	Master cylinder bore diameter	22,23 mm	0.875 in
	Brake operation	Hydraulic	
	Hydraulic fluid	Castrol/Girling Universal Brake and Clutch Fluid—exceeding specification S.A.E. J.1703/D	
	Main brake friction pad material	Ferodo 2430 slotted	
	Hand brake friction pad material	Mintex M.68/1	
	Servo unit refs.: R.H.D. cars	Girling 64049669	
	L.H.D. cars	Girling 64049668	
Front Suspension	Type	Independent coil spring	
	Castor angle	$2\frac{1}{4}° \pm \frac{1}{4}°$ positive	
	Camber angle	$\frac{1}{2}° \pm \frac{1}{4}°$ negative	
	Front wheel alignment	0 mm to 3,2 mm toe in	0 in to $\frac{1}{8}$ in toe in
	Dampers	Telescopic, gas filled	
Rear Suspension	Type	Independent coil springs, co-axial with dampers	
	Camber angle	$\frac{3}{4}° \pm \frac{1}{4}°$ negative	
	Rear wheel alignment	Parallel ± 0,08 mm	Parallel ± $\frac{1}{32}$ in
	Dampers	Telescopic, gas filled	
Power Assisted Steering	Type	Rack and pinion	
	Number of turns lock to lock	2.87	
	Turning circle, wall to wall	12,85 m	42 ft
Electrical Equipment			
Battery	Make	Lucas, chloride or Delco Remy	
	Voltage	12V	
Alternator	Make and type: All air-conditioned cars	Lucas 25ACR or Motorola 9AR 25 12P	
	Non air-conditioned cars	Lucas 18ACR	
	Nominal voltage	12V	
	Cut-in voltage	13.5V at 2100 rev/min (Motorola 14V at 1050 rev/min)	
	Earth polarity	Negative	
	Maximum output	18ACR	45A
		25ACR	66A
		Motorola	70A
	Maximum operating speed	12 400 rev/min	
	Rotor winding resistance	3.2 ohms (18ACR) at 20°C	
		3.6 ohms (25ACR)	
	Brush spring pressure	9 to 13 ozf	
	Make and type	Lucas A133	
	Maximum output	65A — 6 Cyl. non air cond. cars	
		75A — 6 Cyl. air cond. cars and all 12 Cyl. cars	
	Regulator controlled voltage	13.6-14.4V (measured across battery)	
	Maximum operating speed	15,000 rev/min	
	New brush length	20 mm (0.8 in)	
	Renew at	10 mm (0.4 in)	
	Brush spring pressure	4.7-9.8 oz	
Starter Motor	Make and type	Lucas 3M100 pre-engaged	
	Lock torque at 940 amps	4,01 kgf m	29 lbf ft
	Torque at 1000 rev/min at 535 amps	1,80 kgf m	13 lbf ft
	Light running current	100A at 5 000 to 6 000 rev/min	

Windscreen Wiper Motor	Make and type	Lucas 16W
	Light running speed, rack disconnected (after 60 seconds from cold)	Normal: 46 to 52 rev/min; high: 60 to 70 rev/min
	Light running current (after 60 seconds from cold)	Normal: 1.5A; high: 2.0A

GENERAL SPECIFICATION DATA—12 Cylinder Cars

Engine	See Engine Tuning Data	Section 05
Final Drive Unit	Type	Hypoid with Powr Lok differential
	Ratio: Standard Non HE	3.07:1 (43/14)
	HE Onwards	2.88:1 (49/17)
	Alternative	3.31:1 (43/13) Australia
Automatic Gearbox	Make and type	General Motors GM 400
	Ratios: First gear	2.48 :1
	Second gear	1.48 :1
	Third gear	1.00 :1
	Reverse	2.07 :1
	Torque converter	2.00 :1
Cooling System	Water pump: Type	Centrifugal, with two outlets
	Drive	Belt driven from crankshaft
	No. of cooling fans	Two (1 12-bladed, belt-driven through Holset coupling, plus 1 4-bladed electrically driven, thermostatically controlled)
	Cooling system control	2 thermostats
	Thermostat opening temperature	88°C 190°F
	Thermostat fully open temperature	93.5° to 96°C 200° to 205°F
	Filler cap pressure rating	1,05 kgf/cm² 15 lbf/in²
	Filler cap make	A.C. Delco

Fuel Injection Equipment

Make and type:

N.A.S., U.K. and European markets	Lucas Digital 'P', pressure sensing
Japanese and Australian markets	Lucas/Bosch Jetronic D

	'A' Emissions N.A.S. only	'A' Emissions Japan only	'B' Emissions U.K./Europe	'D' Emissions Australia only
Injector reference no.	Lucas 73178A	Lucas 73143B	Lucas 73178A	Lucas 73143B
Cold start injector—reference no.	Lucas 73180A	Lucas 73160A	Lucas 73180A	Lucas 73147A
Pressure regulator—reference no.	Lucas 73177A	Lucas 73146A	Lucas 73177A	Lucas 73146A
Throttle switch—reference no.	Lucas type 193SA	Lucas 30625A	Lucas type 193SA	Lucas 30625A
Water temperature sensor—reference no.	Lucas 73170A	Lucas 73142A	Lucas 73170A	Lucas 73142A
Air temperature sensor—reference no.	Lucas 73197A	Lucas 73141A	Lucas 73197A	Lucas 73141A
Thermotime switch—reference no.	Lucas 33704A	Lucas 30491A	Lucas 33704A	Lucas 30491A
Extra air valve—reference no.—all markets	Lucas 73192A			
Deceleration valve—reference no.	Lucas 73156A	—	—	Lucas 73156A
Supplementary air valve—reference no.	—	—	Tecalemit TDA832	—
Full throttle micro-switch—reference no.	Burgess YBFYR1	—	—	—
Electrical control unit—reference no.	Lucas 83622A	Lucas 83477B	Lucas 83632A	Lucas 83546A
E.G.R. control unit—reference no.	—	Lucas 73158B	—	Lucas 73158B
Lambda sensors—reference no.	Lucas 73199A	—	—	—
Pressure sensor—reference no.	—	Lucas 73164A	—	Lucas 73164A
Power resistor—reference no.	Lucas 73196A	—	Lucas 73196A	—
Power amplifier—reference no.	—	Lucas 83486A	—	Lucas 88486A

Fuel System Pump	Make and type	Lucas 73175A — Electrical roller cell pump with integral relief valve and non-return valve.

GENERAL SPECIFICATION DATA—12 Cylinder Cars

Braking System	Front brakes: Make and type	Girling; ventilated discs, bridge-type calipers	
	Rear brakes: Make and type	Girling; damped discs, bridge-type calipers incorporating handbrake friction pads	
	Handbrake: Type	Mechanical, operating on rear discs	
	Disc diameter: Front	284 mm	11.18 in
	Rear	263,5 mm	10.375 in
	Disc thickness: Front	24,13 mm	0.95 in
	Rear	12,7 mm	0.50 in
	Master cylinder bore diameter	22,23 mm	0.875 in
	Brake operation	Hydraulic	
	Hydraulic fluid	Castrol/Girling Universal Brake and Clutch Fluid—exceeding specification S.A.E. J.1703/D	
	Main brake friction pad material	Ferodo 2430 slotted	
	Hand brake friction pad material	Mintex M68/1	
	Servo unit refs.: L.H.D.	Girling 64049668	
	R.H.D.	Girling 64049670	
Front Suspension	Type	Independent coil spring	
	Castor angle	$3\frac{1}{2}° \pm \frac{1}{4}°$ positive	
	Camber angle	$\frac{1}{2}° \pm \frac{1}{4}°$ negative	
	Front wheel alignment	0 mm to 3,2 mm toe in	0 to $\frac{1}{8}$ in toe in
	Dampers	Telescopic, gas filled	
Rear Suspension	Type	Independent, coil springs, co-axial with dampers	
	Camber angle	$\frac{3}{4}° \pm \frac{1}{4}°$ negative	
	Rear wheel alignment	Parallel ± 0,08 mm	Parallel ± $\frac{1}{32}$ in
	Dampers	Telescopic, gas filled	
Power Assisted Steering	Type	Rack and pinion	
	Number of turns lock to lock	2.75	
	Turning circle, wall to wall	13,5 m	44 ft
Electrical Equipment			
Battery	Make and type	Lucas, chloride or AC Delco	
Alternator	Make and type	Lucas 25ACR or Motorola 9AR2533P	
	Nominal voltage	12V	
	Cut-in voltage	13.5V at 1500 rev/min (Motorola 14V at 1100 rev/min	
	Polarity	Negative earth	
	Maximum output	66A (Motorola 70A)	
	Maximum operating speed	15 000 rev/min	
	Rotor winding resistance	3.6 ohms at 20°C	
	Brush spring pressure	255 to 369 gf	9 to 13 ozf
Starter Motor	Make and type	Lucas M45 pre-engaged	
	Lock torque (at 940 amps)	4,01 kgf m	29 lbf ft
	Torque at 1000 rev/min (at 535 amps)	1,80 kgf m	13 lbf ft
	Light running current	100A at 5000 to 6000 rev/min	
Wiper motor	Make and type	Lucas 16W	
	Light running speed, rack disconnected (after 60 seconds from cold)	Normal: 46 to 52 rev/min, high: 60 to 70 rev/	
	Light running current (after 60 seconds from cold)	Normal: 1.5A; high: 2.0A	

BULB CHART — 6 cyl. & 12 cyl. vehicles

See Section 86A for bulb charts

TYRE DATA

Fitted as complete sets only

Type:	6 cylinder cars	Dunlop ER70 VR 15 Sport or Pirelli Cinturato P5 205/70 VR 15
	12 cylinder cars	Dunlop 205/70 VR 15 D1 SP Sport Super or Pirelli Cinturato P5 205/70 VR15
	from Sept. 83	Pirelli Cinturato 215/70 VR 15; Dunlop 215/70 VR 15 D7 Sport Super

PRESSURE:

All Series III 6 cyl. Engined Saloons

	Front	Rear
For speeds above 100 mph (160 km/h) with driver and two passengers	2.27 bar 2.32 kgf/cm^2 33 lbf/in^2	2.21 bar 2.25 kgf/cm^2 32 lbf/in^2
For speeds above 100 mph with full load (including luggage) of 410 kg (904 lb)	2.27 bar 2.32 kgf/cm^2 33 lbf/in^2	2.48 bar 2.53 kgf/cm^2 36 lbf/in^2

The above pressures may also be reduced by 0.41 bar; 0.42 kgf/cm^2; (6 lbf/in^2) on the front and rear tyres to obtain maximum comfort, provided the speed does not exceed 100 mph (160 km/h).

All Series III 12 cyl. Engined Saloons

	Front	Rear
For speeds above 100 mph (160 km/h) with driver and two passengers	2.48 bar 2.53 kgf/cm^2 36 lbf/in^2	2.21 bar 2.25 kgf/cm^2 32 lbf/in^2
For speeds above 100 mph with full load (including luggage) of 410 kg (904 lb)	2.48 bar 2.53 kgf/cm^2 36 lbf/in^2	2.48 bar 2.53 kgf/cm^2 36 lbf/in^2

The above pressures may also be reduced by 0.41 bar; 0.42 kgf/cm^2; (6 lbf/in^2) on the front and rear tyres to obtain maximum comfort, provided the speed does not exceed 100 mph (160 km/h).

Tyre Replacement and Wheel Interchanging
When replacement of tyres is necessary, it is preferable to fit a complete car set. Should either front or rear tyres only show a necessity for replacement, new tyres must be fitted to replace the worn ones. No attempt must be made to interchange tyres from front to rear or vice–versa as tyre wear produces characteristic patterns depending upon their position and if such position is changed after wear has occurred, the performance of the tyre will be adversely affected. It should be remembered that new tyres require to be balanced.

The radial–ply tyres specified above are designed to meet the high–speed performance of which the car is capable.

Only tyres of identical specification as shown under 'TYRE DATA' must be fitted as replacements and, if to different tread pattern, should not be fitted in mixed form.

UNDER NO CIRCUMSTANCES SHOULD CROSS–PLY TYRES BE FITTED.

RECOMMENDED SNOW TYRE

The following information relates to the only snow tyre recommended for Jaguar Cars.

Snow tyres MUST ONLY BE fitted in complete sets of four, failure to do so could adversely affect the handling of the car under certain conditions.
Tyre type – Pirelli Winter 190 215/65 R15 M&S
Tyre pressures – Are the same as the standard tyre equipment.
Maximum speed – without snow chains – 190 km/h (118 mph)
with snow chains – 50 km/h (30 mph)

Snow Chains

Rud Kantenspur snow chains may be fitted to the rear wheels only.
NOTE: Always ensure that they are correctly fitted and fully tensioned.
Snow chains must only be used with the recommended winter tyres.

XK ENGINES

A Emission North America and Japan (1978-80)
B Emission Rest of World
C Emission Canada and Japan 81 on and Australia 1986
D Emission Australia -85 Sweden and Switzerland
E Emission Saudia Arabia

	3.4 Pre 81	3.4 After 81
Ignition timing	8° B.T.D.C.	8° B.T.D.C.
$ =Vac off idle normal run temp	static	$
# = Vac off normal running temp		
! = at 3000 r.p.m.		
& = 700 r.p.m. with vac off		
Valve clearances	0.012 to 0.014 in	0.012 to 0.014 in
Spark plugs — make/type	N12Y	N12Y
— gap	0.025 in	0.035 in
Ignition coil — make Lucas/type	16C6	16C6
Primary resistance @ 20°C (ohms)	1.2 to 1.5	1.2 to 1.5
Output (open circuit) Kv min	25	25
Output at plug Kv min (assuming plug gap and lead to spec)	10	10
Distributor — make/type	45D6	45D6
Rotation of rotor view above	Anticlockwise	Anticlockwise
Points gap	0.015 in	0.015 in
Pick up coil resistance K Ohms	——	——
Firing order	1, 5, 3, 6, 2, 4@	1, 5, 3, 6, 2, 4@
@ — cylinders numbered from rear		
Spark plug lead resistances	Min — Max	
1	8.61 to 20.56K	
2	9.00 to 21.48K	
3	7.24 to 17.34K	
4	6.11 to 14.69K	
5	5.47 to 13.20K	
6	5.13 to 12.30K	
Exhaust emission reading Co	3% max	3% max
HC		
Idle speed	750 r.p.m.	750 r.p.m.
Compression pressure	135 to 150 lbf/in^2	135 to 150 lbf/in^2
Differential between cylinders	15% maximum	
Carburettor — type	SU HIF7	SU HIF7
— needle	BDW	BDW
— jet	0.100	0.100
— spring	Red	Red
Auto choke — type	TZX 1002	TZX 1002

XK ENGINES

A Emission North America and Japan (1978-80)
B Emission Rest of World
C Emission Canada and Japan 81 on and Australia 1986
D Emission Australia -85 Sweden and Switzerland
E Emission Saudia Arabia

	4.2 Emiss A 1979-80	4.2 Emiss A 1982	4.2 Emiss A/D Pre 83	4.2 Emiss A 1983	4.2 Emiss A 1984-
Ignition timing	4° B.T.D.C.	14°B.T.D.C.	8°B.T.D.C.	14°B.T.D.C.	17°B.T.D.C.
$ =Vac off idle normal run temp	at 800 r.p.m.	$	&	&	&
# = Vac off normal running temp					
! = at 3000 r.p.m.					
& = 700 r.p.m. with vac off					
Valve clearances	0.012 to 0.014 in	0.012 to 0.014 in	0.012 to 0.014 in	0.012 to 0.014 in	0.012 to 0.014 in
Spark plugs — make/type	N12Y	N12Y	N12Y	N12Y	N12Y
— gap	0.035 in	0.035 in	0.035 in	0.035 in	0.035 in
Ignition coil — make Lucas/type	16C6	16C6	16C6	32C5	32C5
Primary resistance @ 20°C (ohms)	1.2 to 1.5	1.2 to 1.5	1.2 to 1.5	0.75 to 0.85	0.75 to 0.85
Output (open circuit) Kv min	25	25	25	25	25
Output at plug Kv min (assuming plug gap and lead to spec)	10	10	10	10	10
Ignition coil — Ducellier/type	——	——	——	——	520076A
Primary resistance @ 20°C (ohms)	——	——	——	——	0.8 to 1.0
Ballast resistance @ 20°C (ohms)	——	——	——	——	0.8 to 1.0
Output (open circuit) Kv min					25
Output at plug Kv min (assuming plug gap and lead to spec)					10
Distributor — make/type	45DM6	45DM6	45DM6	45DM6	45DM6
Rotation of rotor view above	Anticlockwise	Anticlockwise	Anticlockwise	Anticlockwise	Anticlockwise
Pick up mod/rot gap	0.008 to 0.014 in	0.008 to 0.014 in	0.008 to 0.014 in	0.008 to 0.014 in	0.008 to 0.014 in
Pick up coil resistance K Ohms	2.2 to 4.8	2.2 to 4.8	2.2 to 4.8	2.2 to 4.8	2.2 to 4.8
Firing order	1, 5, 3, 6, 2, 4@	1, 5, 3, 6, 2, 4@	1, 5, 3, 6, 2, 4@	1, 5, 3, 6, 2, 4@	1. 5, 3, 6, 2, 4@
@ — cylinders numbered from rear					
Spark plug lead resistances	Min — Max				
1	8.61 to 20.56K				
2	9.00 to 21.48K				
3	7.24 to 17.34K				
4	6.11 to 14.69K				
5	5.47 to 13.20K				
6	5.13 to 12.30K				
Exhaust emission reading Co	0.5 to 1.5%	0.5 to 1.5%	0.5 to 1.5%	0.5 to 1.5%	0.5 to 1.5%
HC					
Idle speed	750 r.p.m.	750 ± 50 r.p.m.	750 r.p.m.	800 r.p.m.	800 r.p.m.
Compression pressure	120 to 135 lbf/in^2	120 to 135 lbf/in^2	120 to 135 lbf/in^2	120 to 135 lbf/in^2	120 to 135 lbf/in^2
Differential between cylinders			15% maximum		
Fuel pressure			35.5 to 38.8 lbf/in^2		

XK ENGINES

A Emission North America and Japan (1978-80)
B Emission Rest of World
C Emission Canada and Japan 81 on and Australia 1986
D Emission Australia -85 Sweden and Switzerland
E Emission Saudia Arabia

	4.2 Emiss B	4.2 Emiss C 1985-6	4.2 Swiss 1985-6	4.2 Australia 1985
Ignition timing	6° B.T.D.C.	14°B.T.D.C.	4° ± 2	4°B.T.D.C.
$ =Vac off idle normal run temp	$	!	B.T.D.C.$	at 800 r.p.m.
# = Vac off normal running temp				
! = at 3000 r.p.m.				
& = 700 r.p.m. with vac off				
Valve clearances	0.012 to 0.014 in	0.012 to 0.014 in	0.012 to 0.014 in	0.012 to 0.014 in
Spark plugs — make/type	N10Y	N12Y	N12Y	N12Y
— gap	0.035 in	0.035 in	0.035 in	0.035 in
Ignition coil — make Lucas/type	32C5	32C5	32C5	32C5
Primary resistance @ 20°C (ohms)	0.75 to 0.85	0.75 to 0.85	0.75 to 0.85	0.75 to 0.85
Output (open circuit) Kv min	25	25	25	25
Output at plug Kv min (assuming plug gap and lead to spec)	10	10	10	10
Ignition coil — Ducellier/type	520076A	520076A	520076A	520076A
Primary resistance @ 20°C (ohms)	0.8 to 1.0	0.8 to 1.0	0.8 to 1.0	0.8 to 1.0
Ballast resistance @ 20°C (ohms)	0.8 to 1.0	0.8 to 1.0	0.8 to 1.0	0.8 to 1.0
Output (open circuit) Kv min	25	25	25	25
Output at plug Kv min (assuming plug gap and lead to spec)	10	10	10	10
Distributor — make/type	45DM6	45DM6	45DM6	45DM6
Rotation of rotor view above	Anticlockwise	Anticlockwise	Anticlockwise	Anticlockwise
Pick up mod/rot gap	0.008 to 0.014 in	0.008 to 0.014 in	0.008 to 0.014 in	0.008 to 0.014 in
Pick up coil resistance K Ohms	2.2 to 4.8	2.2 to 4.8	2.2 to 4.8	2.2 to 4.8
Firing order	1, 5, 3, 6, 2, 4@	1, 5, 3, 6, 2, 4@	1, 5, 3, 6, 2, 4@	1, 5, 3, 6, 2, 4@
@ — cylinders numbered from rear				
Spark plug lead resistances	Min — Max			
1	8.61 to 20.56K			
2	9.00 to 21.48K			
3	7.24 to 17.34K			
4	6.11 to 14.69K			
5	5.47 to 13.20K			
6	5.13 to 12.30K			
Exhaust emission reading Co	1.25 to 1.75	1.25 to 1.75	0.75 ± 25%	0.5 to 1.0%
HC			300 p.p.m. max	
Idle speed	750 r.p.m.	750 ± 50 r.p.m.	800 ± 100 r.p.m.	800 r.p.m.
Compression pressure	135 to 150 lbf/in^2	135 to 150 lbf/in^2	135 to 150 lbf/in^2	135 to 150 lbf/in^2
Differential between cylinders	15% maximum			
Fuel pressure	35.5 to 38.8 lbf/in^2			

V12 ENGINES

A Emission North America and Japan (1978-80)
B Emission Rest of World
C Emission Canada and Japan 81 on and Australia 1986
D Emission Australia -85 Sweden and Switzerland
E Emission Saudia Arabia

	D Jetronic	
	5.3	5.3
	A Emiss	D Emiss
Ignition timing	10° B.T.D.C.	4°B.T.D.C.
$ =Vac off idle normal run temp	Static	Static
at 3000 r.p.m.		
Valve clearances	0.012 to 0.014 in	0.012 to 0.014 in
Spark plugs — make/type	N10Y	N10Y
— gap	0.035 in	0.035 in
Ignition coil — make/type	22C12	22C12
Primary resistance @ 20°C (ohms)	0.9 to 1.1	0.9 to 1.1
Output (open circuit) Kv min	25	25
Output at plug Kv min (assuming plug gap and lead to spec)	10	10
Distributor — make/type	36DE12	36DE12
Rotation of rotor view above	Anticlockwise	Anticlockwise
Pick up mod/rot gap	0.020 to 0.025 in	0.020 to 0.025 in
Pick up coil resistance K Ohms	——	——
Firing order	1A-6B-5A-2B-3A-4B-6A-1B-2A-5B-4A-3B*	
* — cylinders numbered from front		
Spark plug lead resistances	Min — Max	Min — Max
	1A 3.05 to 7.35K	1B 4.00 to 9.66K
	2A 2.09 to 5.04K	2B 2.78 to 6.72K
	3A 2.27 to 5.46K	3B 1.31 to 3.15K
	4A 3.48 to 8.40K	4B 2.00 to 4.83K
	5A 3.13 to 7.56K	5B 3.31 to 7.98K
	6A 3.22 to 7.77K	6B 3.92 to 9.45K
Exhaust emission reading Co	1 to 2%	1 to 2%
Idle speed	750 r.p.m.	750 r.p.m.
HC		
Compression pressure	135 lbf/in^2	135 lbf/in^2
Differential between cylinders	15% maximum	
Fuel pressure	28.5 to 30.8 lbf/in^2	

V12 ENGINES

A Emission North America and Japan (1978-80)
B Emission Rest of World
C Emission Canada and Japan 81 on and Australia 1986
D Emission Australia -85 Sweden and Switzerland
E Emission Saudia Arabia

	P System PI Digital			
	5.3 A Emiss Pre HE	5.3 B Emiss Pre HE 9:1	5.3 B Emiss Pre HE 10:1 to 301612	5.3 B Emiss Pre HE-
Ignition timing	25 to 27°	5°B.T.D.C.	10°B.T.D.C.	24°B.T.D.C.
$ =Vac off idle normal run temp	B.T.D.C. #	Vac on	#	#
# = Vac off normal running temp at 3000 r.p.m.				
Valve clearances	0.012 to 0.014 in	0.012 to 0.014 in	0.012 to 0.014 in	0.012 to 0.014 in
Spark plugs — make/type	N10Y	N10Y	N10Y	N10Y
— gap	0.035 in	0.035 in	0.035 in	0.035 in
Ignition coil — make/type	22C12	23C12	23C12	23C12
Primary resistance @ 20°C (ohms)	0.9 to 1.1	0.7 to 0.85	0.7 to 0.85	0.7 to 0.85
Output (open circuit) Kv min	25	25	25	25
Output at plug Kv min (assuming plug gap and lead to spec)	10	10	10	10
Distributor — make/type	36DE12	36DE12	36DE12	36DE12
Rotation of rotor view above	Anticlockwise	Anticlockwise	Anticlockwise	Anticlockwise
Points/pick up mod/rot gap	0.020 to 0.025 in	0.020 to 0.025 in	0.020 to 0.025 in	0.020 to 0.025 in
Pick up coil resistance K Ohms	2.2 to 4.8	2.2 to 4.8	2.2 to 4.8	2.2 to 4.8
Firing order	1A-6B-5A-2B-3A-4B-6A-1B-2A-5B-4A-3B*			
* — cylinders numbered from front				
Spark plug lead resistances	Min — Max	Min — Max		
	1A 3.05 to 7.35K	1B 4.00 to 9.66K		
	2A 2.09 to 5.04K	2B 2.78 to 6.72K		
	3A 2.27 to 5.46K	3B 1.31 to 3.15K		
	4A 3.48 to 8.40K	4B 2.00 to 4.83K		
	5A 3.13 to 7.56K	5B 3.31 to 7.98K		
	6A 3.22 to 7.77K	6B 3.92 to 9.45K		
Exhaust emission reading Co	1 to 2%	1 to 2%	1 to 2%	1 to 2%
Idle speed	750 r.p.m.	750 r.p.m.	750 r.p.m.	750 r.p.m.
HC				
Compression pressure	135 lbf/in^2	135 lbf/in^2	150 lbf/in^2	165 lbf/in^2
Differential between cylinders			15% maximum	
Fuel pressure			35.5 to 38.8 lbf/in^2	

V12 ENGINES

A Emission North America and Japan (1978-80)
B Emission Rest of World
C Emission Canada and Japan 81 on and Australia 1986
D Emission Australia -85 Sweden and Switzerland
E Emission Saudia Arabia

	P System PI Digital			
	5.3 A & B Em HE	5.3 A & B Em HE After 7P50275	5.3 Australia 1985	5.3 Switzerland 1985
Ignition timing	18° B.T.D.C.	18°B.T.D.C.	18°B.T.D.C.	18° +0–2 B.T.D.C.
$ =Vac off idle normal run temp	#	#	#	
# = Vac off normal running temp at 3000 r.p.m.				
Valve clearances	0.010 to 0.012 in	0.010 to 0.012 in	0.010 to 0.012 in	0.010 to 0.012 in
Spark plugs — make/type	BN5	RS5C	RS5C	RS5C
— gap	0.025 in	0.025 in	0.025 in	0.025 in
Ignition coil — make/type	35C6x2	35C6x2	35C6x2	35C6x2
Primary resistance @ 20°C (ohms)	0.6 to 0.8	0.6 to 0.8	0.6 to 0.8	0.6 to 0.8
Output (open circuit) Kv min	25	25	25	25
Output at plug Kv min (assuming plug gap and lead to spec)	10	10	10	10
Distributor — make/type	36DM12	36DM12	36DM12	36DM12
Rotation of rotor view above	Anticlockwise	Anticlockwise	Anticlockwise	Anticlockwise
Points/pick up mod/rot gap	0.006 to 0.014 in	0.006 to 0.014 in	0.006 to 0.014 in	0.006 to 0.014 in
Pick up coil resistance K Ohms	2.2 to 4.8	2.2 to 4.8	2.2 to 4.8	2.2 to 4.8
Firing order	1A-6B-5A-2B-3A-4B-6A-1B-2A-5B-4A-3B*			
@ — cylinders numbered from rear				
* — cylinders numbered from front				
Spark plug lead resistances	Min — Max	Min — Max		
	1A 3.05 to 7.35K	1B 4.00 to 9.66K		
	2A 2.09 to 5.04K	2B 2.78 to 6.72K		
	3A 2.27 to 5.46K	3B 1.31 to 3.15K		
	4A 3.48 to 8.40K	4B 2.00 to 4.83K		
	5A 3.13 to 7.56K	5B 3.31 to 7.98K		
	6A 3.22 to 7.77K	6B 3.92 to 9.45K		
Exhaust emission reading Co	1 to 2%	1 to 2%	0.5 to 1%	0.75 ± 0.25%
Idle speed	750 r.p.m.	750 r.p.m.	800 r.p.m.	800 ± 50 r.p.m.
HC				500 p.p.m. max.
Compression pressure	200 to 240 lbf/in^2	200 to 240 lbf/in^2	200 to 240 lbf/in^2	200 to 240 lbf/in^2
Differential between cylinders	15% maximum			
Fuel pressure	35.5 to 38.8 lbf/in^2			

	5.3 All markets except U.K. and Europe After Engine No. 7P 56622	5.3 Middle East After Engine No 7P 56622	5.3 Australia, Canada, Japan After Engine No 7P 56622
Ignition timing	16° ± 1° BTDC	16° ± 1° BTDC	16° ± 1° BTDC

	5.3 Australia, Canada, Japan, USA After VIN 326520	5.3 All markets except Australia, Canada, Japan, USA After VIN 326520	5.3 Australia, Canada, Japan After Engine No 7P 56622
Spark plugs — make/type	EAC 9186 Champion RS9YC	EAC 8554 NGK BR7 EFS	EAC 8554 NGK BR7 EFS

GENERAL FITTING INSTRUCTIONS

Precautions Against Damage

Always fit covers to protect the wings before commencing work in the engine department.
Cover the seats and carpets, wear clean overalls and wash your hands or wear gloves before working inside the car.
Avoid spilling hydraulic fluid or battery acid on paintwork. Wash off with water immediately if this occurs.
Use polythene sheets in the bo to protect carpets.
Always use a recommended service l, or a satisfactory equivalent, where specified.
Protect temporarily exposed screw threads by replacing nuts or fitting plastic caps.

Safety Precautions

Whenever possible use a ramp or pit when working beneath a car, in preference to jacking. Chock the wheels as well as applying the handbrake.
Never rely on a jack alone to support a car. Use axle stands or blocks carefully placed at the jacking points to provide a rigid location.
Ensure that a suitable form of fire extinguisher is conveniently located.
Check that any lifting equipment used has adequate capacity and is fully serviceable.
Inspect power leads of any mains electrical equipment for damage, and check that it is properly earthed.
Disconnect the earth (grounded) terminal of a car battery.
Do not disconnect any pipes in the air conditioning refrigeration system, if fitted, unless trained and instructed to do so. A refrigerant is used which can cause blindness if allowed to contact the eyes.
Ensure that adequate ventilation is provided when volatile de-greasing agents are being used.

CAUTION: Fume extraction equipment must be in operation when trichlorethylene, carbon tetrachloride, methylene chloride, chloroform, or perchlorethylene are used for cleaning purposes.

Do not apply heat in an attempt to free stiff nuts or fittings; as well as causing damage to protective coatings, there is a risk of damage to electronic equipment and brake lines from stray heat.
Do not leave tools, equipment, spilt oil, etc., around or on work area.

Safe use of Petrol

When draining petrol tanks, choose a well ventilated area preferably out of doors. Never drain petrol over a pit; keep all sources of ignition well away; use a proper fuel retriever or syphon whenever possible; if draining into a container use a funnel.
Store petrol in secure containers, properly labelled in a store agreed by your local petroleum licensing authority (Trading Standard Dept of Fire Brigade).
Carry petrol in a clearly labelled metal or approved plastic can securely closed.
Use petrol as a fuel only and not for cleaning hands, clothing or components. Do not add petrol to diesel fuel or put petrol on bonfires.
Avoid splashes and spillages; always use a funnel or filling spout for filling in a well ventilated area. If clothing is splashed, change as soon as possible. Keep the clothing away from heat and sources of ignition and tell whoever washes it about the petrol splashes.
Clean up or contain any spillage straight away and open doors and windows.
Keep ignition sources, e.g. handlamps, heaters and welding sets away from petrol.
Dispose of any petrol soaked rags safely.
DO NOT smoke when handling petrol.
NEVER play with petrol, it is highly dangerous and illegal.

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

Health Protection Precautions

1. Avoid prolonged and repeated contact with oils, particularly used engine oils.
2. Wear protective clothing, including impervious gloves where practicable.
3. Do not put oily rags in pockets.
4. Avoid contaminating clothes, particularly underpants, with oil.
5. Overalls must be cleaned regularly. Discard unwashable clothing and oil impregnated footwear.
6. First Aid treatment should be obtained immediately for open cuts or wounds.
7. Use barrier creams, applying before each work period, to help the removal of oil from the skin.
8. Wash with soap and water to ensure all oil is removed (skin cleaners and nail brushes will help). Preparations containing lanolin replace the natural skin oils which have been removed.
9. Do not use petrol, kerosine, diesel fuel, gas oil, thinners or solvents for washing skin.
10. If skin disorders develop, obtain medical advice.
11. Where practicable, degrease components prior to handling.
12. 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 to 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, or licensed waste disposal sites or to the waste oil reclamation trade. If in doubt, contact the Local Authority for advice on disposal facilities.

Preparation

Before removing a component, clean it and its surrounding area as thoroughly as possible.
Blank off any openings exposed by component removal, using greaseproof paper and masking tape.
Immediately seal fuel, oil or hydraulic lines when separated, using plastic caps or plugs, to prevent loss of fluid and entry of dirt.
Close the open ends of oilways, exposed by component removal, with tapered hardwood plugs or readily visible plastic plugs.
Immediately a component is removed, place it in a suitable container; use a separate container for each component and its associated parts.
Before dismantling a component clean it thoroughly with a recommended cleaning agent; check that the agent is suitable for all materials of component.
Clean the bench and provide marking materials, labels, containers and locking wire before dismantling a component.

Dismantling

Observe scrupulous cleanliness when dismantling components, particularly when brake, fuel or hydraulic system parts are being worked on. A particle of dirt or a cloth fragment could cause a dangerous malfunction if trapped in these systems.
Blow out all trapped holes, crevices, oilways and fluid passages with an air line. Ensure that and 'O' rings used for sealing are correctly replaced or renewed if disturbed.
Mark mating parts to ensure that they are replaced as dismantled. Whenever possible use marking ink, which avoids possibilities of distortion or initiation of cracks, liable if centre-punch or scriber are used.
Wire together mating parts where necessary to prevent accidental interchange (e.g. roller bearing components).
Wire labels onto all parts which are to be renewed, and to parts requiring further inspection before being passed for reassembly; place these parts in separate containers from those containing parts for rebuild.
Do not discard a part due for renewal until after comparing it with a new part, to ensure that its correct replacement has been obtained.

Inspection – General

Never inspect a component for wear or dimensional check unless it is absolutely clean; a slight smear of grease can conceal an incipient failure. When a component is to be checked dimensionally against figures quoted for it, use correct equipment (surface plates, micrometers,

dial gauges, etc.) in serviceable condition. Makeshift checking equipment can be dangerous. Reject a component if its dimensions are outside the limits quoted, or if damage is apparent. A part may, however, be refitted if its critical dimension is exactly limit size, and is otherwise satisfactory.

Use Plastigauge 12 Type PG-1 for checking bearing surface clearances.

Directions for its use, and a scale giving bearing clearances in 0,0025 mm (0.0001 in) steps are provided with it.

Ball and Roller Bearings

NEVER REPLACE A BALL OR ROLLER BEARING WITHOUT FIRST ENSURING THAT IT IS IN AS-NEW CONDITION.

Remove all traces of lubricant from a bearing under inspection by washing it in petrol or a suitable de-greaser; maintain absolute cleanliness throughout the operations.

Inspect visually for markings of any form on rolling elements, raceways, outer surface of outer rings or inner suface of inner rings. Reject any bearings found to be marked, since any markings in these areas indicates onset of wear.

Holding the inner race between finger and thumb of one hand, spin the outer race and check that it revolves absolutely smoothly. Repeat, holding the outer race and spinning the inner race.

Rotate the outer ring with a reciprocating motion, while holding the inner ring; feel for any check or obstruction to rotation, and reject the bearing if action is not perfectly smooth.

Lubricate the bearing generously with lubricant appropriate to installation. Inspect shaft and bearing housing for discolouration or other marking suggesting that movement has taken place between bearing and seatings.

If markings are found use Loctite in installation of replacement bearing.

Ensure that the shaft and housing are clean and free from burrs before fitting the bearing.

If one bearing of a pair shows an imperfection it is generally advisable to renew both bearings; an exception could be made only if the faulty bearing had covered a low mileage, and it could be established that damage was confined to it.

When fitting bearing to shaft, apply force only to inner ring of bearing, and only to outer ring when fitting into housing (Fig. 1).

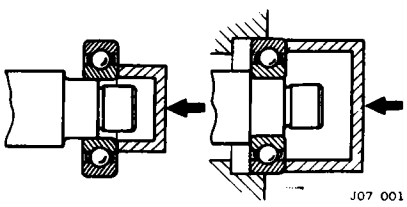


Fig. 1

In the case of grease-lubricated bearings (e.g. hub bearings) fill the space between the bearings and outer seal with a recommended grade of grease before fitting the seal.

Always mark components of separable bearings (e.g, taper-roller bearings) in dismantling, to ensure correct reassembly. Never fit new rollers in a used cup.

Oil Seals

Always fit new oil seals when rebuilding an assembly. It is not physically possible to replace a seal exactly as it had bedded down.

Carefully examine the seal before fitting to ensure that it is clean and undamaged.

Smear sealing lips with clean grease; pack dust excluder seals with grease, and heavily grease duplex seals in cavity between sealing lips.

Ensure that seal spring, if provided, is correctly fitted.

Place lip of seal towards fluid to be sealed and slide into position on shaft, using fitting sleeve (Fig. 2) when possible to protect sealing lip from damage by sharp corners, threads or splines. If fitting sleeve is not available, use plastic tube or adhesive tape to prevent damage to sealing lip.

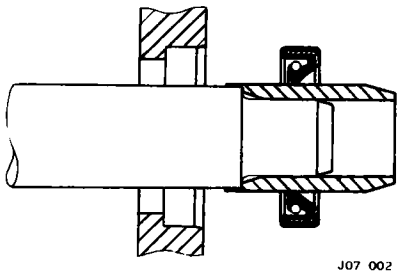


Fig. 2

Grease the outside diameter of the seal, place it square to the housing recess and press it into position, using great care and if possible a 'bell piece' (Fig. 3) to ensure that seal is not tilted. (In some cases it may be preferable to fit the seal to the housing before fitting to the shaft). Never let weight of an unsupported shaft rest in a seal.

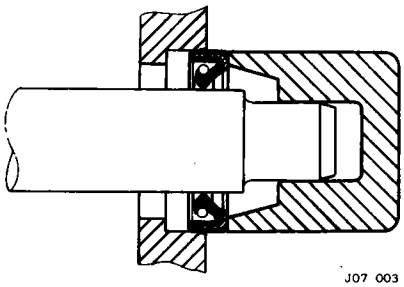


Fig. 3

If correct service tool is not available, use a suitable drift approximately 0,4 mm (0.015 in) smaller than the outside diameter of the seal. Use a hammer VERY GENTLY on the drift if a press is not suitable.

Press or drift a seal into the depth of housing if the housing is shouldered, or flush with the face of the housing where no shoulder is provided.

NOTE: Most cases of failure or leakage of oil seals are due to careless fitting, and resulting damage to both seals and sealing surfaces. Care in fitting is essential if good results are to be obtained.

Joints and Joint Faces

Always use the correct gaskets where they are specified.

Use jointing compound only when recommended. Otherwise fit joints dry.

When jointing compound is used, apply in a thin uniform film to metal surfaces; take great care to prevent it from entering oilways, pipes or blind tapped holes.

Remove all traces of old jointing materials prior to reassembly. Do no use a tool which could damage joint faces.

Inspect joint faces for scratches or burrs and remove with a fine file or oil-stone; do not allow swarf or dirt to enter tapped holes or enclosed parts. Blow out any pipes, channels or crevices with compressed air, renewing any 'O' rings or seals displaced by air blast.

Flexible Hydraulic Pipes, Hoses

Before removing any brake or power steering hose, clean end fittings and area surrounding them as thoroughly as possible.

Obtain appropriate blanking caps before detaching hose end fittings, so that ports can be immediately covered to exclude dirt.

Clean hose externally and blow through with airline. Examine carefully for cracks, separation of plies, security of end fittings and external damage. Reject any hose found faulty.

When refitting hose, ensure that no unnecessary bends are introduced, and that hose is not twisted before or during tightening of union nuts.

Containers 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 due to a lowering of its boiling point.

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 bled from system. Always use clean brake fluid, or a recommended alternative, to clean hydraulic components.

Fit a blanking cap to a hydraulic union and a plug to its socket after removal to prevent ingress of dirt.

Absolute cleanliness must be observed with hydraulic components at all times.

After any work on hydraulic systems, inspect carefully for leaks underneath the car while a second operator applies maximum pressure to the brakes (engine running) and operates the steering.

Metric Bolt Identifcation

An ISO metric bolt or screw, made of steel and larger than 6 mm in diameter can be identified by either of the symbols ISO M or M embossed or indented on top of head (Fig. 4).

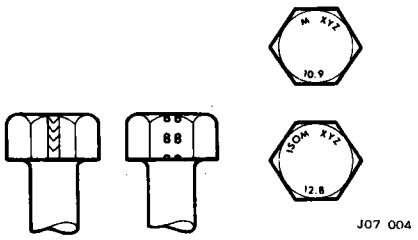


Fig. 4

In addition to marks to identify the manufacture, the head is also marked with symbols to indicate the strength grade i.e. 8.8, 10.9, 12.9, or 14.9, where the first figure gives the minimum tensile strength of the bolt material in tens of kgf/mm^2.
Zinc plated ISO metric bolts and nuts are chromate passivated, a greenish-khaki to gold-bronze colour.

Metric Nut Identification

A nut with an ISO metric thread is marked on one face (1, Fig. 5) or on one of the flats (2, Fig. 5) of the hexagon with the strength grade symbol 8, 12 or 14. Some nuts with a strength 4, 5 or 6 are also marked and some have the metric symbol M on the flat opposite the strength grade marking.

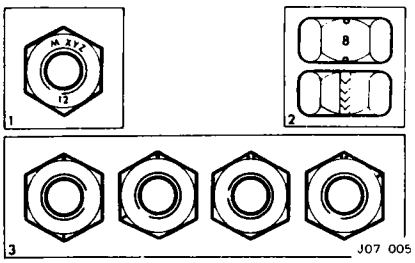


Fig. 5

A clock face system (3, Fig. 5) 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.

Hydraulic Fittings – Metrication

WARNING: Metric and Unified threaded hydraulic parts. Although pipe connections to brake system units incorporate threads of metric form, those for power assisted steering are of U.N.F. type. It is vitally important that these two thread forms are not confused, and careful study should be made of the following notes.

Metric threads and metric sizes are being introduced into motor vehicle manufacture and some duplication of parts must be expected. Although standardization must in the long run be good, it would be wrong not to give warning of the dangers that exist while U.N.F. and metric threaded hydraulic parts continue together in service.
Fitting U.N.F. pipe nuts into metric ports and vice-versa should not happen, but experience of the change from B.S.F. to U.N.F. indicated that there is no certainty in relying upon the difference in thread size when safety is involved.
To provide permanent identification of metric parts is not easy but recognition has been assisted by the following means:
All metric pipe nuts, hose ends, unions and bleed screws are coloured black.
The hexagon area of pipe nuts is indented with the letter 'M'.
Metric and U.N.F. pipe nuts are slightly different in shape.

NOTE: In Figs 6 to 9, A indicates the metric type and 'B' the U.N.F. type.

The metric female nut is **always** used with a trumpet flared pipe and the metric male nut is **always** used with a convex flared pipe (Fig. 6).

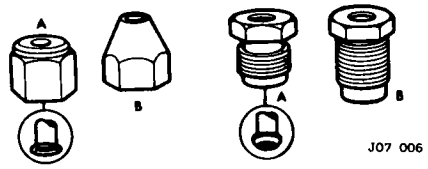


Fig. 6

All metric ports in cylinders and calipers have no counterbores, but unfortunately a few cylinders with U.N.F. threads also have no counterbore. The situation is, all parts with counterbores are U.N.F., but ports not counterbored are most likely to be metric (Fig. 7)

Fig. 7

The colour of the protective plugs in hydraulic ports indicates the size and the type of the threads, but the function of the plugs is protective and not designed as positive identification. In production it is difficult to use the wrong plug but human error must be taken into account.
The plug colours and thread sizes are:

	U.N.F.
RED	$\frac{3}{8}$" × 24 U.N.F.
GREEN	$\frac{7}{16}$" × 20 U.N.F.
YELLOW	$\frac{1}{2}$" × 20 U.N.F.
PINK	$\frac{5}{8}$" × 18 U.N.F.
	METRIC
BLACK	10 × 1 mm
GREY	12 × 1 mm
BROWN	14 × 1,5 mm

Hose ends differ slightly between metric and U.N.F. (Fig. 8)

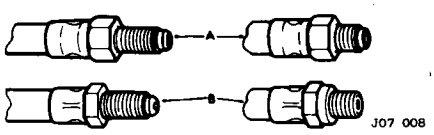


Fig. 8

Gaskets are not used with metric hoses.
The U.N.F. hose is sealed on the cylinder or caliper face by a copper gasket but the metric hose seals against the bottom of the port and there is a gap between faces of the hose end and cylinder (Fig. 9).

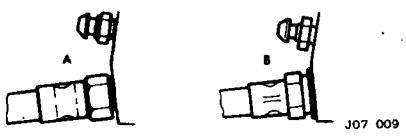


Fig. 9

Pipe sizes for U.N.F. are $\frac{3}{16}$ in, $\frac{1}{4}$ in, and $\frac{5}{16}$ in outside diameter.
Metric pipe sizes are 4,75 mm, 6 mm and 8 mm.
4.75 mm pipe is exactly the same as $\frac{3}{16}$ in pipe.
6 mm pipe is 0.014 in smaller than $\frac{1}{4}$ in pipe.
8 mm pipe is 0.002 in larger than $\frac{5}{16}$ in pipe.
Convex pipe flares are shaped differently for metric sizes and when making pipes for metric equipment, metric pipe flaring tools must be used.
The greatest danger lies with the confusion of 10 mm and $\frac{3}{8}$ in U.N.F. pipe nuts used for $\frac{3}{16}$ in (or 4,75 mm) pipe. The $\frac{3}{8}$ in U.N.F. pipe nut or hose can be screwed into a 10 mm port but is very slack and easily stripped. The thread engagement is very weak and cannot provide an adequate seal. The opposite condition, a 10 mm nut in a $\frac{3}{8}$ in port, is difficult and unlikely to cause trouble. The 10 mm nut will screw in $1\frac{1}{2}$ or two turns and seize. It has a crossed thread 'feel' and it is impossible to force the nut far enough to seal the pipe. With female pipe nuts the position is of course reversed.
The other combinations are so different that there is no danger of confusion.

Keys and Keyways

Remove burrs from edges of keyways with a fine file and clean thoroughly before attempting to refit key.
Clean and inspect key closely; keys are suitable for refitting only if indistinguishable from new, as any indentation may indicate the onset of wear.

Split Pins

Fit new split pins throughout when replacing any unit.
Always fit split pins where split pins were originally used. Do not substitute spring washers; there is always a good reason for the use of a split pin.
All split pins should be fitted as shown in Fig. 10 unless otherwise stated.

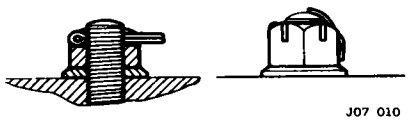


Fig. 10

Tab Washers

Fit new tab washers in all places where they are used. Never replace with a used tab washer.
Ensure that the new tab washer is of the same design as that replaced.

Nuts

When tightening up a slotted or castellated nut **never slacken it back** to insert split pin or locking wire wire except in those recommended cases where this forms part of an adjustment. If difficulty is experienced, alternative washers or nuts should be selected, or washer thickness reduced.
Where self-locking nuts have been removed it is advisable to replace them with new ones of the same type.

NOTE: Where bearing pre-load is involved nuts should be tightened in accordance with special instructions.

Locking Wire

Fit new locking wire of the correct type for all assemblies incorporating it.
Arrange wire so that its tension tends to tighten the bolt heads, or nuts, to which it is fitted.

Screw Threads

Both U.N.F. and Metric threads to ISO standards are used. See below for thread identification.
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.
Always ensure that replacement bolts are at least equal in strength to those replaced.
Do not allow oil, grease or jointing compound 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 figure, first slacken a quarter of a turn, then re-tighten to the correct figure.
Always oil thread lightly before tightening to ensure a free running thread, except in the case of self-locking nuts.

Unifed Thread Identification

Bolts

A circular recess is stamped in the upper surface of the bolt head (1, Fig. 11).

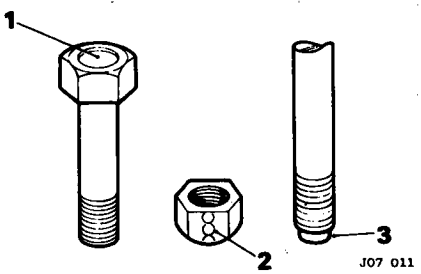


Fig. 11

Nuts

A continuous line of circles is indented on one of the flats of the hexagon, parallel to the axis of the nut (2, Fig. 11).

Studs, Brake Rods, etc.

The component is reduced to the core diameter for a short length at its extremity (3, Fig. 11).

JACKING, LIFTING AND TOWING

JACKING POINT

Four jacking points are provided beneath the body side-members (1, Fig. 1), one in front of each rear wheel and one behind each front wheel. They consist of downward-facing spigots (2, Fig. 1) designed to engage the lifting head of the tool kit jack (3, Fig. 1).

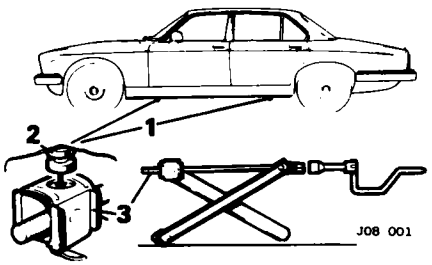


Fig. 1

Ensure that the jack head is fully engaged with spigot before lifting the car, and that wheels on side opposite to that being lifted are chocked, as well as checking handbrake application.

STANDS

When carrying out any work which requires a wheel to be raised (apart from a simple wheel-change) always replace the tool kit jack by a stand engaging the jacking spigot, to provide secure support.

WORKSHOP JACK

Front—one wheel

Place the jack head under the lower spring support pan, interposing a suitable wooden block before raising the wheel. Place a stand in position at the adjacent spigot and remove the jack before working on the car.

Rear—one wheel (Fig. 2)

Place the jack head under the outer fork of the wishbone at the wheel to be raised; interpose a suitable wooden block between the jack head and the wishbone, ensuring that the aluminium alloy hub carrier and its grease nipple will not be contacted by the block as the wheel is raised. Place a stand in position at the adjacent spigot and remove the jack before working on the car.

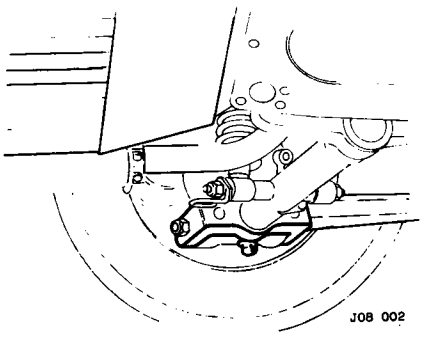


Fig. 2

Front—both wheels (Fig. 3)

Place the jack, with a shallow wooden block on its head, centrally beneath the front cross-member, between the lower wishbones. Raise the car, then lower it on to two stands engaging the front jacking spigots; remove the jack before working on the car.

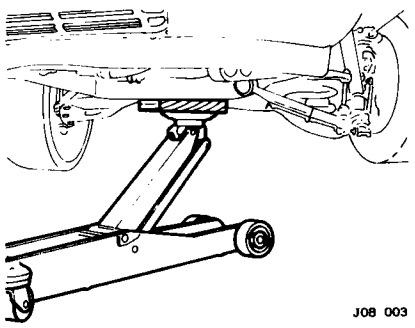


Fig. 3

Rear—both wheels (Fig. 4)

Place the jack head centrally under the plate below the final drive unit and interpose a wooden block between the jack head and plate, the block being shaped to prevent load being applied to the plate flanges. Raise the rear end of the car, then lower on to two stands engaging rear jacking spigots; remove the jack before working on the car.

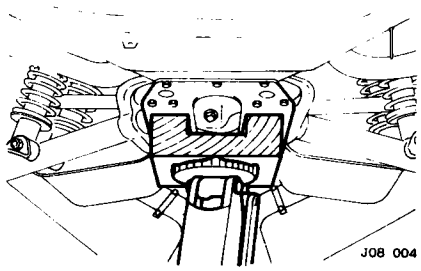


Fig. 4

LIFTING

Locate lifting pads at the four jacking spigots.

TOWING

Two towing eyes are provided on all cars, located adjacent to the front cross-member forward attachments, for use in towing from the front. Tie-down lugs at rear damper lower attachments are NOT suitable for rear towing. When towing an automatic transmission car, it is essential to carry out the following operations:

A. With automatic transmission functioning correctly:

1. Add 1,7 litres (3.0 pints) of correct automatic transmission fluid to the transmission, via the underbonnet filler tube.
2. Place the selector lever at 'N'.
3. Check that the ignition key is in place, and turn it to position '1'.
4. Tow the car at a speed not exceeding 48 km/h (30 m.p.h.) for not more than 48 km (30 miles).
5. After completing the tow, remove sufficient fluid from the transmission to restore correct reading on the dipstick.

CAUTION: It must be remembered that steering is no longer power-assisted when the engine is not running, and that the brake servo will become ineffective after a few applications of the brakes. Be prepared, therefore, for relatively heavy steering and the need for increased pressure on the brake pedal. This applies to manual transmission cars as well as to those with automatic transmission.

B. With automatic transmission defective, either tow the car with the rear wheels clear of the ground, or disconnect the propeller shaft at the final drive input flange and firmly secure the rear end of the shaft to one side of the flange. Restrictions on towing distance do not apply when the output shaft of the gearbox is not being turned, but it is still essential that the ignition key is turned to position '1' and the cautionary note above still applies.

Recovery of cars fitted with manual gearbox: Due to the possibility of internal gearbox damage, resulting from inadequate lubrication, it is essential, if the car is to be towed, that either the rear wheels are clear of the ground, or the propeller shaft is disconnected from the final drive input flange. If the propeller shaft is disconnected it must be firmly secured away from the final drive flange. Ensure that the ignition key is in position '1'.

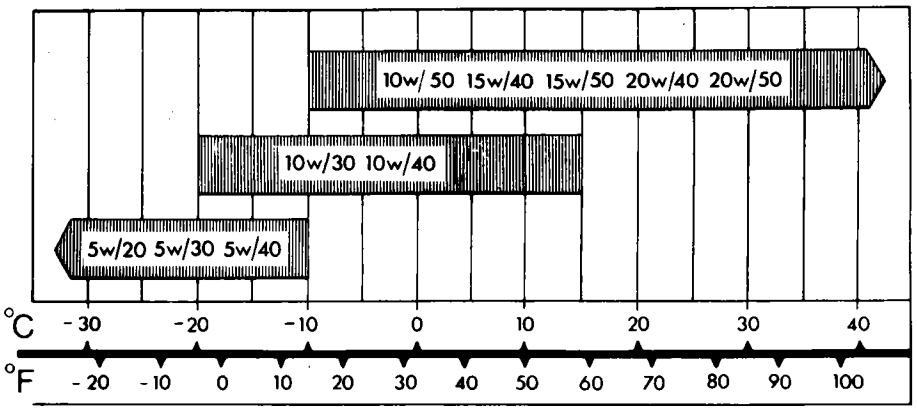
TRANSPORTING

Automatic transmission cars only

CAUTION: When the vehicle is being transported the selector lever must be in 'N' or 'D', never in 'P'. To obviate the possibility of damage to the pawl mechanism, the handbrake should be applied.

RECOMMENDED LUBRICANTS, FLUIDS, CAPACITIES AND DIMENSIONS

Engine Oil—Recommended S.A.E. Viscosity Range / Ambient Temperature Scale



J09-001A

Component—Model	Temperature Range	Specification	S.A.E. Viscosity Rating	Approved Brands Available in U.K. for Temperatures Above −10°C (14°F)
Engine—All Models **Distributor—All Models** **Oil Can—All models**	Above −10°C (14°F) −20°C to 10°C (−4°F to 50°F) Below −10°C (14°F)	BLSO OL.02 or MIL-L-2104 B or A.P.1. SE	10W/50, 15W/50, 20W/40, 20W/50 10W/30, 10W/40, 10W/50 5W/20, 5W/30	Unipart Super Multigrade, BP Super Viscostatic, Castrol GTX, Duckhams (15W/50) Hypergrade Motor Oil, Esso Uniflow, Fina Super Grade, Mobiloil Super, Shell Super Oil, Texaco Havoline
Manual Gearbox—6 cyl. —Refill —Top up ONLY	 All All	 Shell E3766 Hypoid Oil	 75W EP 80 W	 JRT Part No. RTC 1896
Powr-Lok Differential—All —Initial Fill —Refill	 All All	 Use only approved brands of fluid specially formulated for Powr-Lok	 90 90	 Shell Spirax Super 90, Shell Spirax Super 90, BP Gear Oil 1453, BP Limslip Gear Oil 90/1, Castrol G722, Castrol Hypoy LS, Duckhams Hypoid 90 DL,Texaco 3450 Gear Oil, Veedol Multigear Limited Slip S.A.E. 90
Drain and Top-Up —Top-up only if above oil not available **Normal Differential—6 cyl.** —Refill or top-up	All All	MIL-L-2105 B	EP 90	BP Gear Oil S.A.E. 90 EP, Castrol Hypoy, Duckhams Hypoid 90, Esso Gear Oil GX 90/140, Mobilube HDGO, Shell Spirax HD 90 Texaco Multigear Lubricant EP 90
GM 400 Automatic Transmission—12 cyl.	All	Dexron 2D		BP Autran DX, Castrol TQ Dexron, Esso ATF Dexron, Mobil ATF 220 Dexron, Shell ATF Dexron, Texaco Texamatic Fluid 6673
Borg-Warner Automatic Transmission Model 66 6 cyl.	All	Type G (M2C 33 G)	—	BP Autran G, Castrol TQF, Duckhams Q-Matic, Esso Glide Type G, Fina Purfimatic 33F, Mobil ATF 210, Shell Donax TF, Texaco Texamatic Type G
Power Assisted Steering—All	All	Above Specification or Dexron 2D	—	BP Autran DX, Castrol TQ Dexron, Esso ATF Dexron, Mobil ATF 220 Dexron, Shell ATF Dexron, Texaco Texamatic Fluid 6673
Grease Points—All	All	Multipurpose Lithium Grease, N.L.C.I. Consistency No. 2	—	BP Energrease L8, Castrol LM, Duckhams LB10, Esso Multipurpose H, Fina Marson HTL2, Mobilgrease MP, Shell Retinax A, Texaco Marfak

COOLING SYSTEM , CAPACITIES AND DIMENSIONS

COOLING SYSTEM

Additive	Jaguar Radiator Leak Sealer 2 135 ml bottles per vehicle – 12 cyl. 1 135 ml bottle per vehicle – 6 cyl. Barrs leaks 2 sachets per vehicle – 12 cyl. 1 sachet per vehicle – 6 cyl.
Coolant	Jaguar Anti–freeze/Coolant/Corrosion Inhibitor Concentration – 50% Canada/USA Jaguar Anti–freeze/Summer Coolant Concentration – 50% Australia JRA Limited Year Round Coolant Concentration – 33% to 50% Should these not be available then phosphate free anti–freeze conforming to specification BS6580 may be used.
Always top up the system with the recommended type and strength of coolant, NEVER with water only.	

CAPACITIES

	Litres	Imperial	U.S.
Engine refill (including filter)			
6 cylinder model			
Up to Vin nos. 8L161546; 8A15190; 7M4883	8,25	14.5 pt	17.5 pt
From Vin nos. 8L161546; 8A15190; 7M4883	8,81	15.5 pt	18.7 pt
12 cylinder model	10,8	19 pt	22.8 pt
Automatic transmission unit			
6 cylinder model (from dry)	8,00	14 pt	16.75 pt
12 cylinder model	9,1	16 pt	19.2 pt
Final drive unit	1,6	2.75 pt	3.25 pt
Cooling system, including reservoir and heater or air conditioning:			
6 cylinder model	18,2	32 pt	38.5 pt
12 cylinder model Not HE	21,2	37.5 pt	45 pt
HE	19,5	35 pt	42 pt
Fuel tanks – left and right – per tank	47,7	10.5 gal	12.6 gal
Luggage compartment	0,27 m^3	9.55 ft^3	9.55 ft^3

DIMENSIONS

Wheelbase	2865 mm	112.8 in
Track Front	1480 mm	58.26 in
Rear	1495 mm	58.86 in
Overall length: European cars	4959 mm	195.25 in
U.S.A. and Canada	5067 mm	199.5 in
Overall width	1770 mm	69.7 in
Overall height	1377 mm	54.2 in
Turning circle: between kerbs	12,2 mm	40 ft
Ground clearance: kerb condition	152,4 mm	6 in

WEIGHTS

U.K. and European Models	XJ 3.4		XJ 4.2 Daimler Sovereign		XJ 5.3 Daimler Sovereign	
	kg	lb	kg	lb	kg	lb
Kerb weight	1766	3902	1830	4044	1930	4265
Gross vehicle weight	2186	4831	2250	4973	2350	6294
*Gross train weight	3453	7631	3517	7773	3617	7994
Maximum permitted front axle load	1055	2332	1085	2398	1170	2580
Maximum permitted rear axle load	1150	2742	1180	2607	1200	2652
Federal Models	XJ 6		XJ 12			
	kg	lb	kg	lb		
Gross vehicle weight rating	2258	4979	2371	5229		
Gross axle weight rating—Front	1074	2370	1170	2580		
Gross axle weight rating—Rear	1183	2609	1201	2649		

* Gross train weight is the gross vehicle weight plus maximum trailer weight.

RECOMMENDED HYDRAULIC FLUID

Braking System

Castrol-Girling Universal Brake and Clutch fluid. This fluid exceeds S.A.E. J1703/D specification.
NOTE: Check all pipes in the brake system at the start and finish of each winter period for possible corrosion due to salt and grit used on the roads.

FUEL REQUIREMENTS

General

The use of either leaded or unleaded fuel depends on the type of emission control system fitted to the engine and the legislative requirements in the country for which the vehicle is manufactured.
Vehicles with engines designed to use unleaded fuel are clearly marked 'UNLEADED FUEL ONLY' adjacent to the fuel filler cap.
Consult the vehicle handbook for the fuel type and octane rating to be used.

Leaded Fuel

All vehicles supplied for use in the United Kingdom and certain Overseas markets have engines which are designed to use leaded fuel only. It is important to realise that unleaded fuel although labelled 'PREMIUM' is not the same as 4-Star leaded fuel, and that THE USE OF FUEL WITH A LOWER OCTANE RATING CAN CAUSE SERIOUS ENGINE DAMAGE and could result in loss of warranty coverage.
Use leaded fuel with an octane rating of at least 97 in vehicles with high compression engines.
When refuelling, ensure that the petrol pump is clearly marked 'LEADED FUEL', if any doubt exists consult the service station operator for further advice.

Unleaded Fuel

Engines fitted with catalytic converters in the exhaust system are designed to use only unleaded fuel. Unleaded fuel must be used for the emission control system to operate properly. Its use will also reduce spark plug fouling, exhaust system corrosion and engine oil deterioration.
Using leaded fuel will damage the emission control system and could result in loss of warranty coverage. The effectiveness of the catalyst in the catalytic converter decreases after the use of as little as one tank of leaded fuel. Also, the vehicle is equipped with an electronic fuel injection system, which includes an oxygen sensor. Leaded fuel will damage the sensor, and deteriorate emission control.
Only petrol pumps delivering unleaded fuel have nozzles which fit the filler neck of the vehicle's fuel tank.
Using unleaded fuel with an octane rating lower than recommended can cause persistent, heavy 'spark knock' (a metallic rapping noise). If severe, this can lead to engine damage. However, occasional light 'spark knock' for a short time while accelerating or driving up hills may occur. Although this noise should not give cause for concern, it may be eliminated by the use of a fuel of a higher octane rating than that recommended.

Unleaded Fuels Containing Alcohol

Some fuel suppliers sell fuel containing alcohol without advertising its presence. Where uncertainty exists check with the service station operator.

Ethanol:

Fuels containing up to 10% ethanol may be used. Ensure the fuel has octane ratings no lower than those recommended for unleaded fuel. Most driver's will not notice any operating difference with fuel containing ethanol, but some may, in which case the use of conventional unleaded fuel should be resumed if preferred.

Methanol:

Some fuels contain methanol (methyl or wood alcohol). DO NOT USE fuels containing methanol that do not also contain cosolvents and corrosion inhibitors for methanol. Also, DO NOT USE fuels that contain more than 3% methanol even if they contain cosolvents and corrosion inhibitors. Fuel system damage or vehicle performance problems resulting from the use of such fuels is not the responsibility of Jaguar Cars Limited and may not be covered under the warranty.

Methyl Tertiary Butyl Ether (MTBE)

Unleaded fuel containing an oxygenate known as MTBE can be used provided the ratio of MTBE to petrol does not exceed 15%.
MTBE is an ether based compound, derived from petroleum, which has been specified by several refiners as the substance to enhance the octane rating of fuel.
Should driveability problems be encountered when using MTBE blended fuel, the use of conventional unleaded fuel should be resumed.

CAUTION: Take care to not spill fuel during refuelling. Fuel containing alcohol can cause paint damage, which may not be covered under the warranty.

Components of Emission Control Systems

The component with most impact on the running of the vehicle is the catalytic converter which, when fitted, always requires the use of unleaded fuel.
The specifications of vehicles depend on the country legislation and/or option level chosen at the time of purchase.

Exhaust Emission – Testing

In order that exhaust emissions are kept within the legislated limits, an exhaust emission test with the engine running at idling speed MUST be carried out after any unscheduled service operations which might affect the emission control system.

MAINTENANCE SUMMARY—UK & Europe—Early Cars (up to VIN 322373)

OPERATION	Interval in Kilometres x 1000 Interval in Miles x 1000	5 3	10 6	20 12
PASSENGER COMPARTMENT				
Fit seat cover, place protective cover on carpets		X	X	X
Drive car on lift (ramp)		X	X	X
Check function of original equipment, i.e. interior and exterior lamps, indicators, horns and warning lights		X	X	X
Check operation of window controls		X	X	X
Check handbrake operation		X	X	X
Check footbrake operation		X	X	X
Check clock is running and set to time		X	X	X
Check windscreen washers and wipers for correct operation and that jets are clear and correctly positioned		X	X	X
Check condition and security of seats and seat belts		X	X	X
Check rear-view mirrors for cracks and crazing		X	X	X
EXTERIOR AND LUGGAGE COMPARTMENT				
Check door locks for correct operation		X	X	X
Check luggage compartment light for correct operation		X	X	X
Check/adjust tyre pressures, including spare		X	X	X
Check that tyres comply with manufacturer's specification		X	X	X
Check tyres for tread depth, visually for cuts in fabric, exposure of ply or cord structure, lumps or bulges		X	X	X
Check tightness of road wheel fastenings and that spare is correctly stowed		X	X	X
Check for fuel leaks at pumps and pipes; ensure that all connections are tight		X	X	X
Check front wheel alignment			X	X
Lubricate all locks and hinges (not steering lock)			X	X
Check, if necessary renew, windscreen wiper blades		X	X	X
Check/adjust headlight alignment		X	X	X
ENGINE COMPARTMENT				
Open bonnet, fit wing covers		X	X	X
Check/top-up engine oil		X		
Top-up carburetter piston dampers (where applicable)		X	X	X
Check/top-up cooling system		X	X	X
Check/top-up windscreen washer reservoir		X	X	X
Check/top-up brake fluid reservoir		X	X	X
Check/top-up clutch fluid reservoir		X	X	X
Check/top-up fluid in power steering reservoir		X	X	X
Check/top-up automatic gearbox fluid			X	X
Check distributor points; adjust or renew (where applicable)			X	X
Clean/adjust spark plugs			X	
Renew spark plugs				X
Lubricate distributor			X	X
Lubricate accelerator control linkage and check operation			X	X
Clean engine breather filter				X
Renew fuel filter				X
Clean A.E.D. unit filter (where applicable)		X	X	X
Renew air cleaner element and seal				X
Check/adjust torque of cylinder head nuts (not V12 engine)				X
Check/adjust torque of exhaust manifold nuts (not V12 engine)				X
Check/adjust ignition timing and distributor characteristics using electronic equipment			X	X
Check/adjust carburetter idle speed (where applicable)			X	X
Check/adjust driving bolts		X	X	X
Check/top-up battery electrolyte; clean and grease terminals		X	X	X
Check cooling and heating systems for leaks		X	X	X
Check visually hydraulic pipes and unions for chafing, leaks and corrosion		X	X	X
Check visually all joints for petrol, oil or air leaks		X	X	X
Check exhaust system for leakage and security		X	X	X

MAINTENANCE SUMMARY – UK & EUROPE – Early Cars (up to VIN 322373)

OPERATION	Interval in Kilometres x 1000 Interval in Miles x 1000	5 3	10 6	20 12
UNDERBODY				
Raise ramp		x	x	x
Renew engine oil and filter			x	x
Check/top-up gearbox oil – cars fitted with manual transmission only			x	x
Check/top-up final drive oil			x	
Renew final drive oil				x
Check/adjust clutch push-rod free travel – cars fitted with manual transmission only			x	x
Lubricate clutch linkage			x	x
Lubricate automatic gearbox exposed selector linkage			x	x
Lubricate handbrake mechanical linkage and cable			x	x
Lubricate all grease points excluding hubs			x	x
Lubricate all grease points including hubs				x
Insert brake pads for wear and discs for condition		x	x	x
Check security of engine and suspension fixings				x
Check exhaust system for leakage and security		x	x	x
Check engine, power assisted steering, gearbox and final drive for oil leaks		x	x	x
Check condition and security of steering unit joints and gaiters		x	x	x
Check cooling and heating system for leaks			x	x
Check visually hydraulic pipes and unions for chafing, leaks and corrosion		x	x	x
Check visually all joints for petrol, oil or air leaks		x	x	x
Check/adjust tyre pressures		x	x	x
Lower ramp				
Remove wing covers, close bonnet and check bonnet for correct operation		x	x	x
ROAD OR DYNAMOMETER TEST				
(Clean hands before carrying out following items)				
Ensure that seat cover and protective cover on carpets are in place		x	x	x
Drive car off lift (ramp)		x	x	x
Carry out road/roller test and check function of all instrumentation. Check safety harness inertia reel mechanism		x	x	x
Remove seat cover and protective cover from carpets		x	x	x

ADDITIONAL MAINTENANCE OPERATIONS – ALL VEHICLES

Brake System – Preventive Maintenance

In addition to the 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, hoses and pipes should be examined at intervals no greater than those laid down in the Passport to Service.

2. Brake fluid should be changed completely every two years.

3. All fluid seals in the hydraulic system should be renewed and all flexible hoses should be examined and renewed if necessary every three years or 96 000 km (60 000 miles) whichever is the sooner. At the same time the working surfaces of the pistons and the bores of the master cylinder, wheel cylinders and other slave cylinders should be examined and new parts fitted where necessary.

Care should be taken to observe the following:

a. At all times use the recommended brake fluid.

b. Never leave fluid in unsealed containers; it absorbs moisture quickly and can be dangerous if used in the braking system in this condition.

c. Fluid drained from the system or used for bleeding is best discarded.

d. The necessity for absolute cleanliness when carrying out any operations on the braking system cannot be over-emphasized.

MAINTENANCE SUMMARY — UK & EUROPE — Later Cars (from VIN 322374)

OPERATION	Interval in Kilometres x 1000 Interval in Miles x 1000	1.5 1	12 7.5	24 15
Fit protection kit		x	x	x
Check condition and security of seats and seat belts		x	x	x
Check operation of seat belt warning system		x		
Check footbrake operation		x	x	x
Check operation of lamps		x		
Check operation of horns		x		
Check operation of warning indicators		x		
Check operation of windscreen wipers		x		
Check operation of windscreen washers		x		
Check security of handbrake – release fully after checking		x	x	x
Check rear-view mirrors for security and function		x		
Mark stud to wheel relationship			x	x
Remove front wheels			x	
Remove road wheels – front and rear				x
Check that tyres are of the correct size and shape		x	x	x
Check tyre tread depth		x	x	x
Check tyres visually for external lumps, bulges and uneven wear		x	x	x
Check tyres visually for external exposure of ply or cord		x	x	x
Check/adjust tyre pressures		x	x	x
Inspect brake pads for wear and discs for condition			x	x
Adjust front hub bearing end-float				x
Grease hubs (up to VIN 481999)				x
Check for oil leaks from steering and fluid leaks from suspension system		x	x	x
Check condition and security of steering unit joints and gaiters		x	x	x
Refit road wheels in original position			x	x
Check tightness of road wheel fastenings		x	x	x
Drain engine oil		x	x	x
Check/top up gearbox oil (manual)		x	x	x
Renew automatic transmission filter 48 000 km (30 000 miles)				48 km
Renew automatic transmission fluid 48 000 km (30 000 miles)				48 km
Grease all points excluding hubs			x	x
Check/top up rear axle/final drive oil		x	x	x
Renew final drive oil 48 000 km (30 000 miles)				48 km
Check visually hydraulic hoses, pipes and unions for chafing, cracks, leaks and corrosion		x	x	x
Check exhaust system for leakage and security		x	x	x
Lubricate handbrake mechanical linkage and cables		x	x	x
Check condition of handbrake pads				x
Lubricate automatic gearbox exposed selector linkage		x	x	x
Check tightness of propshaft coupling bolts		x		x
Check security of accessible engine mountings		x		
Check condition and security of steering unit, joints and gaiters		x	x	x
Check security and condition of suspension fixings		x	x	x
Check steering rack for oil leaks		x	x	x
Check power steering for leaks, hydraulic pipes and unions for chafing, corrosion and security		x	x	x
Check shock absorbers for fluid leaks		x	x	x
Renew engine oil filter element			x	x
Refit engine drain plug		x	x	x
Check for oil leaks – engine and transmission		x	x	x

MAINTENANCE SUMMARY — UK & Europe — Later Cars

OPERATION	Interval in Kilometres x 1000 Interval in Miles x 1000	1.5 1	12 7.5	24 15
Check/adjust torque of cylinder head nuts/bolts (not V12 engine)		×		
Fill engine with oil		×	×	×
Lubricate accelerator control linkage and pedal pivot		×		
Top up carburetter piston dampers (where applicable)		×	×	×
Renew air cleaner element(s)				×
Check security of accessible engine mountings		×		
Check driving belts; adjust or renew		×		×
Clean and adjust spark plugs			×	
Renew spark plugs				×
Check/top-up battery electrolyte (where applicable)		×	×	×
Clean and grease battery connections		×	×	×
Check/top-up clutch fluid reservoir (where applicable)		×	×	×
Check/top-up brake fluid reservoir		×	×	×
Check brake servo hose(s) for security and condition		×	×	×
Check/top-up windscreen washer reservoir		×		
Check cooling and heater system for leaks and hoses for security and condition		×	×	×
Change coolant ensuring the correct antifreeze concentration 48.000 km (30 000 miles)				48 km
Check/top-up cooling system		×		
Renew fuel filter — 3.4				×
Clean engine breather filter (where applicable)				×
Check crankcase breathing system for leaks, hoses for security and condition		×		×
Clean A.E.D. filter (where applicable)		×	×	×
Check/top-up fluid in power steering reservoir; check security and condition of oil pressure hose at oil filter		×	×	×
Run engine and check for sealing of oil filter; stop engine			×	×
Check/top-up engine oil			×	×
Connect electronic instruments and check underbonnet label data		×		×
Check visually distributor points; adjust or renew (where applicable)		×		
Renew distributor points (where applicable)				×
Lubricate distributor (not cam wiping pad) V12 at 36.000 km (22 500 miles)		×		36 km
Disconnect vacuum pipe, check dwell angle, adjust as necessary		×		×
Check ignition timing (at normal operating temperature on HE models)		×	×	×
Check distributor automatic advance		×		×
Check advance increases as vacuum pipe is reconnected		×		×
Lubricate all locks, hinges and door check mechanisms (not steering lock)		×		×
Check operation of bonnet lock and boot and door locks and lights		×		
Check operation of window controls		×		
Check and if necessary renew windscreen wiper blades			×	×
Check/adjust engine idle speed and carburetter mixture settings (where applicable) stop engine — disconnect instruments		×		×
Check power steering system for leaks, hydraulic pipes and unions for chafing and corrosion		×	×	×
Check for oil leaks from engine and transmission		×	×	×
Check/top-up automatic gearbox fluid		×	×	×
Re-check tension if driving belt has been renewed		×		×
Remove spare wheel		×	×	×
Check that the tyre is the correct size and type		×	×	×
Check tyre tread depth		×	×	×

MAINTENANCE SUMMARY — UK & EUROPE — Later Cars

OPERATION	Interval in Kilometres x 1000 Interval in Miles x 1000	1.5 1	12 7.5	24 15
Check tyre visually for external exposure of cord or ply		x	x	x
Check tyre visually for external lumps or bulges		x	x	x
Check/adjust tyre pressure		x	x	x
Renew fuel filter (not 3.4)				x
Refit spare wheel		x	x	x
Check/adjust headlamp alignment		x		x
Check/adjust front wheel alignment		x		x
Carry out road or roller test		x	x	x
Check operation of seat belt inertia mechanism		x	x	x
Ensure cleanliness of controls, door handles, steering wheel, etc		x	x	x
Remove protection kit		x	x	x
Report additional work required		x	x	x

It is further recommended:
At 24 month intervals:
Change brake fluid.

At 96 000 km (60 000 mile) or 36 month intervals:
Renew all fluid seals in hydraulic system; examine and renew if necessary all flexible hoses.
Examine working surfaces of master cylinder and calipers. Renew if necessary.

OPTIONAL SERVICES

OPERATION	Interval in Kilometres x 1000 Interval in Miles x 1000	12 7.5	24 15
Check operation of lamps			x
Check operation of horns			x
Check operation of warning indicators			x
Check operation of windscreen wipers			x
Check operation of windscreen washers			x
Check operation of window controls		x	x
Check operation of boot lamp			x
Check operation of all door, bonnet and boot locks		x	x
Check sunroof and controls for correct operation (if fitted)			x
Check operation of headlamp wipe/wash (if fitted)			x
Check rear view mirrors for security and function			x
Check/top–up windscreen washer reservoir			x
Check/top–up cooling system		x	x
Lubricate all locks, hinges and door check mechanisms (not steering lock)		x	
Check operation of cruise control (if fitted)			x
Clean aerial mast		x	
Check/adjust headlamp alignment		x	
Check/adjust front wheel alignment		x	

MAINTENANCE SUMMARY — North American Markets

Service Code Letter	DISTANCE Mileage x 1000												
A	1												
B		7.5		22.5		37.5		52.5		67.5		82.5	97.5
C			15				45				75		
D					30				60			90	

THE PERIOD BETWEEN SERVICES SHOULD NOT EXCEED 12 MONTHS

Maintenance, replacement or repair of the emission control devices and system may be performed by an automotive repair establishment or individual using any automotive part which has been certified by the part manufacturer. Your dealer will supply particulars.

MAINTENANCE SUMMARY North American Markets

1000 MILES
A INTERVAL

LUBRICATION

Lubricate handbrake mechanical linkage and cables
Renew engine oil and engine oil filter
Check/top-up rear axle oil
Check/top-up brake fluid reservoir
Check/top-up automatic transmission fluid
Check battery condition/clean and grease connections if necessary
Check/top-up cooling system
Check/top-up power steering reservoir
Check/top-up windscreen washer fluid
Lubricate all locks and hinges (not steering lock)
Renew fluid — manual transmission
Check/top-up clutch fluid

ENGINE

Check for oil leaks
Check all driving belts; adjust
Check cooling and heater system for leaks, for hose condition and security
Check security of engine mountings

FUEL AND EXHAUST SYSTEMS

Check fuel system for leaks, pipes and unions for chafing and corrosion
Check exhaust system for leaks and security

TRANSMISSION, BRAKES, STEERING AND SUSPENSION

Check for fluid/oil leaks
Check condition and security of steering unit, joints and gaiters
Check visually brake hydraulic pipes and unions for cracks, chafing, leaks and corrosion
Check suspension component condition and security
Check shock absorbers for leaks and condition
Check/adjust wheel alignment
Check brake servo hoses for security and condition
Check footbrake and handbrake operation

WHEELS AND TYRES

Check that tyres comply with manufacturer's specification
Check tyres for tread depth and visually for external cuts in fabric, exposure of ply or cord structure, lumps or bulges
Check tyres for irregular tread wear; perform necessary alignment/repair
Check and adjust tyre pressure, including spare wheel
Check for damaged/deformed wheel rims
Check tightness of road wheel fastenings

ELECTRICAL

Check/adjust operation of windscreen wipers and washers
Check function of all original equipment: lights, horns, warning indicators, radio, etc.
Check/adjust headlight alignment (refer to state and local requirement)

BODY

Check operation and security of seats and seat belts — front and rear
Check operation of all door, bonnet and boot locks
Check operation of window and sunroof controls
Check/open underbody drains (also during annual rust inspection)

GENERAL
Road Test:

Check vehicle performance, shifting, braking, handling
Check function of all instrumentation
Check function of trip computer
Check function of cruise control
Check function of climate control and ventilation systems

Report Additional Work Required After Road Test:

Check engine for leaks
Check/top-up automatic transmission fluid
Check/top-up brake fluid reservoir
Check/top-up power steering reservoir

MAINTENANCE SUMMARY North American Markets

7500 MILES
B INTERVAL

LUBRICATION

Lubricate all grease points (not wheel hubs or steering rack)
Lubricate handbrake mechanical linkage and cables
Renew engine oil and engine oil filter
Check/top-up rear axle oil
Check/top-up brake fluid reservoir
Check/top-up automatic transmission fluid
Check battery condition/clean and grease connections if necessary
Check/top-up cooling system
Check/top-up power steering reservoir
Check/top-up windscreen washer fluid
Lubricate all locks and hinges (not steering lock)
Renew brake fluid every 18 000 miles or 18 months
Renew coolant every 2 years
Check/top-up clutch fluid

ENGINE

Check for oil leaks
Check all driving belts; adjust/renew as necessary (applicable above 30 000 miles)
Check cooling and heater system for leaks, for hose condition and security

FUEL AND EXHAUST SYSTEMS

Check fuel system for leaks, pipes and unions for chafing and corrosion
Check exhaust system for leaks and security
Renew fuel filter (at 52 500 miles only)

TRANSMISSION, BRAKES, STEERING AND SUSPENSION

Check for fluid/oil leaks
Check condition and security of steering unit, joints and gaiters
Check visually brake hydraulic pipes and unions for cracks, chafing, leaks and corrosion
Check suspension component condition and security
Check shock absorbers for leaks and condition
Inspect brake pads for wear and discs for condition (including handbrake pads)
Check/adjust wheel alignment
Check brake servo hoses for security and condition

WHEELS AND TYRES

Check that tyres comply with manufacturer's specification
Check tyres for tread depth and visually for external cuts in fabric, exposure of ply or cord structure, lumps or bulges
Check tyres for irregular tread wear; perform necessary alignment/repair
Check and adjust tyre pressure, including spare wheel
Check for damaged/deformed wheel rims
Check tightness of road wheel fastenings

ELECTRICAL

Check/adjust operation of windscreen wipers and washers
Check function of all original equipment: lights, horns, warning indicators, radio, etc.
Check wiper blades and arms: renew if necessary
Check/adjust headlight alignment (refer to state and local requirement)

BODY

Check operation and security of seats and seat belts — front and rear
Check operation of all door, bonnet and boot locks
Check operation of window and sunroof controls
Check/open underbody drains (also during annual rust inspection)

GENERAL
Road Test:

Check vehicle performance, shifting, braking, handling
Check function of all instrumentation
Check function of trip computer
Check function of cruise control
Check function of climate control and ventilation systems

Report Additional Work Required After Road Test:

Check engine for leaks
Check/top-up automatic transmission fluid
Check/top-up brake fluid reservoir
Check/top-up power steering reservoir

MAINTENANCE SUMMARY North American Markets

15 000 MILES C INTERVAL

LUBRICATION

Lubricate all grease points
Lubricate handbrake mechanical linkage and cables
Lubricate front/rear wheel hubs
Lubricate steering rack (hand operated equipment only)
Renew engine oil and engine oil filter
Renew manual transmission fluid
Check/top-up rear axle oil
Check/top-up brake fluid reservoir
Check/top-up automatic transmission fluid
Check battery condition/clean and grease connections if necessary
Check/top-up cooling system
Check/top-up power steering reservoir
Check/top-up windscreen washer fluid
Lubricate accelerator control linkages and pedal pivot; check operation
Lubricate all locks and hinges (not steering lock)
Renew brake fluid every 18 000 miles or 18 months
Renew coolant every 2 years
Check/top-up clutch fluid

ENGINE

Check for oil leaks
Check all driving belts; adjust/renew as necessary (applicable above 30 000 miles)
Check cooling and heater system for leaks, for hose condition and security

FUEL AND EXHAUST SYSTEMS

Check fuel system for leaks, pipes and unions for chafing and corrosion
Check exhaust system for leaks and security

TRANSMISSION, BRAKES, STEERING AND SUSPENSION

Check for fluid/oil leaks
Check condition and security of steering unit, joints and gaiters
Check visually brake hydraulic pipes and unions for cracks, chafing, leaks and corrosion
Check suspension component condition and security
Check shock absorbers for leaks and condition
Inspect brake pads for wear and discs for condition (including handbrake pads)
Check/adjust front wheel alignment
Check/adjust front hub bearing end float
Check tightness of propeller shaft coupling bolts
Check brake servo hoses for security and condition

WHEELS AND TYRES

Check that tyres comply with manufacturer's specification
Check tyres for tread depth and visually for external cuts in fabric, exposure of ply or cord structure, lumps or bulges
Check tyres for irregular tread wear; perform necessary alignment/repair
Check and adjust tyre pressure, including spare wheel
Check for damaged/deformed wheel rims
Check tightness of road wheel fastenings

ELECTRICAL

Check/adjust operation of windscreen wipers and washers
Check function of all original equipment: lights, horns, warning indicators, radio, etc.
Check wiper blades and arms; renew if necessary
Check/adjust headlight alignment (refer to state and local requirement)

BODY

Check operation and security of seats and seat belts — front and rear
Check operation of all door, bonnet and boot locks
Check operation of window and sunroof controls
Check/open underbody drains (also during annual rust inspection)

GENERAL

Road Test:

Check vehicle performance, shifting, braking, handling
Check function of all instrumentation
Check function of trip computer
Check function of cruise control
Check function of climate control and ventilation systems

Report Additional Work Required After Road Test:

Check engine for leaks
Check/top-up automatic transmission fluid
Check/top-up brake fluid reservoir
Check/top-up power steering reservoir

MAINTENANCE SUMMARY North American Markets

30 000 MILES
D INTERVAL

LUBRICATION
Lubricate all grease points
Lubricate handbrake mechanical linkage and cables
Lubricate front/rear wheel hubs
Lubricate steering rack (hand operated equipment only)
Renew engine oil and engine oil filter
Renew automatic transmission fluid (and filter GM400) (clean screen BW)
Check/top-up rear axle oil
Check/top-up brake fluid reservoir
Check/top-up manual transmission fluid
Check battery condition/clean and grease connections if necessary
Check/top-up cooling system
Check/top-up power steering reservoir
Check/top-up windscreen washer fluid
Lubricate accelerator control linkage and pedal pivot; check operation
Lubricate distributor
Lubricate all locks and hinges (not steering lock)
Renew brake fluid every 18 000 miles or 18 months
Renew coolant every 2 years
Check/top-up clutch fluid

ENGINE
Check for oil leaks
Renew air cleaner element(s)
Renew spark plugs
Check all driving belts; adjust/renew as necessary (applicable above 30 000 miles)
Check cooling and heater system for leaks, for hose condition and security
Check crankcase breathing and evaporative loss control system

FUEL AND EXHAUST SYSTEMS
Check fuel system for leaks, pipes and unions for chafing and corrosion
Check exhaust system for leaks and security
Renew oxygen sensor(s)

TRANSMISSION, BRAKES, STEERING AND SUSPENSION
Check for fluid/oil leaks
Check condition and security of steering unit, joints and gaiters
Check visually brake hydraulic pipes and unions for cracks, chafing, leaks and corrosion
Check suspension component condition and security
Check shock absorbers for leaks and condition
Inspect brake pads for wear and discs for condition (including handbrake pads)
Check/adjust front wheel alignment
Check/adjust front hub bearing end float
Check tightness of propeller shaft coupling bolts
Check brake servo hoses for security and condition

WHEELS AND TYRES
Check that tyres comply with manufacturer's specification
Check tyres for tread depth and visually for external cuts in fabric, exposure of ply or cord structure, lumps or bulges
Check tyres for irregular tread wear; perform necessary alignment/repair
Check and adjust tyre pressure, including spare wheel
Check for damaged/deformed wheel rims
Check tightness of road wheel fastenings

ELECTRICAL
Check/adjust operation of windscreen wipers and washers
Check function of all original equipment: lights, horns, warning indicators, radio, etc.
Check wiper blades and arms; renew if necessary
Check/adjust headlight alignment (refer to state and local requirement)

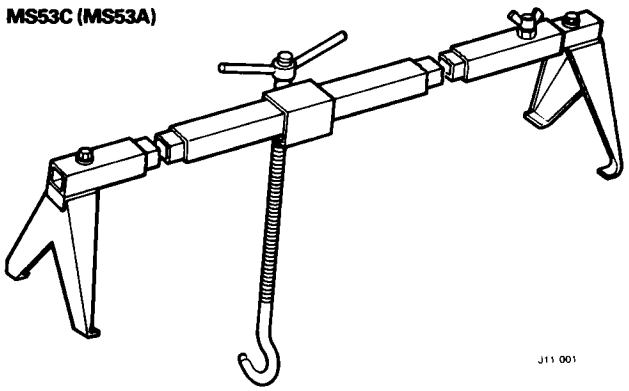
BODY
Check operation and security of seats and seat belts — front and rear
Check operation of all door, bonnet and boot locks
Check operation of window and sunroof controls
Check/open underbody drains (also during annual rust inspection)

GENERAL
Road Test:
Check vehicle performance, shifting, braking, handling
Check function of all instrumentation
Check function of trip computer
Check function of cruise control
Check function of climate control and ventilation systems

Report Additional Work Required After Road Test:
Check engine for leaks
Check/top-up automatic transmission fluid
Check/top-up brake fluid reservoir
Check/top-up power steering reservoir

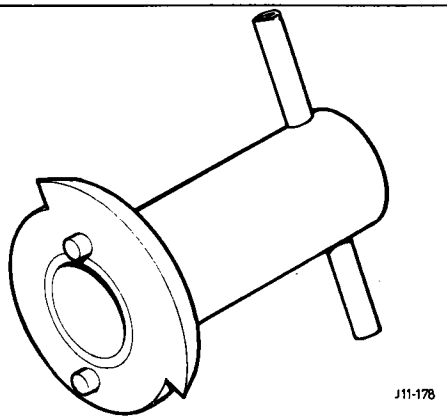
SERVICE TOOLS – SECTION 11 – 6 CYLINDER ENGINE – SECTION 12

MS53C (MS53A)



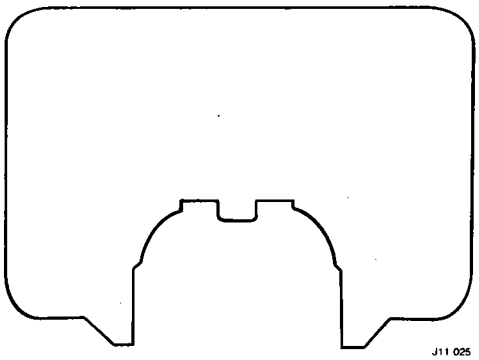
Engine support bracket

JD 2B



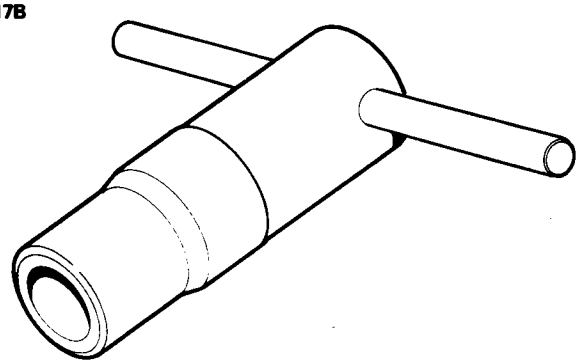
Timing chain adjusting plate

C 3993



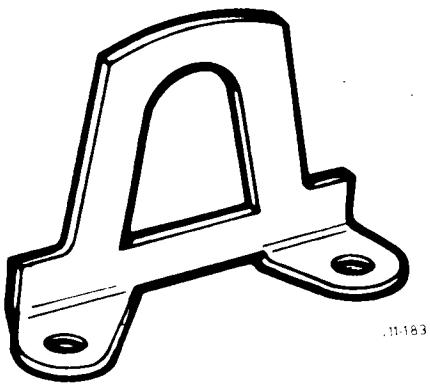
Valve and Timing gauge

JD 17B



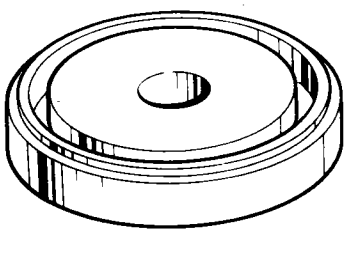
Oil seal packing presizing tool

***C37851**



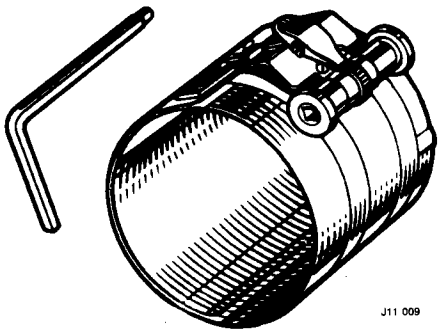
Lifting eye

JD 6118C



Valve spring compressor

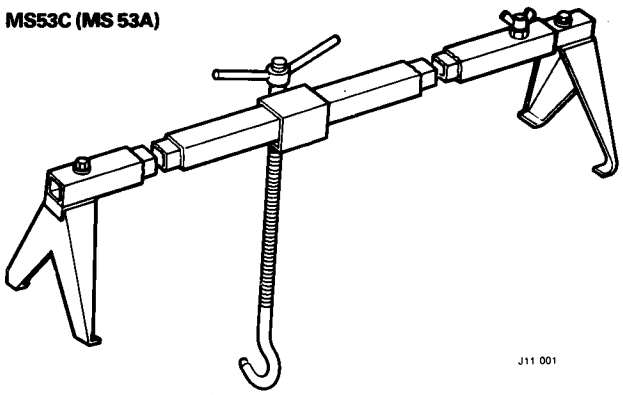
18G 55A (38U3)



Piston ring compressor

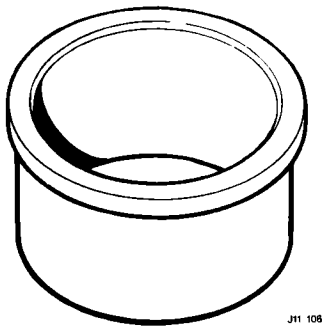
12 CYLINDER ENGINE – SECTION 12

MS53C (MS 53A)



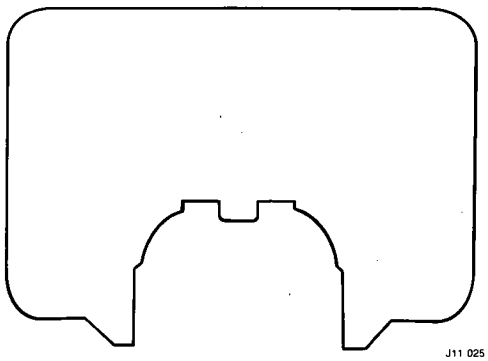
Engine support bracket

JD 17B-1



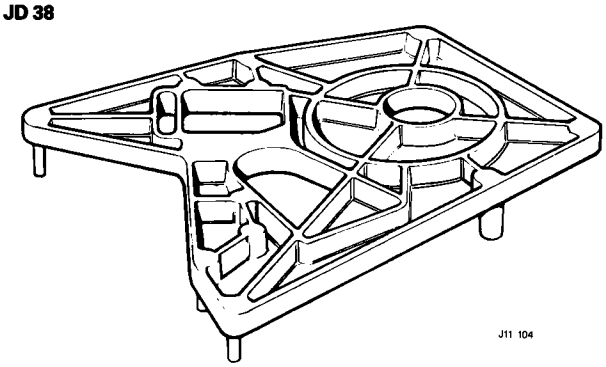
Adaptor crankshaft rear oil seal presizing tool

***C 3993**



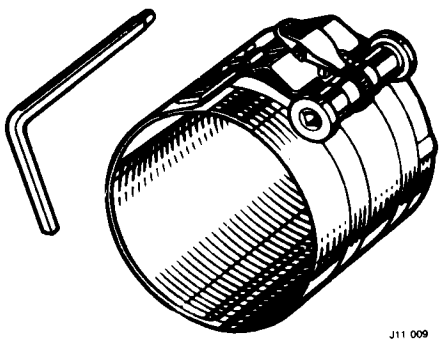
Valve and Timing gauge

JD 38



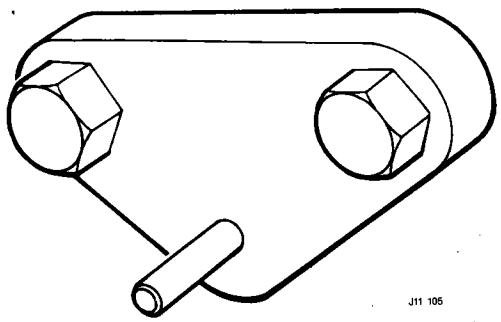
Damper setting jig

18G.55A (38U3)



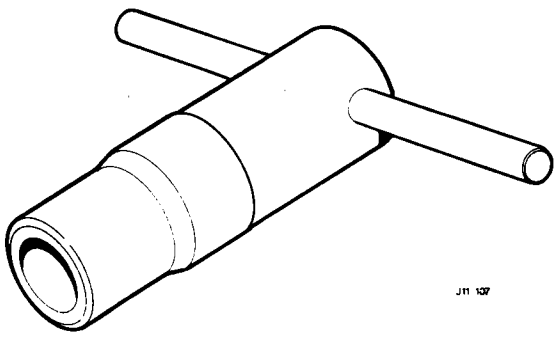
Piston ring compressor

JD 39



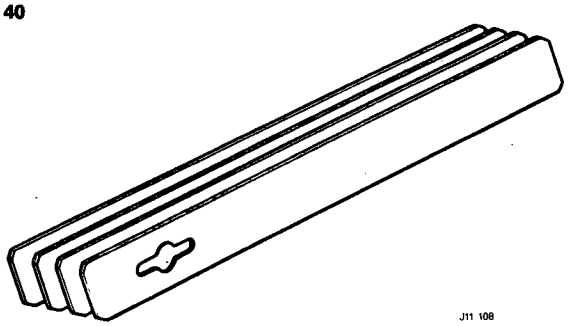
Jackshaft sprocket holder

JD 17B



Oil seal packing presizing tool

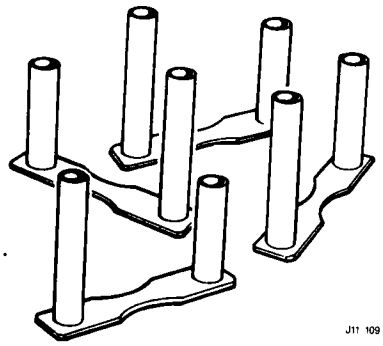
JD 40



Camshaft sprocket retainer

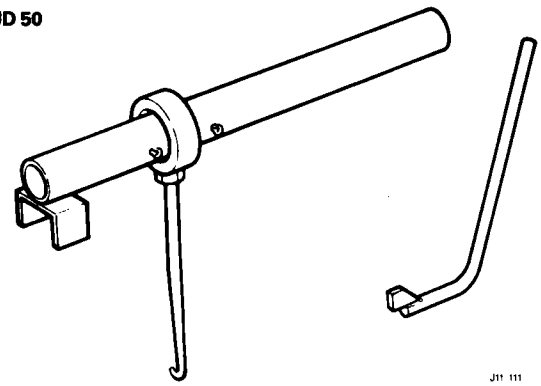
12 CYLINDER ENGINE – SECTION 12 – continued

JD 41



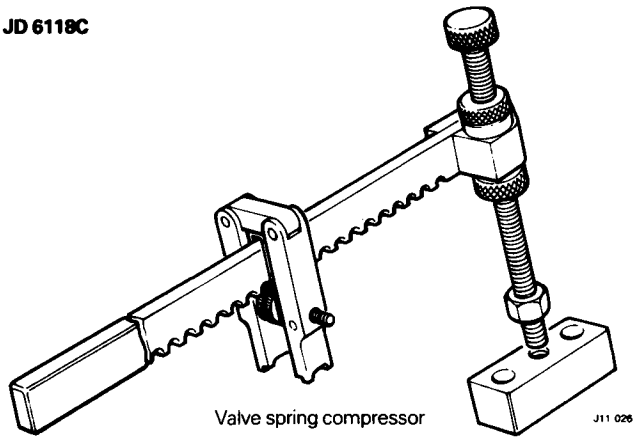
Cylinder liner retainers

JD 50



Timing chain tensioner retainer

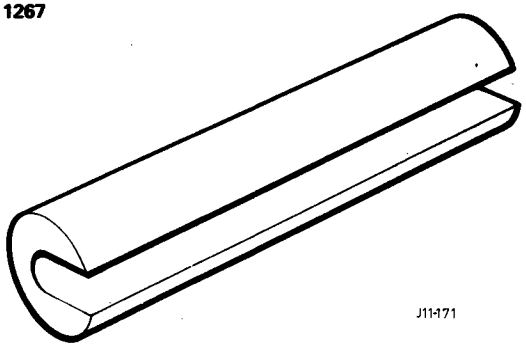
JD 6118C



Valve spring compressor

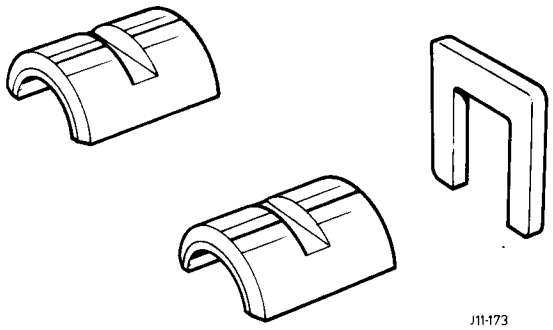
FUEL SYSTEM – SECTION 19

18G 1267



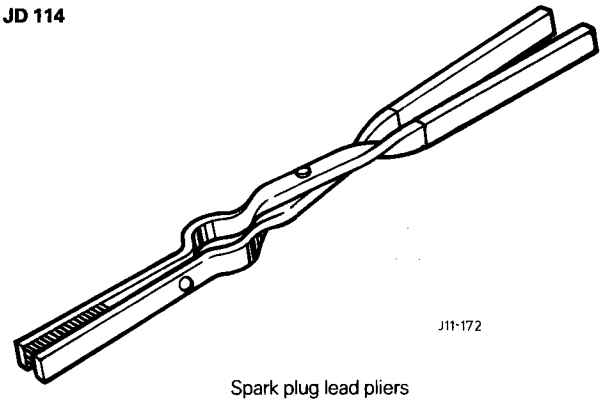
Replacer – Damper assembly retainer

JD 116



Injector hose fitting tool

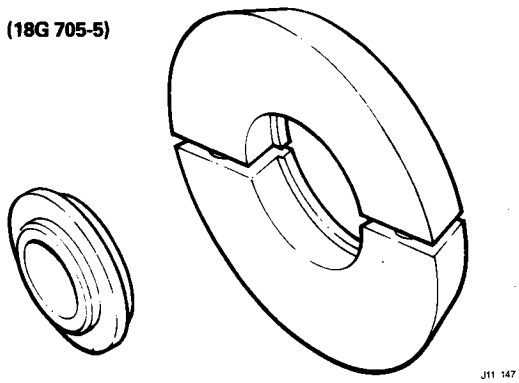
JD 114



Spark plug lead pliers

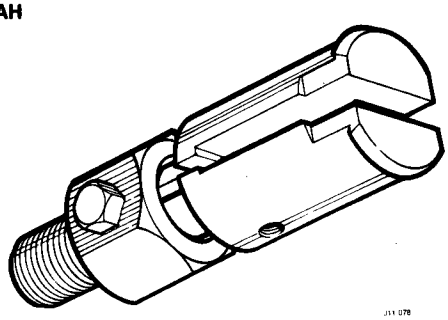
MANUAL GEARBOX – SECTION 37

18G 47-1 (18G 705-5)



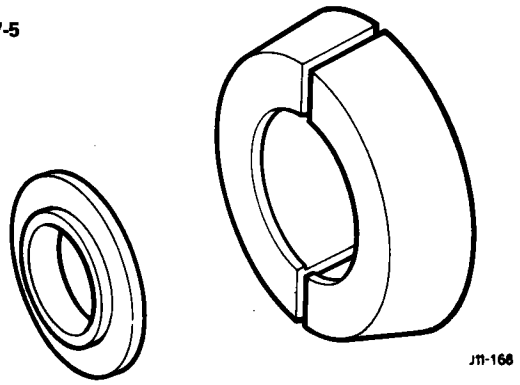
Adaptor – remover, layshaft cluster bearings

18G 284AAH



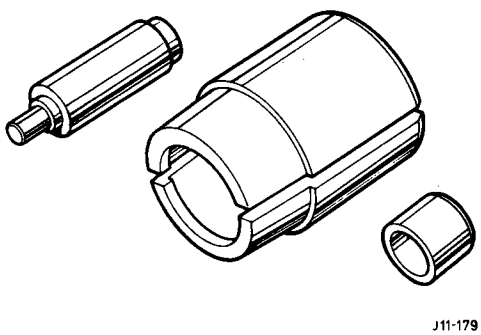
Adaptor/remover – mainshaft pilot outer bearing outer track

18G 47-5



Adaptor remover/replacer constant pinion bearing

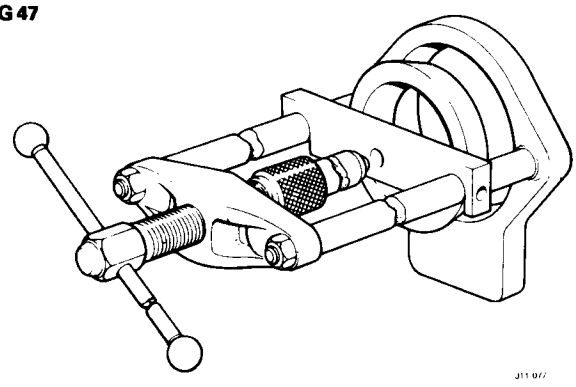
18G 705-1A



Adaptor/remover 5th speed gear

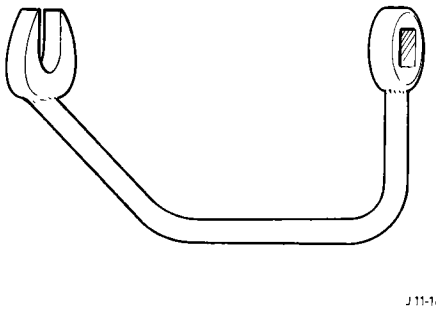
MANUAL GEARBOX – SECTION 37 – continued

18G 47



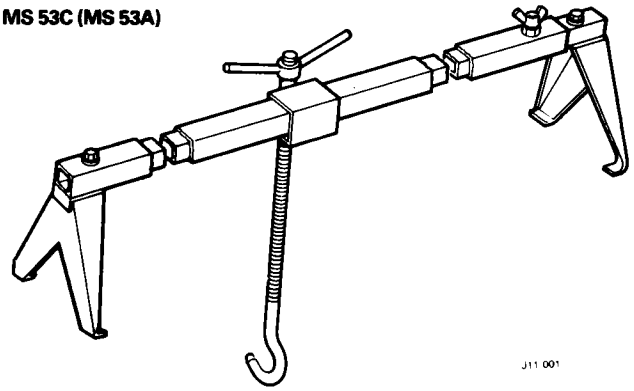
Multi-purpose handpress

#ST1136



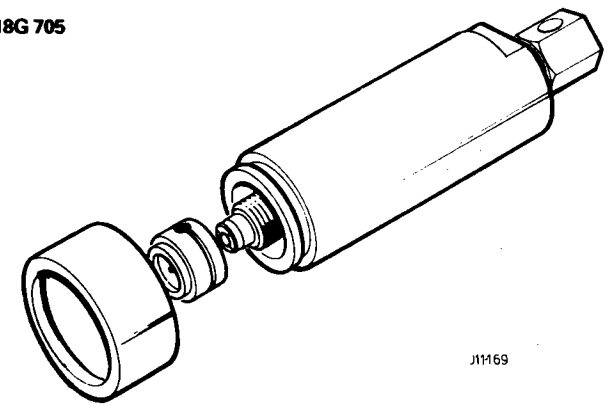
Offset spanner

MS 53C (MS 53A)



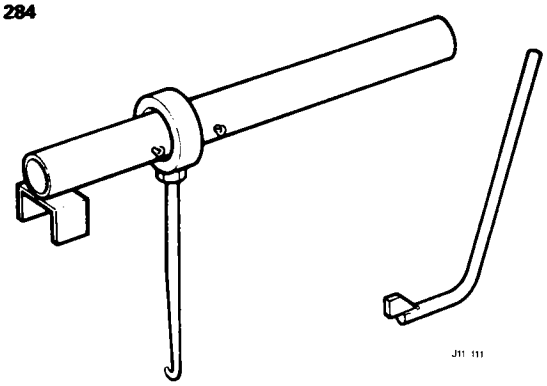
Engine support bracket

18G 705



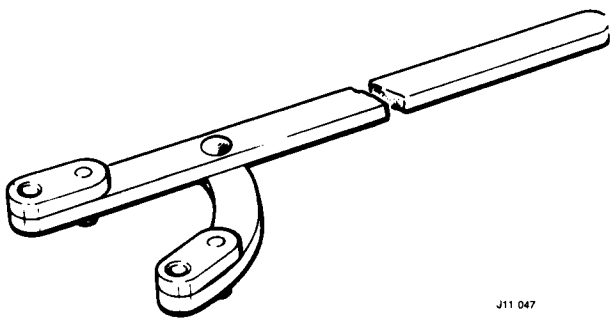
Remover bearing race centre

18G 284



Impulse extractor

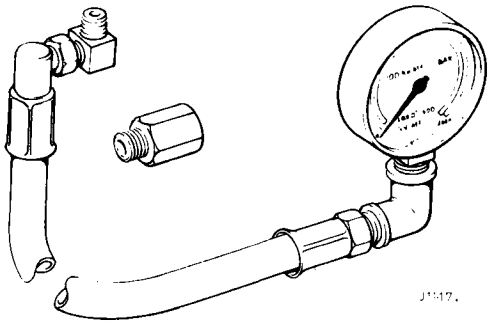
18G 1205



Propellor shaft flange wrench

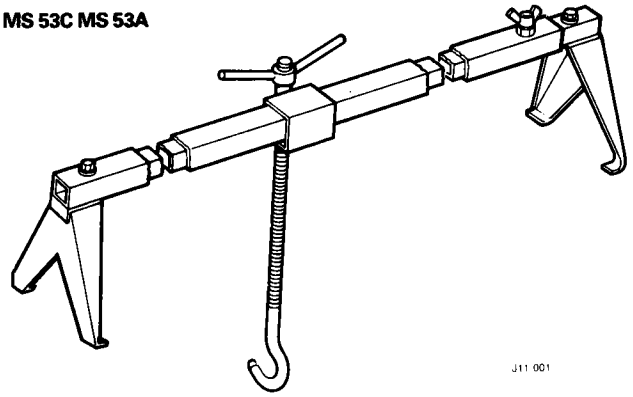
AUTOMATIC TRANSMISSION – BORG-WARNER MODEL 66 – SECTION 44BW

CBW 1C



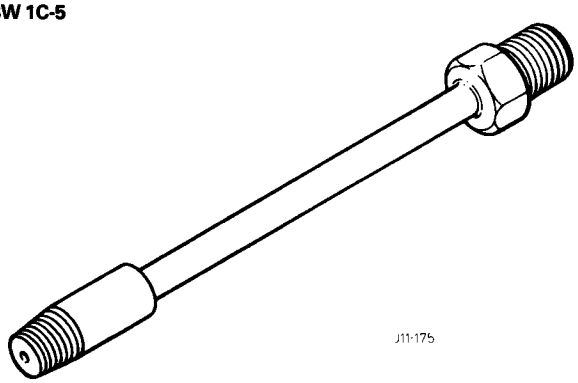
Hydraulic pressure test equipment

MS 53C MS 53A



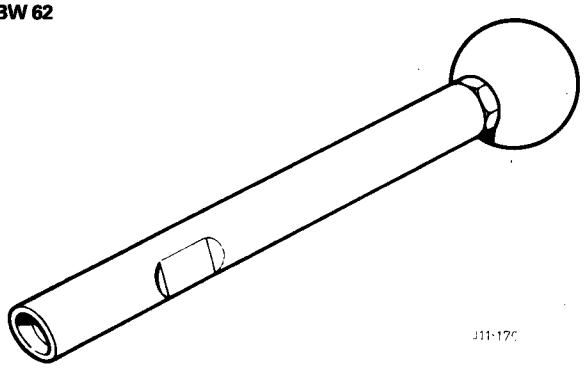
Engine support bracket

CBW 1C-5



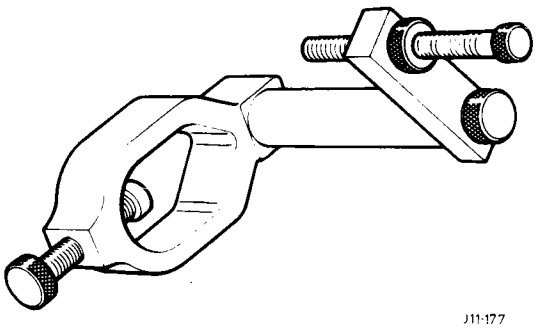
Adaptor – pressure test

CBW 62



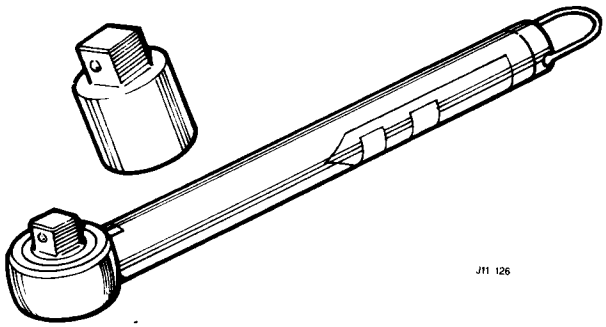
Remover – throttle cable mounting seal

CBW 87



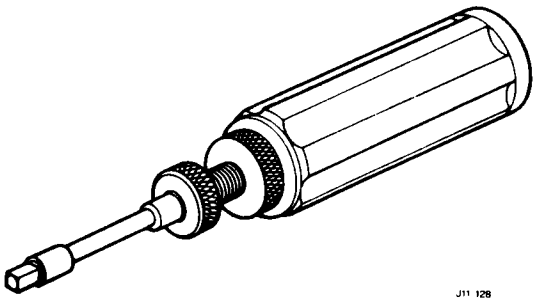
End float checking gauge

CBW 547B-30 (CBW 547B-75)



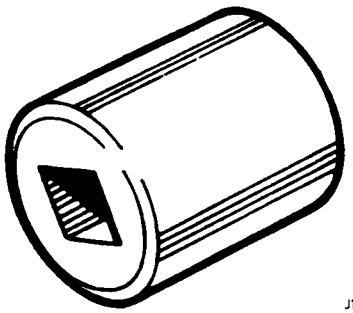
Tension wrench

18G 681



Torque screwdriver

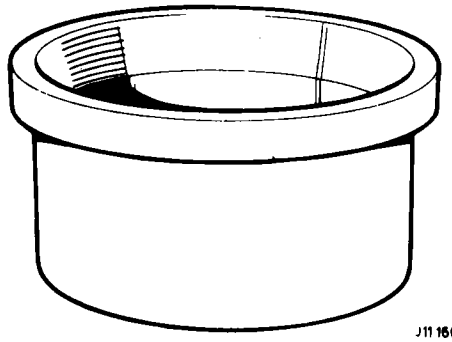
CBW 547-50-2A



Rear servo adjuster adaptor

AUTOMATIC TRANSMISSION – BORG-WARNER MODEL 66 – SECTION 44BW Continued

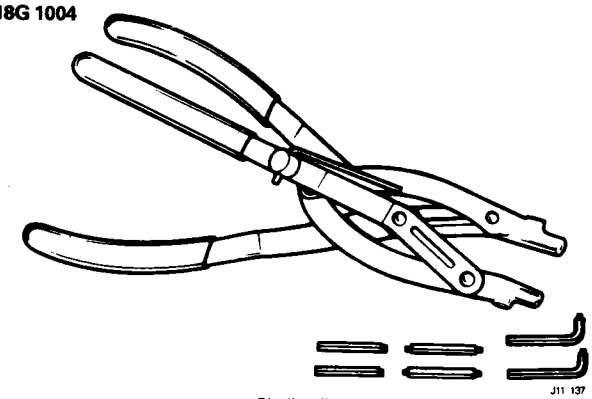
18G 702



J11 166

Replacer rear clutch piston

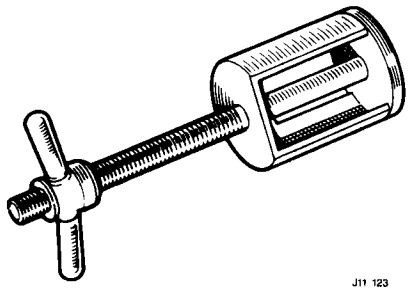
18G 1004



J11 137

Circlip pliers

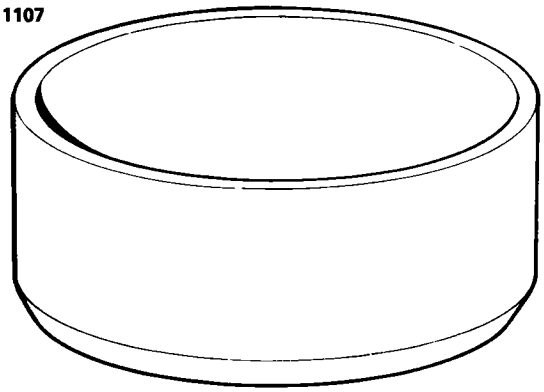
18G 1016 (JD 107)



J11 123

Clutch spring compressor

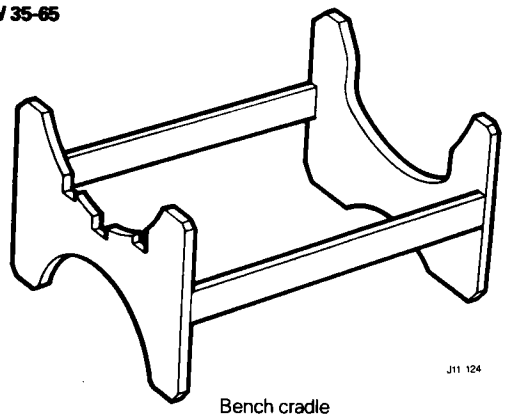
18G 1107



J11-191

Replacer – front clutch piston

CBW 35-65

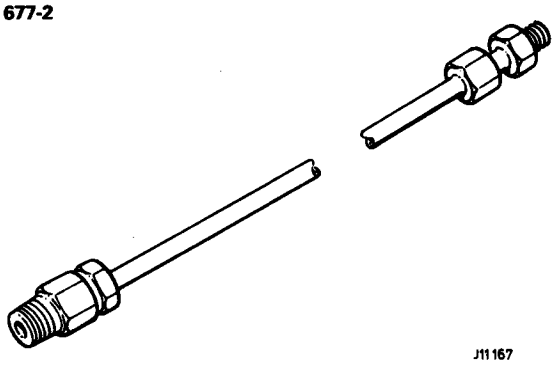


J11 124

Bench cradle

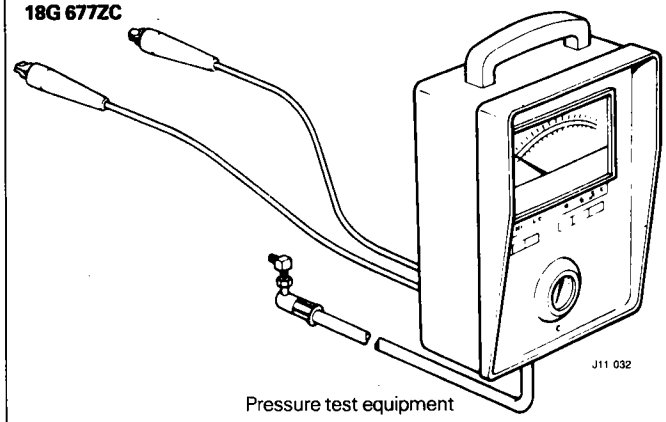
AUTOMATIC TRANSMISSION – GM 400 – SECTION 44GM

18G 677-2



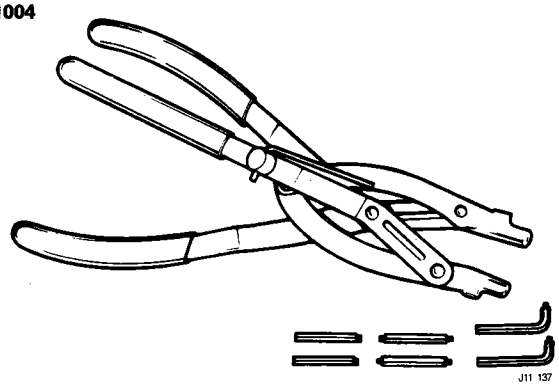
Adaptor set

18G 677ZC



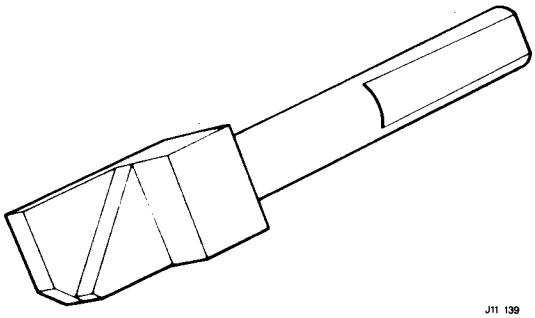
Pressure test equipment

18G 1004



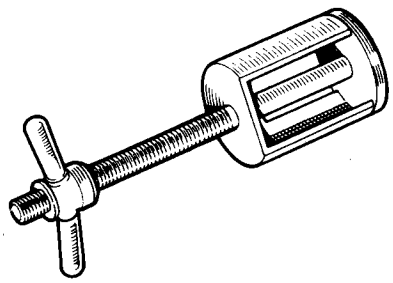
Circlip pliers

18G 1004J



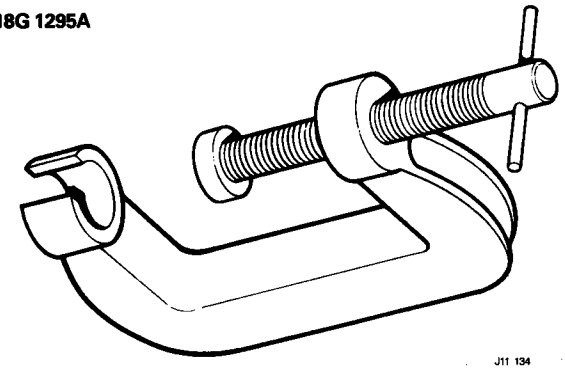
Points for 18G.1004

18G 1016 (JD 107)



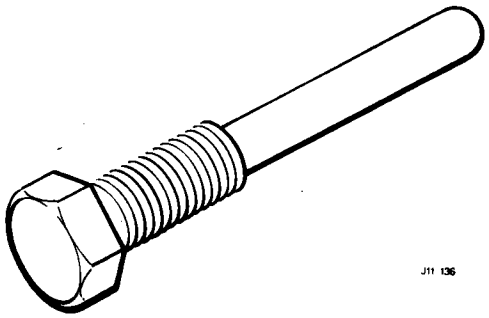
Clutch spring compressor

18G 1295A



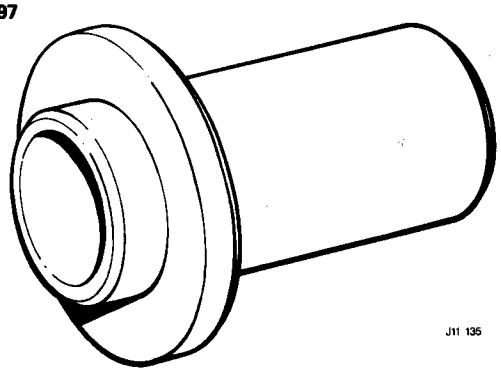
Compressor piston accumulator control valve

18G 1296A



Extractor bolt oil pump

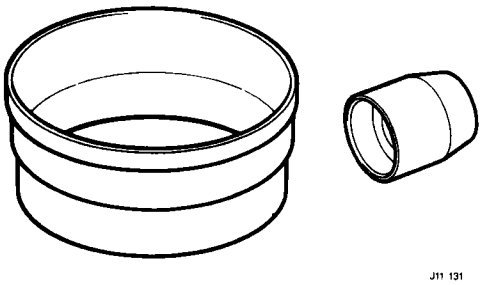
18G 1297



Replacer oil pump and rear extractor oil seals

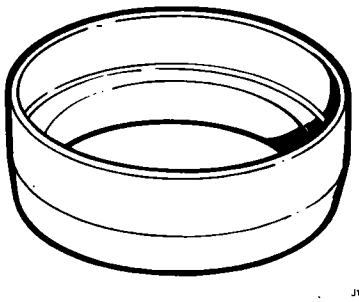
AUTOMATIC TRANSMISSION – GM 400 – SECTION 44GM Continued

18G 1298



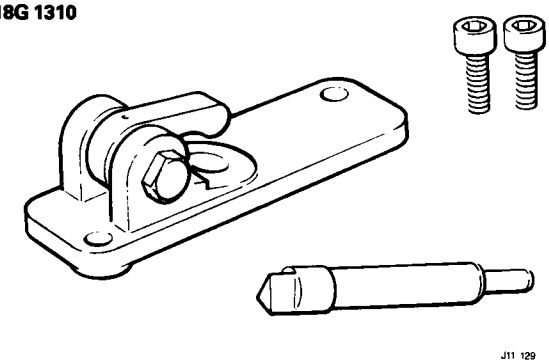
Forward and intermediate clutch piston replacer seal protector inner

18G 1309



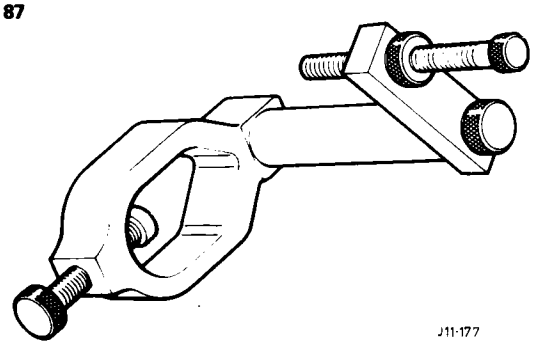
Intermediate clutch inner seal protection sleeve

18G 1310



Band application pin selection gauge

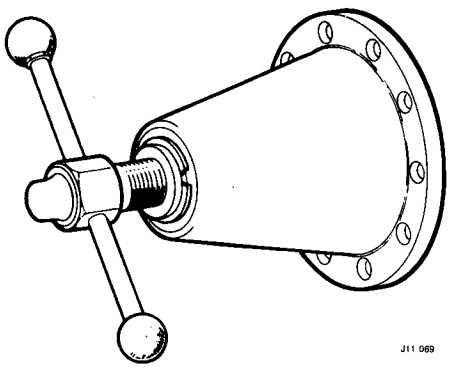
CBW 87



End float checking gauge

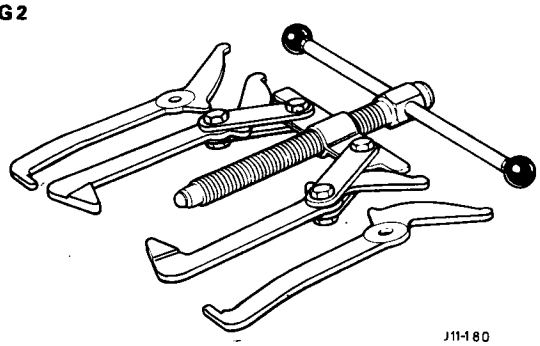
DRIVE SHAFT AND PROPELLER SHAFTS – SECTION 47

JD 1D



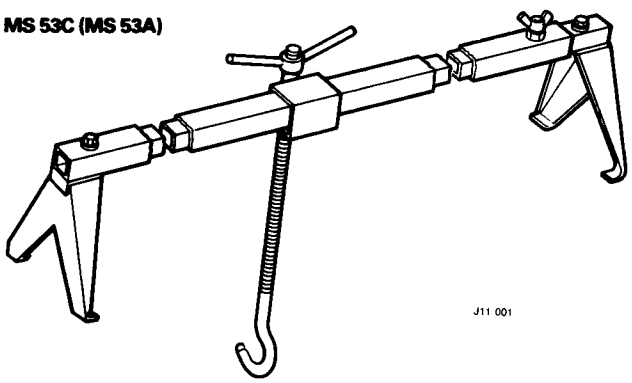
Hub remover

18G 2



Two legged puller

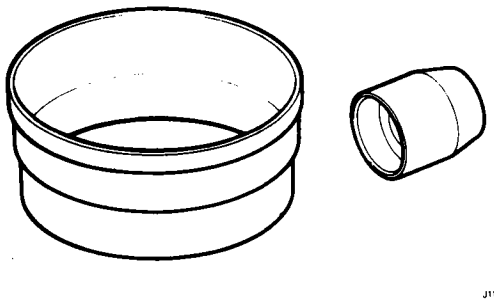
MS 53C (MS 53A)



Engine support bracket

FINAL DRIVE – SECTION 51

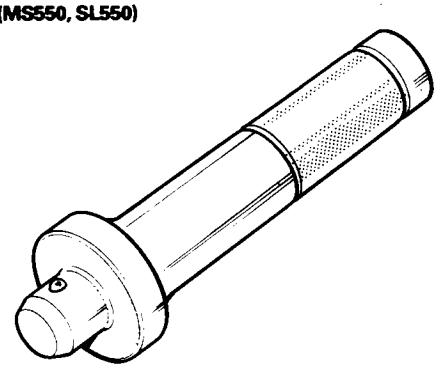
18G 120 5



J11 131

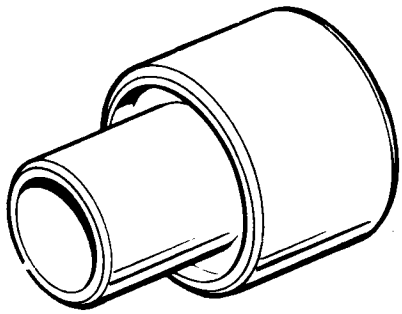
Flange holder

18G 134 (MS550, SL550)



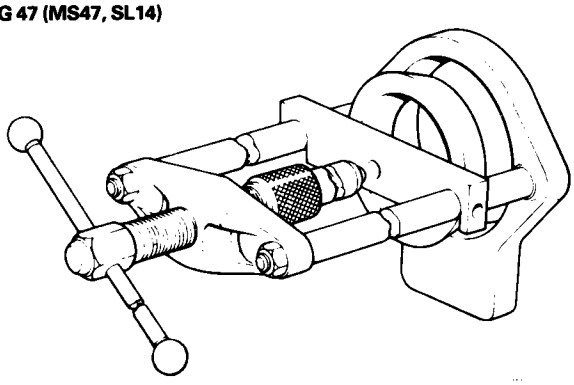
Driver handle J11 023

SL 550-1



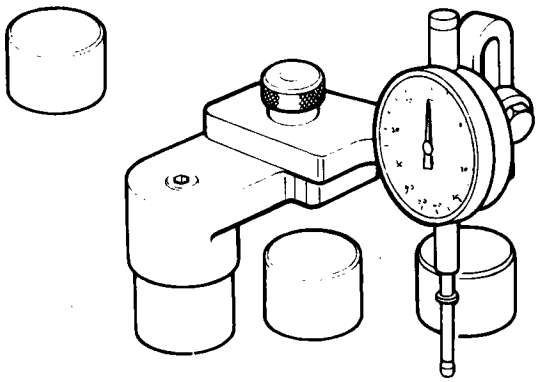
Replacer differential bearing cone

18G 47 (MS47, SL14)



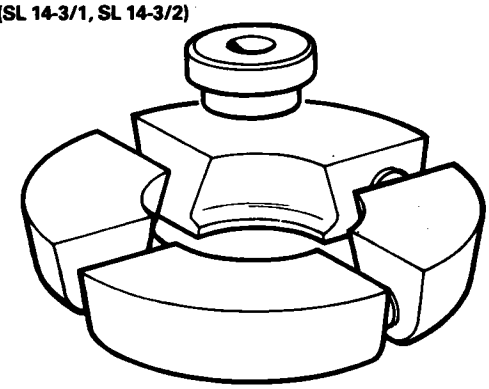
Hand press

SL3



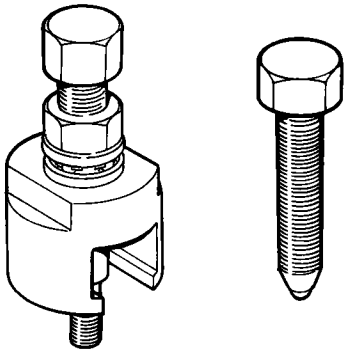
J11 144

SL 14-3 (SL 14-3/1, SL 14-3/2)



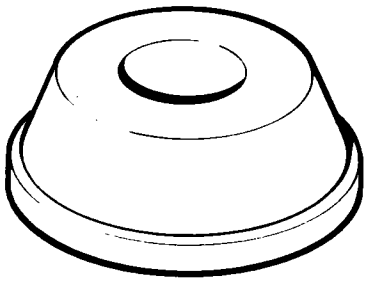
Adaptor/remover differential bearing cone J11 145

SL 4HA



Pinion height setting button J11-182

SL 550-9

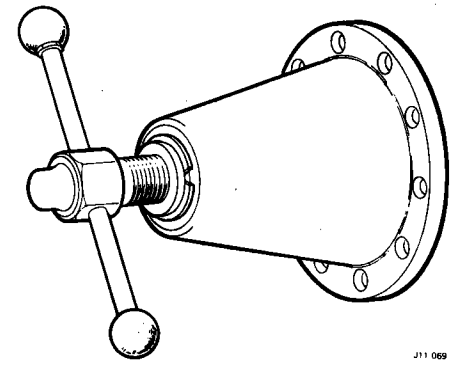


J11 150

Adaptor/replacer – drive pinion inner bearing cup

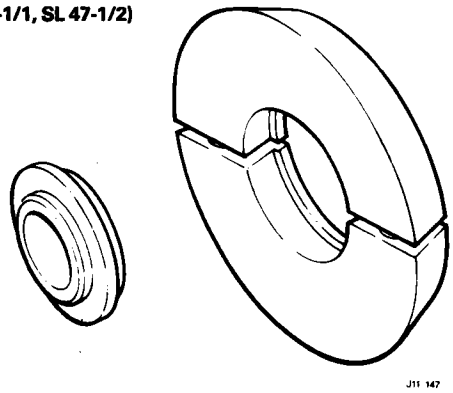
FINAL DRIVE – SECTION 51 Continued

SL 550-8



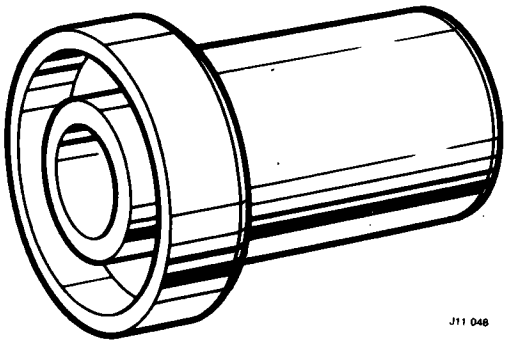
Adaptor/replacer – drive pinion outer bearing cup

SL 47-1 (SL 47-1/1, SL 47-1/2)



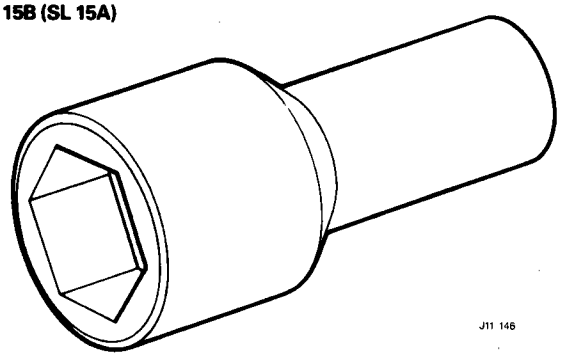
Pinion bearing cone remover/adaptor

18G 1428A



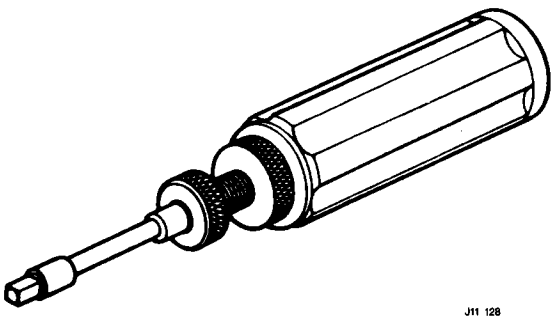
Rear oil seal replacer

SL 15B (SL 15A)



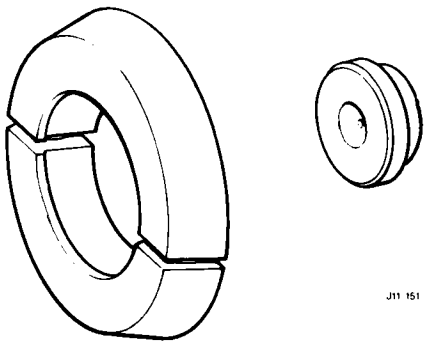
Remover/replacer drive shaft bearing cone

18G 681 (CBW 548)



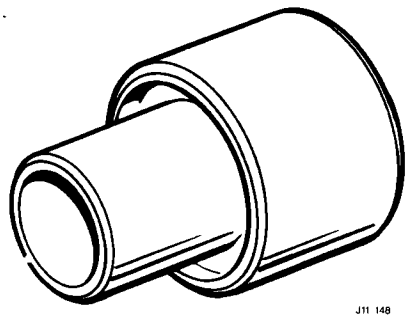
Torque driver

SL 47-3, (SL 47-3/1)



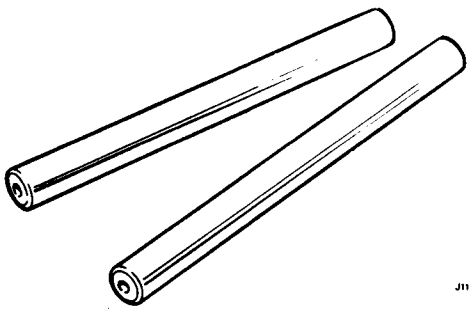
Output shaft outer bearing remover/replacer

SL 47-3/2



Output shaft outer bearing replacer

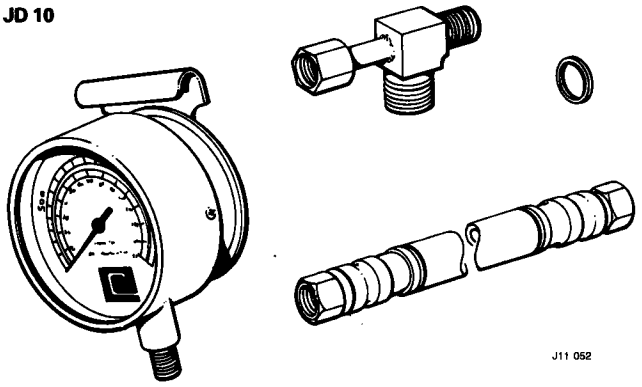
JD 14



Dummy shaft

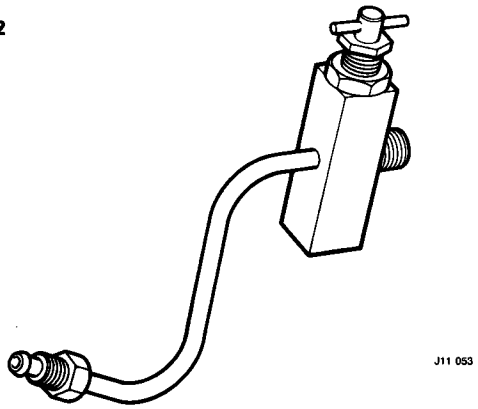
STEERING – SECTION 57

JD 10



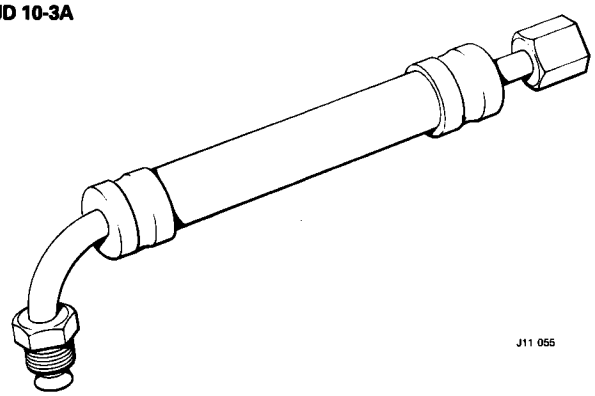
Power steering test set

JD 10-2



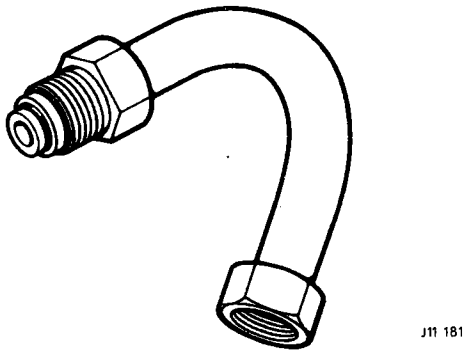
Adaptor – hydraulic pressure test

JD 10-3A



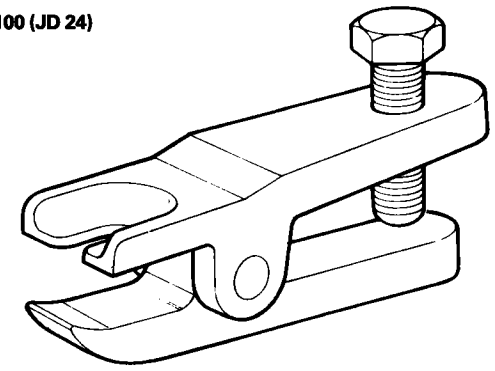
Adaptor – power steering

JD 10-4A



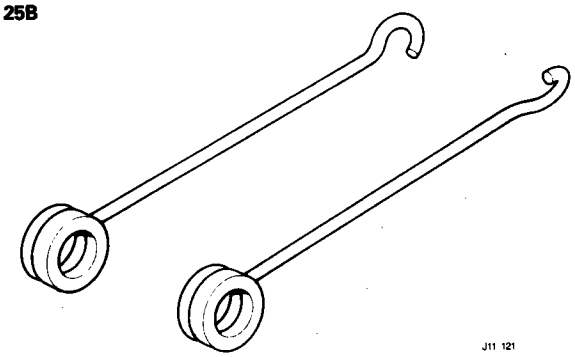
Adaptor hydraulic pressure test

JD 100 (JD 24)



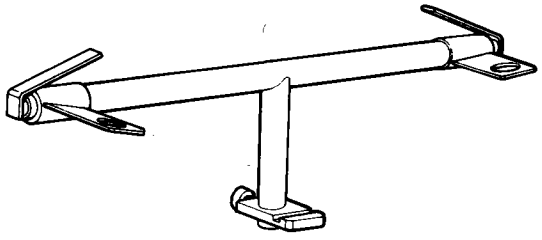
Steering joint taper separator

JD 25B



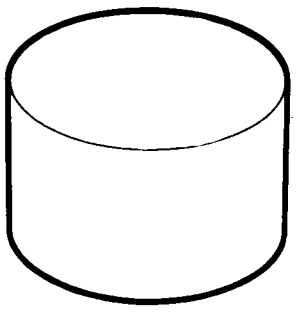
Rear camber setting links

JD 36A



Steering rack checking fixture

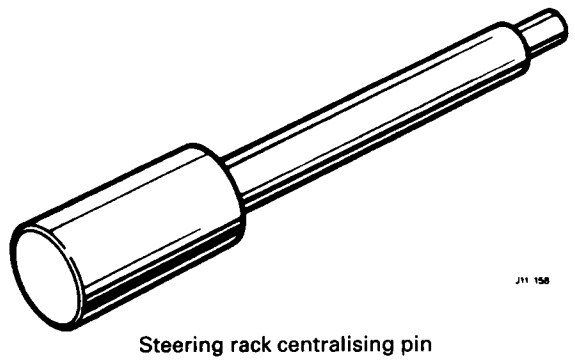
18G 1326



Remover/replacer pulley power steering pump

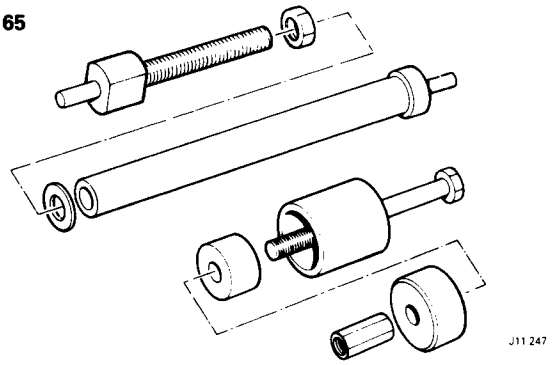
STEERING – SECTION 57 Continued

JD 117 (18G 1466)



Steering rack centralising pin

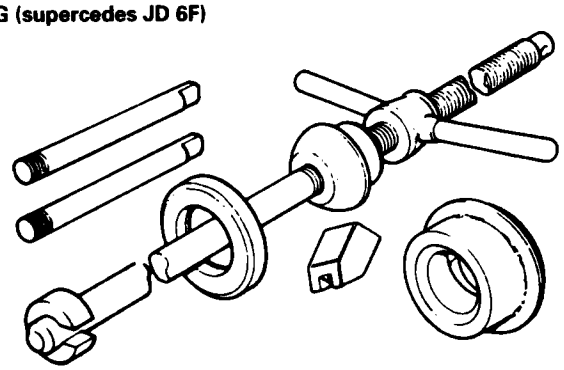
JD 165



Steering rack mounting bush replacement

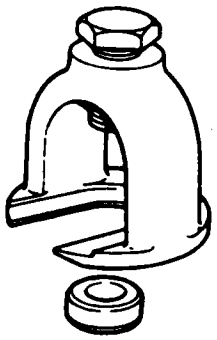
FRONT SUSPENSION – SECTION 60

JD 6G (supercedes JD 6F)



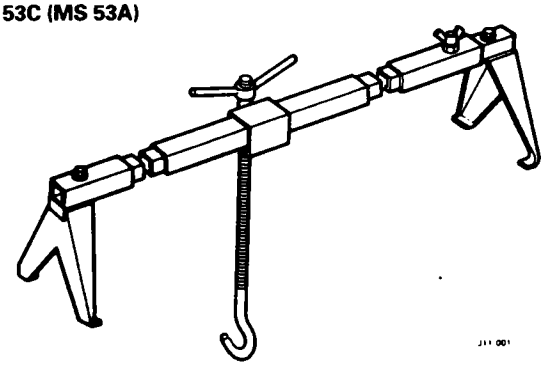
Front coil spring compressor

JD 100 (JD 24)



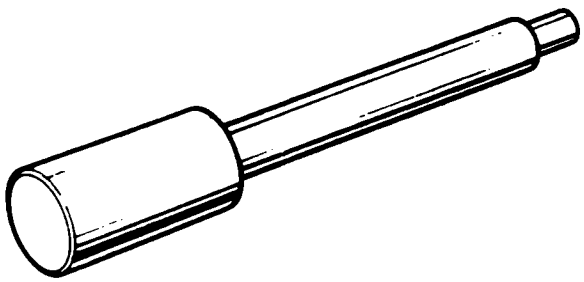
Steering joint taper separator

MS 53C (MS 53A)



Engine support bracket

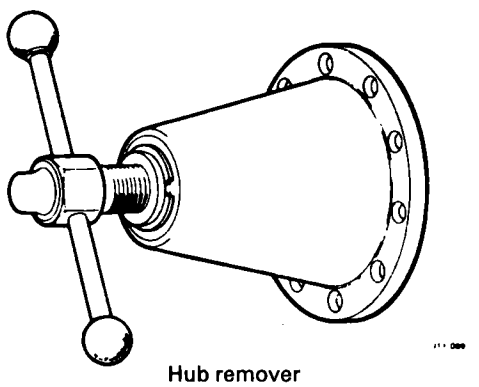
JD 117 (18G 1466)



Steering rack centralising pin

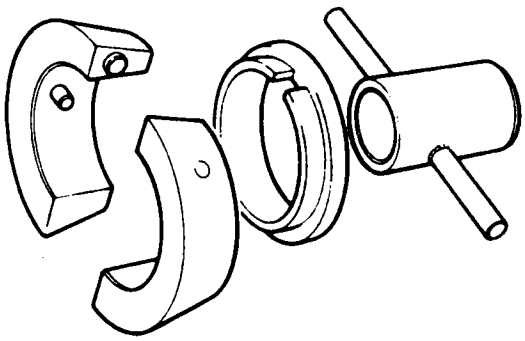
REAR SUSPENSION – SECTION 64

JD 1D



Hub remover

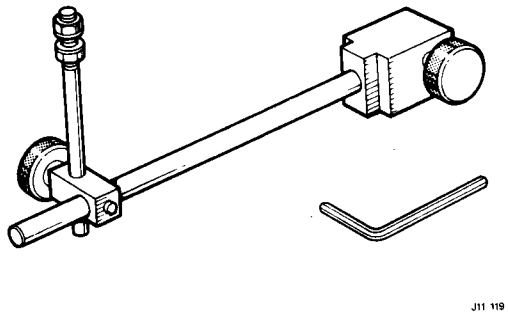
JD 11B



Adaptor dismantler dampers spring unit

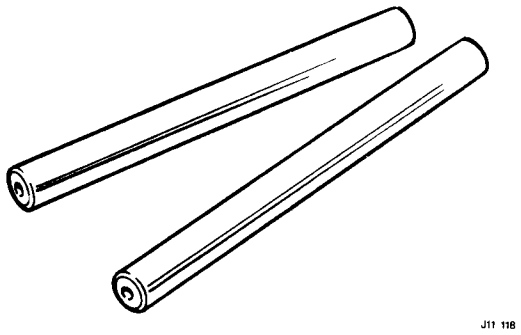
REAR SUSPENSION – SECTION 64 Continued

JD 13B (JD 13A)



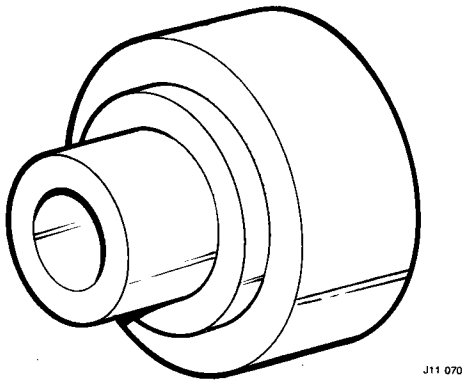
Rear hub end-float gauge

JD 14



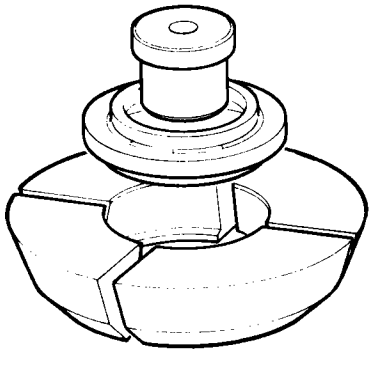
Rear wishbone pivot dummy shaft

JD 15



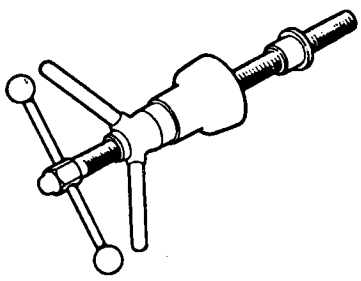
Replacer – rear hub master spacer and bearing

JD 16C



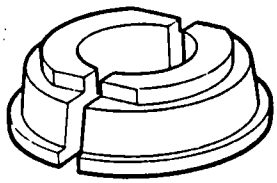
Remover/replacer – rear hub outer bearing cone

JD 20A



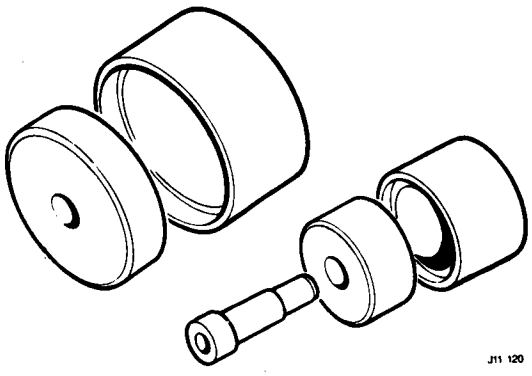
Bearing remover – main tool

JD 20A-1A (JD 20A-1)



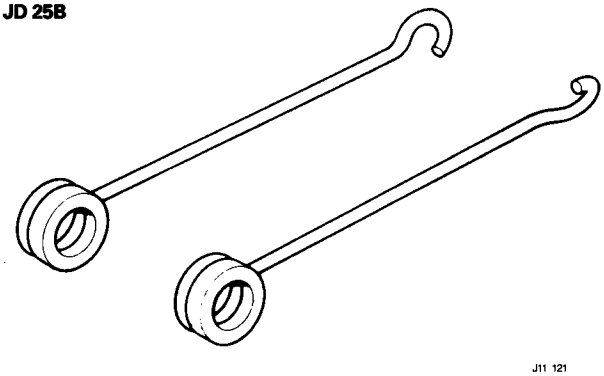
Rear hub inner and outer cups remover/replacer adaptor

JD 21



Torque arm bush remover/replacer

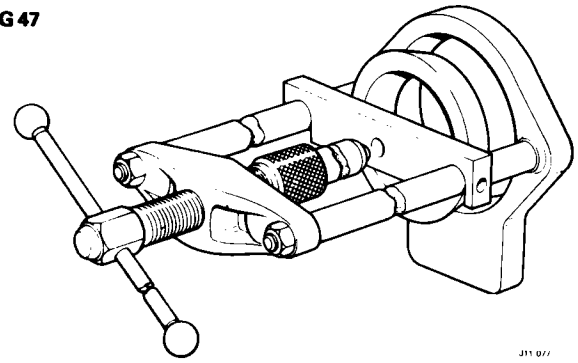
JD 25B



Rear camber setting links

REAR SUSPENSION – SECTION 64 Continued

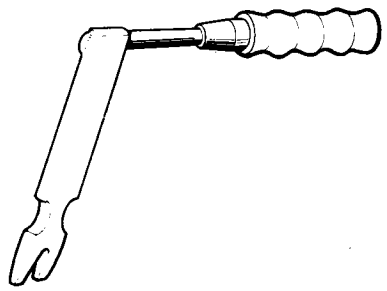
18G 47



Multipurpose handpress

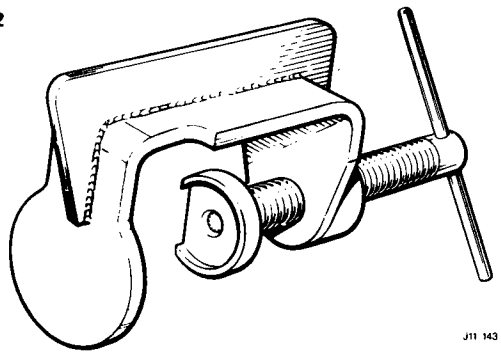
BRAKES – SECTION 70

+64932392



Girling brake piston retraction tool

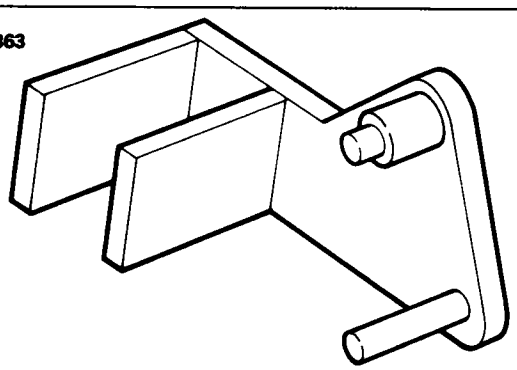
18G 672



Replacer – disc brake piston seal

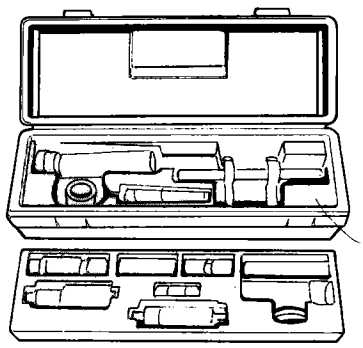
AIR CONDITIONING – SECTION 82

18G 1363



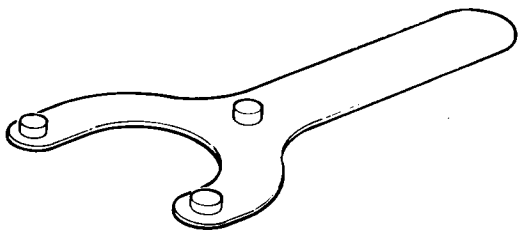
Air conditioning link setting jig

$10500



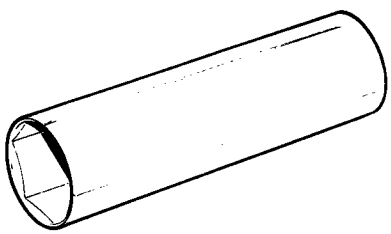
Tool kit

$10418



Hub holding tool

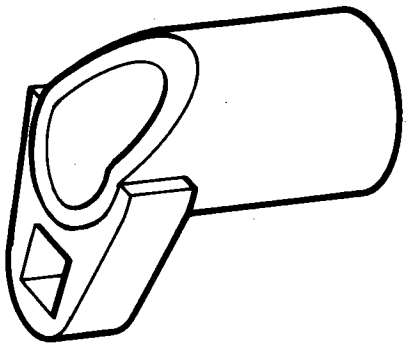
$10416



Thin walled socket

ELECTRICAL – SECTION 86

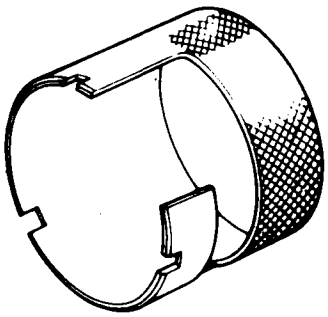
18G 1364



Spark plug wrench

INSTRUMENTS – SECTION 88

18G 1001



Spanner for fuel tank

All service tools listed are available from:

V. L. Churchill & Co. Limited
P.O. Box 3
Daventry
Northamptonshire NN11 4NF

excepting items marked thus:

* Available from Jaguar Parts Division
\# Snap-on tool available from a Snap-on tool retail outlet
\+ Girling tool available from a Girling tool retail outlet
$ Kent Moore tool available from Kent Moore

CONTENTS

TORQUE WRENCH SETTINGS

SECTION 12

NOTE: Set the torque wrench to the mean of the figures quoted unless otherwise specified.

Early cars prior to / Later cars from } Engine 8L137746 — (4.2); 8A14210 — (3.4)

ITEM	DESCRIPTION	TIGHTENING TORQUE		
		Nm	kgf m	lbf ft
ENGINE				
Cam cover (domed nuts) — early cars	$\frac{1}{4}$ in U.N.F. nut	6,7 to 8,1	0,69 to 0,83	5 to 6
— later cars	$\frac{1}{4}$ in U.N.F. nut	9,5 to 11	0,98 to 1,12	7 to 8
Camshaft bearing caps	$\frac{5}{16}$ in U.N.F. nut	12,2 max.	1,24 max.	9.0 max.
Connecting rod big-end	$\frac{3}{8}$ in U.N.F. bolt	48,4 to 50,8	4,93 to 5,18	35.7 to 37.5
Crankshaft front end	$\frac{3}{4}$ in U.N.F. bolt	170 to 203	17,29 to 20,73	125 to 150
Cylinder head nuts: check/reset	$\frac{7}{16}$ in U.N.F. nut	70,5 to 73,2	7,19 to 7,47	52 to 54
initial assembly	$\frac{7}{16}$ in U.N.F. nut	67,8 to 70,5	6,92 to 7,19	50 to 52
Distributor clamp bolt	$\frac{1}{4}$ in trapped nut	5,7 max.	0,58 max.	4.2 max.
Fan drive assembly securing bolt	$\frac{3}{8}$ in U.N.F. bolt	40,7 max.	4,15 max.	30 max.
Flywheel	$\frac{7}{16}$ in U.N.F. bolt	85,9 to 90,4	8,76 to 9,22	63.4 to 66.6
Gemi hose clips (up to No. 16)	4 mm thread	0,34 to 0,68	0,04 to 0,07	0.25 to 0.50
Main bearing caps	$\frac{1}{2}$ in U.N.F. bolt	93 to 97,6	9,46 to 9,96	68.4 to 72
Power assisted steering pump to mounting bracket	$\frac{3}{8}$ in U.N.C. nut	50,2 max.	5,12 max.	37.0 max.
Pulleys to crank damper	$\frac{5}{16}$ in U.N.F. bolt	16,3 to 20,3	1,66 to 2,07	12 to 15
Sealing cap, CO sampling adaptor	$\frac{7}{16}$ in U.N.F.	8,5 to 10,2	0,86 to 1,03	6.3 to 7.5
Torque converter	$\frac{3}{8}$ in U.N.F. bolt	47,5 max.	4,84 max.	35.0 max.
ENGINE MOUNTINGS				
Front mounting bracket to beam	$\frac{5}{16}$ in U.N.F. nut	19,0 to 24,4	1,94 to 2,48	14 to 18
Rear mounting bracket to body fixing	$\frac{5}{16}$ in U.N.F. nut	10,8 to 13,6	1,1 to 1,38	8 to 10
	$\frac{5}{16}$ in U.N.F. bolt	19,0 to 24,4	1,94 to 2,48	14 to 18
	$\frac{3}{8}$ in U.N.F. bolt	36,7 to 43,4	3,74 to 4,42	27 to 32
Rear mounting peg	$\frac{1}{2}$ in U.N.F. nut	33,9 to 40,7	3,46 to 4,14	25 to 30
Rear rubbers	$\frac{3}{8}$ in U.N.F. nut	36,7 to 43,4	3,74 to 4,42	27 to 32
Strengthening plate assembly to body	M8 setscrew	16,3 to 19,0	1,66 to 1,93	12 to 14
Tie-bolts	$\frac{1}{2}$ in U.N.F. nut	33,9 to 40,7	3,46 to 4,14	25 to 30

DESCRIPTION

The 6-cylinder engine fitted to Series III Jaguar and Daimler cars is developed directly from the 3.4 litre unit introduced with the Jaguar XK 120 car in 1948; although superficially very similar, these two engines now have few parts in common and none of the accessories fitted to the current engines are interchangeable with those of the early units. The basic design of the engine has, however, remained unchanged, and the latest units retain chain-driven twin-overhead camshafts, seven main bearings and a stroke of 106 mm (4.173 in) which were incorporated in the first production engines.

Major changes have been made in recent years to the arrangements for fuel supply and the reduction of undesirable emissions, and a redesigned, electronically triggered ignition system is fitted to the 4.2L Series III cars; these items are dealt with fully in the appropriate sections of the manual, but the necessity for the removal of fuel injection and emission control equipment before certain operations can be carried out on the engine will be found to have affected certain of the repair operations in this section, when compared with the instructions for similar operations in earlier publications.

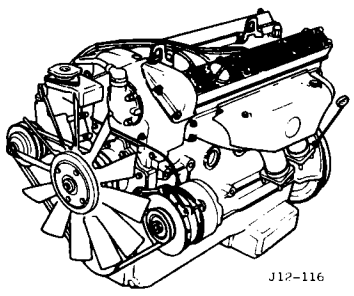


Fig. 1

CYLINDER PRESSURES

Check 12.25.01

Set the transmission selector at 'P'— automatic transmission cars only.

Run the engine until normal operating temperature is reached. Switch off the engine.

Remove the h.t. cable from the ignition coil.

Remove all sparking plugs.

Fit an approved pressure gauge (1, Fig. 2) at one plug hole and with the throttle held fully open, crank the engine with the starter motor. Note the highest steady pressure reading achieved and repeat at each plug hole in turn. The reading taken at each cylinder must not differ from the reading taken at any other cylinder by more than 0,35 kgf/cm² (5 lbf/in²).

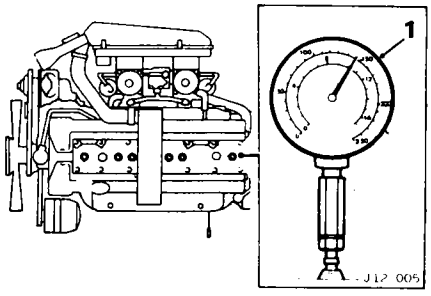


Fig. 2

FAULT FINDING

The location and rectification of faults in the fuel system, emission control and ignition systems is detailed in the sections of the manual dealing with these components; the emission control section includes basic engine checks which are repeated below.

BASIC ENGINE CHECKS

POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
Low battery condition	Check the battery condition with a hydrometer. Re-charge, clean and secure the terminals, or renew as necessary. (If the battery is serviceable but discharged, trace and rectify the cause of flat battery, e.g. short circuit or insufficient charge from the alternator.)
Start system deficient	If the starter fails to turn the engine briskly, check the engagement circuit and connections. Check and clean the main starter circuit and connections.
Poor compressions	Check compressions with a proprietary tester. If compressions are low or uneven, check/adjust valve clearances and re-test. If compressions are still unsatisfactory, remove the cylinder head for further examination and rectification. NEVER turn the crankshaft when the head is removed, or the valves and pistons will be damaged when the head is replaced.
Exhaust system leaking or blocked	Check and rectify as necessary.
Faults on areas of the vehicle other than the engine	Check for binding brakes, slipping clutch, etc.
Air leaks at the inlet manifold	Check the inlet manifold/cylinder head joint. Re-make with a new gasket if necessary. Check the manifold tappings for leaks; seal as necessary.
Cooling system blocked or leaking	Flush the system and check for blockage. Check the hoses and connections for security and leakage. Renew as necessary. Check the thermostat, and renew if faulty.
Cylinder head gasket leaking	Check the cylinder block/head joint for signs of leakage. Renew the gasket if necessary.

CAMSHAFT

Remove and refit—Left-hand **12.13.02**
Right-hand **12.13.03**

Service tools: Top timing chain adjuster tool JD 2B; valve timing gauge C 3993

Removing

Remove the camshaft covers.
Remove the nuts (1, Fig. 3) securing the breather housing to the front of the cylinder head and withdraw the housing.

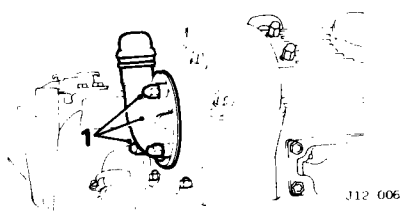


Fig. 3

Slacken the nut on the idler sprocket shaft.
Knock down the tabs and remove the two camshaft sprocket retaining bolts (1, Fig. 4).
Rotate the engine until the valve timing gauge (1, Fig. 5) can be fitted to the slot in the camshaft, remove the remaining camshaft bolts.
Use service tool JD 2B (2, Fig. 4), turned in a clockwise direction, to slacken the camshaft chain.

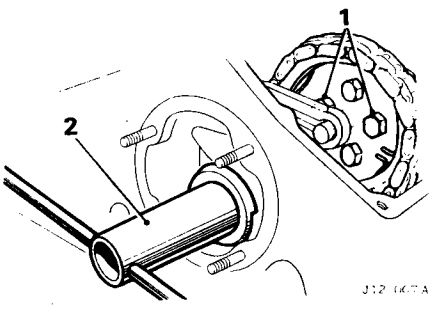


Fig. 4

CAUTION: Do not rotate the engine with the camshafts disconnected.

Slide the sprocket up the support bracket.
NOTE: Mark 'fit' holes in the adjuster plates.
Progressively slacken the camshaft bearing cap nuts, starting with the centre cap and working outwards; lift off the bearing caps. Note the mating marks on each bearing cap (2, Fig. 5).
NOTE: If the same shell bearings are being refitted, note their location to ensure that they are fitted in the original position.
Lift the camshaft from the cylinder head.

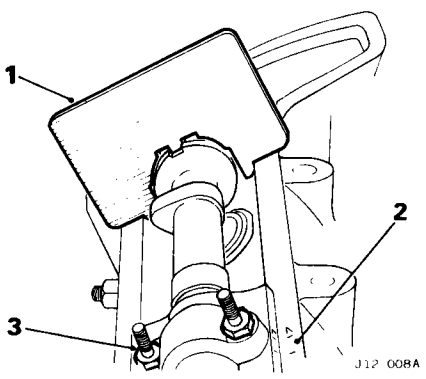


Fig. 5

Refitting

It the camshaft shell bearings
Fit the camshaft in the bearings so that the keyway in the front flange is uppermost.
Fit the bearing caps to their respective positions and fit 'D' washers, spring washers and nuts.
Tighten down the bearing caps evenly, commencing with the centre cap.
Tighten the nuts (3, Fig. 5) to correct torque.
Align camshaft using timing gauge C 3993.
Locate the camshaft sprocket on the camshaft and ensure that the 'fit' holes line up. Fit one bolt on the lock plate.

NOTE: If all the preceding instructions have been followed, valve timing will be correct.

Rotate the engine and fit remaining bolts to the camshaft sprocket. Turn up the tabs.
Using tool JD 2B, tension the top timing chain until slight flexibility remains in the chain on both outer sides of the camshaft sprockets. The chain MUST NOT be dead tight.
Check the tappet adjustment.
Securely tighten the locknut.
Replace the camshaft covers and breather housing.

CAMSHAFT BEARINGS (Complete set)

Remove and refit **12.13.13**

Follow the procedure detailed under 'Camshaft—Remove and refit—12.13.02 or 12.13.03', above.

CRANKSHAFT DAMPER AND PULLEY

Remove and refit **12.21.01**

Removing

Remove the central bolt securing the Torquatrol unit and fan to the water pump pulley; collect the washer and remove the unit.
Remove the steering pump belt, compressor belt (on cars fitted with air conditioning only) and alternator belt.
Knock back the locking tabs (1, Fig. 6) at the pulley bolts, turning the crankshaft to improve access to the tabs.

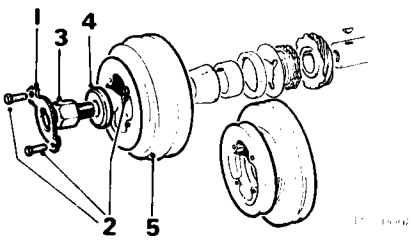


Fig. 6

Remove the four bolts (2, Fig. 6) securing the crankshaft pulley to the torsional damper. Recover the locking ring and remove the outlet pulleys.
Remove the large bolt (3, Fig. 6) securing the torsional damper and recover the large plain washer (4, Fig. 6).
Strike the damper (5, Fig. 6) with a hide mallet and remove it from the crankshaft.

Inspection

Examine the rubber portions of the damper for signs of deterioration and, if necessary, fit a new damper.
Examine the pulley and damper grooves for wear. Drive belts must not bottom in the grooves.

Refitting

Reverse the removal operations, fitting new tab washers and tightening the bolts to the correct torque.
Correctly tension the drive belts.

CRANKSHAFT FRONT OIL SEAL

Remove and refit **12.21.14**

Removing

Remove the crankshaft damper and pulley.
If the cone (1, Fig. 7) has not drawn clear with the torsional damper, prise the slot open and draw it from the crankshaft. Recover the Woodruff key.
Remove the oil sump.
Draw the distance piece from the crankshaft and discard.
Prise the oil seal (2, Fig. 7) from the front timing cover recess, taking great care not to damage the surface of the crankshaft or the oil seal recess.
Remove oil flinger, if fitted, by cutting into the notches.

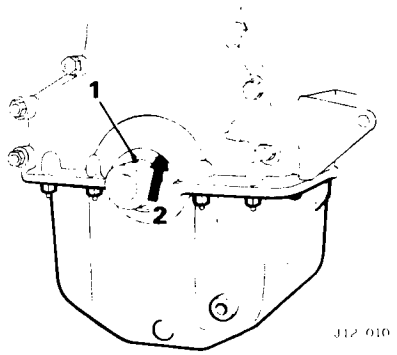


Fig. 7

Refitting

Fit a new oil seal dry, as supplied and locate it in the timing cover recess, open side inwards.
Check the 'O' ring seal in the new distance piece, lubricate with clean engine oil and fit distance piece onto crankshaft.
Fit the oil sump.
Fit the Woodruff key in the crankshaft and fit the cone.
Fit the crankshaft damper and pulley.

MAIN BEARINGS

Remove and refit (set) — Engine in situ **12.21.39**

Removing

Remove the oil pump and pipes (1, Fig. 8).

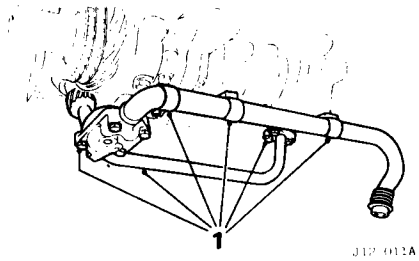


Fig. 8

Withdraw the bolts (1, Fig. 9) securing the rear main bearing cap and discard the washers.
Note the corresponding numbers (2, Fig. 9) on the bearing cap and crankcase.
Withdraw the upper half of the bearing shell.
Liberally coat the replacement bearing shells with clean engine oil and locate in the crankcase and bearing cap. Ensure that the lugs on the bearing shell locate correctly.
Secure the bearing cap using bolts and a new flat washer.
Tighten the bolts to the correct torque.
Repeat operations to renew shells on the four intermediate main bearing caps. Continue by removing the bolts securing the centre main bearing cap. Discard the bearing shells and thrust washers.

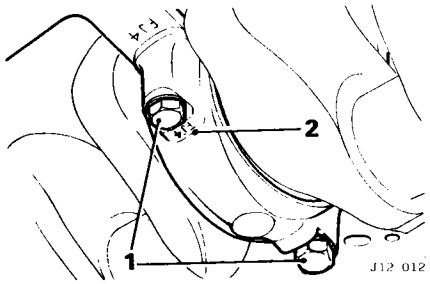


Fig. 9

Liberally coat the replacement bearing shells and two new thrust washers with clean engine oil and locate the shells in the crankcase and bearing cap. Ensure that the lugs on the bearing shell locate correctly.

continued

Locate the thrust washers (1, Fig. 10) on either side of the bearing cap, white metal side outwards, and secure the cap using bolts and new flat washers.
Tighten the bolts (2, Fig. 10) to the correct torque.
Set the crankshaft to T.D.C. No. 6 cylinder (front) firing, and remove distributor cap.
Remove the setscrew and remove the distributor.

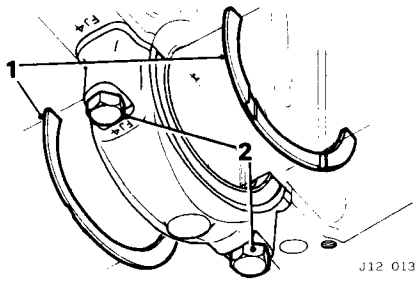


Fig. 10

Remove the bolts (1, Fig. 11) securing the front main bearing cap and manoeuvre the cap clear. Discard the bearing shells.

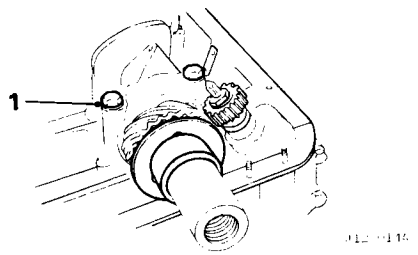


Fig. 11

Refitting

Liberally coat the replacement bearing shells with clean engine oil and locate the shells in the crankcase and bearing cap.
Ensure that the lugs on the bearing shell locate correctly.
Secure the bearing cap, using the bolts and new flat washers.
Tighten the bolts to the correct torque.
Refit the oil pump and pipes (1, Fig. 8).

CAMSHAFT COVERS AND SEALS

Remove and refit **12.29.42**

Removing

Disconnect the battery.
Disconnect the plug leads.
Cars fitted with air conditioning only

WARNING: On no account must any portion of the air conditioning system be disconnected by anyone other than a qualified refrigeration engineer. Blindness can result if the gas contained within the system comes into contact with the eyes.

Depressurise the fuel system.
Release the inlet and outlet petrol pipe union nuts at the fuel cooler. Plug the inlet petrol pipe to prevent fuel syphon.
On 3.4 litre cars only, detach the hot air duct (1, Fig. 12) early models only.

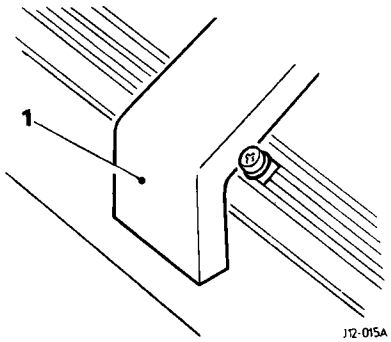


Fig. 12

Remove the 11 nuts and one screw (1, Fig. 13) securing the cover to the head. Remove the cover.
Detach the gasket (2, Fig. 13) from the cover and prise the cover seal (3, Fig. 13) from the head. Clean the joint surfaces of the cover and head.

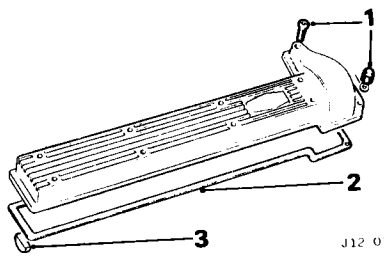


Fig. 13

Refitting

Smear the camshaft cover seal (3, Fig. 13) with sealant and replace it in the head.
Fit a new gasket to the head and replace the cover; tighten the attachment nuts and screw, to the figure quoted in the data sheet.
Replace the hot air duct on 3.4 litre cars only.
Refit the petrol pipes to the fuel cooler and replace the cooler on air-conditioned cars.
Reconnect the plug leads, reconnect the battery.

CONNECTING ROD BEARINGS

Remove and refit (set) — Engine in situ **12.17.16**

Removing

Remove the oil sump.
Turn the engine until one big-end bearing is at bottom dead centre.
Remove the connecting rod cap, noting that corresponding cylinder numbers on the connecting rod and cap are on the same side (1, Fig. 14).
Lift the connecting rod from the crank pin and withdraw the bearing shells (2, Fig. 14).

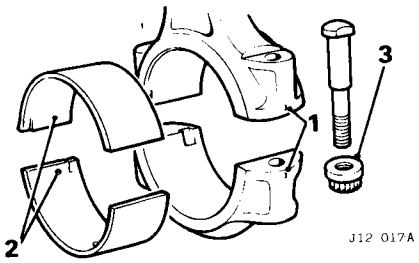


Fig. 14

Inspection

Check the crank pin for signs of overheating, scoring or transfer of bearing metal. If the crank pin is suspect in any way, the engine must be removed and the crankshaft rectified, or renewed as necessary.

Refitting

Liberally coat the replacement bearing shells with clean engine oil and locate in the connecting rod and cap.
Secure the connecting rod cap, ensuring that the marks coincide.
Tighten the connecting rod nuts (3, Fig. 14) to the correct torque.
Repeat operations to change bearings on the remaining five journals, then replace the oil sump.

TAPPETS

Adjust **12.29.48**

Service tool: Valve timing gauge C 3993

CAUTION: If checking valve clearances with the cylinder head removed from the engine, the camshafts must be fitted and checked one at a time. If one camshaft is rotated while the other is in position, fouling is likely between inlet and exhaust valves.

If necessary remove the camshaft covers.
Rotate the camshafts and record the clearance between the back of each cam in turn, and the respective tappet, using a feeler gauge as shown (1, Fig. 15). Clearance to be as detailed in group 05. If adjustment is necessary, proceed with operations below as appropriate.

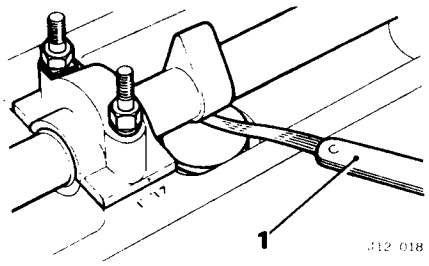


Fig. 15

If the cylinder head is on the engine, before removing the last securing bolt, rotate the engine until the valve timing gauge C 3993 can be located in the front flange of each camshaft (1, Fig. 16)
If necessary, disconnect the sprockets from the camshafts.

CAUTION: Do not rotate the engine while the camshaft sprockets are disconnected.

When the cylinder head is on the engine and the camshaft sprockets disconnected, ensure that no piston is at T.D.C. otherwise valve/piston fouling could occur.

Remove the camshaft bearing caps (2, Fig. 16) and lift the camshaft clear.

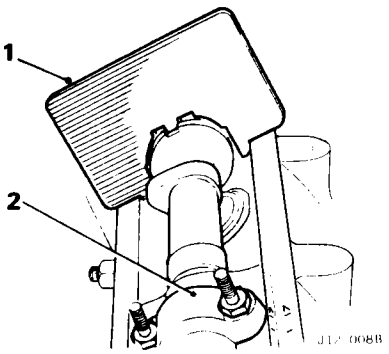


Fig. 16

Remove each tappet, taking careful note of its location. Remove and check the adjusting pad.
NOTE: Subtract the appropriate valve clearance from the dimension obtained above and select suitable adjusting pads which equal this new dimension. Adjusting pads are available rising in 0,03 mm (0.001 in) sizes from 2,16 to 2,79 mm (0.085 to 0.110 in) and are etched on the surface with a letter 'A' to 'Z', each letter indicating an increase in size of 0,03 mm (0.001 in).
Fit selected adjusting pads and fit the tappets.
Fit the camshaft bearing caps and nuts.

NOTE: If the cylinder head is on the engine, locate the camshaft using gauge C 3993 before tightening the bearing cap nuts.
Tighten the bearing cap nuts to the correct torque.
Connect the camshaft sprockets.
Refit the camshaft covers.

OIL FILTER ASSEMBLY

Remove and refit **12.60.01**

Removing

From beneath the car disconnect the oil pressure switch lead. Separate the filter housing from the pipe to the sump by releasing the two hose clips (1, Fig. 17). Catch any spilled oil.
Release the nut (2, Fig. 17) connecting the camshaft oil feed to the filter housing.
Unscrew and withdraw the four setscrews (3, Fig. 17) securing the filter housing to the crankcase casting.
Withdraw the filter and housing.
Remove and discard the gasket (4, Fig. 17).
Detach the canister (5, Fig. 17) and thoroughly clean the housing.

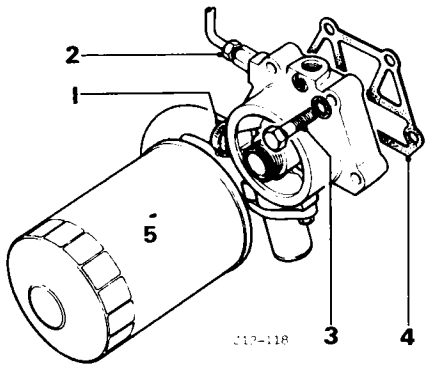


Fig. 17

Refitting

Fit a new gasket and reverse above operations as appropriate.
Fit a new canister, smearing the seal with engine oil and screwing the canister into place by hand only.
Run the engine and check for oil leaks.
Check the oil level, and top up as necessary.

OIL PRESSURE SWITCH

Remove and refit **12.60.50**

See 88.25.08/2.

OIL PRESSURE RELIEF VALVE

Remove and refit **12.60.56**

Removing

From beneath the car, remove the two set bolts (1, Fig. 18) securing the relief valve to the filter head and withdraw the cap (2, Fig. 18), spring (3, Fig. 18), and valve (4, Fig. 18). Collect washer (5, Fig. 18) from the cap.

Refitting

Fit a new 'O' ring (6, Fig. 18) to the valve body and replace in the filter head. Insert the valve and spring, place the washer in the cap and refit to the filter head.

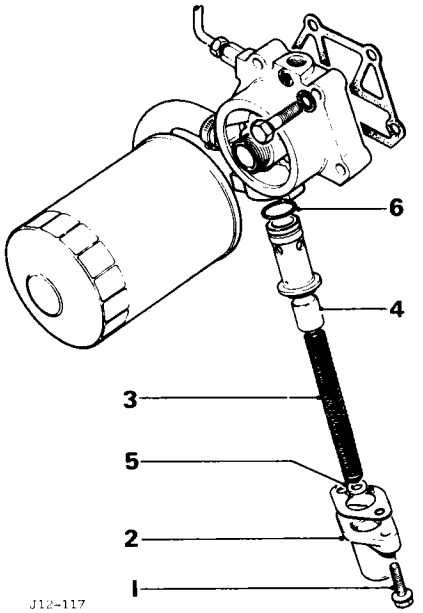


Fig. 18

CAMSHAFT OIL FEED PIPE

Remove and refit **12.60.83**

Removing

Remove the union nut (1, Fig. 19) at the oil filter housing.
Remove the banjo bolts (2, Fig. 19) at the rear of each camshaft.
Manoeuvre the oil feed pipe clear.
Thoroughly clean out the pipe.

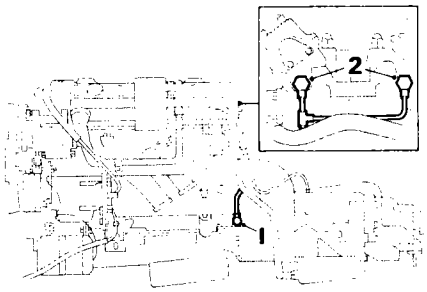


Fig. 19

Refitting

Ensure that the copper seals are in good condition and refit the banjo bolts.

TIMING CHAIN

Adjust **12.65.44**

Service tool: Timing chain adjuster tool JD 2B

Release the clip (1, Fig. 20) securing the crankcase breather pipe to the breather.
Remove the dome head nuts (2, Fig. 20) securing the breather housing. Note the position of the clips and brackets fitted.

continued

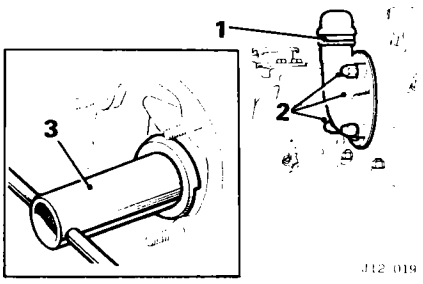


Fig. 20

Withdraw the breather housing and filter gauze.
Slacken the locknut and use tool JD 2B (3, Fig. 20) to tension the top chain. Rotate the tool in an anti-clockwise direction and DO NOT use undue force.
Tighten the locknut and refit the breather housing and all brackets and clips removed.

ENGINE MOUNTING—FRONT SET

Remove and refit **12.45.04**

Removing

Remove the air cleaner assembly.
Remove the nuts from above and below the rubber mounting pads on both sides of the engine (1, Fig. 21).
Carefully raise the engine, using a trolley jack with a wooden block between the jack head and the sump, to release the weight from the mountings.

NOTE: Avoid fouling the fan and cowl

Remove the bolts (2, Fig. 21) securing the mounting brackets to the engine and withdraw the mounting brackets.
Collect the packing pieces and lift out the rubber mountings.

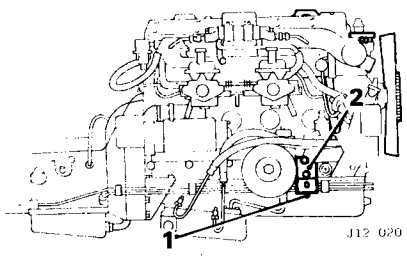


Fig. 21

Refitting

Place replacement mountings in position on the chassis brackets, fitting the insulator between the rubber and the beam on R.H. mountings on 3.4 litre cars only. Replace the spring washers and nuts; tighten the nuts by hand only.
Replace the mounting brackets on the engine, fitting new insulator pads between the brackets and rubber mountings; fit two insulators between the bracket and the rubber mounting on 3.4 litre air-conditioned cars only. Replace the plain washer and Cleveloc nuts, but do not tighten the nuts. Lower the jack.
Tighten the attachment bolts and nuts at the brackets to the correct torque and finally tighten the mounting nuts.
Replace the air cleaner.

ENGINE MOUNTING—REAR SPRING

Remove and refit **12.45.26**

Service tool: Engine support tool MS 53(A)

Removing

Disconnect the battery.
Position service tool MS 53(A) (1, Fig. 22) across the rear engine lifting eye (2) and set the hook to support the engine.

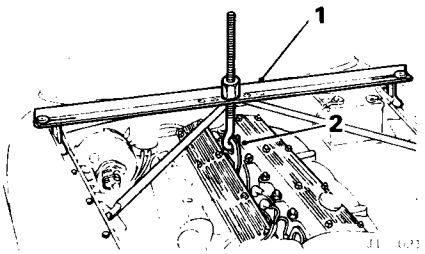


Fig. 22

Jack up the front of the car and place it on two stands.
Disconnect the intermediate exhaust pipe (1, Fig. 23) from the down pipe, remove the sealing olive. Remove the tie plate between the transmission and sump.
Place the jack (2, Fig. 23) with a suitable wooden block under the mounting plate and remove the four setscrews (3, Fig. 23) and washers; lower the jack and remove the rear mounting assembly; collect the spacers and remove the spring.

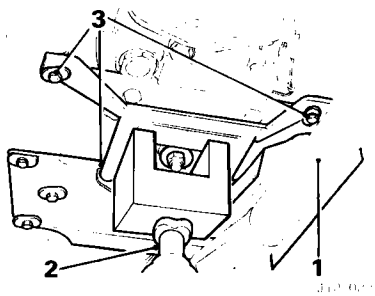


Fig. 23

Refitting

Fit the spring and inner spacers to the mounting assembly and raise it into position on the jack; fit the rear spacers, place washers on the setscrews, insert and tighten.
Lower the jack.
Fit the centre spacer and replace the tie plate.
Reconnect the exhaust pipe, using sealant at the joints; remove the car from the stands and remove tool MS 53(A).

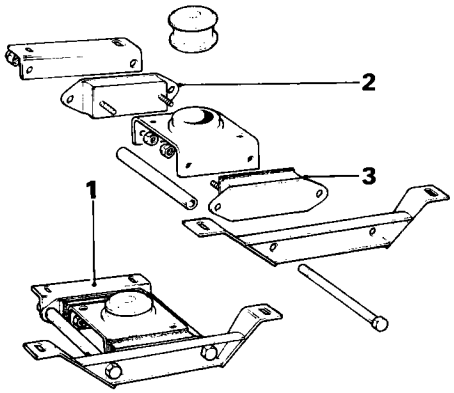


Fig. 24

ENGINE MOUNTING—REAR—FRONT AND REAR RUBBERS

Remove and refit **12.45.24**
12.45.25

Detach the mounting (1, Fig. 24) as above, and dismantle to release the front and rear rubbers (2 and 3, Fig. 24).

CYLINDER HEAD

Remove and refit **12.29.11**

Service tools: Top timing chain adjuster tool JD 2B; valve timing gauge C 3993

Removing

Depressurize the fuel injection system on 4.2 litre cars and drain the cooling system, retaining the coolant for refill.
Detach the wiring and air-conditioning system pipes (if fitted) from the valance to dash ties, remove the bolts at valances, slacken the bolts at dash and swing the ties across the car. Disconnect the coolant hoses.

WARNING: Do not disconnect any refrigerant hoses. Blindness can result if the gas contained within the system comes into contact with the eyes.

Remove the camshaft covers and seals.
Remove the dome headed nuts securing the breather housing, detach the hose and remove the housing.
Remove the bolt securing dipstick tube from model 66 automatic transmission to the inlet manifold.

Detach the down-pipes from the exhaust manifolds.
Disconnect and plug the fuel hoses from the fuel cooler, if fitted.
Disconnect the h.t. leads and remove the harness from the head; separate the temperature transmitter lead and detach the earth lead from the manifold.
Remove the air cleaner; detach the air-flow meter hoses and remove the meter; remove the air cleaner and detach the fuel hoses on 3.4 litre cars; disconnect the throttle and kick-down cables.
Disconnect the heater pipes and remove the camshaft oil feed pipes by detaching the banjo bolts at the rear of the head.
Jack up the front of the car and place it on two stands.
Turn the crankshaft until the two camshaft timing notches are below the camshafts, then remove the two accessible bolts (1, Fig. 26) from each camshaft flange; turn the crank through one complete revolution and release the remaining bolts, but leave one bolt in position in each flange.
Slacken the locknut on the idler sprocket shaft.

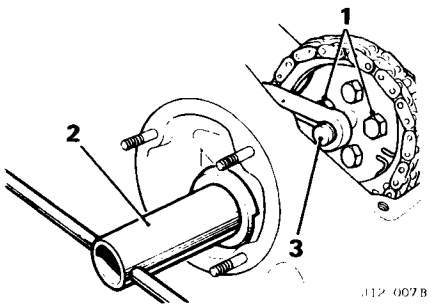


Fig. 26

Use service tool JD 2B (2, Fig. 26) to slacken top timing chain tension by pressing on to serrated adjuster plate and rotating the tool in a clockwise direction.
Remove the remaining bolts.

CAUTION: The engine MUST NOT be rotated while the camshaft sprockets are disconnected and the cylinder head is in place.

Draw the sprockets from the camshafts and slide the sprockets up the support brackets (3, Fig. 26).

NOTE: Mark 'fit' holes in the adjuster plates.

Remove the fourteen cylinder head domed nuts and six nuts securing the front of the cylinder head, working out from the centre.
Recover the two lifting brackets.
Lower the vehicle from the stands and carefully lift the cylinder head assembly from the cylinder block.

NOTE: As the valves in the fully open position protrude below the cylinder head joint face, the cylinder head **must not** be placed joint face downwards directly on a flat surface; support the cylinder head on wooden blocks, one at each end.

Thoroughly clean the joint faces of the cylinder head and block.

Refitting

Fit a new gasket, dry, on the cylinder block ensuring that the side marked 'TOP' is uppermost.
Ensure that No. 6 cylinder (front) is at T.D.C. position, with the distributor rotor arm pointing approximately forward along the engine.
Rotate the camshafts until the timing gauge

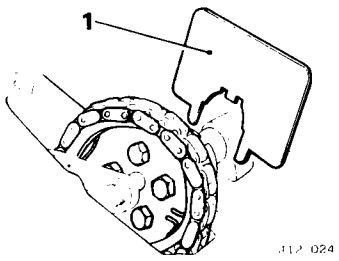


Fig. 27

C 3993 (1, Fig. 27) can be located in the slots in the front flanges.

CAUTION: Ensure that the inlet and exhaust valves do not foul each other.

Lower the cylinder head into position on the cylinder block.
Fit the spark plug lead bracket and lifting brackets to appropriate cylinder head studs.
Place the washers on the cylinder head studs and fit the fourteen large cylinder head domed nuts.
Fit six nuts and washers to secure the forward end of the cylinder head.

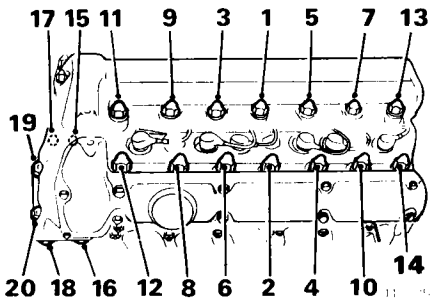


Fig. 28

Tighten the large nuts, in the order shown in Fig. 28, to the correct torque.
Fully tighten the six small nuts.

CAUTION: Do not rotate the engine or camshaft until the camshaft sprockets have been connected.

Locate the sprockets on the camshaft flanges and ensure that both holes in each flange are in alignment with the 'fit' holes in the adjuster plates.

NOTE: If necessary, remove the circlip, disengage the serrations and re-position the adjuster plate as necessary. Refit the circlip.

Secure each adjuster plate to the camshaft, using two bolts and lockplates.
Rotate the engine until the remaining holes on each camshaft are accessible and fit the bolts.
Turn up the tabs.
Tension the timing chain by using service tool JD 2B rotated in an anti-clockwise direction. See Fig. 29.

NOTE: When correctly tensioned there should be slight flexibility on both outer sides of the chain.

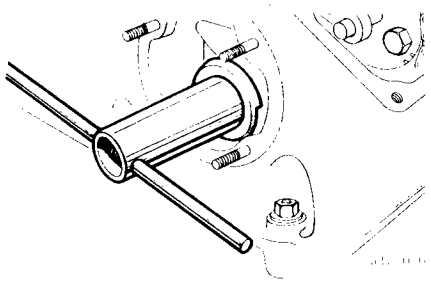


Fig. 29

Securely tighten the locknut.
Ensure that No. 6 cylinder is at T.D.C. firing (with the pointer opposite 'O' on the timing scale) and re-check the position of the camshafts using gauge C 3993.
Reverse the removal operations as appropriate, to complete the reassembly.
Re-check ignition timing as appropriate.
Carry out an exhaust emission check where required by legislation.

CYLINDER HEAD GASKET

Remove and refit **12.29.02**

Removing

Follow the procedure given for removal of the cylinder head (12.29.11). Check the cylinder head and the faces of the cylinder block and liners for damage that caused, or was the result of, gasket failure; rectify as necessary.

OIL SUMP

Remove and refit **12.60.44**

Removing

Remove the front suspension.
Drain engine oil.
Remove the two nuts and lock washers securing the oil return pipe.
Remove the nuts, bolts and washers securing the transmission oil cooler pipe clips — cars fitted with automatic transmission only.
Remove the setscrews and lock washers (1, Fig. 30) and four nuts and lock washers (2, Fig. 30) securing the oil sump.

continued

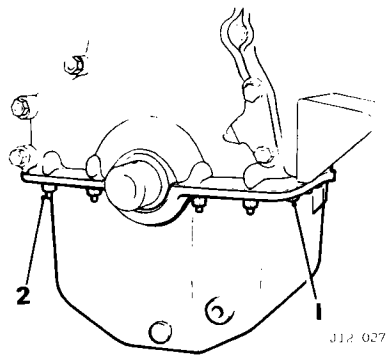


Fig. 30

Remove the four setscrews and washers (1, Fig. 31) securing the intake strainer box.
Clean out the sump pan and strainer.
Thoroughly clean all traces of gaskets and seals from the sump, taking great care not to damage the alloy surfaces.
Thoroughly clean the mating surface of the cylinder block

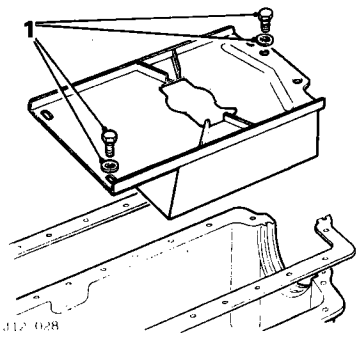


Fig. 31

Refitting

Fit the strainer box and secure using four set-screws and lock washers.
Ensure that the 'O' ring seal is fitted to the oil return pipe.
Fit the new oil seal dry, as supplied and locate in groove in the sump. **DO NOT** trim the ends, but press the seal into the groove until the ends are flush.
Apply RTV sealant compound to both sides of the sump face at the seal aperture joint.
Lightly grease the new gaskets and locate on the sump.
Offer the sump into position and secure it using twenty-six setscrews — short setscrew at front right-hand corner — four nuts and spring washers torque tightening to 20 Nm (15 lbf.ft.)

NOTE:

a. Ensure that the oil return pipe locates in the sump. Secure using two nuts and lock washers.
b. Ensure that the front oil seal locates correctly in the groove.
c. Locate the transmission oil cooler pipe brackets on the relevant setscrews — cars fitted with automatic transmission only.

Refit the front suspension.
Pour 8,25 litres (14.5 Imp. pints) of recommended oil into the engine.
Run the engine, check the oil level, and adjust as necessary.

OIL PICK-UP STRAINER

Remove and refit **12.60.20**

Removing

Remove the oil sump.
Remove the four setscrews and spring washers (1, Fig. 31) securing the strainer box.

Clean

Wash the suction strainer gauze in clean paraffin or petrol, and dry thoroughly. Clean out the sump.

Refitting

Secure the strainer box in position, using four setscrews and spring washers.
Refit the oil sump.

OIL PUMP

Remove and refit **12.60.26**

Removing

Remove the oil sump.
Detach the suction and delivery pipe clips (1, Fig. 32) from the brackets.
Knock back the tabs and remove the setscrews (2, Fig. 32) securing the delivery pipe.
Pull both pipes from the oil pump.
Knock back the tabs and remove the setscrews (3, Fig. 32) securing the oil pump.
Recover the pipe bracket and drive coupling (4, Fig. 32).

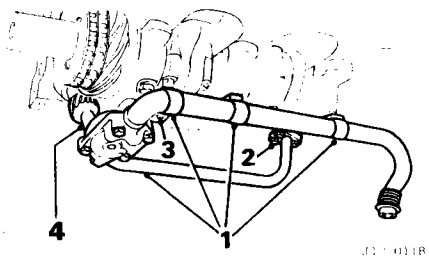


Fig. 32

Refitting

Check the condition of the 'O' ring seals and, if necessary, fit new ones.
Locate the drive coupling on the oil pump and secure the pump using three setscrews, tab washer and pipe bracket. Turn up the tabs.
Fit the delivery pipe on a new gasket, turn up the tabs.
Locate the suction pipe and secure the clips to the brackets. Ensure that the pipe intake is on the centre line of the engine.
Refit the oil sump.

ENGINE AND GEARBOX ASSEMBLY

Remove and refit **12.37.01**

Service tools: Engine support tool MS 53(A); lifting eye C 37851

Removing

Remove the bonnet.
Drain the coolant and conserve for refill.
Drain the oil from the engine.
Detach the radiator hoses and remove the radiator and lower cowl.
Remove R.H. harness cover from the inner wing and disconnect the headlamps at the snap connectors.
Detach the hoses from the valance to bulkhead ties, remove the bolts to valances and slacken the bolts to bulkhead; swing the ties across the car.
Detach the fuel pipes from the cooler (if fitted) and plug them, detach the fuel feed from the carburetters on 3.4 litre cars.
Detach the wiring from the compressor; remove the belt and support the detached compressor alongside the engine. DO NOT SEPARATE REFRIGERANT HOSES FROM THE COMPRESSOR.
Detach the wiring from the alternator.
Disconnect the exhaust down-pipes from the manifolds.
Remove the engine earth lead.
Separate the transmission oil cooler from the valance.
Remove the air cleaner.
Disconnect the air-flow meter wiring and remove the air-flow meter and bracket on 4.2 litre cars.
Disconnect and plug the fuel supply pipe.
Remove the power steering pump from the engine (do not disconnect the hoses) and tie to adjacent wheel arch valance.
Disconnect the wiring, hoses, vacuum pipes and throttle cable from the engine.
Disconnect the injector harness, earth lead and starter lead.
Lift the fresh air intake out of position and remove the heater hose and water valve.
Fit engine support tool MS 53(A) and jack up the front of the car; place it on two stands.
Remove rear and intermediate heat shields.
Detach the tie from between the sump and transmission.
Place the head of the trolley jack under the rear engine mounting and raise it to release the load from the mounting; remove the four bolts and detach the mounting. Collect the spacers.
Remove the four bolts securing the propeller shaft to drive flange, disconnect the shaft and speedometer drive from the gearbox; detach the selector control. Lift the car and remove the stands
Detach the front lifting eye from the two R.H. studs and replace with lifting eye C 37851, secured by head nuts on the second row of studs from the front of the engine; engage lifting tackle with eye.
Place the trolley jack, with a suitable wooden block on the head, under the gearbox.

Remove the securing nuts from both forward engine mountings.
Carefully raise the engine on the jack and lifting tackle and move it forward to clear the rack housing, then lower the jack slightly and hoist the engine clear of the body.

Refitting

Lower the engine and gearbox into the car; position the trolley jack under the car with a wooden block on the head.
Carefully lower the unit, and locate the gearbox on the trolley jack head; move the unit back (observing clearance of steering rack housing) and align engine to mountings.
Insert the correct packing pieces at the front mountings, fit and tighten the mounting nuts.
Fit engine support tool MS 53(A) and withdraw the lifting tackle.
Remove the lifting eye C 3785 1 and replace the standard lifting eye.
Remove the jack from under the gearbox, jack up the front of the car and place it on two stands.
Reconnect the speedometer drive, gear selector and propeller shaft.
Raise the rear mounting into position on the jack, insert spacers and secure in position with four bolts.
Fit the sump to the gearbox tie, replace the intermediate and rear heat shields, lower the car from the stands and detach the support tool.
Replace the detached items by reversing the removal sequence; replace or renew the coolant, refill the engine sump and check the fluid levels in power steering and brake reservoirs, and transmission. Bleed the clutch on manual transmission cars.
Replace the bonnet and check emissions where required.

TIMING COVER

Remove and refit **12.65.01**

Removing

Remove the engine and gearbox assembly.
Remove the gearbox from the engine and place the engine on an approved engine stand.
Remove the cylinder head, using operations from Cylinder head—remove and refit —12.29.11 as appropriate.
Remove the water pump.
Remove the crankcase breather.
Remove the torsional damper (1, Fig. 36), cone (2, Fig. 36) and crankshaft Woodruff key.
Remove the timing gear cover (3, Fig. 36) and recover the timing pointer (4, Fig. 36).
Recover the distance piece (5, Fig. 36) and front oil seal (6, Fig. 36).

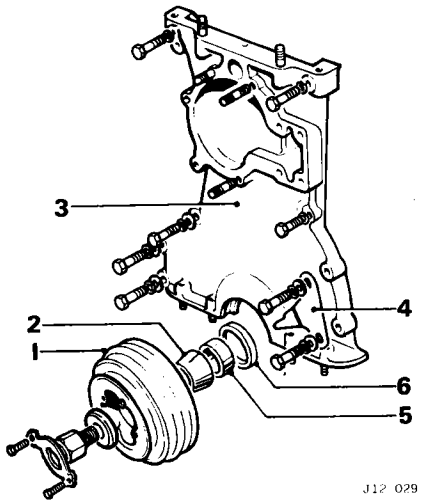


Fig. 36

Refitting

Thoroughly clean all mating faces, taking care not to damage the alloy casting.
Reverse the removal operations, using new gaskets, 'O' rings and seals.

TIMING CHAINS

Remove and refit **12.65.14**

Removing

Remove the timing cover.
Remove the oil thrower (1, Fig. 37—if fitted) from the crankshaft.

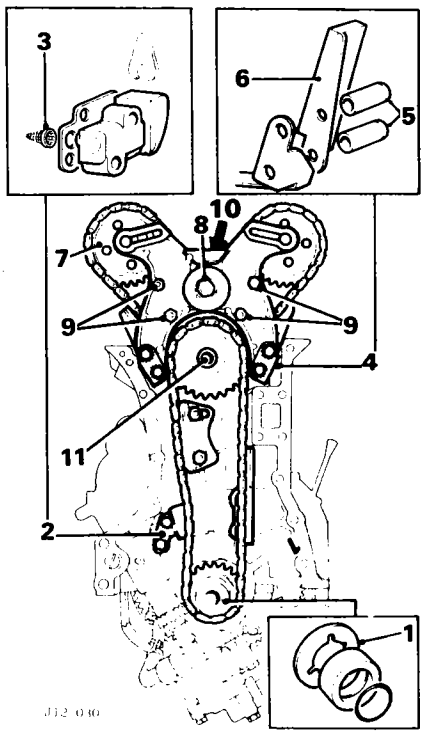


Fig. 37

Remove the setscrews (2, Fig. 37) securing the bottom timing chain tensioner and chain guides. Recover the conical filter (3, Fig. 37) behind tensioner.
Slacken the four setscrews and shakeproof washers (4, Fig. 37) securing the top timing chain assembly. Do not remove the setscrews at this stage.
Withdraw the crankshaft timing sprocket and chain assembly. Recover the distance pieces (5, Fig. 37), top timing chain dampers (6, Fig. 37) and top timing chain retainer.
Disengage the camshaft sprockets (7, Fig. 37) from the top chain.
Remove the nut and serrated washer (8, Fig. 37) from the idler shaft and withdraw the serrated plate, plunger and spring.
Remove the four nuts and serrated washers (9, Fig. 37) securing the front mounting bracket to the rear mounting bracket.
Separate the brackets.
Remove the timing chains from the intermediate and idler sprockets.
Draw the idler shaft (10, Fig. 37), idler sprocket and bush from the rear mounting bracket.
Remove the circlip and press the intermediate shaft from the rear mounting bracket. Recover the intermediate sprockets, bush and shim.

Inspection

Examine the timing chains for signs of damage or wear.
Examine all sprockets for signs of damage or wear.
Examine all dampers and the chain tensioner for signs of damage or excessive wear.
Examine the idler sprocket bush and intermediate sprocket bush for signs of wear.

NOTE: If the timing chains or sprockets show signs of excessive wear or are damaged in any way, all sprockets and the chains should be renewed.

Refitting

Fit the eccentric idler shaft (1, Fig. 38) to the hole in the front mounting bracket.
Fit the spring and plunger (2, Fig. 38) in the bracket and locate the serrated plate (3, Fig. 38) on the shaft. Loosely secure using serrated washer and nut (4, Fig. 38).
Fit the idler sprocket (5, Fig. 38) (21 teeth) to the idler shaft.
Fit the intermediate sprocket (6, Fig 38), large gear forward, on the intermediate shaft; fit shim in rear mounting bracket, ensuring that the roll-pin engages in the slot, and retain the shaft with the circlip.
Locate the top timing chain (longer) on the small intermediate sprocket, and lower timing chain on the large sprocket.
Loop the top chain beneath the idler sprocket and secure the top mounting bracket to the rear mounting bracket using four nuts and serrated washers (7, Fig. 38).
Fit four long setscrews (8, Fig. 38) and spring washers to the front mounting bracket and fit

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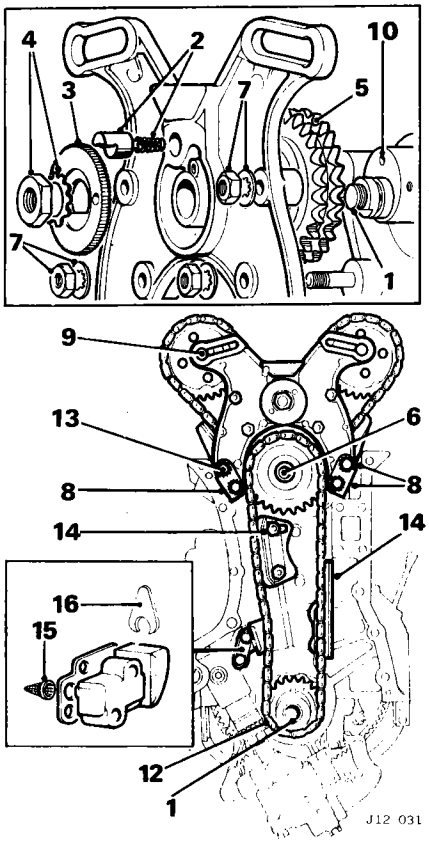


Fig. 38

the dampers, chain support plate and distance pieces to the setscrews.
Equalize the loops of the top timing chain, and locate the camshaft sprockets in the loops (9, Fig. 38).
Rotate the eccentric idler shaft (10, Fig. 38) to lift the idler sprocket to the highest position between the camshaft sprockets.
Ensure that the Woodruff key is fitted to the crankshaft.
Locate the crankshaft sprocket (11, Fig. 38) on the shaft, but do not slide it fully home at this stage.
Loop the bottom timing chain (12, Fig. 38) beneath the crankshaft sprocket, tap the sprocket fully home and locate the assembly.
Tighten the four setscrews (13, Fig. 38) to retain the assembly.
Fit the bottom timing chain guides (14, Fig. 38) but do not tighten the setscrews at this stage.
Fit the conical filter (15, Fig. 38) in the hole in the cylinder block.
Screw the slipper into the tensioner until the dimension of 3,2 mm (0.125 in) exists between slipper and body.
Locate the tensioner on shims as necessary to ensure that the slipper runs central on the chain and secure using two setscrews and lockplate.
Place slip gauge or distance card (16, Fig. 38) supplied with new tensioner between slipper and body of tensioner to maintain dimension of 3,2 mm (0.125 in) and adjust the intermediate damper to touch the chain. Tighten the setscrews and turn up tabs of the lockplate.
Remove the slip gauge and top chain or the tensioner slipper to release the ratchet.
Position the oil thrower on the crankshaft.
Refit the timing cover.

TIMING CHAIN TENSIONER

Remove and refit **12.65.28**

Removing

Remove the timing cover.
Remove the setscrews and locking plate securing the tensioner. Recover the tensioner and shim (1, Fig. 39).
Remove the conical filter (2, Fig. 39) from the cylinder block.

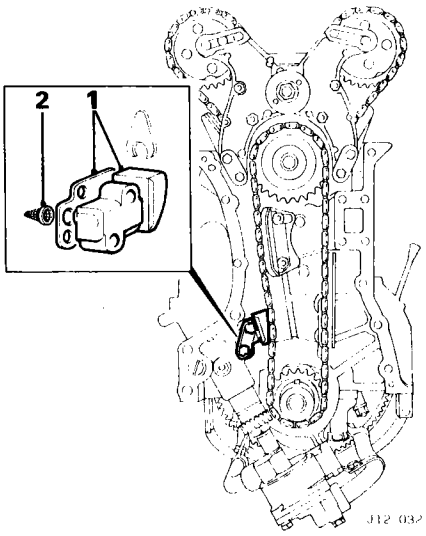


Fig. 39

Refitting

Thoroughly clean the conical filter and fit to the cylinder block.
Screw the slipper into the tensioner and fit the distance card supplied with new tensioner or 3,2 mm (0.125 in) slip gauge between the slipper and body.
Locate the tensioner on shims as necessary to ensure that the slipper runs central on the chain and secure it using two setscrews and lockplate.
Slacken the setscrews securing the intermediate damper and set it into light contact with the chain. Tighten the screws and re-lock.
Remove the slip gauge and tap the chain or tensioner slipper to release the ratchet.

FLYWHEEL

Remove and refit **12.53.07**

Removing

Remove the clutch assembly.
Knock down the locking plate tabs and remove ten bolts (1, Fig. 40).

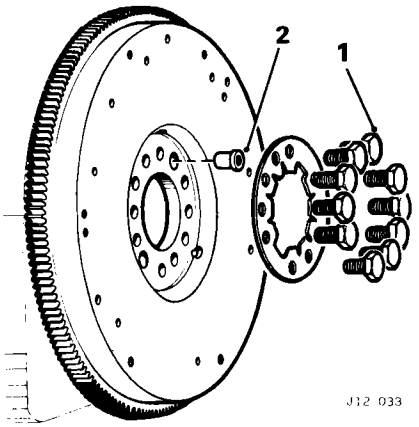


Fig. 40

Remove the flywheel from the crankshaft, using drawbolts through the dowels (2, Fig. 40).

NOTE: On later vehicles dowels are not fitted

Refitting

Locate the dowels where fitted in the crankshaft and tap them fully home through the flywheel.
Fit the locking plate and secure the flywheel using ten bolts. Tighten to the correct torque.
Turn up the tabs.
Refit the clutch assembly.

DRIVE PLATE

Remove and refit **12.53.13**

Removing

Remove the torque converter.
Knock down the locking plate tabs and remove ten bolts (1, Fig. 41).
Remove the drive plate from the crankshaft using drawbolts through the dowels (2, Fig. 41).

NOTE: On later vehicles dowels are not fitted.

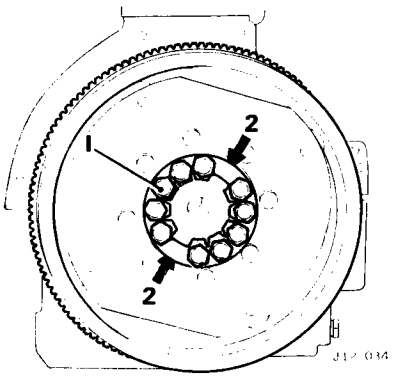


Fig. 41

Refitting

Locate the dowels where fitted in the crankshaft and tap them fully home through the drive plate.
Fit the locking plate and secure the drive plate, using ten bolts. Tighten to the correct torque.
Turn up the tabs.
Refit the torque converter.

PISTON AND CONNECTING ROD

Remove and refit—engine set **12.17.01**

Service tool: Piston ring clamp 18G 55A

Removing

Remove the engine and gearbox assembly.
Remove the gearbox and place the engine on an approved engine stand.
Remove the cylinder head.
Remove the oil sump.
Remove the nuts (1, Fig. 42) from the connecting rod bolts.
Remove the connecting rod cap (2, Fig. 42), noting corresponding cylinder numbers (3, Fig. 42) on the connecting rod and cap. Number 1 cylinder at rear of engine.

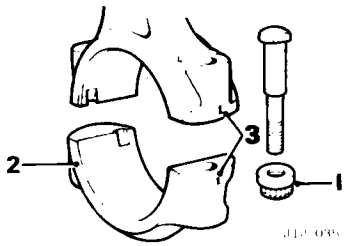


Fig. 42

Remove the connecting rod bolt (4, Fig. 42) and withdraw the piston and connecting rod from the top of the cylinder bore.
Repeat operations to remove pistons on each cylinder, then continue with piston refitting.

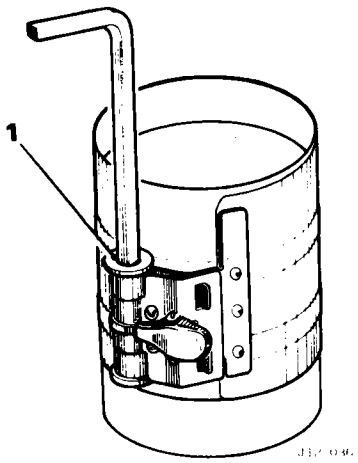


Fig. 43

Refitting

NOTE: If the original pistons and connecting rods are being fitted, they must be replaced in the cylinder bore from which they were removed.
If new pistons and connecting rods are being fitted they should be stamped with the number of the bore in which they are to be installed. Number 1 cylinder is at the rear of the engine. Fit service tool 18G 55A (1, Fig. 43) to a piston, and fully compress the piston rings.
Enter the piston into the cylinder bore, ensuring that stamped 'FRONT' on the piston is towards the front of the engine.
Fit bearing shells to connecting rod and cap, liberally coating them with clean engine oil.
Fit cap to connecting rod, ensuring that the cylinder numbers stamped on each part are on the same side.
Tighten the connecting rod nuts to the correct torque.
Repeat for each cylinder in turn.
Refit the oil sump.
Refit the cylinder head.
Refit the engine and gearbox assembly.

PISTON AND CONNECTING ROD

Overhaul **12.17.10**

NOTE: Pistons are supplied complete with gudgeon pins. As pins and pistons are matched assemblies it is not permissible to interchange component parts.

Overhaul

Remove the piston and connecting rods.
Remove the circlips.
Push the gudgeon pin out of the piston.
Withdraw the connecting rod.

Refitting

Fit the gudgeon pin (1, Fig. 44) in the piston.

CAUTION: Connecting rods must be refitted to pistons in such a way that when installed in the engine the word 'FRONT' on the piston crown faces the front of the engine and the chamfer on the big-end eye faces the crank pin radius.

Align the small-end (2, Fig. 44) with the end of the gudgeon pin and push the pin home.
Use new circlips (3, Fig. 44) to retain the gudgeon pin.

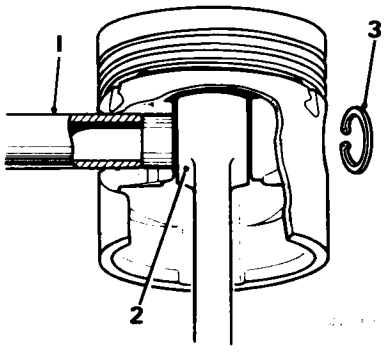


Fig. 44

NOTE: The gudgeon pin is a push fit in the piston at 20°C (68°F). Fit will vary with ambient temperature.

Three piston rings are fitted, as follows:

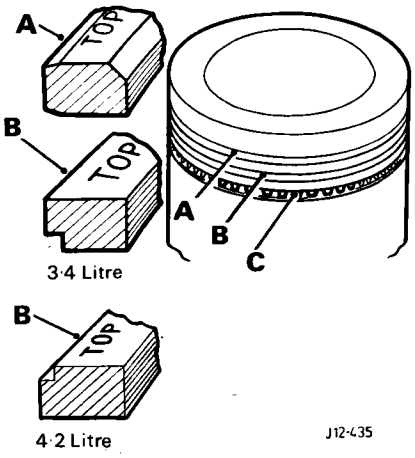


Fig. 45

A. Top ring—compression.
B. Second ring—compression.
C. Bottom ring—oil control.

Both top and second rings have tapered peripheries and are marked 'TOP' to ensure correct fitting. In addition, the top ring has a chrome plated periphery and is also cargraph coated. This coating is coloured RED and must not be removed. The bottom ring consists of an expander sandwiched between two rails.
Check the piston ring gap in the bore. Push the ring to a point midway down the bore, check that the ring is square and measure the gap—see Engine Data.
Fit the bottom ring ensuring that the expander ends are not overlapping.
Fit the second and top rings ensuring that they are fitted the correct way up.
Position the rings so that the gaps are staggered around the periphery of the piston.
Check the side clearance of the rings in the piston groove—see Engine Data.
Check the connecting rods for alignment on a suitable jig.
Check the bore of the small-end bush—see Engine Data.

CAUTION: If the small-end bush is worn beyond acceptable limits, a service exchange connecting rod must be fitted. It is NOT advisable to renew the bushes as specialized equipment is needed to hone the bushes to finished size. Refit the pistons and connecting rods.

CYLINDER HEAD

Overhaul **12.29.19**

Service tools: Valve spring compressor JD 6118C; valve timing gauge C 3993

Remove the cylinder head.

Dismantling

Remove the inlet and exhaust manifolds from the cylinder head. Discard the gasket and thoroughly clean the mating faces, taking great care not to damage the castings.

continued

Remove the four bearing caps from each camshaft. Note the mating marks (1, Fig. 46) on each bearing cap
Lift out the camshafts.
Withdraw the tappets and lay them out in order to ensure the correct replacement.
Remove the adjusting pads from each valve stem, and place them with their respective tappets

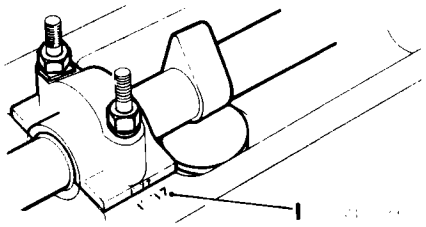


Fig. 46

A. 31 mm (1¼ in)
B. 31 mm (1¼ in)
C 96 mm (3 25/32 in)
D 111 mm (4 3/8 in)
E. 152 mm (6 in)
F 76 mm (3 in)
G. 203 in (8 in)

Make up a wooden block to the dimensions given (Fig. 47) and use it to support the valves.

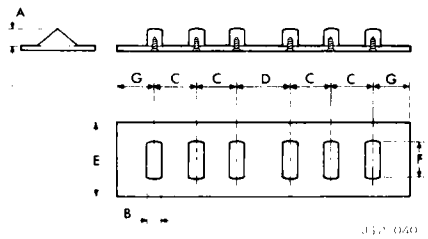


Fig. 47

Compress the valve spring using service tool JD 6118C and extract the cotters, see Fig. 48. Remove the collars, valve springs and spring seats. Repeat for the remaining five cylinders.

NOTE:
a. Remove the oil seal from the stem of the inlet valves before removing the spring seat.
b. Valves are numbered and must be replaced in original locations, No. 1 cylinder being at the flywheel end of the engine.

Remove all traces of carbon from the combustion chambers and deposits from the induction and exhaust ports. Great care must be taken to avoid damaging the head, use worn emery cloth and paraffin only.

Valve guides
Check the clearance between the valve guide and stem, this should be 0,025 to 0,10 mm (0.001 to 0.004 in). When removing a worn guide, care must be taken to identify each individual guide to its bore in the cylinder head. Replacement guides are available in the three following sizes, and have identification grooves machined in the shank as noted below.

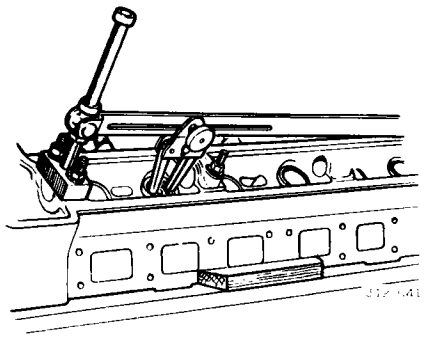


Fig. 48

NOTE: Valve guides, when fitted during initial engine assembly, are to the following dimensions and may be fitted in mixed form.

Standard (no identification)
12,73 to 12,75 mm (0.501 to 0.502 in).
1st oversize (one machined groove)
12,78 to 12,80 mm (0.503 to 0.504 in).
2nd oversize (two machined grooves)
12,85 to 12,88 mm (0.506 to 0.507 in).
3rd oversize (three machined grooves)
12,98 to 13,00 mm (0.511 to 0.512 in).

When new guides are to be fitted, they should always be one size larger than the old guide.
Standard and 1st oversize valve guides may be replaced in the following manner.
Immerse the head in boiling water for 30 minutes
Using a piloted drift, drive the guide out of the head from the combustion chamber end.
Coat the new valve guide with graphite grease and refit the circlip.
Heat the cylinder head.
Using a piloted drift, drive in the guide (1, Fig. 49) from the top until the circlip is seated in the groove.

CAUTION: This procedure is not recommended owing to the difficulty of establishing truth with the centre of the valve seat; it should not be attempted unless comprehensive machine shop facilities are available. A replacement cylinder head should be considered as an alternative.

NOTE: If a 2nd oversize guide is to be replaced the cylinder head bore must be reamed to the following dimension.
12,95 mm + 0,012 mm—0,005 mm (0.510 + 0.0005 in—0,0002 in).

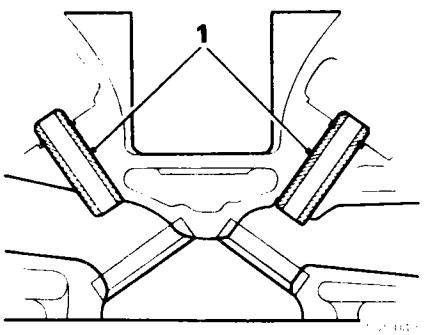


Fig. 49

Valve seats
Examine the valve seats for pitting or excess wear. If the seats are damaged past reclamation by approved refacing procedures, the seat inserts may be replaced

CAUTION: This procedure is not recommended owing to the difficulty of removing the old valve seat and the risk of damage to the cylinder head; it should not be attempted unless comprehensive machine shop facilities are available. A replacement cylinder head should be considered as an alternative.

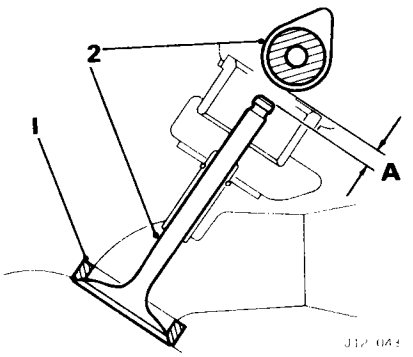


Fig. 50

Remove the inserts by machining, leaving approximately 0,25 mm (0.010 in) of metal which can easily be removed by hand without damaging the cylinder head.
Measure the diameter of the insert recess in the cylinder head.
Grind down outside diameter of the new insert to a dimension 0,08 mm (0.003 in) larger than the insert recess.
Heat the cylinder head for half an hour from cold at a temperature of 150°C (300°F).
Fit the insert (1, Fig. 50) ensuring that it beds evenly in the recess.
Renew or reface valves as necessary.
Correct valve seat angles are:

Inlet	Exhaust
44½ degrees	44½ degrees

Valves
Check the valve stems for distortion or wear, renew the valves with stems worn in excess of 0,08 mm (0.003 in), see section 05 book 1.
Using a suitable suction tool, grind the valves into their respective seats.
If new valve inserts have been fitted, the clearance 'A' between valve stem and cam (2, Fig. 50) must be checked; this should be 8,13 mm (0.320 in) plus the valve clearance. The dimension must be taken between the valve stem and the back of the cam. Should this dimension not be obtained, metal must be ground from the valve seat of the insert.

NOTE: Only suitable grinding equipment should be used.

Tappet guides
Examine the tappets and tappet guides for wear. The diametrical clearance between the tappet and tappet guide should be 0,02 to 0,05 mm (0.0008 to 0.0019 in).

CAUTION: The following procedure is not recommended owing to the difficulty of removing the old tappet guide and the risk of damage to the cylinder head; it should not be attempted unless comprehensive machine shop facilities are available. A replacement cylinder head should be considered as an alternative.

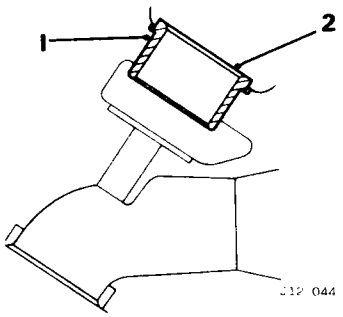


Fig. 51

Remove the old tappet guide (1, Fig. 51) by boring out until the guide collapses. Take great care not to damage the guide bore in the cylinder head.
Carefully measure the diameter of the tappet guide bore at room temperature 20°C (68°F).
Grind down the outside diameter of the replacement tappet guide to a dimension 0,089 mm (0.0035 in) larger than the tappet guide bore diameter measured above.
Grind the same amount from the 'lead-in' at the bottom of the tappet guide. The reduction in diameter from the adjacent diameter should be 0.089 to 0.16 mm (0.0037 to 0.0062 in).
Heat the cylinder head in an oven for half an hour from cold at a temperature of 150°C (300°F).
Fit the tappet guide, ensuring that the lip at the top of the guide beds evenly in the recess in the top of the cylinder head, see 2, Fig. 51.
Allow the cylinder head to cool, then ream the tappet guide bore to the diameter of 34,925 mm + 0,018 mm − 0,000 mm (1.375 in + 0.007 in − 0.000 in).
It is essential that, when reamed, the tappet guide bore is concentric with the valve guide bore.

Adjusting pads

Examine the adjusting pads (1, Fig. 52) for signs of indentation.
Renew, if necessary, with appropriate size when making valve clearances adjustment on reassembly.

Valve springs

Test the valve springs for pressure either by checking against Valve Spring Data or against a new spring.

Reassembling

Examine the valves for pitting, burning or distortion, and reface or renew valves as necessary. Also reface the valve seats in the cylinder head and grind the valves to their respective seats using a suction valve tool. When refacing valves or seat inserts do not remove more metal than is necessary to clean up the facings.
Refit the valves in the order removed and place the cylinder head on the wooden blocks.

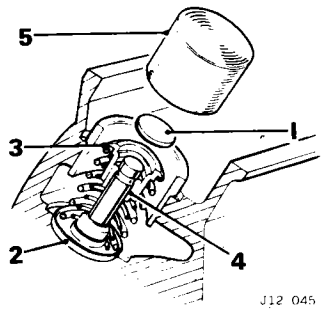


Fig. 52

Refit the valve spring seats (2, Fig. 52) and refit the inlet valve guide oil seals.
Refit the springs and collars (3, Fig. 52).
Compress the springs using service tool JD 6118C and fit the split cotters (4, Fig. 52). Tap the valve stems to ensure that the cotters are seated.
Fit the adjusting pads and tappets (5, Fig. 52) to their respective valves.

CAUTION: Camshafts must not be rotated independently.

Fit the camshaft shell bearings, locate one camshaft and secure the bearing cap nuts working from the centre outwards. Tighten the nuts to the correct torque.
Check the tappet adjustment.
Remove the camshaft fitted previously after checking, and fit the remaining camshaft.
Check the tappet adjustment.
Fit adjustment pads as required and fit camshafts, lining each up using service tool C 3993.

OIL PUMP

Overhaul **12.60.32**

Dismantling

Remove the oil pump.
Unscrew the four bolts and detach the bottom cover.
Withdraw the inner and outer rotors from the oil pump body.

NOTE: Do not attempt to separate the inner rotor from the shaft.

Inspection

Thoroughly clean all components.
Check that the clearance between the lobes of the inner and outer rotors (1, Fig. 53) does not exceed 0,15 mm (0.006 in).
Check that the clearance between outer rotor and pump body (1, Fig. 54) does not exceed 0,25 mm (0.010 in).
Check that the end-float of the rotors (1, Fig. 55) does not exceed 0,06 mm (0.0025 in).

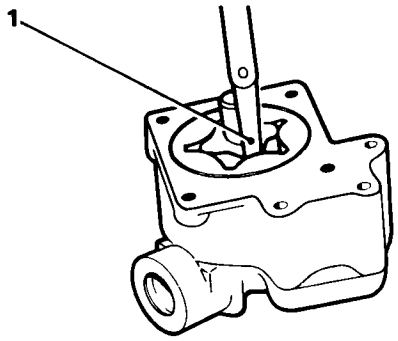


Fig. 53

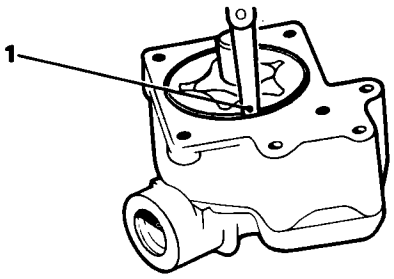


Fig. 54

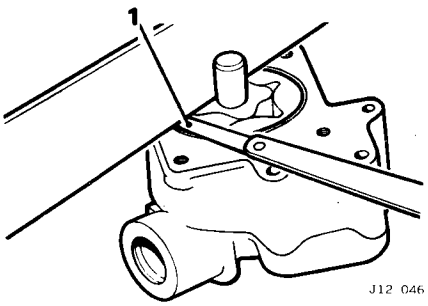


Fig. 55

NOTE: If necessary the outer rotor and/or body may be lapped on a surface plate to rectify.

Examine all components for signs of scoring or wear.
Ensure that the inner rotor is tight on the drive shaft.

NOTE: Inner rotor drive shaft and outer rotor are only available as an assembly.

Renew the 'O' ring seals in the pump body.

Reassembling

Assemble the inner rotor to the body.
Assemble the outer rotor to the body ensuring that the chamfered end is inserted first.
Secure the bottom cover using four bolts and lock washers.
Fit the oil pump.

ENGINE

Dismantle and reassemble 12.41.05

Deglazing cylinder bores see page 12—21

Service tools: Oil seal pre-sizing tool JD 17B; timing chain adjuster tool JD 2B; piston ring compressor 38 U3; valve timing gauge C 3993.

Drain the engine oil. For plug see item 1, Fig. 56.

Remove the torque converter—cars fitted with automatic transmission only.

Remove the clutch assembly—cars fitted with manual transmission only.

Secure the engine to an approved engine stand.

Dismantling

Remove the distributor cap (2, Fig. 56); pull the vacuum pipe from the capsule.

Remove the ignition coil bracket from the engine.

Note the connection and remove the engine cable harness.

Slacken the clips (3, Fig. 56) on the coolant pipes at the front of the engine.

Remove the two screws (4, Fig. 56) securing the hot air duct on 3.4 litre cars only.

Remove the four plain nuts (5, Fig. 56) and spring washers securing the fan and Torquatrol unit to the water pump pulley.

Remove the air-conditioning compressor (6, Fig. 56) and bracket (7, Fig. 56)—cars fitted with air-conditioning only.

Remove the alternator and bracket (8, Fig. 56).

Remove the power assisted steering pump and bracket (9, Fig. 56).

Remove the nut securing the automatic transmission unit filler tube bracket (10, Fig. 56)—cars fitted with automatic transmission only.

Cars fitted with exhaust gas recirculation only

Release the union nut at the E.G.R. system 'Y' piece (11, Fig. 56).

Remove the setscrew at the rear of the cylinder block securing the E.G.R. system supply pipe (12, Fig. 56).

Remove the camshaft oil feed pipe banjo bolts (13, Fig. 56).

Remove the ten dome headed nuts (14, Fig. 56) and two cross-head screws securing each camshaft cover.

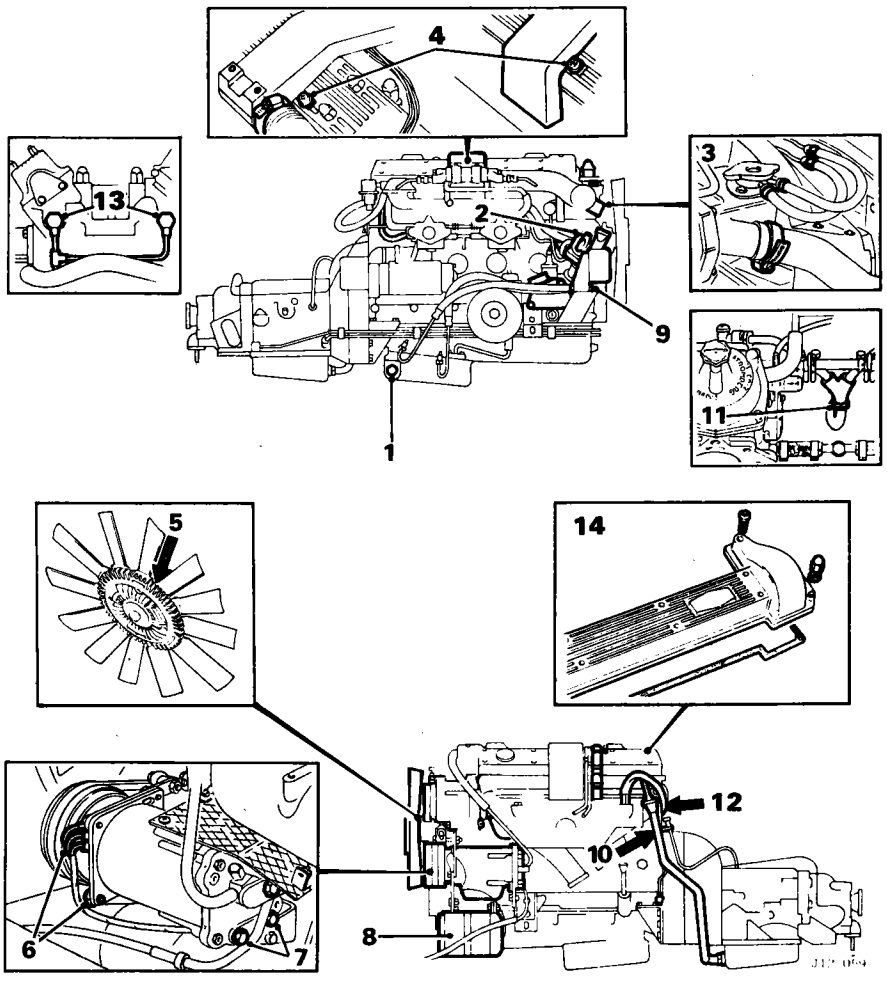


Fig. 56

Remove the dome headed nuts (1, Fig. 57) securing the crankcase breather.

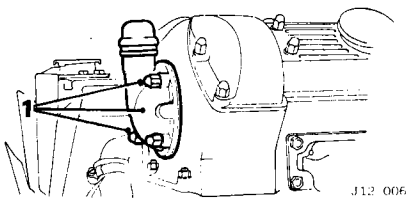


Fig. 57

Slacken the locknut and use tool JD 2B (1, Fig. 58) to slacken the top timing chain. Rotate the tool in a clockwise direction.

Knock down the tabs at the camshaft sprockets and remove the two bolts (2, Fig. 58) from each.

Rotate the engine to gain access to the remaining bolts and remove.

CAUTION: Engine MUST NOT be rotated with the camshaft sprockets disconnected and the cylinder head in place.

Draw the sprockets from the camshafts and slide the sprockets up the support brackets.

NOTE: Mark 'fit' holes in the adjuster plates.

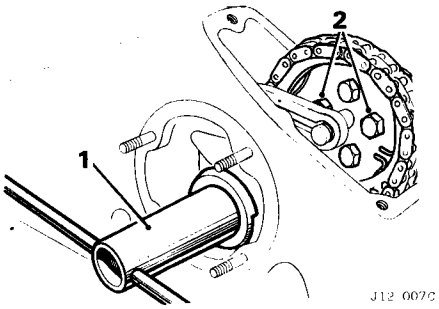


Fig. 58

Remove the fourteen cylinder head domed nuts and six nuts securing the front of the cylinder head working out from the centre.

Recover the two lifting brackets. Lift the h.t. leads clear.

Carefully lift the cylinder head assembly from the cylinder block.

NOTE: As the valves in the fully open position protrude below the cylinder head joint face, the cylinder head MUST NOT be placed joint face downwards directly on a flat surface; support the cylinder head on wooden blocks, one at each end.

Remove and discard the gasket, clean the face of the block.

On the flywheel on manual transmission cars, or the drive plate on automatic transmission cars, tap down the lock plate tabs and remove the bolts. Remove the drive plate/flywheel from the crankshaft using draw-bolts through the dowels.

Knock back the locking tabs (1, Fig. 59) on the crankshaft pulley bolts.
Remove the four bolts (2, Fig. 59) securing the pulley(s) to the torsional damper. Recover the locking ring and remove the outer pulleys.
Remove the large bolt (3, Fig. 59) securing the

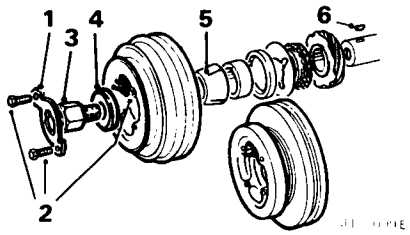


Fig. 59

torsional damper and recover the large plain washer (4, Fig. 59).
Strike the damper with a hide mallet to break the taper, and remove it from the crankshaft.
Remove the cone (5, Fig. 59) and extract the Woodruff key (6, Fig. 59) from the crankshaft.

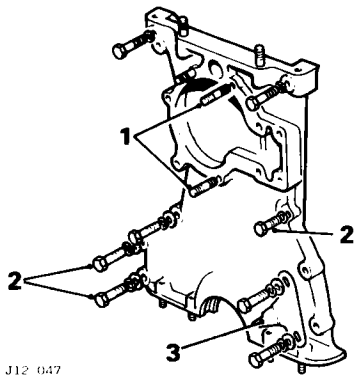


Fig. 60

Remove the bolts, nuts and spring washers (1, Fig. 60) securing the water pump. Remove the water pump and clean all traces of gasket from the mating faces.
Unscrew the oil filter canister from the housing.
Slacken the hose clips on the oil return pipe to the sump.

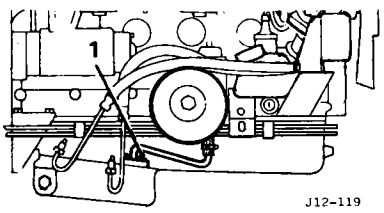


Fig. 61

Remove the four setscrews and spring washers securing the oil filter housing to the cylinder block. Pull the housing from the return pipe and clean all traces of gasket from the mating faces.
Remove the two nuts and shakeproof washers (1, Fig. 61) and lift the return pipe from the oil sump. Check the condition of the 'O' ring seal and renew it if necessary.
Remove the setscrew, plain and spring washers and lift the distributor from the cylinder block.
Twist the dipstick tube from the cylinder block.
Remove the camshaft oil feed pipe banjo bolt.
Slacken the nuts, bolts and washers and draw the transmission oil cooler pipes from the brackets—cars fitted with automatic transmission only.
Remove the four nuts and spring washers, and all setscrews and spring washers securing the oil sump. Note the location of cooler pipe brackets—cars fitted with automatic transmission only.

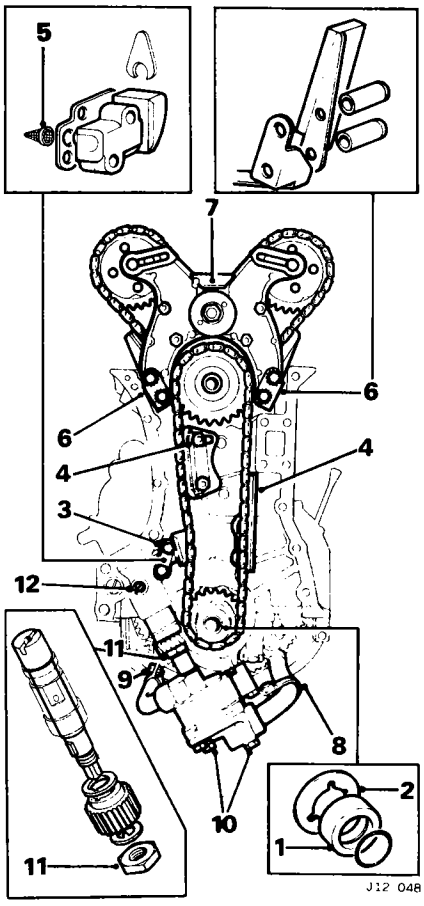


Fig. 62

Remove the setscrews and special washers (2, Fig. 60) and carefully prise the timing chain cover from the engine. Recover the timing pointer (3, Fig. 60).
Remove and discard the gasket and crankshaft oil seal.
Draw the distance piece (1, Fig. 62) from the crankshaft, check the condition of 'O' ring seal, and renew if necessary. Recover the oil thrower (2, Fig. 62) if fitted.
Remove the setscrews securing the lower timing chain tensioner (3, Fig. 62) and chain guides (4, Fig. 62). Recover the conical filter (5, Fig. 62) behind the tensioner.
Slacken the four setscrews and shakeproof washers (6, Fig. 62) securing the upper timing chain assembly. Do not remove the setscrews at this stage.
Withdraw the crankshaft timing gear and chain assembly (7, Fig. 62), carry out the overhaul.

Remove the self locking nuts, bolts and washers and pull the suction pipe (8, Fig. 62) from the oil sump.
Knock down the tabs, remove the self locking nut, washer and bolt, and pull the delivery pipe (9, Fig. 62) from the oil sump.
Knock down the tabs and remove the three bolts (10, Fig. 62) securing the oil pump. Draw the oil pump clear and recover the drive coupling.
Knock down the tab washer and remove the nut (11, Fig. 62) securing the distributor drive gear.
Draw the gear and thrust washer from the shaft; remove the shaft and key.
If necessary, remove the locating grub screw (12, Fig. 62) and drift the distributor drive shaft bush downwards from the cylinder block.

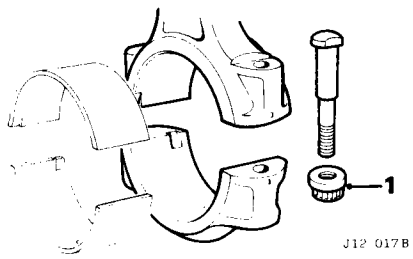


Fig. 63

Remove the special nuts (1, Fig. 63) securing the connecting rod bearing caps; remove the caps together with the shell bearings.
Pass the pistons up through the bores.
Remove the crankshaft rear oil seal assembly cap screws. Remove and discard the oil seal.

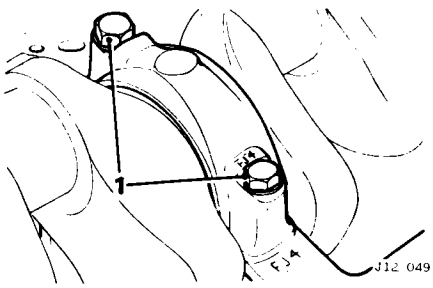


Fig. 64

Remove the main bearing bolts (1, Fig. 64) and washers, noting the position of the oil pipe brackets. Remove the bearing caps.
Remove the two Allen screws securing the lower half of the rear oil seal. Prise out the seal.
Remove the three Allen screws securing the upper half of the rear oil seal. Prise out the seal.
Lift the crankshaft from the cylinder block.
Recover the bearing shells.

continued

Inspection

CAUTION: Ensure that all components are scrupulously clean, blow out all oil galleries in the crankcase, crankshaft and camshaft with clean, dry compressed air.

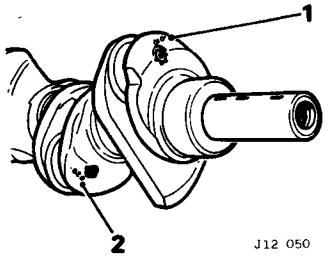


Fig. 65

Early engines prior to engine nos:-

8A15562	All 3.4
8L168437	R o W except
8L147650	UK and Europe

a. Crankshaft. Regrinding of the crankshaft is generally recommended when wear or ovality in excess of 0,08 mm (0.003 in) is found. Grinding may be undertaken to a limit of 0,51 mm (0.020 in). Grinding beyond the limit of 0,51 mm (0.020 in) is not recommended and in such circumstances a new crankshaft must be obtained. Oversizes of journals are stamped in the adjacent web at the forward end of the crankshaft. 1.—Main journal. 2.—Crankpin. See Fig. 65

Later engines from engine nos:

8A15562	All 3.4
8L168437	R o W except
8L147650	UK and Europe

The crankshaft of the above engines are specially hardened and cannot be reground.

b. Cylinder Block. Check the top face of the cylinder block for truth. Check that the main bearing caps have not been filed and that the bearing bores are in alignment. Should the caps show damage or the bearing housing misaligned, the caps must be re-machined and the bearing housings line bored.

Remove the cylinder head studs (1, Fig. 66). Check the area around the studs holes for flatness (2, Fig. 66). Skim any raised areas flush with the joint face to ensure a perfectly flat surface. Reboring is normally recommended when the ovality exceeds 0,15 mm (0.006 in). Reboring beyond the limit of 0,51 mm (0.020 in) is not recommended. Oversize pistons are available of this size, see group 05. If the bores will not clean out at 0,51 mm (0.020 in) new liners and standard size pistons should be fitted.

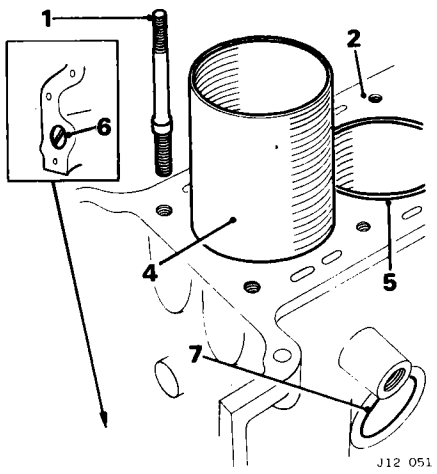


Fig. 66

Press out the worn liners (Fig. 67) from below. Before fitting a new liner, lightly smear the cylinder walls with jointing compound to a point halfway down the bore and also smear the top outer surface of the liner (4, Fig. 66). Press in the new liners flush with the top face of the cylinder block (5, Fig. 66). Dry liners are fitted in engine manufacture to early 4.2 litre blocks, but not normally to 3.4 litre blocks.

Bore out and hone the liners to suit the grade of pistons to be fitted. (See piston grades below). See Bore Deglazing page 12—21.

Following reboring, the blanking plugs in the main oil gallery (6, Fig. 66) should be removed and the cylinder block oilways and crankcase interior thoroughly cleaned.

When dry, coat the interior of the crankcase with an oil- and heat-resisting paint.

Check all core plugs (7, Fig. 66) fitted to the cylinder block and renew any which show signs of leaking.

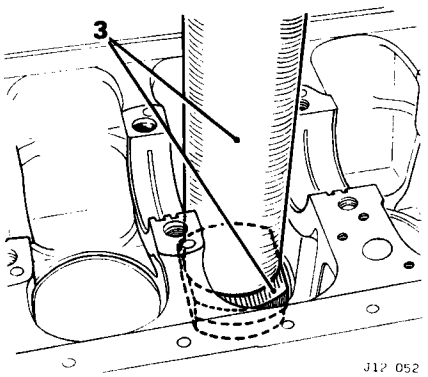


Fig. 67

c. Piston and connecting rod

Piston grades

The following selective grades are available in standard size pistons only. When ordering standard size pistons the identification letter of the selective grade should be clearly stated. Pistons are stamped on the crown with the letter identification and the cylinder block is also stamped on the top face adjacent to the bores.

Grade Identification

Letter	For cylinder bore size	
	3.4 Litre	4.2 Litre
F	82,989 to 82,997 mm (3.2673 to 3.2676 in)	92,075 to 92,0826 mm (3.6250 to 3.6253 in)
G	83,000 to 83,007 mm (3.2677 to 3.2680 in)	92,0852 to 92,0928 mm (3.6254 to 3.6257 in)
H	83,010 to 83,017 mm (3.2681 to 3 2684 in)	92,0953 to 92,1029 mm (3.6258 to 3.6261 in)

'S' pistons are 82,995 to 83,020 mm (3.2675 to 3.2685 in) dia. across bottom of skirt for 3.4 litre engines and 92,080 to 92,105 mm (3.6252 to 3.6262 in) dia. across bottom of skirt for 4.2 litre engines.

Measure exact dimension, at right angles to the gudgeon pin, and hone the bores to 0,018 to 0,033 mm (0.0007 to 0.0013 in) more than this measured dimension when fitting 'S' pistons.

Always use new circlips on assembly.

Gudgeon pins are graded by colour coding (red or green). For identification purposes the colour coding is also indicated on the gudgeon pin hole boss on the pistons.

Oversize pistons

Oversize pistons are available in + 0,51 mm (0.020 in) only.

There are no selective grades in oversize pistons as grading is necessary purely for factory production methods. For reboring the cylinder see the instructions given above.

If connecting rods have been in use for very high mileage, or if bearing failure has been experienced, it is desirable to renew the rod(s) owing to the possibility of fatigue.

The connecting rods fitted to an engine should not vary one with another by more that 3.5 grammes (2 drams). The alignment should be checked on an approved connecting rod alignment jig.

If alignment is incorrect, an exchange rod should be fitted.

The big-end bearings are of the precision shell type and under no circumstances should they be hand-scraped or the bearing cap filed.

The small-ends are fitted with steel-backed phosphor-bronze bushes which are a press fit in the connecting rod. After fitting, the bush should be bored, reamed and honed to a diameter of 22,225 to 22,23 mm (0.875 to 0.8752 in). Always use new connecting bolts and nuts at overhauls.

Before fitting new big-end bearings, the crankpins must be examined for damage or the transfer of bearing metal.

When a new connecting rod is fitted, although the small-end bush is reamed to the correct dimensions, it may be necessary to hone the bush to achieve the correct gudgeon pin fit.

d. General. Remove the oil suction strainer in the sump and clean thoroughly. Inspect all components for damage.

Reassembling

NOTE: Before refitting the crankshaft the rear oil seal must be offered up and sized correctly. Before fitting the seal halves into the housing grooves, brush a thin coat of red Hermetite into both grooves for 25 mm (1 inch) from the joint face on opposite halves (from leading edge of seal on both).

Carefully tap the new rear oil seal halves (1, Fig. 68) on side face to narrow section and press into the grooves in the seal housings (2, Fig. 68). Use a hammer handle (3, Fig. 68) to roll the seal into the housing until the ends do not protrude. DO NOT cut the ends of the seal. Use a knife or similar tool to ensure that no loose strands are proud.

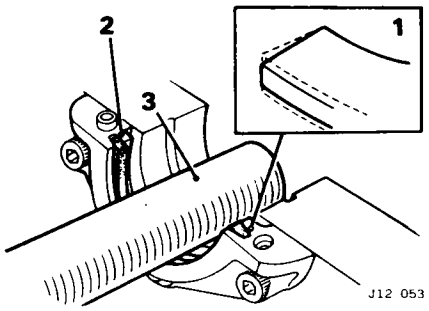


Fig. 68

Assemble the two halves of the seal and secure using two socket head screws (1, Fig. 69).
Fit the rear main bearing cap without bearings and tighten the bolts to torque quoted in data sheet.
Assemble the rear oil seal housing to the cylinder block using three socket head screws.

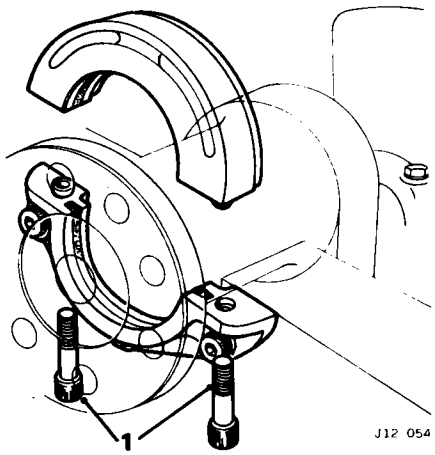


Fig. 69

Smear a small quantity of colloidal graphite around the inside surface of the oil seal and insert the sizing tool JD 17B (1, Fig. 70).
Press the tool inwards and rotate it until fully home. Withdraw the tool by pulling and twisting at the same time.
Remove and separate the rear main bearing oil seal housing and remove the rear main bearing cap (2, Fig. 70).
Check the distributor drive shaft bush for wear, and, if necessary, renew it.
Tap the bush in from the bottom of the crankcase ensuring that the locating holes line up.
Fit the locating peg.
Fit the main bearing shells in the cylinder block, lay the crankshaft in position and fit the rear oil seal housing.

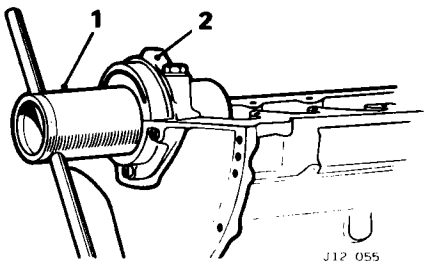


Fig. 70

Fit new thrust washers (1, Fig. 71) to centre main bearing cap, white metal side outwards.
Fit the cap to the cylinder block.
Check the crankshaft end-float which should be 0,10 to 0,15 mm (0.004 to 0.006 in).

NOTE: Thrust washers are supplied in two sizes, standard and 0,10 mm (0.004 in) oversize and should be selected to bring the end-float within required limits. Oversize washers are stamped .004 on the steel face.

Fit the main bearing shells and caps with the numbers on the caps corresponding with the numbers on the cylinder block (2, Fig. 71).
Fit the main bearing bolts, locating the oil pipe brackets as noted, and lock washer and tighten to the correct torque.
Test the crankshaft for free rotation.
Fit the Woodruff key to the inner slot and tap oil pump/distributor drive gear into position.
Fit the pistons and connecting rods to cylinder bores and secure to crankshaft using special nuts. Check the crankshaft for free rotation.

CAUTION: Ensure that the pistons are fitted with 'FRONT' on each crown towards the front of the cylinder block.

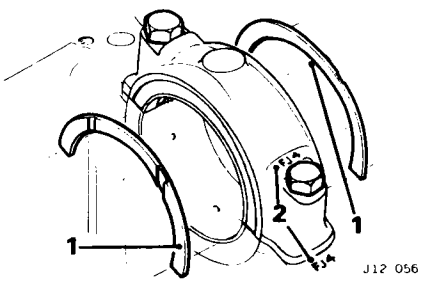


Fig. 71

Turn the crankshaft to accurately set pistons 1 and 6 to T.D.C.
Place the distributor drive shaft in position with the offset slot as shown (1, Fig. 72).
Slightly withdraw the shaft and fit Woodruff key (2, Fig. 72), thrust washer (3, Fig. 72) and drive gear (4, Fig. 72) on shaft.
Maintaining correct slot position, press the shaft into gear, ensuring that the keyway engages correctly.
Fit the pegged tab washer (5, Fig. 72) and secure it with plain nut (6, Fig. 72).
Check the end-float of the shaft. The clearance should be 0,10 to 0,15 mm (0.004 to 0.006 in).
If no clearance exists, renew drive gear. In emergency, the thrust washer can be reduced.
Locate the lower timing chain dampers (7, Fig. 72) and loosely fasten.
Fit the Woodruff key to the second slot.
Offer the top and bottom timing chain assembly and chain sprockets (8, Fig. 72) into position and secure using four setscrews and locking washers (9, Fig. 72).
Position the damper in light contact with the chain and secure it.
Screw the slipper of the chain tensioner into the body casting. Fit the slip gauge or distance card (10, Fig. 72) supplied with the new tensioner to maintain a clearance of 3,17 mm (0.125 in) between slipper and body.
Locate the conical filter (11, Fig. 72) in the cylinder block.
Secure the chain tensioner to the cylinder block using two setscrews (12, Fig. 72) and lockwashers. Fit the shims as required to ensure that the slipper runs central on the chain.
Set the adjustable damper (13, Fig. 72) into light contact with the chain and secure it.

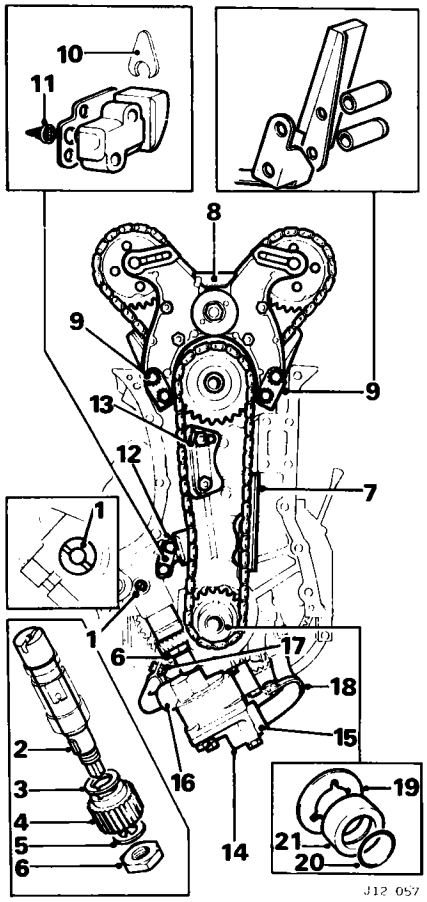


Fig. 72

Remove the slip gauge or distance card, lightly tap to release ratchet.
Locate the coupling on the oil pump (14, Fig. 72) and secure it to the front main bearing cap.
Fit the lockplates and pipe bracket.
Ensure that the 'O' ring seal is fitted in the oil pump suction (15, Fig. 72) and delivery ports (16, Fig. 72).
Use a new gasket and fit the delivery pipe between the oil pump and cylinder block.
Secure the pipe clip (17, Fig. 72).
Fit the oil suction pipe and secure the pipe clips (18, Fig. 72).

continued

NOTE: Locate the pipe on the main bearing cap brackets so that the intake end is on the centre line of the engine.

Fit the oil thrower (19, Fig. 72) at the timing chain sprocket, if originally fitted.
Use new gaskets smeared with grease and fit the timing cover. Fit the ignition timing pointer.
Liberally coat a new front oil seal with engine oil and locate it in the timing cover recess, open side inwards.
Check the 'O' ring seal (20, Fig. 72) in the distance piece (21, Fig. 72) and fit on to the crankshaft.
Use new gaskets smeared with grease and fit the oil sump. Locate the transmission oil cooler pipe brackets on cars fitted with automatic transmission only.

CAUTION: Ensure that the short setscrew is fitted at the front right-hand corner.

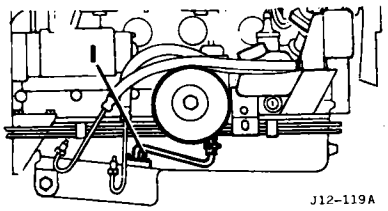


Fig. 73

Fit a new 'O' ring seal on the oil return pipe and secure it to the sump using two plain nuts and spring washers (1, Fig. 73).
Using a new gasket lightly smeared with grease, fit the oil filter housing. Locate the oil return pipe hose, oil feed pipe to camshafts and oil cooler hoses, if fitted.
Secure the housing to the block using four setscrews and shakeproof washers.
Tighten the hose clips and replace the oil pressure transmitter and pedestal.
Smear the seal of the new canister with engine oil and screw it into place by hand only. DO NOT OVERTIGHTEN.
Fit the water pump, omitting the lower right-hand bolt if the car is to Federal emission control specification.

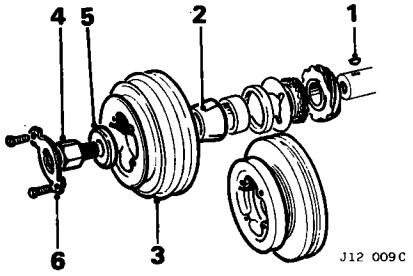


Fig. 74

Fit the Woodruff key (1, Fig. 74) to the forward slot in the crankshaft and fit the damper cone (2, Fig. 74).
Fit the Woodruff key in the damper cone and fit the torsional damper (3, Fig. 74). Secure with the large bolt (4, Fig. 74) and plain washer (5, Fig. 74).
Fit the crankshaft pulley(s) and secure using four setscrews and lockplate (6, Fig. 74).

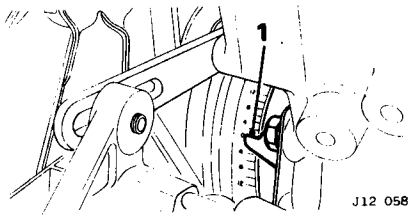


Fig. 75

Accurately set No. 1 and No. 6 pistons at T.D.C. and adjust the position of the ignition timing pointer (1, Fig. 75).
Locate flywheel/drive plate on the crankshaft and tap the dowels through. Secure using ten bolts on the new lockplate.

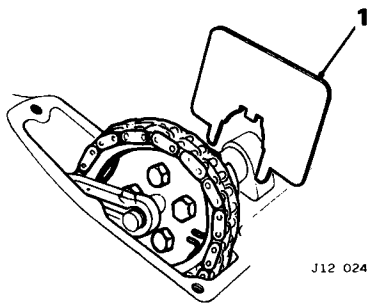


Fig. 76

Fit a new cylinder head gasket, dry, ensuring that the side marked 'TOP' is uppermost.
Check that No. 6 (front) cylinder is at T.D.C.
Carefully rotate the camshafts and set with gauge C 3993 (1, Fig. 76).

CAUTION: Ensure that the valves do not foul each other.

Fit the cylinder head, complete with manifolds, to the cylinder block.

CAUTION: The engine MUST NOT be rotated until the camshaft sprockets are connected.

Fit the spark plug lead carrier brackets and lifting eyes to the appropriate studs and fit plain washers to the rest.
Fit and tighten the fourteen large dome headed nuts to the correct torque.
Fit the six nuts and spring washers across the front of the cylinder head.

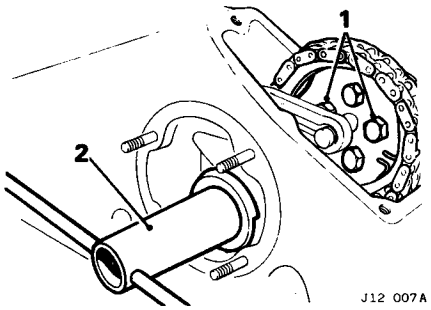


Fig. 77

Locate the camshaft sprockets on the camshafts, remove the circlips and pull the adjuster plates forward to disengage the serrations.
Rotate the adjuster plates until the 'fit' holes line up exactly with the tapped holes in the camshafts.
Fit one bolt at each camshaft.
Rotate the engine to afford access to the remaining holes and fit the bolts (1, Fig. 77).
Lock the bolts at both camshafts.
Tension the top timing chain using special tool JD 2B (2, Fig. 77) until there is slight flexibility on the outer sides of the chain. Tighten the locknut.
Complete the reassembly by reversing the early dismantling operations as appropriate.

DEGLAZING CYLINDER BORES

Should it be necessary to deglaze cylinder bores due to excessive oil consumption, the following procedure must be observed. This is the only deglazing method approved by Jaguar Service:

Equipment

a. GBD 89 mm (3.5 in) diameter 80 grit silicon carbide flex hone tool. The Flex Hone Tool is colour coded orange at the hone end of the tool.
b. Variable speed electric drill, which must be capable of running at 750 rev/min unladen.

Method

1. Remove engine and dismantle as per Repair Operation 12.41.05.

   NOTE: It is NOT necessary to dismantle the cylinder head.
2. Position the dismantled cylinder block so that The Flex Hone Tool can be inserted vertically. Tape over water and oil galleries on cylinder block top face.
3. Lubricate each cylinder using clean engine oil.
4. Secure the Flex Hone Tool in drill.
5. The Flex Hone Tool must be revolving when inserted OR removed from each cylinder, and must not be stopped and restarted during the deglazing cycle.
   Using a vertical stroking motion (with flex hone already revolving), hone for 45 seconds at the rate of 2 strokes per second.
   THE DURATION OF HONING TIME AND THE NUMBER OF STROKES PER SECOND MUST BE STRICTLY OBSERVED TO GIVE THE CORRECT BORE FINISH AND CROSS-HATCH SPECIFICATION.

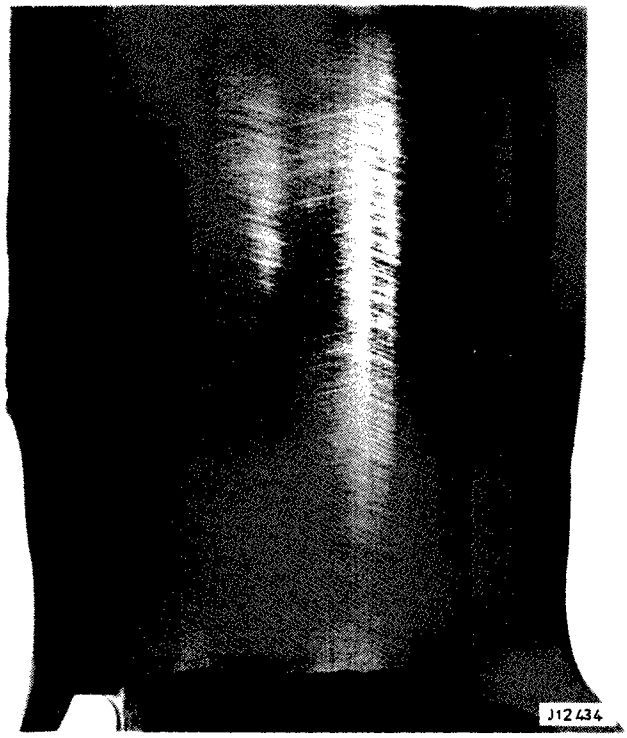
This method has been developed and evaluated on Service cylinder blocks, and when strictly adhered to, will produce the required bore finish.

6. Cleaning:
   a. Remove oil gallery plugs and flush out oilways with suitable cleaning solvent. Replace plugs.
   b. Using soapy water, thoroughly brush cylinder bores AND crankcase.
   c. Brush the bores and crankcase with clean water.
   d. Wipe each bore with clean white cloth/ tissue. Wipe all main bearing journals similarly.
   Repeat process until cloth/tissue can be removed clean.

CLEANLINESS CANNOT BE OVERSTRESSED

IMPORTANT

Even though excess oil consumption is diagnosed, IT MAY NOT BE NECESSARY to deglaze cylinder bores.
If there is no measurable bore wear and the cylinder walls have a surface finish as illustrated, it will only be necessary to replace pistons and/or piston rings.



CONTENTS

EMISSION CONTROL SYSTEM

Description **17.00.00**

The emission control system fitted is designed to comply with local legislative requirements. Some or all of the following components may be fitted depending on those requirements. The description that follows refers to cars with an emission control system that complies with North American Federal Specification.

Crankcase breather system

To ensure that piston blow-by gas does not escape from the crankcase to atmosphere, a depression is maintained in the crankcase under all operating conditions. This is achieved by connecting the crankcase breather housing, located at the front of the cylinder head, to the air intake system between the air-flow meter and the throttle housing where a depression exists under all engine operating conditions.

Fuel evaporative loss control

The fuel tank venting is designed to ensure that vapours are vented through the control system even when the car is parked on an inclined surface.
A capacity limited device in the fuel tanks ensures sufficient free volume is available after filling to accommodate fuel which would otherwise be displaced as a result of high temperature rise.
Cars have a fuel tank evaporative loss control system fitted as standard equipment to meet U.S. Federal and Californian requirements.
The system operates as follows:
Interconnected tubing attached to the air vents in both fuel tanks conveys petrol vapour via a sealed storage canister to the throttle body.
The system is completely sealed. However, it is essential that routine maintenance operations detailed in this supplement are carried out by your Dealer at the specified mileage intervals.

Catalytic converters

A catalytic converter is fitted into the exhaust system in order to reduce emissions of carbon monoxide, hydrocarbons, and oxides of nitrogen.

Catalytic converter precautions

1. In order to maintain the efficiency of the emission control system it is essential to use UNLEADED gasoline only; this fuel minimizes spark plug fouling, thereby sustaining engine performance.
2. DO NOT tamper with the engine settings: they have been established to ensure that the vehicle will comply with stringent exhaust emission regulations. Incorrect engine settings could cause unusually high catalytic converter temperatures and thus result in damage to the converter and vehicle. If adjustment to the settings is considered necessary this should be performed by a British Leyland Dealer or other qualified service facility.
3. A correctly tuned engine optimizes exhaust emissions performance and fuel economy and it is recommended that the vehicle is maintained as outlined under **MAINTENANCE SUMMARY** of this manual.
4. DO NOT continue to operate the vehicle if any engine malfunction is evident; malfunctions should be rectified immediately. For instance, misfire, loss of engine performance or engine run-on may lead to unusually high catalytic converter temperature and may result in damage to the converter and car.
5. NEVER leave the vehicle unattended with the engine running.
6. The use of a catalytic converter increases exhaust system temperatures (particularly under engine malfunction); therefore do not operate or park the vehicle in areas where combustible materials such as dry grass or leaves may come into contact with the exhaust system.
7. The vehicle is designed for normal road use. Below are examples of abuse which could damage the catalytic converters and car and may lead to a dangerous condition due to excessively high catalytic converter temperatures:
   a. Competition use
   b. Off roadway use
   c. Excessive engine revolutions
   d. Overloading the vehicle
   e. Excessive towing loads
   f. Switching off the engine and coasting in gear.
8. DO NOT run the engine with either a spark plug lead disconnected or a spark plug removed.

   DO NOT use any device that requires an insert into a spark plug hole in order to generate air pressure (e.g. tyre pump, paint spray attachment, etc.), as this could also result in catalytic converter damage.
9. DO NOT push or tow the vehicle to start it; this could damage the catalytic converters. It is recommended that jumper leads are used.
10. Heavy impact on the converter casing must be avoided as it contains ceramic material which is easily damaged.

Fuel filler caps

Unleaded fuel MUST be used on catalyst-equipped cars, and labels to indicate this are displayed on the fuel gauge and the tank filler caps. The filler caps are designed to accommodate unleaded fuel pump nozzles only. The anti-surge flap prevents leaded fuel from being added to the fuel tanks because it does not open when a leaded fuel pump nozzle is entered into the filler neck up to the position of the restrictor and the pump is switched on.

Misfiring

If the engine misfires, the cause must be immediately rectified to prevent catalytic converter damage.
The emission control system fitted to this engine is designed to keep emissions within legislated limits providing ignition timing and fuel injection settings are correctly maintained and the engine is in sound mechanical condition.
It is essential that routine maintenance operations detailed in this Manual are carried out by your Dealer at the specified mileage intervals.

Exhaust Emission—Testing

In order that exhaust emissions are kept within the legislated limits an idle exhaust emission test MUST be carried out after any unscheduled service operations which might affect the emission control system.

CAUTION: CO content must not exceed 1.5% or be less than 0.5% with the electrical lead to the oxygen sensor disconnected.

It is essential that the equipment used for testing purposes is of the following type:

1. An infra-red CO exhaust gas analyser.
2. Engine and ignition diagnostic equipment.
3. Lucas 'EPITEST' fuel injection diagnostic equipment.

EXHAUST GAS RECIRCULATION (E.G.R.)

A vacuum operated E.G.R. valve (Fig. 1) meters a proportion of the exhaust gas into the intake system. The exhaust gas is diverted from the rear exhaust manifold and fed via the E.G.R. valve into the rear of the inlet manifold.

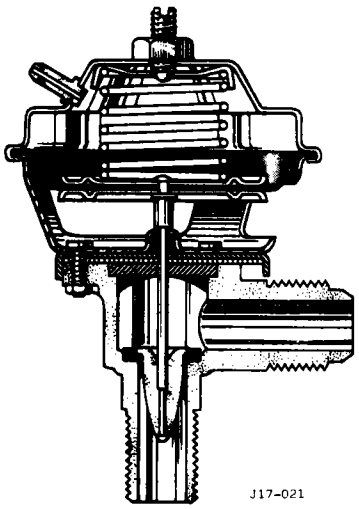


Fig. 1

The vacuum signal 81 mmHg which lifts the valve is obtained from the throttle edge port and is such that no recirculation occurs at idle. The E.G.R. valve has a shaped pintle to give the variation in gas flow required for different engine operating conditions.

THERMAL VACUUM VALVE

With the high rates of E.G.R. required to reduce emission of NO_2 following engine cold starting, it is necessary to inhibit the E.G.R. until the engine is part warm.

A thermal vacuum (Fig. 2) at the rear of water rail senses coolant temperature. The vacuum signal is switched to the E.G.R. valve when its temperature-sensitive bi-metal discs which open the valve on rising temperature (43°C) and close on a falling temperature of 33°C.

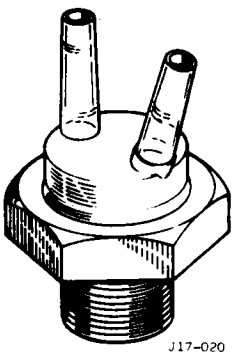


Fig. 2

Another throttle edge vacuum port operates the distributor vacuum capsule (6) rotating the base plate and relative to the reluctor. This vacuum port is positioned such that when the throttle is in the idling or near fully open there is insufficient vacuum to operate the capsule. To delay the operation of the vacuum advance capsule, a delay valve is fitted in the signal pipe between the capsule and the throttle edge port. This valve consists of sintered discs which determines the vacuum delay, and a non-return by-pass valve which allows the vacuum in the distributor capsule to dissipate immediately the signal is removed.

EMISSION CONTROL SYSTEM

Evaporative Loss

Description

Hydrocarbon emissions in the form of fuel vapour are emitted from vehicle fuel tanks (1, Fig. 3).

To prevent these emissions entering the atmosphere the fuel tanks have unvented, sealed filler caps.

The vapour is passed to a vapour storage canister (2, Fig. 3) containing activated charcoal which absorbs the vapours when the vehicle is stationary and desorbs them when the engine is running.

The desorption or purging is obtained by connecting the purge pipe from the canister to a vacuum source via a 3mm restriction located at the junction of the purge pipe and the crankcase breather pipe (3, Fig. 3).

To ensure that piston blow-by gases do not escape from the crankcase a depression is maintained in the crankcase under all operating conditions.

This is achieved by a pipe (with 6mm restriction) connecting the crankcase breather housing (at the front of the cylinder head) to a port in the throttle housing (air cleaner side) upstream of the throttle disc, such that a depression is created in the breather pipe at all times.

The depression is at minimum at closed throttle and maximum at full throttle.

Charcoal canister

The canister is mounted in the R.H. front wheel arch. Filter pads above and below the charcoal prevent the ingress of foreign matter or passage of charcoal into the purge line.

Emissions from the fuel tanks enter at the bottom of the canister and the purging air enters at the top, passing through the charcoal to the purge outlet at the top of the canister to the vacuum source.

Fuel expansion and tank venting

The fuel tanks, mounted in each rear wing, have a 10% expansion volume incorporated, obtained by limiting the amount of fuel into the tank.

A fuel filler tube extends into the tank to the required level.

A 1mm orifice (6, Fig. 3) at the top of the filler neck extension allows the expanding fuel to slowly displace the air from the tank into the venting system via the filler neck and a port in the tanks side panels to vapour separators (4, Fig. 3) in each rear screen pillar.

Condensed vapour drains back to the tanks. Excess vapour is passed to the charcoal canister via a pipe under the floor and a pressure relief valve (5, Fig. 3). The valve controls the flow of vapour.

continued

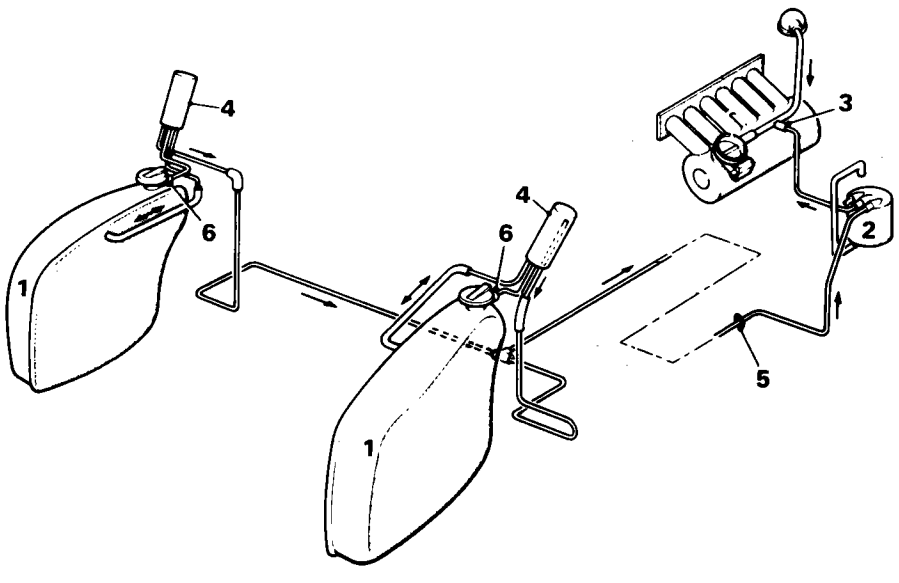


Fig. 3

When the fuel tanks are full and pressurized, to prevent fuel spillage when the filler cap is released it is necessary to lower the level of the fuel below the filler neck extension.
A domed restriction tank is sealed to the inside of the tank side panel. This tank occupies fuel space during refuelling.
To lower the fuel level fuel is allowed to flow into the restriction tank via a 2,5mm orifice.

Fuel filler cap

Each tank has a lockable fuel filler cap incorporating a pressure blow-off facility. A spring-loaded seal is mounted on the filler neck flap and seats on the filler neck face. No vacuum relief is provided. Incorporated in the filler neck is the leaded fuel restriction.

Pressure relief valve

This valve (5, Fig. 3) controls the transfer of vapour from the vapour separators to the charcoal canister (2, Fig. 3), and prevents the transfer until a pre-set pressure is exceeded.
To allow a flow to the tanks from the canister a vacuum relief is incorporated.

EMISSION TEST AND CHECKS (1979)

3.4 Cars

Anti-run-on valve check

Run engine at idle, switch off ignition, listen for operation of E.G.R. valve two to five seconds after the engine has stopped.
Restart engine and idle.
Disconnect black lead from anti-run-on valve solenoid.
Connect —ve lead from battery to anti-run-on valve solenoid.
Engine should stop immediately connection is made.
Remove lead and replace original black lead.
Switch off ignition.

XJ6 Fuel Injection with E.G.R. Valve—Australia—Check E.G.R.

Run engine at idle speed when warm after probe.
Slowly open throttle to 2000 rev/min. Observe movement of E.G.R. valve spindle.

XJ6 Fuel Injection with Catalyst and Oxygen Sensor—U.S.A./Canada/Japan

Remove exhaust manifold sample cap and fit sample pipe to manifold.
Run engine until warm (engine temperature 90). Clamp off extra air valve hose. If idle speed drops, warm up for extra five minutes. Adjust idle speed (750 rev/min) using screw in air distribution block.
Connect exhaust analyser to sample pipe.
Read off CO emission.
Refer to Book 1, Section 05 for exhaust emission CO reading. Adjust screw in air metering unit. Disconnect manifold vacuum pipe from fuel pressure regulator. Blank off pipes.
Observe CO reading. After five seconds reading should increase and after a further few seconds return to original reading.
This indicates correct operation of the oxygen sensor.

XJ6 Fuel Injection—European

Run engine at 2000 rev/min in neutral or 'N' for ten seconds. Close throttle and allow engine to idle for fifteen seconds.
Insert probe into tail pipe or connect sample pipe to manifold. Switch analyser switch to 'T' in Test (Sun-Tester EPA 75).
Read off CO 0.56 to 1.5 %. If incorrect, adjust setting screw in air metering unit to achieve correct CO reading.

XJ6 Fuel Injection with Catalyst and Oxygen Sensor—USA/Canada/Japan

Switch off engine after warm-up. Remove plug from exhaust manifold sample cap and fit sample pipe to manifold. Disconnect oxygen sensor electrical lead.
Run engine at 2000 rev/min for 10 seconds in Neutral or 'N' then close throttle, allow to idle.
Connect exhaust analyser to sample pipe, switch to 'T' or Test.
Refer to Book 1, Section 05 for exhaust emission CO reading. Adjust setting screw in the air metering unit to achieve correct CO reading.
Switch off ignition, remove sample pipe from exhaust manifold. Replace plugs. Restart engine, run at 2000 rev/min, close throttle and allow idle to stabilize. Reconnect oxygen sensor lead.
Insert probe into tail pipe. Read off emission level from analyser.

LUCAS CONSTANT ENERGY IGNITION

A Lucas Constant Energy Ignition System is fitted to XJ 4.2 E.F.I. Models on Series III. The new ignition system operates by maintaining the energy stored in the coil at a constant level, allowing the output voltage to remain constant over a wide range of engine speeds. The power dissipated in both the coil and module compared with equivalent constant dwell systems is greatly reduced.

Constant energy system component description

Amplifier AB 14

The amplifier consists of a solid state electronic module housed in a aluminium case with two pre-wired leads which connect to the low tension terminals on the ignition coil.

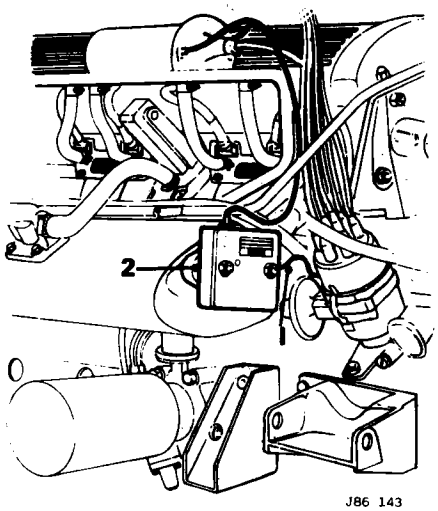


Fig. 4

Connection from the distributor pick-up module is made by an assembly of two leads inside a screening braid which plugs into a socket on the amplifier side (1, Fig. 4). The amplifier mounting is shown in (2, Fig. 4).

Distributor (45 DM)

The distributor incorporates a standard automatic advance system, anti-flash shield (1, Fig. 5), rotor arm, and cover (2, Fig. 5). The previous pick-up and module assembly is replaced by a reluctor and pick-up module (3, Fig. 5). The reluctor is a gear-like component (with as many teeth as there are cylinders) which is mounted on the distributor drive shaft.

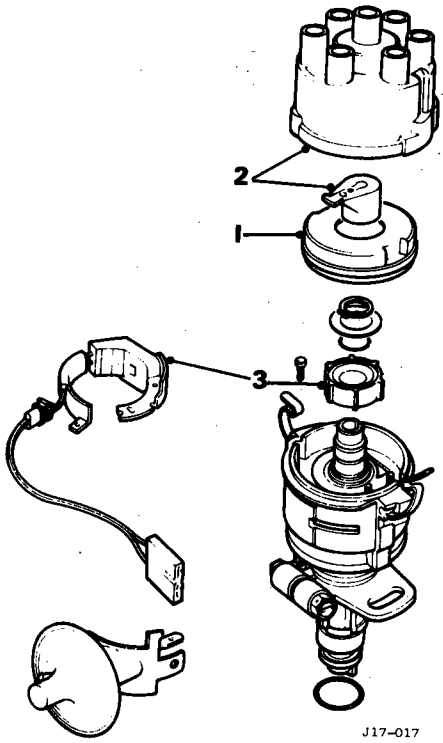


Fig. 5

The pick-up module consists of a winding around a pole-piece attached to a permanent magnet.
The distributor is pre-wired with two leads terminating in a moulded two-pin inhibited connector, which plugs into the amplifier previously described.

During normal service the air gap between the reluctor and the pick-up module does not alter and will only require re-setting if it has been tampered with. If it is necessary to adjust the gap, then it should be set so that the minimum clearance between the pick-up and the reluctor teeth is not less than 0,20 mm (0.008 in). The gap should not be set wider than 0,35 mm (0.014 in) (1, Fig. 6).

The air gap is measured between a reluctor tooth and the pick-up module and should be checked with a plastic feeler gauge. The use of a metal feeler gauge may result in a misleading gauge reading due to the pick-up module contacts being magnetic. However, their use will not affect the electical operation of the pick-up module.

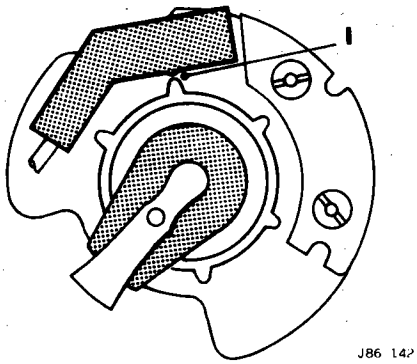


Fig. 6

FAULT FINDING PROCEDURE

SWITCH ON IGNITION

MEASURE BATTERY VOLTS

LESS THAN 11.5 VOLTS—BATTERY DISCHARGED

MORE THAN 11.5 VOLTS—BATTERY O.K.

MEASURE VOLTAGE AT COIL '+' TERMINAL SHOULD BE 1 VOLT MAX. BELOW BATTERY VOLTAGE

INCORRECT

CHECK WIRING TO/FROM IGNITION SWITCH

CORRECT

MEASURE VOLTAGE AT COIL '−' TERMINAL— SHOULD BE THE SAME AS ON THE + TERMINAL

INCORRECT

DISCONNECT WIRE TO AB14 AMPLIFIER FROM COIL '−' TERMINAL

MEASURE VOLTAGE AT COIL '−' TERMINAL

LESS THAN 2 VOLTS—COIL FAULTY

MORE THAN 2 VOLTS—AMPLIFIER FAULTY

CORRECT

DISCONNECT DISTRIBUTOR PICK COIL FROM AMPLIFIER

MEASURE PICK-UP MODULE—RESISTANCE SHOULD BE 2.2 TO 4.8 K OHMS

INCORRECT

CHANGE PICK-UP MODULE

CORRECT

RECONNECT PICK-UP MODULE TO AMPLIFIER

MEASURE VOLTAGE AT COIL '−' TERMINAL CRANK ENGINE

VOLTAGE SHOULD FALL

INCORRECT

AMPLIFIER FAULTY

CORRECT

CHECK H.T. CIRCUIT COIL SECONDARY H.T. LEADS ROTOR ARM DISTRIBUTOR COVER SPARK PLUGS

FAULT FINDING

This chart indicates the possible areas of the cause of the faults. Perform checks and remedial action shown in the order given until the fault is rectified.

Details of the checks and remedial action are given on the respective area charts.

Extra checks shown in brackets refer only to the specific condition shown in brackets after the symptom.

SYMPTOM	POSSIBLE CAUSES IN ORDER OF CHECKING
Will not start (warm engine)	B1, B2, D1, D2, A1, A13, (A5), A5, A3, A6, A7, C1, C2, C3, A20 A8, A18.
Poor or erratic idle (cold engine)	D1, D2, A1, A12, A6, (A5), A3, C4, C6, C3, C5, A10, B4, B3, B6, (A13), E1, E3, E4, E5, A21, A7, A8, A18.
Hestitation or flat spot (cold engine)	D1, D2, A1, A4, (A5), A9, A3, A6, B5, (A13), C4, C6, C3, C5, A15, B4, B3, B6, E1, E3, E4, E5, A7, A8, A18.
Excessive fuel consumption	D3, A4, A5, B5, B4, B3, B6, B8, B7, E1, E3, E4, E5, A21, A7, A19, A8, A18.
Lack of engine braking or high idle speed	A2, A16, A9, A12, A3, A13, A10, C3, B5, A14, B6.
Lack of engine power	D1, D2, A1, A4, A5, A17, A3, B5, A15, A6, C4, C6, C3, C5, B4, B3, B6, E1, E3, E4, E5, A8, A18.
Engine overheating	B7, B8, C4.
Engine cuts out or stalls (at idle)	D1, D2, A1, A7, (A12), (A5), A5, A15, (A3), B4, A6, C4, C6, C3, C5, B6, E1, E3, E4, E5, B3, A8, A18.
Engine misfires	D1, D2, A1, A5, A6, A3, C4, C6, C3, C5, A15, B4, B3, B6, E1, E3, E4, E5, A21, A8, A18.
Fuel smells	D3, A5, E4, E2, E3, E5, A15, A19, A21, A8, A18.
Engine runs on	D1, A12, A16, A10, E4, E3, B7, B8, C3, C5.
Engine knock or pinking	D1, C3, C5, B7, B8.
Arcing at plugs	C4, C6.
Lean running (low CO)	A1, A14, A4, A2, A7, D1, D2, B6, E1, E3, E4, E5, A8, A18.
Rich running (excess CO)	A5, E5, A19, A21, A8, A18.
Backfiring in exhaust	D1, D2, A1, A15, B4, B6, C3, E1, A8, A18.

ELECTRONIC FUEL INJECTION SYSTEM CHECKS

	POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
A1	Connections	Ensure all connector plugs are securely attached. Ensure electronic control unit (E.C.U.) multi-pin connector is fully made. Ensure all ground connections are clean and tight.
A2	Air leaks	The engine will run weak because air leaking into the manifold is not mo itored by the air-flow metering device. Ensure all hose and pipe connections are secure. Check all joints for leakage and re-make as necessary.
A3	Sticking air flap	Ensure that the air-flow meter flap moves freely. If the flap sticks, the air-flow meter should be replaced.
A4	Throttle switch	Check function of full load switch or vacuum switch.
A5	Cold start system inoperative	Check function of cold start system (see Epitest Section 3).
A6	Triggering system	Check function of triggering system (from coil).
A7	Temperature sensors	Check sensors for open and short circuit.
A8	E.C.U.	As a last resort the E.C.U. should be checked by substitution.
A9	Throttle butterfly adjustment	Reset as per operation.
A10	Throttle by-pass valve	The valve should be suitably adjusted until fault has been rectified and re-check function.
A12	Incorrect idle speed	This should be adjusted by means of the screw on the air distribution block.
A13	Auxiliary air valve inoperative	Test in accordance with operation 19.20.17.
A14	Throttle spindle leaks	Check seals, bearings and spindles for wear. Renew as required.
A15	Air cleaner blocked	Inspect element, and renew as necessary.
A16	Throttle sticking	Lubricate, check for wear and reset.
A17	Throttle inhibited	Check and remove obstructions of free movement of throttle mechanism through total travel. If no obstructions apparent, reset.
A18	Air-flow meter	As a last resort, the air-flow meter should be checked by substitution.
A19	Oxygen sensor	The oxygen sensor should be checked by substitution.
A20	Power resistors	The power resistors should be checked by substitution.
A21	Injector faults	Check function of injectors.

BASIC ENGINE CHECKS

	POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
B1	Low battery condition	Check battery condition with hydrometer. Re-charge, clean and secure terminals, or renew as necessary. (If battery is serviceable but discharged, trace and rectify cause of flat battery, e.g. short circuit or insufficient charge from alternator.)
B2	Start system deficient	If starter fails to turn engine briskly, check engagement circuit and connections. Check and clean main starter circuit and connections.
B3	Poor compressions	Check compressions with proprietary tester. If compressions are low or uneven, check/adjust valve clearance and re-test. If compressions are still unsatisfactory remove cylinder head for further examination and rectification.
B4	Exhaust system leaking or blocked	Check, and rectify as necessary.
B5	Faults on areas of vehicle other than engine.	Check for binding brakes, slipping clutch, etc.
B6	Air leaks at inlet manifold	Check inlet manifold/cylinder head joint. Re-make with new gasket if necessary. Check manifold tappings for leaks—seal as necessary.
B7	Cooling system blocked or leaking	Flush system and check for blockage. Check hoses and connections for security and leakage. Renew as necessary. Check thermostat, and renew if faulty.
B8	Cylinder head gasket leaking.	Check cylinder block/head joint for signs of leakage. Renew gasket if necessary.

IGNITION SYSTEM CHECKS

	POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
C4	System deterioration	Check ignition wiring for fraying, chafing and deterioration. Check distributor cap for cracks and tracking and rotor condition. Renew leads, cap or rotor as necessary.
C5	Advance system faults	Disconnect vacuum pipes and check operation of advance mechanism against advance figures, using stroboscopic timing light. Lubricate or renew as necessary. Re-connect vacuum pipes and check operation of advance unit. Renew or secure vacuum pipes if necessary.
C6	Spark plug faults	Remove spark plugs, clean, reset gap and test on proprietary spark plug testing machine. Renew if in doubt.

FUEL SYSTEM CHECKS

	POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
D1	Insufficient, incorrect or contaminated fuel	Ensure that the fuel tank has an adequate level of the correct grade of fuel. If dirt or water contamination is suspected, drain and flush the fuel tank, flush the system and renew the fuel line filter before filling with clean fuel.
D2	Fuel starvation	Check fuel pressure according to operation 19.45.12. if not satisfactory, check fuel feed pipes for leaks or blockage. Renew connectors if damaged or deteriorated. If contamination of fuel is discovered, flush fuel system and renew line filter. If necessary, renew fuel line filter, pressure regulator or fuel pump to rectify.
D3	Leaking fuel	Check fuel system for leaks and rectify as necessary. Renew any doubtful connectors.

EVAPORATIVE AND CRANKCASE VENTILATION SYSTEM CHECKS

	POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
E1	Engine oil filter cap loose or leaking	Check cap for security. Renew cap if seal is deteriorated.
E2	Fuel filler cap defective	Check seal for condition—renew if deteriorated. Check filler cap for security—rectify or renew as necessary.
E3	Restrictors missing or blocked	Check and clear or renew as necessary.
E4	Hoses blocked or leaking	Check and clear as necessary. Renew any deteriorated hoses.
E5	Charcoal canister restricted or blocked	Inspect, and renew if necessary.

ENGINE BREATHER FILTER

Remove and refit **17.10.02**

Removing

Remove the hose clip securing the rubber cover to breather housing and disconnect.
Remove the rubber cover and lift out the filter (Fig. 7).

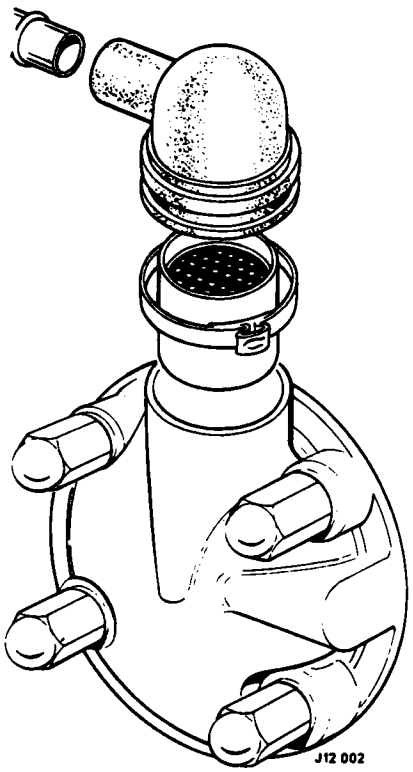


Fig. 7

Refitting

Refitting is a reversal of the above procedure.

ADSORPTION CANISTER

Remove and refit **17.15.13**

Removing

Remove the front right-hand road wheel.
Detach the pipes from the canister (1, Fig. 8).
Remove the nut, spring washer, plain washer and bolt (2, Fig. 8) securing the canister clamp to the mounting strap and withdraw the canister (3, Fig. 8).

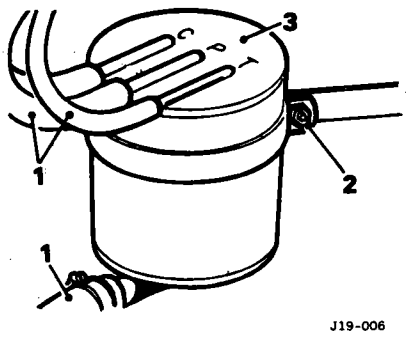


Fig. 8

Refitting

Refitting is a reversal of the above procedure.

CATALYTIC CONVERTER

Remove and refit **17.50.01**

Removing

Raise the vehicle on a ramp.
Remove the nuts, plain washers and bolts securing the flanges, separate the intermediate pipe from the down-pipe. Ensure that the intermediate pipe is adequately supported.
Remove the nuts and plain washers securing the heatshield and down-pipe to the exhaust manifolds; withdraw the heatshield.
Withdraw down-pipe/catalyst (Fig. 9).

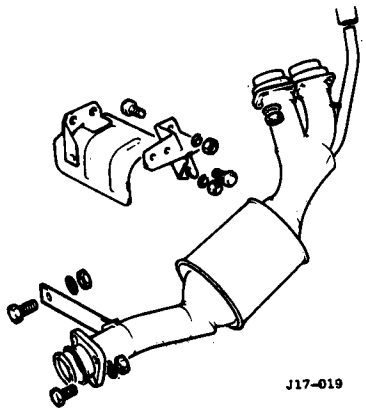


Fig. 9

Refitting

When refitting, first coat all joints with Firegum. Tighten the down-pipe and clamping flange fixings by diagonal selection to avoid distortion.

AIR SWITCHING VALVE VACUUM FEED HOSE

Renew **17.25.46**

Open the bonnet.
Cut and remove the plastic straps securing the vacuum feed hose.
Disconnect the vacuum feed hose from the air switching valve.
Disconnect the hose from the manifold.
Remove the vacuum hose.
Fit the new vacuum hose to the engine.
Connect the hose to the manifold.
Connect the hose to the air switching valve.
Reposition the hose to its mounting position and secure with plastic straps.
Close the bonnet.

HOSE — FEED PIPE TO AIR CLEANER

Renew **17.25.45**

Open the bonnet.
Slacken the air cleaner feed pipe to the air cleaner hose securing clips.
Disconnect the hose from the air cleaner.
Remove the hose assembly from the feed pipe.
Remove the hose clips.

HOSE — AIR SWITCHING VALVE TO AIR CLEANER FEED PIPE

Renew **17.25.44**

Open the bonnet.
Slacken the air switching valve to the air cleaner feed pipe hose clips.
Disconnect the hose from the switching valve.
Remove the hose assembly from the air pipe.
Remove the hose clips.
Place the hose aside.
Place the new hose to the front.
Fit the hose clips.
Fit the hose assembly to the air feed pipe.
Connect the hose to the air switching valve.
Tighten the hose clips.
Close the bonnet.

HOSE — CHECK VALVE TO AIR RAIL

Renew **17.25.43**

Open the bonnet.
Slacken the check valve to air rail hose securing clips.
Disconnect the hose from the air rail.
Remove the hose assembly.
Remove the clips.
Place the hose aside.
Place the new hose to the front.
Fit the hose clips.
Fit the hose assembly to the check valve.
Connect the hose to the air rail.
Tighten the hose clips.
Close the bonnet.

HOSE — AIR RAIL FEED PIPE TO CHECK VALVE

Renew **17.25.42**

Open the bonnet.
Slacken the air rail feed pipe to check valve hose clips.
Disconnect the hose from the check valve.
Remove the hose assembly from the feed pipe.
Remove the hose clips.
Place the hose aside.
Place the new hose to the front.
Fit the hose clips.
Fit the hose assembly to the feed pipe.
Connect the hose to the check valve.
Tighten the hose clips.
Close the bonnet.

HOSE — AIR SWITCHING VALVE TO AIR RAIL FEED PIPE

Renew **17.25.41**

Open the bonnet.
Slacken the air switching valve to air rail feed hose securing clips.
Disconnect the hose from the feed pipe.
Remove the hose from air pump.
Remove the hose clips.
Place the hose aside.
Place the new hose to the front.
Fit the hose clips.
Fit the hose to the air pump.
Connect the hose to the feed pipe.
Tighten the hose clip.
Close the bonnet.

THERMAL SWITCH

Renew **17.25.40**

Open the bonnet.
Remove and refit the pressure cap to the relieve coolant pressure.
Disconnect the switch feed wires.
Undo and remove the switch.
Fit and tighten the new switch.
Connect the switch feed wires.
Close the bonnet.

AIR SWITCHING VALVE

Renew **17.25.38**

Open the bonnet.
Disconnect the switching valve block connector.
Disconnect the switching valve vacuum hose.
Slacken the air cleaner feed pipe hose securing clip.
Disconnect the hose from valve.
Slacken the air rail feed pipe hose securing clip.
Disconnect the hose from valve.
Undo and remove the switching valve to **lower** air pump securing nuts.
Remove the air switching valve.
Remove and discard the switching valve gasket.
Clean the gasket faces.
Fit the new valve gasket.
Fit the new switching valve.
Fit and tighten the switching valve securing nuts.
Connect the air rail feed pipe hose to the valve.
Tighten the hose clip.
Connect the air cleaner feed pipe hose to the valve.
Tighten the hose clip.
Connect the valve vacuum feed hose.
Connect the valve block connector.
Close the bonnet.

CHECK VALVE/NON RETURN VALVE

Renew **17.25.21**

Open the bonnet.
Slacken the valve hose securing clips.
Disconnect the air rail feed hose from the valve.
Remove the check valve assembly.
Undo and remove the check valve from the union.
Fit and tighten the check valve to the union.
Fit the check valve assembly to the feed hose.
Connect the air rail feed hose.
Tighten the hose clips.
Close the bonnet.

AIR RAIL — SINGLE

Renew **17.25.17**

Open the bonnet.
Slacken the air rail feed hose clip.
Disconnect the hose from air rail.
Undo and remove the heat shield to air rail securing nuts.
Remove clamp halves.
Displace the rear plug lead bracket for access.
Remove the heat shield.
Undo the air rail to cylinder head union nuts.
Remove the air rail assembly.
Remove and discard the air rail olives.
Finally remove the union nuts.
Place the air rail aside.
Clean the air rail, seatings and olives.
Place the new air rail to the front.
Fit the air rail union nuts.
Fit the new sealing olives.
Fit and seat the air rail assembly to the head.
Seat the air rail sealing olives.
Tighten the union nuts.
Fit the heat shield to the air rail.

Fit the heat shield clamps.
Fit and tighten the heat shield securing nuts.
Reposition and secure the plug lead bracket.
Connect the air rail feed hose.
Tighten the hose clip.
Close the bonnet.

AIR PUMP DRIVE BELT

Renew **17.25.15**

Open the bonnet.
Undo the link arm adjusting nut.
Slacken the link arm trunnion nut.
Slacken the link arm pivot bolt.
Slacken the pump pivot nut/bolt.
Pivot the pump to the engine.
Release the drive belt from the pulley.
Slacken the power steering pump adjuster link trunnion.
Slacken the adjuster link eye bolt at the power assisted steering pump.
Slacken the power steering pump pivot bolt/nut.
Slacken the adjuster link lock nut.
Pivot the power steering pump towards the engine.
Release the power steering pump from the air pump drive belt pulley.
Reposition the air pump belt from the pulley and into the fan cowl.
Release the drive belt from the fan blades.
Remove the air pump drive belt.
Clean the pulley registers.
Fit the new belt to engine.
Engage the belt over fan blades.
Reposition the air pump belt behind the P.A.S. belt.
Reposition the P.A.S. belt over the pullies.
Tighten the adjusting nut.
Check the tension and tighten the locknut.
Tighten the adjuster link trunnion bolt.
Tighten the adjuster link eye bolt.
Tighten the pump pivot nut/bolt.
Engage the drive belt over the air pump pulley.
Pivot the pump from the engine.
Tighten the link arm adjusting nut to obtain the correct belt tension.
Tighten the lock nut.
Tighten the link arm trunnion nut.
Tighten the link arm pivot bolt.
Tighten the air pump pivot bolt.
Close the bonnet.

AIR PUMP BELT

Tensioning **17.25.13**

Open bonnet.
Slacken the air pump pivot nut/bolt.
Slacken the link arm pivot bolt.
Slacken the link arm trunnion nut.
Slacken the link arm locknut.
Tighten the link arm adjusting nut to give the correct belt tensioning.
Tighten the link arm locknut.
Tighten the link arm trunnion nut.
Tighten the link arm pivot bolt.
Tighten the air pump pivot nut/bolt.
Close the bonnet.

AIR PUMP

Renew **17.25.07**

Open bonnet.
Disconnect the switching valve block connector and the switching valve vacuum hose.
Slacken the air cleaner feed pipe hose securing clip.
Disconnect the hose from the valve.
Slacken the air rail feed pipe hose securing clip.
Disconnect the hose from the valve.
Manually tension the air pump drive belt and break 'Sticktion' of pump pulley securing bolts.
Undo the link arm adjusting nut.
Slacken the link arm trunnion nut.
Undo and remove the air pump pivot nut only.
Undo the link arm pivot bolt.
Pivot the pump to the engine.
Disconnect the drive belt from the pulley.
Finally remove the pump pulley securing bolts.
Remove the pump pulley.
Finally remove the link arm pivot bolt.
Pivot the link arm aside.
Remove the link arm spacer.
Finally remove the pump pivot bolt.
Remove the air pump assembly.
Undo and remove the air switching valve securing nuts.
Remove the switching valve.
Remove and discard the gasket.
Undo and remove the air switching valve studs.
Place the pump aside.
Clean the gasket faces.
Place the new air pump to front.
Fit and tighten the switching valve studs.
Fit switching valve gasket.
Fit switching valve to pump.
Fit and tighten the switching valve securing nuts.
Fit the pump assembly to engine.
Fit but do not tighten the pump pivot nut/bolt.
Align the pump and link arm and fit the spacer.
Fit but do not tighten the link arm pivot bolt.
Fit the pump pulley to pump.
Fit but do not tighten the pump securing bolts.
Engage the drive belt over the pump pulley.
Pivot the pump from the engine.
Tighten the link arm adjusting nut to obtain the correct belt tension.
Tighten the lock nut.
Tighten the link arm trunnion nut.
Finally tighten the link arm pivot bolt.
Finally tighten the pump pivot bolt/nut.
Manually tension the belt.
Finally tighten the pump pulley securing bolts.
Connect the air rail feed hose to the valve.
Tighten the hose clip.
Connect the air cleaner feed pipe hose to valve.
Tighten the hose clip.
Connect the vacuum feed hose to the valve.
Connect the valve block connector.
Close the bonnet.

CONTENTS

DATA 19.15.00

Needle type	BDW
Spring	RED
A.E.D. unit type	TZX 1002

Torque figures

All fuel feed hoses 0,20 to 0,23 kgf m (17 to 21 lbf in).

Description 19.15.00

The HIF (Horizontal Integral Floatchamber) carburetter is functionally similar to preceding SU designs and operates on the variable choke/constant depression principle. This instrument has been designed as part of a carburation system which can achieve the precise induction of mixture required to control exhaust emissions to within statutory limits.

The HIF employs the familiar suction chamber/piston assembly together with a single jet-needle fuel metering system.

Main design changes are to be found in the position and layout of the float chamber, the incorporation of a fuel temperature compensating device and the arrangement for mixture setting.

Float chamber design

The float chamber is integral with the main body casting. Access to the chamber is obtained by removing the bottom cover-plate. The moulded float is shaped so that it surrounds the jet tube and is pivoted along a line parallel to the inlet flange. The float is retained by a spindle which screws into the body casting.

Entry of fuel into the float chamber is through a brass tube in the side of the carburetter body via a needle valve assembly.

The jet is pressed into the top of an aluminium tube which is in turn pressed into a plastic moulding. This hollow moulding known as the jet head is open at the lower end allowing fuel to enter the jet tube.

Mixture adjustment

The jet tube is moved in the vertical plane to provide mixture adjustment only.

Fuel temperature compensation

This device alters the jet position in relation to the metering needle to compensate for changes in fuel viscosity which takes place with changes in fuel temperature.

The jet head is attached to a bi-metal blade. This bi-metal blade is immersed in fuel in the float chamber and will move in the vertical plane in response to changes in fuel temperature. The jet will be raised to a weaker position on the jet needle when the fuel temperature rises and will be lowered to a richer position when the temperature falls.

From this it will be seen that once the jet position has been selected by adjusting the mixture screw, alterations of fuel temperature will bring about slight alterations in jet position to compensate for the change in fuel viscosity.

The effect of this device is that driveability is improved over wide ranges of temperature, and exhaust emissions kept within closer limits during cold starting and warm-up period. Temperature compensation also allows carburetters to have the mixture setting pre-set and sealed before a vehicle is delivered.

AIR CLEANER

Remove and refit 19.10.01

Removing

Disconnect the flexible inlet pipe and the air duct flexible pipe (1, Fig. 1).

Pull the vacuum pipe from the flap valve servo motor (3, Fig. 1).

Release the hose clip securing the vent hose to stub pipe on the inner face of the backplate (2, Fig. 1).

Release the toggle clips and withdraw the air

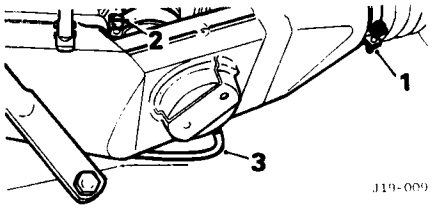


Fig. 1

cleaner cover (1 & 2, Fig. 2).

Lift out the filter element (3, Fig. 2).

Remove the outer pair of nuts and bolts securing the backplate to the carburetter flanges and spacers (4, Fig. 2).

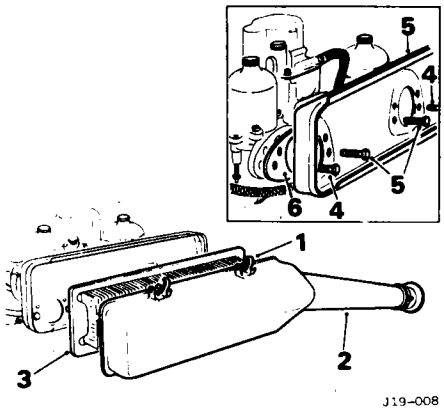


Fig. 2

Support the A.E.D. unit and remove the inner pair of nuts and bolts. Collect spacers (5, Fig. 2).

Move the backplate away from the carburetters and disconnect the vacuum pipe from the temperature sensor unit and the vent hose from the stub.

Lift out the backplate; remove and discard the gaskets (6, Fig. 2).

When refitting, use new gaskets.

RAM TUBE

Remove and refit 19.10.21

Remove the nuts, bolts and washers securing the expansion tank pipe and radiator bleed pipe clips. Retain the cable harness clips (1, Fig. 3).

Remove the setscrews, washers and locknuts securing the fan cowl brackets (2, Fig. 3).

Remove the two self-tapping screws securing the headlamp relay (3, Fig. 3).

Pull the connectors from the headlamp relay and fuse boxes (4 Fig. 3), noting the connections.

Carefully pull the cable harness from the top rail grommet.

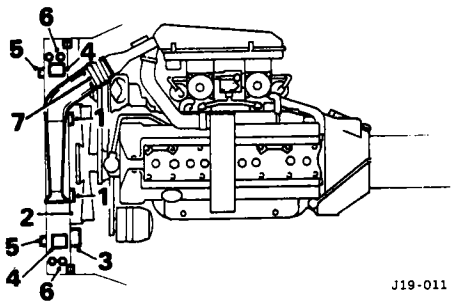


Fig. 3

Cars fitted with air conditioning only

Remove the Phillips head screws, washers and rubber bushes securing the condenser unit (5, Fig. 3). Support the condenser, using suitable padding.

All cars

Remove the six setscrews and two nuts, bolts and washers securing the radiator top rail (6, Fig. 3).

Release the clip securing the flexible inlet pipe.

Lift the ram tube and radiator top rail assembly from car.

Release the clips (7, Fig. 3) and remove the fuse boxes from the top rail.

CARBURETTERS—CAR SET

Tune and adjust 19.15.02

NOTE: Carburetter mixture adjustment is preset and sealed and should not normally be altered. The only adjustments that should be made are to idle speed setting and throttle controls.

Before making any adjustment to carburetters or throttle controls, check and if necessary rectify, spark plug conditions and gaps, contact breaker gap, ignition timing, distributor centrifugal advance mechanism and compression pressures. Check tappet clearances if compression pressures are uneven.

If satisfactory results are not achieved by carrying out the procedure detailed below it will be necessary to refer to 'Mixture Controls, Adjust and Reset'.

NOTE: The operations may not be undertaken unless suitable CO metering equipment is available for emission testing, and it is a legal

requirement for cars in the United Kingdom that the tamperproofing seals fitted to the carburetters of these cars may not be removed unless such equipment is provided. Tamperproof seals MUST be renewed after current emission regulations have been met in test.

Remove the air cleaner element.
Unscrew the damper cap of one carburetter (2, Fig. 4).

CAUTION: (Early models only) It is essential that in lifting the cap, the damper retainer clip fitted below it is not displaced from its position in the position rod. If the retainer is inadvertently displaced it must be refitted by pressing fully into the piston rod.

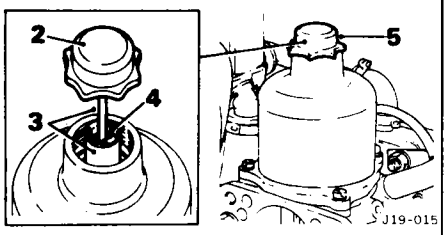


Fig. 4

Carefully withdraw the damper, by raising the cap, until the piston and damper TOGETHER reach the limit of upward travel, and inspect the oil level in the damper retainer (3, Fig. 4).
If the oil is not visible in the retainer, add engine oil (preferably S.A.E. 20) to the recess in the retainer until it is just visible at the bottom of the retainer recess (4, Fig. 4). Move the damper GENTLY up and down to 'pump' any trapped air out of the reservoir.
Replace the cap and tighten firmly by hand.
Repeat on the other carburetter (5, Fig. 4).
Check that the throttle linkage and cable to pedal operate smoothly.
Remove the lids of the tamperproof caps over the slow-running adjusting setscrews (1, Fig. 5). Detach the setscrews, remove the tamperproof seals and replace with new seals. Refit the adjusting screws and screw in until they almost contact the throttle levers. DO NOT close the lid on this operation.

NOTE: If the tamperproof cap is not fitted, unscrew the slow-running adjusting screws until they no longer contact the throttle levers.

Slacken the nuts of the clamp bolts on the throttle operating spindles on both sides of rear carburetter (2, Fig. 5).
Raise the piston in each carburetter with a finger and, using the mirror, inspect to check that both butterfly valves are fully closed and that the over-run valves are correctly seated.
Screw down both of the adjusting screws until they just contact the throttle levers, then screw down another one turn (1, Fig. 5).
Start the engine and run until it reaches normal operating temperature; stop the engine.
Check that the mixture pipe from the A.E.D. unit is warm (3, Fig. 5).
Start the engine again and using a rubber tube as a 'listening tube', compare the intensity of hiss of air entering each choke. Alter the setting of the adjusting screws until hiss is the same on both carburetters.

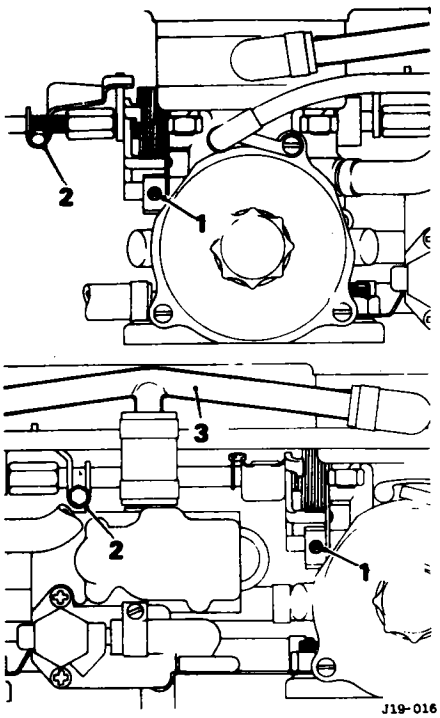


Fig. 5

NOTE: This operation may, if preferred, be carried out using a balance meter to makers' instructions.

Alter the settings of both adjusting screws by the same amount to achieve correct idling speed, i.e. 750 rev/min (1, Fig. 5).
When the correct idling speed is achieved, recheck the balance of the carburetters, alter the settings of the adjusting screws if necessary to secure the correct balance and idling speed.
Stop the engine.
Re-tighten the clamp bolts on the throttle operating rods (2, Fig. 5) to secure the correct opening characteristics on throttle. On automatic transmission cars there should be no backlash between the tongue and upper arm of yoke behind the rear carburetter, or between the tongue and the lower arm of the yoke between carburetters: both butterflies should start to open as soon as throttle cable is moved. On manual transmission cars there should be a gap of up to 0,9 mm (0.036 in) between the tongue and the lower arm of yoke between carburetters, so that the rear butterfly opens by up to 3° before front butterfly starts to open.
There should be no backlash between the tongue and the upper arm of yoke behind the rear carburetter.
Slacken the locknuts on the outer throttle cable and adjust the position of the cable in abutment so that the throttle operating lever rests against the back stop, yet the inner cable is not slack; tighten the locknuts (1, Fig. 6).
Check the operation of the throttle cable; the cable should pick up linkage immediately the pedal is moved (2, Fig. 6).
Slacken the locknut and wind back the operating lever to stop screw (3, Fig. 6).
Press the operating lever (4, Fig. 6) to open the butterfly valves and turn the stop screw (5, Fig. 6) to contact the lever. Tighten the locknut (3, Fig. 6).
Depress the pedal and ensure that the operating lever moves to touch the stop screw with the pedal at the end of its travel.
Adjust the pedal stop so that cable is not under due strain when the pedal is fully depressed.
Check the operation of the kick-down cable on cars fitted with automatic transmission (6, Fig. 6).
Refit the air cleaner element. Check CO emissions, using approved equipment, and correct if necessary to bring within current requirements.
Secure the lids of the tamperproof caps over the slow-running adjustment setscrews.

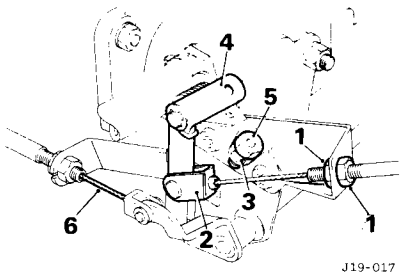


Fig. 6

MIXTURE CONTROL

Adjust and reset 19.15.06

NOTE: Do not adjust the mixture control on carburetters until all other possible factors which could cause faulty carburation have been eliminated; control setting has been correctly set and sealed before delivery, and should not require alteration.
Resetting mixture controls necessitates a check of emissions, using an exhaust gas analyser; regulation regarding emissions must be strictly adhered to. Ensure that equipment required for emission check is available before commencing mixture adjustment, and proceed as follows:
If possible, choose a location with an ambient temperature of between 15° and 26°C (60° to 80°F) to carry out the job. Place selector at 'P' on automatic transmission cars.
Remove the air cleaner.
Remove the plugs and sealant from both carburetter jet adjustment screws (1, Fig. 7).
Turn the jet adjusting screws clockwise, if necessary, (to lower jets) until jets are below level of the transverse bridges in the carburetter bores (2, Fig. 7).
Lift one carburetter piston by hand and insert straight-edge approximately 13 mm (0.5 in) wide alongside the needle in a vertical plane (3, Fig. 7).

continued

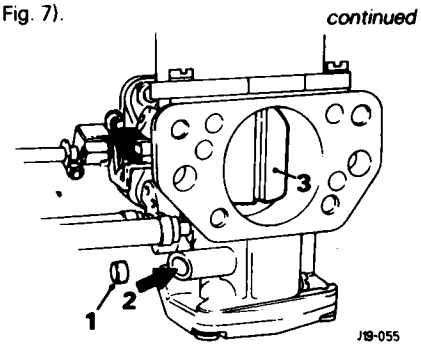


Fig. 7

Turn the adjusting screw anti-clockwise until the jet just contacts the steel rule. The jet is then accurately positioned level with the carburetter bridge.
Screw in the adjusting screw 3⅓ turns, bringing jet 2,97 mm (0.117 in) below carburetter bridge. This is the datum position at 20°C (68°F) from which final adjustments are to be made.
Repeat on the second carburetter.
Check the oil level in the carburetter piston bores.
Start the engine and run until fully warm, for at least five minutes after thermostat opens.
Run the engine at approximately 2500 rev/min for one minute; stop the engine.

NOTE: Adjustment may now be carried out for three minutes, then engine must be run again for one minute at 2500 rev/min before any further adjustment is made.

This cycle of operations—run for one minute, adjust for three—may be repeated as often as necessary.
Check that the idling speed is 750 rev/min and, if not, adjust to this figure.
Turn each jet adjusting screw clockwise to enrich the mixture or anti-clockwise to weaken, turning each screw by the same small amount until fastest idling speed is indicated.
Turn each screw anti-clockwise, each by the same amount, until engine speed just begins to fall.
Turn each screw clockwise by the same very small amount until maximum speed is regained.
Re-adjust the tickover, if necessary, to 750 rev/min.
Connect a suitable exhaust gas analyser to the vehicle exhaust and allow it to stabilise for at least one minute before checking CO emission
If necessary, adjust the mixture screws further to bring emissions just within current regulation limit.
Seal the mixture setting screws and close the aperture with a red plug.
Refit the air cleaner

CARBURETTERS—CAR SET

Remove and refit **19.15.11**

Removing.

Remove the air cleaner and the A.E.D. unit (1, Fig. 8).
Disconnect the crankcase breather pipes from the carburetters (2, Fig. 8).
Disconnect the fuel pipes from the carburetters, and plug the fuel supply pipe (3, Fig. 8).
Disconnect the vacuum pipe from the rear carburetter (4, Fig. 8).
Release the external circlips from the throttle rod and lower pin in linkage (1, Fig. 9). Withdraw the pin.
Disengage the links from the lever on the rod and draw the rod back until its forward end disengages from the nut on the rear carburetter spindle (2, Fig. 9).
Remove the eight nuts and spring washers securing the carburetters to the manifold, and slide the carburetters off the studs (5, Fig. 8).

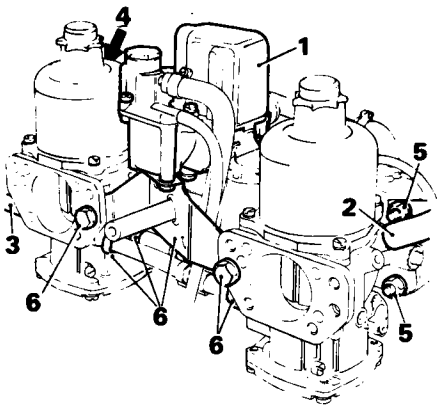


Fig. 8

Discard the flange gaskets but replace two nuts on studs to retain the adaptors and insulating spacers in their original positions.
Release the clips off fuel and vent pipes, remove the A.E.D. bracket and draw the front carburetter with throttle linking rod away from the rear carburetter (6, Fig. 8).

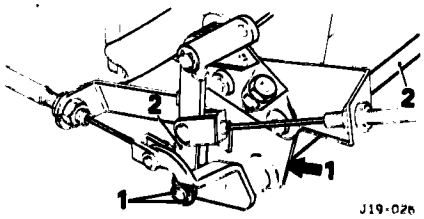


Fig. 9

Refitting

Slide new 'O' clips over the fuel and vent hoses and fit the hoses over the stubs on the carburetters. Do not tighten the clips at this stage.
Engage the rear end of the throttle linking rod with hollow nut on front of the rear carburetter spindle and engage the tongue of clamping bracket with the yoke.
Remove the nuts from manifold studs, place new gaskets in position and offer up carburetter to the studs.
Fit the spring washers and retaining nuts and tighten the nuts by diagonal selection. Ensure that the fuel and vent hoses between the carburetters are not twisted or distorted and secure the 'O' clips retaining them to the stubs.
Move throttle rod forward, engaging its ball-end with the hollow nut on the rear throttle spindle, and the tongue of the clamping bracket with the yoke.
Replace the link pin and circlips.

NOTE: Ensure that the circlips are replaced on the rod and pin. They are not interchangeable.

Check that both of the throttle butterflies are fully closed.
Refit the A.E.D. unit and connect the fuel, breather and vacuum hoses. Tune and adjust the carburetters. Refit the air cleaner.

CARBURETTER

Overhaul **19.15.17**

Dismantling

NOTE: Overhaul procedure is given for rear carburetter. Front carburetter differs in fuel supply and vent pipe connections, throttle spindle details and in absence of vacuum take-off stub.

Service tools: Replacer damper assembly retainer (early models only).

Unscrew the cap of the suction chamber, lift until resistance is felt, support the piston (with a finger through the intake) at the top of its travel and pull the cap firmly upwards to release the damper retainer from the piston rod. Remove the damper (1, Fig. 10).
Unscrew the suction chamber retaining screws and remove the identity tag (2, Fig. 10).
Slightly rotate the suction chamber to free it, and lift vertically from the body without tilting (3, Fig. 10).
Remove the spring, lift out the piston and needle assembly and empty the oil from the piston rod (4, Fig. 10).
Mark the lower face of the piston (to locate the

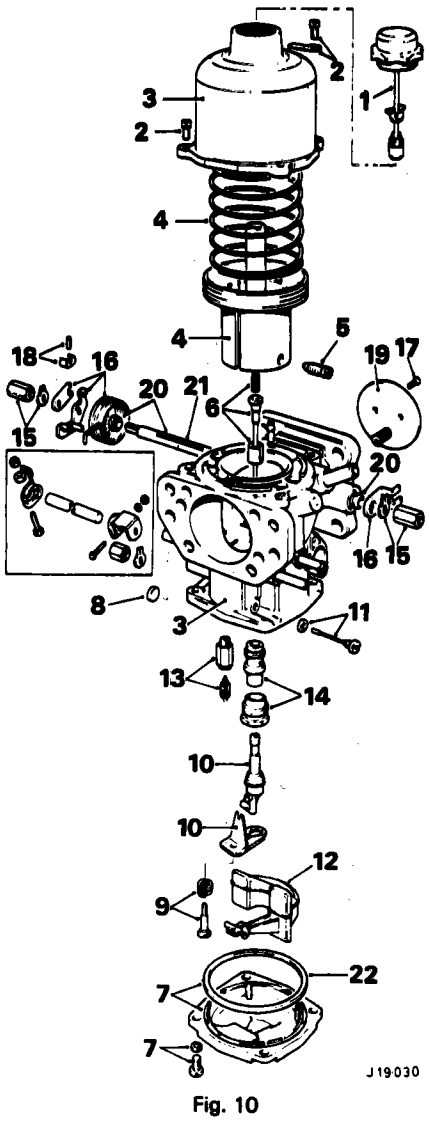


Fig. 10

position of 'V' mark on needle guide for correct reassembly) and remove the needle guide locking screw. Discard the screw (5, Fig. 10).
Withdraw the needle with guide and spring (6, Fig. 10).
Remove the bottom cover-plate retaining screws and the spring washers and detach the cover-plate with the sealing ring (7, Fig. 10).
Only if it is essential, remove the jet adjusting screw, plug and sealing from its counterbore and withdraw screw; and 'O' ring is carried in a groove in its head (8, Fig. 10).
Remove the jet adjusting lever retaining screw. Collect the spring (9, Fig. 10).
Withdraw the jet and adjusting lever together and separate the lever from the jet (10, Fig. 10).
Unscrew and remove the float pivot spindle. Collect washers from between the pin head and carburetter body (11, Fig. 10).
Withdraw the float (12, Fig. 10).
Remove the needle valve and unscrew the valve seat (13, Fig. 10).
Unscrew the jet bearing locking nut and withdraw the jet bearing (14, Fig. 10).
Bend back the lock washer tabs and unscrew the nut retaining the throttle levers and return spring. Note location of levers and spring (15, Fig. 10).
Remove the yoke lever and the return spring (16, Fig. 10).
Remove the throttle disc retaining screws (17, Fig. 10).
Remove the slow-running adjustment grub screw, tamperproof cap, and spring clip (18, Fig. 10).
Close the throttle and mark the position of the throttle disc in relation to the carburetter flange. Do not mark the disc in the vicinity of the over-run valve. Open the throttle and carefully withdraw the disc from the throttle spindle, taking care not to damage the over-run valve (19, Fig. 10).
Withdraw the throttle spindle and remove its seals, noting the way it is fitted in relation to the carburetter body to ensure correct reassembly (20, Fig. 10).

Inspection

Examine the throttle and its bearings in the carburetter body; check for excessive play, and renew parts as necessary (21, Fig. 10).
Examine the float needle and seating for damage and excessive wear; examine the nylon body of the needle for cracks; renew both the needle and the seat if necessary (13, Fig. 10).
Examine all the rubber seals and 'O' rings for damage or deterioration; renew as necessary. The cover-plate sealing ring must be renewed.
Examine the carburetter body for cracks and damage and for security of brass connections and piston key (3, Fig. 10).
Clean inside of the suction chamber and the piston rod guide with fuel or methylated spirit (denatured alcohol) and wipe dry. Abrasives must not be used.
Examine the suction chamber and piston for damage and signs of scoring.
Check that all balls are in piston ball-race (2 rows, 6 per row).
Fit the piston into the suction chamber, without the damper and spring; hold the assembly in a horizontal position and spin the piston. The piston should spin freely in the suction chamber without any tendency to stick.

Reassembling

Fit the new seals to the carburetter body and replace the spindle. Press the seals just inside the spindle housing bosses (1, Fig. 11).
Insert the throttle disc in the spindle, ensuring that it is positioned as previously marked (2, Fig. 11).
Fit two new throttle disc retaining screws. Ensure that the throttle closes correctly before tightening the screws fully, and spread their slotted ends sufficiently to secure. Do not overspread (3, Fig. 11).
Replace the return spring, lever and yoke on throttle spindle (4, Fig. 11).
Fit the new lock washer and replace the nut on throttle spindle. Tighten to 0,43 kgf m (37 lbf in) and secure by bending over tabs (5, Fig. 11).
Replace the slow-running adjusting grub screw, with new spring clip and tamper-proof cover. DO NOT CLOSE LID OF COVER (6, Fig. 11).
Replace the jet bearing and tighten the locking nut 1,38 to 1.65 kgf m (10 to 12 lbf ft) (7, Fig. 11).
Replace the needle valve seat and refit the needle (8, Fig. 11).
Replace the float and spindle with washer and tighten to 0,07 kgf m (6 lbf in) (9, Fig. 11).

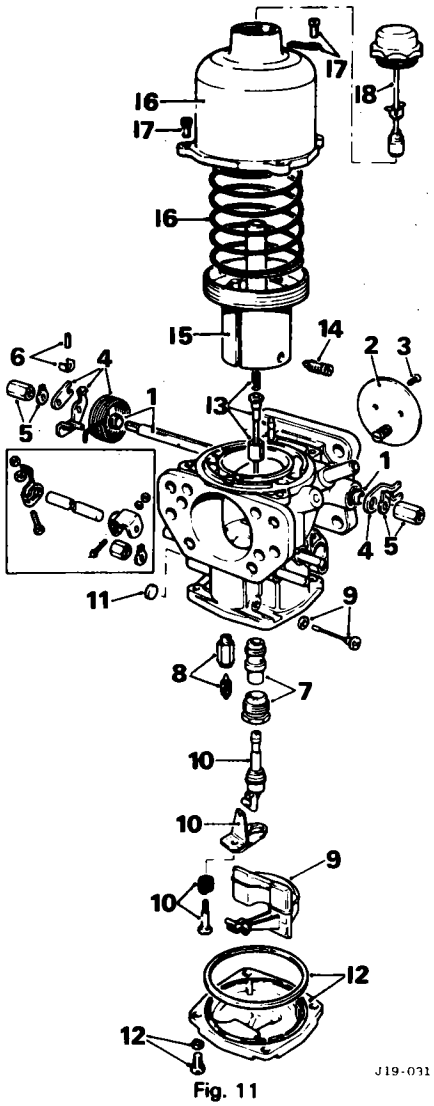


Fig. 11

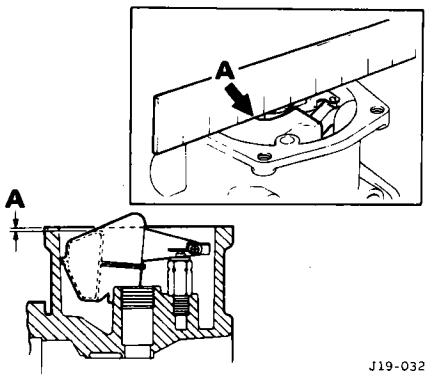


Fig. 12

Invert the carburetter so that the needle valve is held on the seat by the weight of the float. Check that the lowest point indicated on float as 'A' in illustration (Fig. 12) is 1,0 ± 0,5 mm (0.04 ± 0.02 in) below the level of the float chamber face. Adjust if necessary by carefully bending the brass arm. Check that the float pivots correctly about the spindle.
Assemble the jet and the adjusting lever and plate in position in body, engaging the forked end of the lever with the reduced diameter of the adjusting screw. Fit the retaining screw and spring, but tighten finger-tight only initially (10, Fig. 11).
Check that the jet head is free to move in the cut-out in the adjusting lever and slides easily in the jet bearing. Fully tighten the retaining screw.
If the adjusting screw has been removed, fit new 'O' ring to it and insert carefully ensuring that its reduced tip diameter engages the slot of the adjusting lever. Screw in until jet is flush with the bridge of the body, then screw in a further 3⅔ turns, to bring jet 3,0 mm (0.117 in) below bridge (11, Fig. 11).
Fit a new sealing ring to the bottom cover-plate and refit as marked. Replace the four retaining screws and spring washers and tighten the screws (12, Fig. 11).
Refit the spring to needle, ensuring that the spring is located in its groove (13, Fig. 11).
Slide the needle guide over the needle (with open end of slot adjacent to the projection in flange) and insert in the piston as previously marked.
Insert NEW needle retaining screw in the piston, position the needle guide flush with the bottom face of the piston and tighten the screw to 0,14 to 0,17 kgf m (12 to 15 lbf in) (14, Fig. 11).
Carefully replace the piston and the needle assembly in the carburetter body (15, Fig. 11).
Replace the spring on the piston, and lower the suction chamber carefully over the spring, avoiding turning the chamber as it compresses the spring (to prevent the spring from twisting the piston) (16, Fig. 11).
Fit the three screws and the identity tag (17, Fig. 11).
Insert the damper piston in bore of the piston rod using tool, press the damper retainer fully into top of rod (18, Fig. 11).
Fill the bore of the piston rod with engine oil, preferably S.A.E. 20, up to the bottom of damper retainer and tighten suction chamber cap firmly by hand.
Replace carburetters.

AUTOMATIC ENRICHMENT DEVICE (A.E.D.)

Remove and refit **19.15.38**

Removing

Disconnect the battery, the fuel inlet and overflow pipe (1, Fig. 13).
Disconnect the air delivery pipe and the mixture delivery pipe (2, Fig. 13).
Remove the bolts and spring washers securing the A.E.D. unit to mounting bracket; lift off the A.E.D. unit (3, Fig. 13).

Refitting

Reverse the above procedure, use new clips on the hot air inlet and mixture delivery pipes.

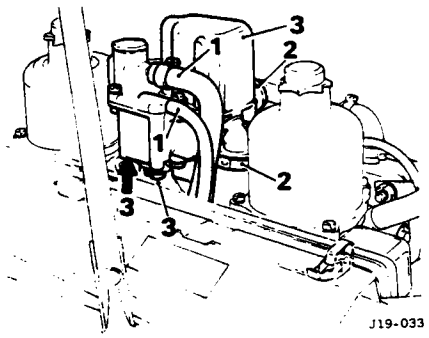


Fig. 13

DIAPHRAGM

Remove and refit **19.15.40**

Remove the A.E.D. unit (1, Fig. 14) and invert.
Remove the four screws and the spring washers securing the diaphragm cover (2, Fig. 14).
Withdraw the cover, spring, diaphragm and locating dowel (3, Fig. 14).

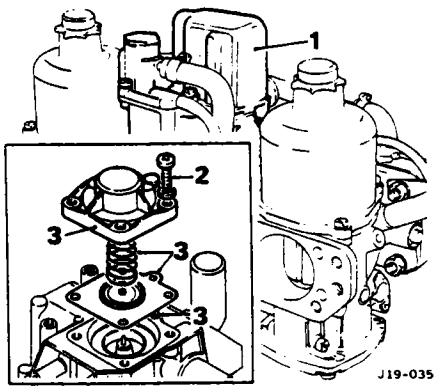


Fig. 14

Refitting

When refitting, ensure that the bore of the locating dowel is clean.
Push the dowel into the hole in the A.E.D. unit.
Locate the diaphragm on the A.E.D. unit.

NOTE: The rivet head must face toward the A.E.D. unit.

Insert the spring in the diaphragm cover.
Position diaphragm cover and spring squarely over the diaphragm, ensuring that the spring is seated in the diaphragm plate.
Push the cover down, ensuring that the locating dowel enters the hole in cover.
Refit the four securing screws and refit the A.E.D. unit.

NEEDLE VALVE

Remove and refit **19.15.42**

Removing

Remove the A.E.D. unit.
Carefully prise off the insulation cover (1, Fig. 15).
Remove the three screws and spring washers securing the float chamber cover (2, Fig. 15).
Lift off cover (3, Fig. 15).

CAUTION: Do not move cover sideways.

Remove and discard the gasket (4, Fig. 15).
Unclip the needle valve from the float arm (5, Fig. 15).

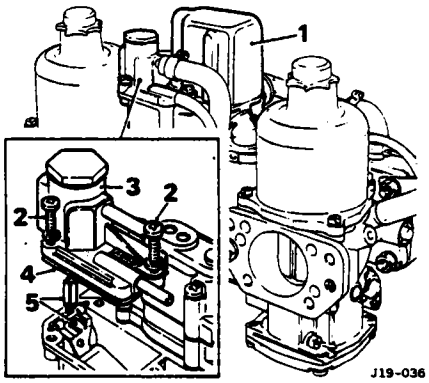


Fig. 15

Refitting

Lift float from the chamber.
Position the needle valve in the recess in the cover.
Clip the needle valve to the float arm by using a steel rule; hold the float against the cover.
Position the new gasket on the A.E.D. body—do not use jointing compound or grease.

Lower the cover on to the A.E.D. unit, ensuring that the float and needle valve are not displaced.
Ensure that the float hinge pin is correctly located before fitting the three securing screws and insulation cover. Refit the A.E.D. unit.

A.E.D. FILTER

Remove, clean and refit **19.15.43**

Disconnect the battery. See operation 86.15.20.
16).
Withdraw the filter element, wash it in petrol and dry using clean, dry compressed air (2, Fig. 16).

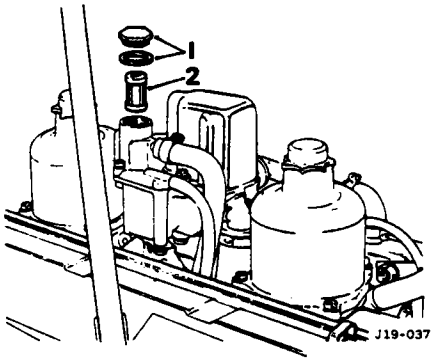


Fig. 16

HOT AIR PICK-UP UNIT

Remove and refit **19.15.44**

Slacken the clamping bolt and withdraw the air delivery pipe from the outlet tube (1, Fig,. 17).
Remove the bolts securing the pick-up unit to the exhaust manifold, withdraw the pick-up unit together with the air filter (2, Fig. 17).

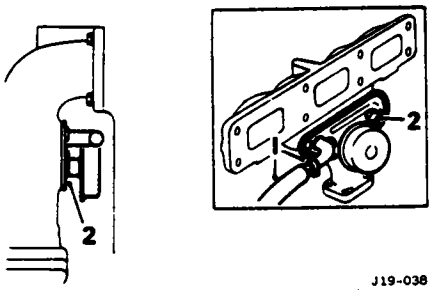


Fig. 17

HOT AIR DELIVERY PIPE

Remove and refit **19.15.45**

Slacken the clamping bolt and withdraw the air delivery pipe from the outlet tube.
Remove the nut and bolt securing the pipe clip to the support bracket.
Disconnect the delivery pipe from the A.E.D. unit.
Use a new clip to secure the delivery pipe to the A.E.D. unit when refitted.

HOT AIR FILTER

Remove, clean and refit **19.15.46**

Slacken the clamping bolt and move the filter towards the cylinder block to withdraw it (1, Fig. 18).
Wash the filter in petrol and dry with compressed air (2, Fig. 18).
Lightly oil the filter gauze with engine oil and refit.

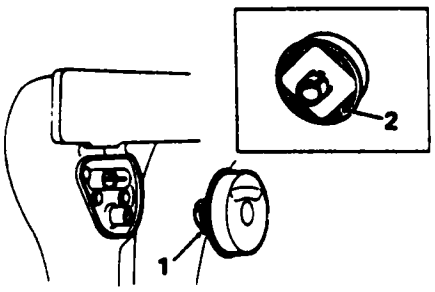


Fig. 18

THROTTLE LINKAGE

Check and adjust **19.20.05**

Fully depress the throttle pedal and ensure that the butterfly valve operating lever comes to a position just touching the operating lever stop screw (1, Fig. 19). If the lever does not touch the stop screw, and linkage was initially correctly set up, adjust as follows:
Slacken the locknuts at the outer throttle cable abutment (2, Fig. 19).
Adjust the position of the outer cable in abutment to place the inner cable under light tension but NOT to move throttle operating lever; secure the locknuts (3, Fig. 19).
Re-check adjustment as above.
Slacken locknuts on outer throttle cable and adjust position of cable in abutment so that throttle operating lever rests against back stop, yet inner cable is not slack; tighten locknuts.

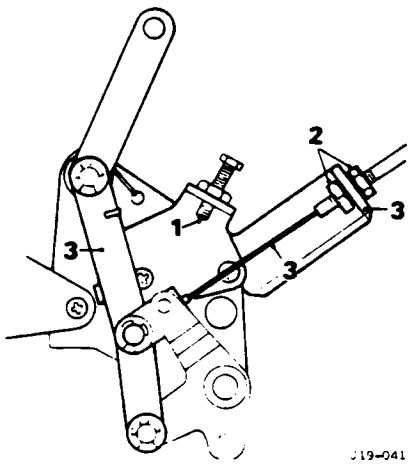


Fig. 19

Depress throttle pedal and ensure that operating lever moves to touch stop screw with pedal at end of its travel. Adjust pedal stop so that cable is not under due strain when pedal is fully depressed.
Check operation of kick-down cable (see 44.30.02—cars fitted with Model 66 automatic transmission only).

THROTTLE OPERATING ROD BUSHES

Remove and refit **19.20.10**

Remove the throttle pedal.
Remove the under-scuttle casing.
Prise the spring clips from the steering-column universal joint cover; detach the covers and padding—left-hand-drive cars only.
Remove the split pin at the top end of the operating rod (1, Fig. 20).
Disengage the sleeve and nipple from the rod (2, Fig. 20).
Remove the two self-locking nuts and draw the pedal arm from the stubs—right-hand-drive cars only.
Remove the split pin from the operating rod pivot (3, Fig. 20).
Pull the rod from the pivot. Recover the plain washer (4, Fig. 20).
When refitting, remove worn bushes and fit new ones where necessary (5, Fig. 20).

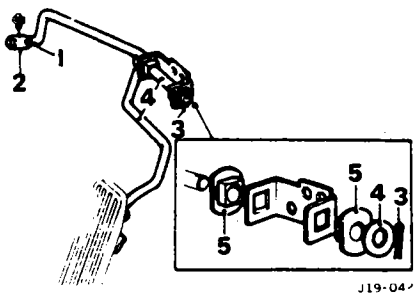


Fig. 20

FUEL PIPE ARRANGEMENT (Fig. 21) (Carburetter cars only)

Description **19.40.00**

The system utilizes two fuel pump assemblies and draws from two fuel tanks fitted in the rear wings.
When the left-hand tank is selected on the instrument panel switch, voltage is applied to the left-hand fuel pump and fuel is passed via the filter to the two carburetter float chambers.
Selection of the right-hand tank energizes the right-hand fuel pump.
The outlet non-return valve of the inoperative pump prevents fuel passing from one tank to the other.

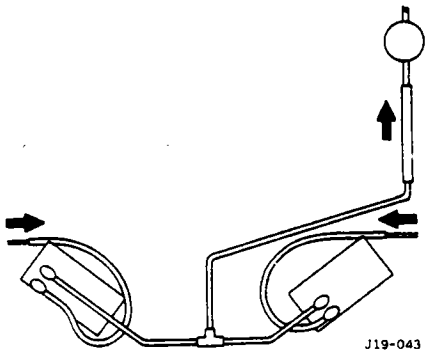


Fig. 21

Separate non-return valves are fitted in the flexible hoses near the tanks.
Air-conditioned cars are equipped with fuel coolers, attached to the hot air duct near the carburetters.
Special precautions detailed below must be taken before working on the fuel cooler.

FUEL COOLER

Remove and refit **19.40.40**

WARNING: Exposure to refrigerant gas, which is released if a refrigerant hose is detached from the cooler, can cause blindness. It is therefore essential to depressurize the air-conditioning system before disconnecting a refrigerant hose.

Fire precautions are also essential as fuel may be spilled when fuel hoses are disconnected.

Disconnect the battery.
Depressurize the air-conditioning system.
Disconnect the refrigerant inlet and outlet hoses from the cooler.
Clamp the fuel hoses.
Disconnect the fuel hoses.
Remove the two self-tapping screws and washers securing the fuel cooler. Collect the mounting clips and insulating sleeve.

After refitting, re-charge the air-conditioning system.

FUEL PUMP

Remove and refit (either side) 19.45.08

Place the car on a ramp, NOT over a pit.
Disconnect the battery.
Remove the rear wheel adjacent to the pump to be removed.
Drain the fuel tank.

WARNING: Take all due precautions against fire and explosion when draining fuel.

Remove the four screws securing the circular cover-plate to the rear vertical wall of the wheel arch. Withdraw the cover along the flexible hose (1, Fig. 22).
Disconnect the electrical leads from the pump (2, Fig. 22).
Release the hose clips and detach the flexible hose from the pump (3, Fig. 22).
Turn the locking flange anti-clockwise to release the pump and withdraw the pump and sealing washers, taking care to avoid damage to the filter as the pump is removed.
Discard the sealing washer (4, Fig. 22).
Remove all sealant from the pump, mounting flange and tank.
When refitting, ensure that the mounting faces of the pump flange and fuel tank are clean, and that the correct pump assembly is being refitted—C45442 is R.H. pump and C45443 is L.H. pump.
Fit new sealing washer and introduce the pump carefully into tank, securing in position with the locking flange.
Refit the flexible hose to the pump outlet pipe and tighten the hose clip screw to not more than 0,07 kgf m (6 lbf in).
Fit the electrical connections and smear the terminals with waterproof grease.
Replace the cover-plate and secure with the four screws.
Make good the sealing around the cover and screw leads by coating with Flintkote or similar protective covering.

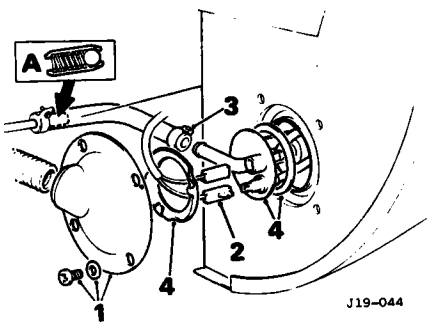


Fig. 22

NOTE: If it is found necessary to detach the forward end of the flexible hose, or to fit a new hose, it is most important that a non-return valve fitted in the forward end of the flexible hose is correctly installed. The purpose of the non-return valve is to prevent fuel from draining into the lower tank when the car is tilted, and therefore the ball must be at rear, or tank, end of fitting, as shown in illustration at 'A'.

NOTE: This type of fuel pump cannot be overhauled and must be renewed if found to be defective.

FUEL TANK

Remove and refit—either 19.55.01

Removing

Drain the fuel tank (1, Fig. 23) and disconnect the battery.
Remove the side section of rear bumper.
Remove the cross-head screws and washers securing the rear quarter fuel tank cover (2, Fig. 23).
Remove the setscrews and nuts, spring and plain washers securing the rear quarter fuel tank cover (3, Fig. 23). Remove the cover.
Remove the self-tapping screw securing the forward end of the luggage compartment side casing. Remove the casing.
Remove the four screws and shakeproof washers securing the flange of the fuel tank filler cap (4, Fig. 23).
Taking care to avoid damaging the paintwork, prise the flange (5, Fig. 23) from the body.
Pull the vent pipe (6, Fig. 23) from the stub where applicable.
Remove the gasket and 'O' ring seal.

NOTE: On carburetter cars fitted with submerged fuel pumps omit above operation and reach up between rear of tank and tail/stop/flasher light units to detach leads from the fuel gauge tank unit. (Submerged pump replaces gauge unit in forward tank aperture.) Detach the leads and flexible hose from pump before withdrawing tank.

Remove the bolt, special washer and shakeproof washer at the side of the luggage boot.
Release the fuel pipe connector at the base of the tank. Separate the connection and push the pipe carefully inwards flush with the panel (8, Fig. 23).
Remove the two bolts, special washers and shakeproof washers in the silencer tunnel and recover wedges (9, Fig. 23).
Release Nyloc nut at the hanger bolt (10, Fig. 23).
Carefully lower the fuel tank, note connections and detach the cables from the tank unit (11, Fig. 23).
On cars with an evaporative control system lower tank until vent pipe (7, Fig. 23) is accessible and detach pipe from stub.

Refitting

On cars with an evaporative control system offer up the tank and attach the vent pipe to stub.

All cars

Lift the tank and connect cables to the tank unit and submerged pump where applicable.
Lift the tank and engage the hanger bolt in bracket; secure with Nyloc nut.
Fit the bolts and special shakeproof washers at the upper and forward location. Do not tighten them at this stage.
Fit the bolt, special and shakeproof washer at the rear location. Fit wedges between the fuel tank and the side panel. Do not tighten at this stage.
Fit new 'O' ring seal in the fuel tank neck.
Press vent pipe onto filler neck stub, where applicable.
Use new gasket at the petrol filler cap flange

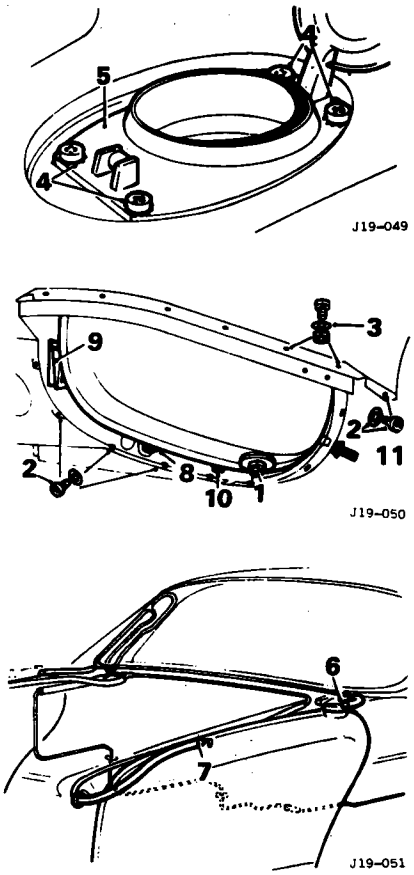


Fig. 23

and secure using the four screws and shakeproof washers.
From beneath, firmly press the fuel tank up to locate on the filler cap flange spigot and tighten the rear mounting bolt on wedges.
Secure the hanger bolt nut. Do not overtighten.
Tighten the remaining two mounting bolts.
Secure the supply pipe union to tank; connect the hose to pump on cars with submerged pumps.
Pour 2 to 3 gallons Imp. (9 to 13 litres) of specified fuel into the tank.
Connect the battery.
Switch on the ignition and select the fuel tank that has been changed.
Check to ensure that there are no leaks at the unions and that the fuel gauge registers.
Switch off the ignition.
Fit and secure the rear quarter fuel tank cover and the side section of the rear bumper.

FUEL TANK

Drain **19.55.02**

WARNING: Petrol (gasoline) must not be extracted or drained from a vehicle standing over a pit.
Petroleum or gasoline vapour is highly flammable and in confined spaces is also very explosive and toxic.
When petrol/gasoline evaporates it produces 150 times its own volume in vapour, which when diluted with air becomes an ignitable mixture. The vapour is heavier than air, and will always fall to the lowest level and it can readily be distributed throughout a workshop by air currents. Even a small spillage of petrol or gasoline is potentially very dangerous.
Extracting or draining petrol (gasoline) from a vehicle fuel tank must be carried out in a well-ventilated area, preferably outside the workshop. All forms of ignition must be extinguished or removed, any hand lamps used must be flameproof and kept clear of any spillage. The receptacle used to contain the petrol drained or extracted must be more than adequate to receive the full amount to be drained.

Open the fuel tank filler cap.
Place a suitable receptacle beneath the fuel tank drain plug.
Remove the drain plug, allow the fuel to drain.
Check the condition of the sealing washer and replace the plug. Do not overtighten.

FUEL FILLER CAP ASSEMBLY

Remove and refit **19.55.08**

Remove the four screws and shakeproof washers (1, Fig. 24) securing the flange of the fuel tank filler cap.
Taking great care to avoid damaging paintwork, prise the flange (2, Fig. 24) from the body.
Pull the vent pipe (3, Fig. 24) from the stub—evaporative loss control cars only.
Remove the gasket and 'O' ring seal.

When refitting use a new gasket and 'O' ring seal.

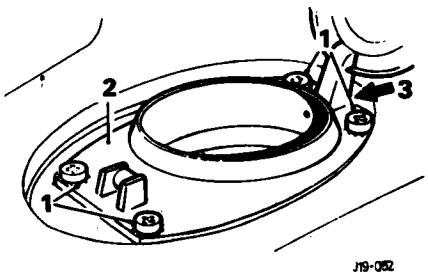


Fig. 24

FUEL FILLER LOCK

Remove and refit **19.55.09**

Open the filler cap lid.
Cover the filler hole with rag or adhesive tape.
Remove the screw and washer securing the ward to the lock barrel.
If the key is available, insert it in the lock, and press the barrel from inside to out.
If the key is not available, insert a piece of stiff wire to lift the tumblers and turn the barrel to mid position (1, Fig. 25).
Keep the barrel in this angular position and press from the lid (2, Fig. 25).

When refitting, insert the key in the barrel of the replacement lock and offer into the lid.
Remove the key (3, Fig. 25).
Secure the ward to the barrel using the screw and washer (4, Fig. 25).
Test-operate the lock and ensure that the ward turns to a position in line with, and facing, the lid catch. Unlock (5, Fig. 25).
Remove the obstruction from the filler hole and close the lid.

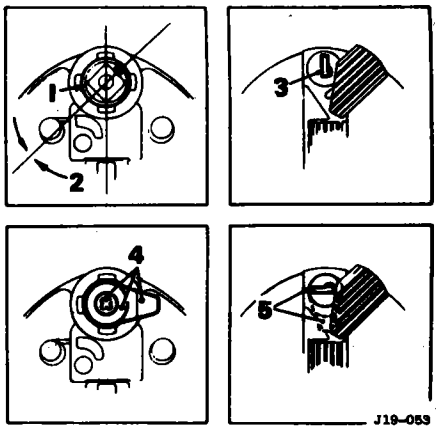


Fig. 25

CONTENTS

ELECTRONIC FUEL INJECTION

Description

The electronic fuel injection 'L' system can be divided into two separate systems interconnected only at the injectors.

The systems are:

1. A fuel system delivering to the injectors a constant supply of fuel at the correct pressure.
2. An electronic sensing and control system which monitors engine operating conditions of load, speed, temperature (coolant and induction air) and throttle movement. The control system then produces electrical current pulses of appropriate duration to hold open the injector solenoid valves and allow the correct quantity of fuel to flow through the nozzle for each engine cycle.

As fuel pressure is held cons ant, varying the pulse duration increases or decreases the amount of fuel passed through the injector to comply precisely with engine requirements.

Pulse duration, and therefore fuel quantity, is also modified to provide enrichment during starting and warming-up and at closed throttle, full throttle and while the throttle is actually opening.

All the injectors are simultaneously operated by the Electronic Control Unit (E.C.U.) twice per engine cycle.

The induction system is basically the same as that on a carburetted engine: tuned ram pipe, air cleaner, plenum chamber and induction ports. The air is drawn through a paper-element cleaner to a single throttle butterly valve and to individual ports for each cylinder leading off the plenum chamber. The injectors are positioned at the cylinder head end of each port so that fuel is directed at the back of each inlet valve.

Fuel system

Fuel supply

Fuel is drawn from the tanks (1, Fig. 1) at the rear of the car by a fuel pump (3, Fig. 1) via a solenoid operating change-over valve (2, Fig. 1) to a fuel rail, through an in-line filter (5, Fig. 1) and a pressure regulator (7, Fig. 1). Fuel is controlled so that the pressure drop across the injector nozzle is maintained at a constant 2,5 bars (36.25 lbf/in²). Excess fuel is returned to the tank from which it was drawn via a fuel cooler (4, Fig. 1)—on air conditioned cars only—and a solenoid-operated shut-off valve. The six fuel injectors (8, Fig. 1) are connected to the fuel rail (6, Fig. 1) and are electro-mechanically operated to inject into each inlet port. Fuel is also supplied to a cold start injector (9, Fig. 1) which is only operated during the starting of a cold engine.

SCHEMATIC DIAGRAM

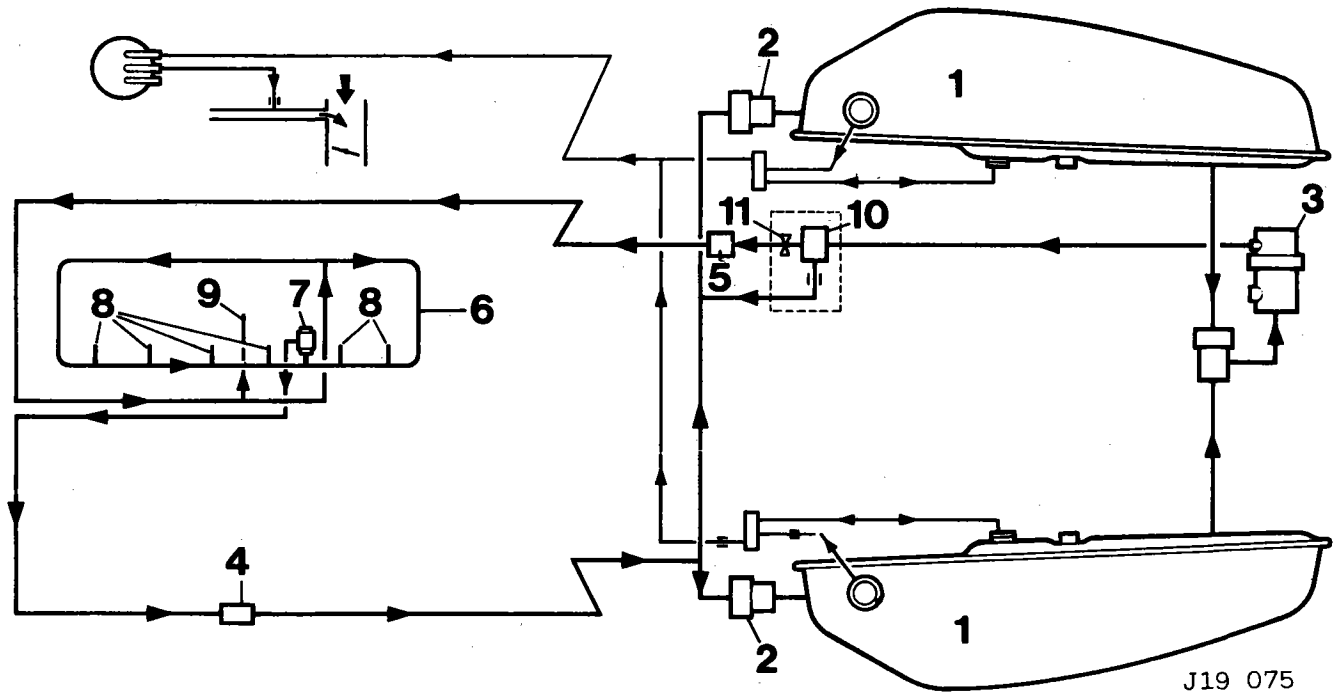


Fig. 1

1. Fuel tank
2. Change-over valve
3. Fuel pump
4. Fuel cooler
5. Fuel filter
6. Fuel rail
7. Fuel pressure regulator
8. Injectors
9. Cold start injector
10. Air bleed valve
11. Non return valve

ENGINE COMPONENT LOCATION (U.K. AND EUROPEAN)

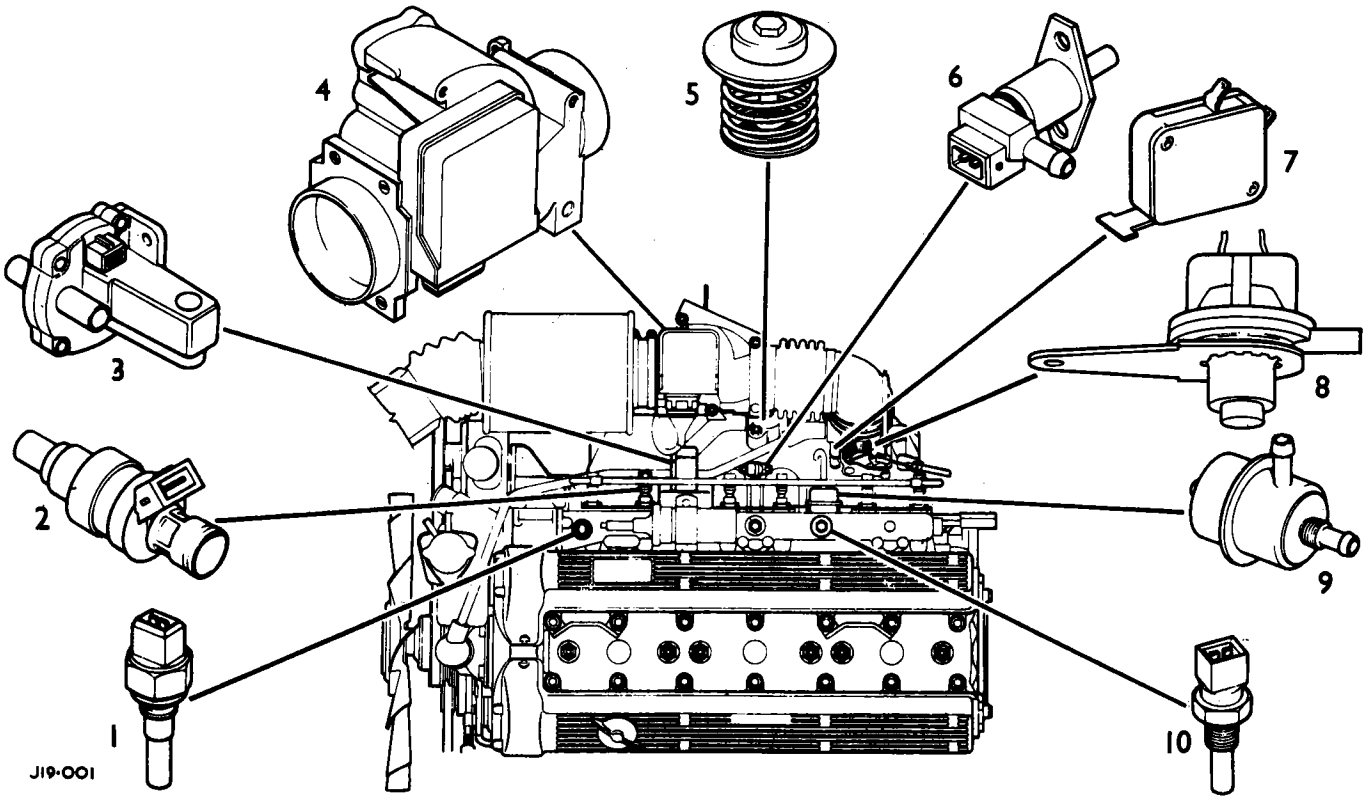


Fig. 2

1. Thermotime switch
2. Fuel injector
3. Auxiliary air valve
4. Air-flow meter
5. Over-run valve
6. Cold start injector
7. Micro-switch (automatic cars only)
8. Vacuum throttle switch
9. Fuel pressure regulator
10. Water temperature sensor

Air intake system

Air is drawn from the air cleaner through the air meter and throttle into the engine. The air passing through the air meter deflects the flap inside against a spring to a position dependent on the rate of air flow. A potentiometer connected to the flap spindle converts the flap angular position to a voltage. This voltage is transmitted to the E.C.U. as a measure of air flow.

Electronic system

The Electronic Control Unit (E.C.U.) receives information from the sensors placed about the engine. It computes the quantity of fuel required and therefore the time for which the injectors must remain open. An ignition L.T. circuit triggers all injectors simultaneously at every third spark. The injectors open twice per engine cycle, each time delivering half the fuel requirement of each cylinder.

Ballast resistor

In order to open and close the injectors a fairly high current drive is needed, about 1.5 amps per injector. The E.C.U. has an output stage designed to deliver this current, but to protect the output transistors of the E.C.U. from injector faults and short circuits there is a ballast resistor wired in series with each injector. These resistors will limit fault current to a safe value, thus protecting the E.C.U. The ballast resistors for each injector are housed in a single unit which is secured to the right-hand front engine valance by two screws.

Idle speed adjustment

The idle speed adjusting screw is located in the air distribution block and controls air flow to the extra air valve.

Auxiliary air valve

The auxiliary air valve consits of a variable orifice controlled by a bi-metal element. The unit is mounted on the water rail and also responds to coolant temperature. A heater is fitted around the bi-metal element to speed up the bi-metal response. The heater is connected in parallel with the fuel pump and so is energized as long as the engine is running.

Temperature sensors

The temperature sensor of the air being taken into the engine through the inlet manifold, and the temperature of the coolant in the cylinder block are constantly monitored. The information is fed directly to the E.C.U. The air temperature sensor has a small effect on the injector pulse width, and should be looked upon as a trimming rather than a control device. It ensures the fuel supplied is directly related to the weight of air drawn in by the engine. Therefore, as the weight (density) of the air charge increases with falling temperature, so the amount of fuel supplied is also increased to maintain optimum fuel/air ratio.
The coolant temperature sensor has a much greater degree of control although its main effect is concentrated while the engine is initially warming-up. The coolant temperature sensor operates in conjunction with the cold start system and the auxiliary air valve to form a completely automatic equivalent to a carburetter choke.

Flooding protection system

With the ignition switched on, the pump will not operate until the engine is cranked. The system prevents flooding should an injector or injectors become faulty (remain in the open position), and the ignition is left switched on.

ENGINE COMPONENT LOCATION (FEDERAL)

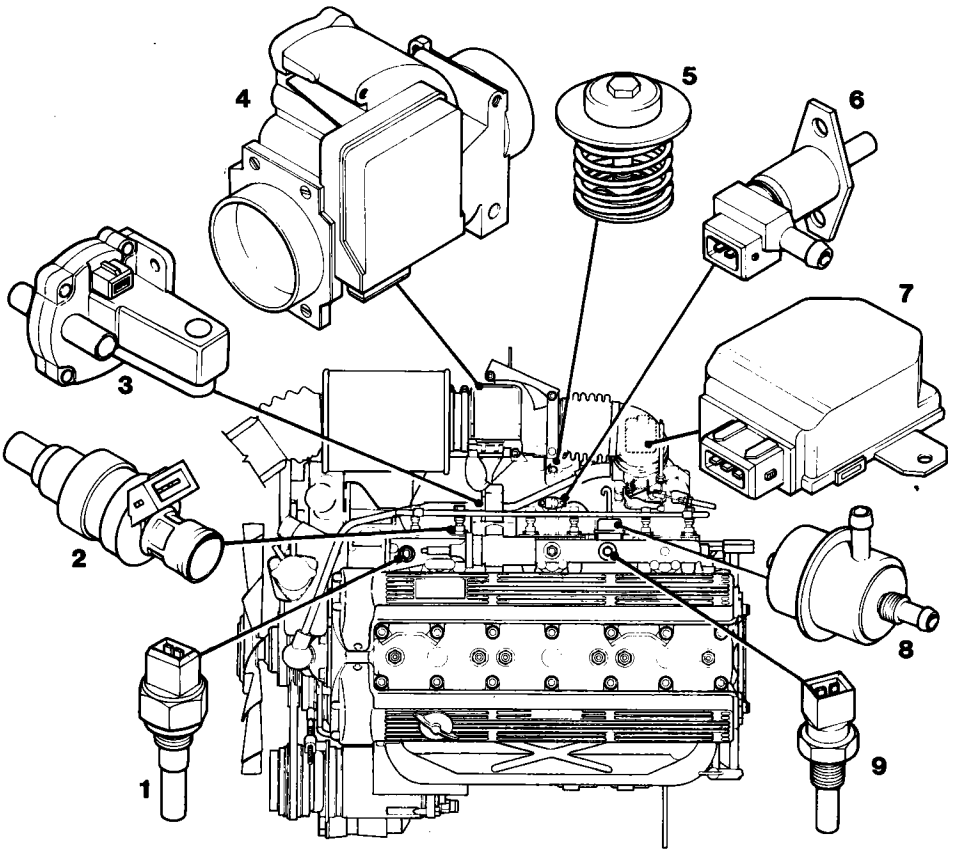


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Fig. 3

1. Thermotime switch
2. Fuel injectors
3. Auxiliary air valve
4. Air-flow meter
5. Over-run valve
6. Cold start injector
7. Throttle switch
8. Fuel pressure regulator
9. Water temperature sensor

Cranking enrichment

The E.C.U. provides an increased pulse duration during engine cranking in addition to any enrichment due to the coolant temperature sensor or the cold start injectors. The additional signal reduces slightly when cranking stops, but does not fall to normal level for a few seconds. This temporary enrichment sustains the engine during initial running.

Throttle switch (Federal)

The throttle switch mounted on the throttle spindle, signals the position of the throttle to the E.C.U.

In addition to a richer air/fuel mixture during cold starting and warm-up a slight additional amount of fuel is required during idle. The E.C.U. supplies this additional amount of fuel on European cars in response to the closed throttle contact on the throttle switch. This contact is fitted, but not used, on cars to the U.S.A. and certain other countries.

Fuel return valves are situated in the left-hand and right-hand rear wheel arches, in line with the rearmost edge of the tyres. Care must be taken when changing them as they are NOT interchangeable, side for side.

The left-hand valve has a fixing bracket spot-welded to it that prevents it being incorrectly fitted (it would contact the wheel). It has an arrow showing direction of fuel flow (towards the rear).

Vacuum full throttle switch (U.K. and European only)

A vacuum switch is fitted to the throttle cable mounting bracket wired into the full throttle enrichment circuit. This senses inlet manifold depression and switches the fuelling from the generally weak condition required for emission control or minimum fuel consumption to a richer condition necessary for maximum engine power. On cars fitted with an automatic gearbox there is an over-run fuel cut-off micro-switch mounted on one of the throttle body mounting bolts, which is mechanically operated by the throttle mechanism when the throttle is fully closed. The switch is controlled by a circuit incorporated in the E.C.U.

When the engine is over-running with the throttle in the closed position the fuel remains cut off until the engine speed falls to below 1400 rev/min.

The control unit circuit will not re-activate the fuel cut-off function until the engine speed exceeds 1470 rev/min.

Cold start

For cold starting, additional fuel is injected into the inlet manifold by the cold start injector. This is controlled by the cold start relay and Thermotime switch. The Thermotime switch senses coolant temperature, and depending on the temperature it senses, interrupts or completes the ground connection for the relay. When the starter is operated the cold start relay is energized with its circuit completed via the Thermotime switch. The Thermotime switch also limits the length of time for which the relay is energized, to a maximum of 12 seconds under conditions of extreme cold. This enrichment is in addition to that provided by the coolant temperature sensor.

If the coolant temperature is above 35°C the switch does not operate at all, no starting enrichment additional to cranking enrichment being required.

Fuel pressure regulator

The fuel pressure regulator operates to maintain a constant pressure drop across the injector nozzles. It is connected one side to a manifold depression and is operated by a spring-loaded diaphragm. Excess fuel is returned to the tank from which it was drawn via a solenoid-operated shut-off valve.

FAULT FINDING

It is assumed that the vehicle has sufficient fuel in the tanks, and that purely engine functions, e.g. ignition timing, valve timing, and the ignition as a whole are operating satisfactorily. If necessary, these functions must be checked before the fuel injection system is suspected.

Symptoms	
Will not start*	Difficult cold start
Difficult hot start	Starts but will not run
Misfires and cuts out	Runs rough
Idle speed too fast	Hunting at idle
Low power and top speed	High fuel consumption

* Before proceeding with checks, hold the throttle fully open and attempt a start. If the engine then starts and continues to run, no further action is necessary.

Possible causes in order of checking	
Battery:	Battery depleted, giving insufficient crank speed or inadequate spark. Check battery condition with hydrometer or by battery condition indicator on 'Freedom Battery'. Re-charge, clean and secure terminals, or renew as necessary.
Connections:	Ensure that all connector plugs are securely attached. Pull back rubber boot and ensure that plug is fully home. While replacing boot press cable towards socket. Ensure that Electronic Control Unit (E.C.U.) multi-pin connector is fully made. Ensure that all ground connections are clean and tight.
Ignition System:	Check ignition system as detailed in the Electrical Section.
Fuel System:	Open filler cap of fuel tank being used. Change tank being used. Check for fuel pipe failure (strong smell of fuel) and retention of in-line fuel pressure. Check inertia switch closed. If necessary, clear fuel tank vents or supply pipe.
Cold Start System:	Fault conditions could cause cold start system to be inoperative on a hot engine. If engine is either very hot, or cold, these particualr faults will cause the engine to run very rich. Check cold start system, see 19.22.32.
E.C.U.:	If the E.C.U. is faulty it is possible that injectors will be inoperative. The E.C.U. may also be responsible for any degree of incorrect fuelling. Before suspecting the E.C.U. for fuelling problems, however, all other likely components should be proved good.
Air Leaks:	Ensure that all hose and pipe connections are secure. Engine is, however, likely to start more easily with air leaks if cold, as air leaking augments that through the auxiliary air valve. A leak, or failed air valve is shown up, however, by a very high idle speed when engine is warm and air valve main passage should be closed.
Temperature Sensors:	If either sensor is short-circuited, starting improves with high engine temperature. Engine will run very weak, improving as temperature rises, but still significantly weak when fully hot. If a sensor is open-circuit, or disconnected, engine will run very rich, becoming worse as temperature rises. Engine may not run when fully hot, and will almost certainly not restart if stalled. Effect of air temperature sensor will be less marked than coolant temperature sensor.
Extra Air Distribution Block:	Check opening throttle. If engine immediately starts, unscrew idle speed adjustment, and re-check start with closed throttle. Re-set idle speed when engine hot. Check cold start. Check throttle return springs and linkage for sticking or maladjustment as a sticking throttle may have enforced incorrect idle speed adjustment on a previous occasion.
Throttle Switch:	Check operation of throttle switch. Incorrect function or sequence of switching will give this fault.
Throttle Butterfly:	Check adjustment of the throttle butterfly valve, ensure that return springs are correctly fitted, and throttle not sticking open.
Over-run Valve:	Check operation of over-run valve.
Compression:	Low compressions: a general lack of engine tune could cause this fault. Check engine timing, ignition timing, and function of ignition system complete. If necessary, check valve condition.
Idle Fuel Control Setting:	Check exhaust gas CO level. If necessary, adjust fuelling trim control in air metering unit. **CAUTION: This knob MUST NOT be moved unless correct test equipment and skilled personnel are in attendance to monitor changes made.**
Air Filters:	Remove air filter and check for choked filter element.
Throttle Linkage:	Check throttle linkage adjustment and ensure that throttle butterfly valve can be fully operated.

For further information relating to 'L' electronic fuel injection refer to the 'Lucas Epitest' operating instructions and test procedures.

MAINTENANCE

There is no routine maintenance procedure laid down for the electronic fuel injection system other than that, at all service intervals, the electrical connectors must be checked for security. The fuel filter must be discarded and a replacement component fitted at intervals specified in the Maintenance Summary.

CAUTION

The following instructions must be strictly observed:

Always disconnect the battery before removing any components.

Always depressurize the fuel system before disconnecting any fuel pipes.

When removing fuel system components always clamp fuel pipes approximately 38 mm (1.5 in) from the unit being removed. Do not overtighten clamp.

Ensure that material is available to absorb possible fuel spillage.

When reconnecting electrical components, always ensure that good contact is made by the connector before fitting the rubber cover. Always ensure that ground connections are made to clean bare metal, and are tightly fastened using correct screws and washers.

AIR CLEANER ELEMENT

The air cleaner element is of the paper type and is situated between the air intake trumpet and the air-flow meter.

Remove and refit **19.10.08**

To renew the element:

Slacken the clips (1, Fig. 4) securing the inlet and outlet hoses; slide the air cleaner assembly forward until the bracket is clear of the mounting spigots.

Release the spring clips securing front cover (2, Fig. 4) and the Nyloc nut (3, Fig. 4) securing the end-plate, withdraw the end-plate filter element and gasket (4, Fig. 4).

Remove dirt, grease, etc., from the air cleaner casing.

Do not overtighten the Nyloc nut when refitting.

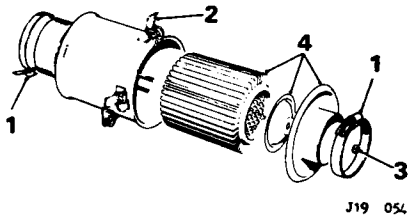


Fig. 4

THROTTLE PEDAL

Remove and refit **19.20.01**

Removing

Fold the carpet away from the base of the throttle pedal.

Remove the nuts and washers securing the base of the pedal to the mounting plate (1, Fig. 5).

Pull the base of the pedal away from the mounting plate and disengage the spring from the pedal (2, Fig. 5).

Examine the spring for wear, and renew if necessary (3, Fig. 5).

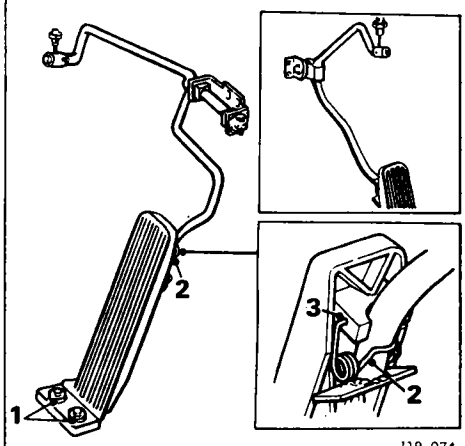


Fig. 5

Refitting

Engage the rod with the pedal. Position the spring on the pedal and push the base of the pedal to locate on the mounting studs, fit nuts and tighten.

THROTTLE SWITCH

U.K. and European Automatic Transmission

Check and adjust **19.22.37**

Check that the throttle butterflies are adjusted correctly with 0,05 mm (0.002 in) between valve and housing when closed. See 19.20.11 for full details.

To adjust throttle micro-switch, connect Continuity Tester across switch terminals (1, Fig. 6).

When throttle lever (2, Fig. 6) is held in direction of arrow by spring (3, Fig. 6) contacts are closed, bulb is on.

Pull lever against spring until spigot (4, Fig. 6) contacts the opposite side of slot (5, Fig. 6). Bulb is off.

Slacken screws (6, Fig. 6) to adjust micro-switch as required. Re-tighten screws.

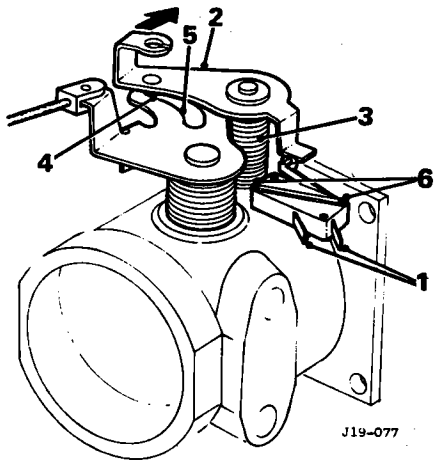


Fig. 6

THROTTLE LINKAGE

Check and adjust **19.20.05**

Checking

Ensure that the throttle return springs are correctly secured and that the throttle moves freely and rests against the closed stop when released.

Ensure that the throttle butterfly closed stop screw has not been moved. If it has, check and if necessary, adjust.

Adjusting

Slacken the locknuts at the outer throttle cable abutment (1, Fig. 7).

Adjust the position of the outer cable in abutment to place inner cable under light tension but NOT to move the throttle operating lever.

Tighten locknuts.

Re-check adjustment.

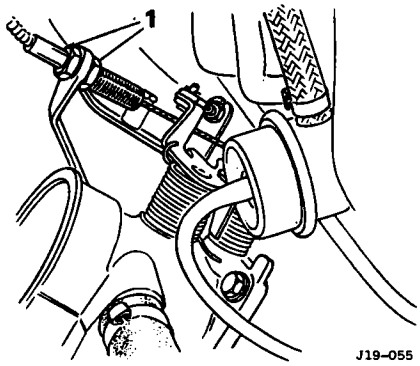


Fig. 7

THROTTLE CABLE

Remove and refit **19.20.06**

Removing

Disengage the throttle return spring from the throttle operating lever.
Slacken the locknuts at the outer throttle cable abutment and draw the cable clear.
Remove the 'C' clip securing the cable yoke clevis pin and detach inner cable from the operating lever: temporarily replace clevis pin.
Slacken the locknut on the top surface of footwell.
Remove the under-scuttle casing.
Remove the split pin at the top end of the operating rod (1, Fig. 8).
Disengage the sleeve and nipple from the rod (2, Fig. 8).
Remove the nut (3, Fig. 8) from the cable sheath and draw the cable assembly into the engine compartment. Recover the operating rod abutment plate.

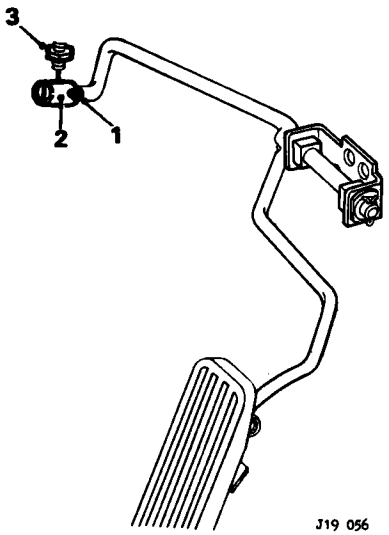


Fig. 8

Refitting

Examine the grommets for wear, and renew as necessary.
Reverse above procedure. Apply sealing compound around thread on top surface of footwell.

THROTTLE BUTTERFLY VALVE

Adjust **19.20.11**

Remove the elbow and convolute hose to expose the throttle body.
Slacken the throttle butterfly locknut and stop screw to ensure that the throttle butterfly valve closes fully.
Insert 0,05 mm (0.002 in) feeler gauge between top of valve and housing to hold valve open (Fig. 9).
Set the stop screw to just touch the stop arm and tighten locknut with the feeler in position.
Press the stop arm against the screw and withdraw the feeler.
Seal the threads of the adjusting screws and locknuts using a spot of paint.
Refit the elbow and convolute hose.
Check the throttle linkage adjustment, operation of the throttle switch and the kickdown switch adjustment.

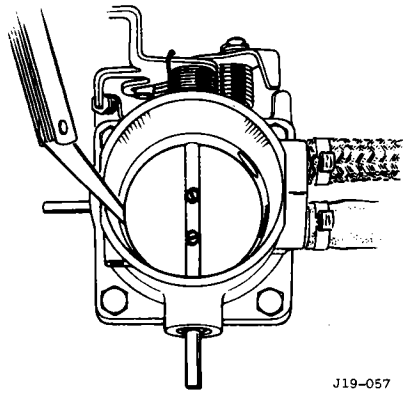


Fig. 9

AUXILIARY AIR VALVE

Description

The auxiliary air valve (Fig. 10) is mounted on the water outlet rail and is controlled by coolant temperature. The valve opens to pass additional air into the inlet manifold under cold start and cold idle conditions.

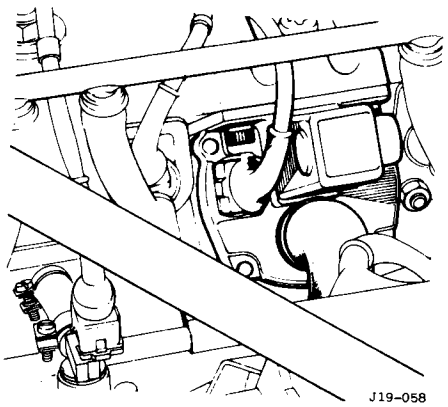


Fig. 10

Remove and refit **19.20.16**

Removing

NOTE: This procedure MUST ONLY be carried out on a cold or cool engine.

Disconnect the battery.
Carefully remove the pressure cap from the remote expansion tank to release any cooling system residual pressure. Replace the cap tightly.
Slacken the clips securing the air hoses to the auxiliary air valve. Pull the hoses clear.
Remove the two screws and washers securing the auxiliary air valve to coolant pipe and lift clear.
Clean all traces of gasket from the coolant pipe, taking care not to damage seating area.

Refitting

Refit the air valve by reversing the above procedure.
Coat the new gasket with suitable non-hardening sealing compound.
Check the coolant level at the remote header tank, and if necessary, top-up.

AUXILIARY AIR VALVE

Test **19.20.17**

Remove the electrical connector from the auxiliary air valve.
Connect a voltmeter across the terminals of the connector.
Crank the engine: battery voltage should be obtained. If there is no voltage there is a fault in the electrical system: check cables for loose connections or open circuit. When power is reaching the extra air valve, the heating coils resistance should be checked.
Connect an ohmmeter between the terminals of the air valve. A resistance of 33 ohms should be obtained. If there is no resistance the air valve should be replaced.
Remove the extra air valve mounting plate from the water rail.
Place the air valve in cold water, do not let water into the electrical terminals or into the by-pass channel. The blocking plate should fully expose the by-pass orifice.
Immerse the air valve mounting plate in hot water. The blocking plate should gradually close the by-pass orifice.

IDLE SPEED

Adjust **19.20.18**

Ensure that the engine is at normal operating temperature.
Check the throttle linkage for correct operation, and that return springs are secure and effective.
Start the engine and run for two to three minutes.
Set the idle speed adjustment screw on air distribution block to achieve 800 rev/min.

NOTE: If it proves impossible to reduce idle speed to specified level carry out the following:

Check ALL pipes and hoses to inlet manifold for security and condition.
Check security of injectors and cold start injectors.
Ensure that all joints and inlet manifold to cylinder head fastenings are tight.
Ensure that throttle butterfly is correctly adjusted.
Check operation of over-run valve.
If the above do not reduce the idle speed, check operation of auxiliary air valve.

OVER-RUN VALVE—Cars fitted with Emission Control

Description

An over-run valve is fitted beneath the air distributor block. The valve is calibrated to open and limit manifold depression under conditions

continued

of closed throttle over-run. This ensures that air is available to maintain a combustible air/fuel ratio under all conditions. Air bleeds into the inlet manifold at 564 mm/Hg 22.2 in/Hg depression.

Test **19.20.21**

Slacken the hose clip securing the over-run valve air feed hose to the throttle body and block the hose.
Start the engine; idle speed should remain correct.
If the idle speed is not correct, renew the over-run valve.

Remove and refit **19.20.22**

Disconnect the battery.
Remove the air-flow meter.
Slacken the securing clip and disconnect the auxiliary air hose from the air distribution block (1, Fig. 11).
Slacken the clip securing the hose from the throttle butterfly housing.
Remove the three screws securing the air distribution block to the inlet manifold.
Lift the air distribution block from the inlet manifold and disconnect the air hose.
Withdraw the over-run valve (2, Fig. 11).
Reverse the above procedure to refit.

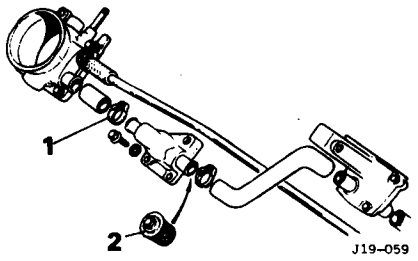


Fig. 11

FUEL CUT-OFF INERTIA SWITCH

Remove and refit **19.22.09**

Removing

Disconnect the battery.
Unclip the switch cover at passenger side of fascia.
Disconnect cables from switch and switch from spring clips.

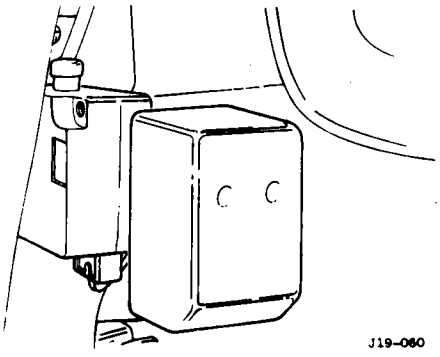


Fig. 12

Refitting

Press switch into spring clips with the ribs towards rear of car and terminals at bottom. Ensuring that the switch is raised in clips to abut on top lip of bracket.
Connect cables and press in plunger at top of switch.
Fit cover and re-connect battery.

OXYGEN SENSOR

Description

The oxygen sensor is located in the exhaust down-pipe. The sensor monitors the oxygen content in the exhaust and sends a proportional signal to the E.C.U., thus maintaining close air/fuel ratio control under all operating conditions.

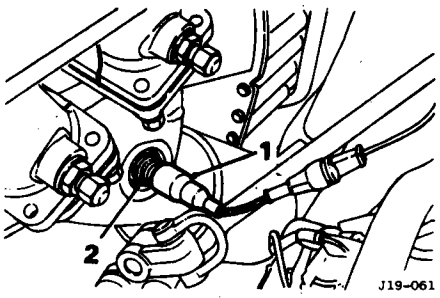


Fig. 13

Remove and refit **19.22.16**

Disconnect the battery.
Disconnect the electrical connector on the oxygen sensor and remove (1, Fig. 13).
Clean the sensor sealing face (2, Fig. 13) and fit new oxygen sensor.
Reset the Service Interval Counter.

COOLANT TEMPERATURE SENSOR

Description

The coolant temperature sensor (Fig. 14) is located at the rear of the water rail.
The sensor comprises a temperature-sensitive resistor with a negative temperature coefficient, that is, the electrical resistance decreases with increasing temperature. The sensor provides the E.C.U. with a coolant temperature parameter that controls the injector signal pulse with respect to engine temperature. Practically, the sensor establishes a rich level of fuelling at low temperature, and a weaker level at high temperature. In conjunction with the auxiliary air valve the coolant temperature sensor forms an equivalent to a carburetter automatic choke.

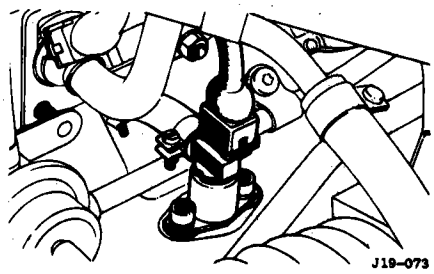


Fig. 14

Remove and refit **19.22.18**

NOTE: This procedure MUST ONLY be carried out on a cold or cool engine.

Disconnect the battery and the connector from the coolant temperature sensor.
Carefully remove the pressure cap from the remote header tank to release any cooling system residual pressure. Replace the cap tightly.
Ensure that the sealing washer is located on a replacement temperature sensor and coat the threads with suitable sealing compound, then remove the temperature sensor from the water rail and screw the replacement temperature sensor into position.
Refit the electrical connector, re-connect the battery and check the coolant level at the remote header tank. If necessary, top-up.

Test **19.22.19**

Disconnect the battery.
Disconnect the cable from the temperature sensor.
Connect a suitable ohmmeter between the terminals; note the resistance reading. The reading is subject to change according to temperature and should closely approximate to the relevant resistance value given in the table.
Disconnect the ohmmeter.
Check the resistance between each terminal in turn and the body of the sensor. A very high resistance reading (open circuit) must be obtained.
Re-connect cable to sensor and re-connect the battery.

Coolant Temperature (°C)	Resistance (kilohms)
−10	9.2
0	5.9
+20	2.5
+40	1.18
+60	0.60
+80	0.325

THERMOTIME SWITCH

Description

The Thermotime switch (Fig. 15) is located at the front of the water rail. The switch comprises a bi-metallic contact opened and closed by coolant temperature and, in addition, auto-excited by a heating element. The switch controls the cold start injector through the cold

start relay and is energized by operation of the starter motor. While the start system is in operation a voltage is applied to the bi-metallic switch contact heating element which then tends to open the contact and isolate the relay and injector. The time that this takes depends upon the initial temperature of the bi-metallic element and can be up to eight seconds under conditions of extreme cold. When the engine is warm, or at normal operating temperature, there will be no fuel supplied by the cold start injector.

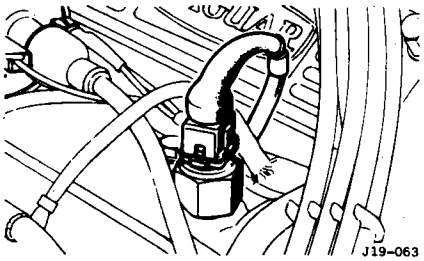

J19-063

Fig. 15

Remove and refit 19.22.20

NOTE: This procedure MUST ONLY be carried out on a cool or cold engine.

Disconnect the battery and the connector from the Thermotime switch.
Carefully remove the pressure cap from the remote header tank to release any cooling system residual pressure. Replace the cap tightly.
Ensure that a new sealing washer is located on replacement Thermotime switch and coat the threads with a suitable sealing compound.
Remove the Thermotime switch from the front of the water rail.
Screw replacement Thermotime switch in position.
Refit electrical connector and re-connect battery.
Check coolant level at remote header tank, and top-up if necessary.

Test 19.22.21

Equipment required: Stop watch, ohmmeter, single-pole switch, jump lead for connecting switch to battery and Thermotime switch, and a thermometer.

NOTE: Check coolant temperature with thermometer and note reading before carrying out procedures detailed below. Check rated value of Thermotime switch (stamped on body flat). The test must be carried out with coolant temperature below the operating temperature to ensure correct operation of the switch.

Disconnect the battery earth lead and the electrical connector from the Thermotime switch.
Connect ohmmeter between terminal 'W' and earth. A very low resistance reading (closed circuit) should be obtained.
Connect 12V supply via isolating switch to terminal 'G' of Thermotime switch.
Using stop watch, check time delay between making isolating switch and indication on ohmmeter changing from low to high resistance. Delay must closely approximate to time stated below.
Renew Thermotime switch if necessary and re-connect the battery.

Coolant Temperature	Delay
−20°C	8 seconds
0°C	4½ seconds
+10°C	3½ seconds
+35°C	0 seconds

AIR TEMPERATURE SENSOR

Description

The air temperature sensor is an integral part of the air-flow meter. The sensor provides information to the E.C.U. relating to the ambient air density and temperature thus maintaining an optimum fuel/air ratio.

Test 19.22.23

Disconnect the battery and remove the multi-pin electrical connector from the air-flow meter.
Connect a suitable ohmmeter between terminals 6 and 27 of the air-flow meter.

Ambient Air Temperature (°C)	Resistance (kilohms)
−10	9.2
0	5.0
+20	2.5
+40	1.18
+60	0.60

Note the resistance reading. The reading is subject to change according to the temperature and should closely approximate to the relevant resistance value given in the table above.
Disconnect the ohmmeter.
Re-connect the multi-pin connector and battery.

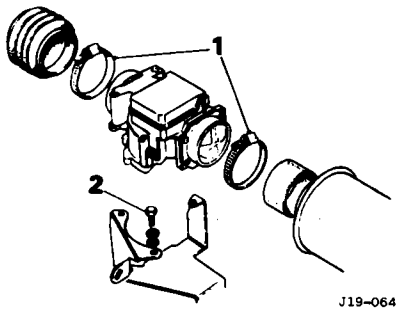
AIR-FLOW METER

Description

The air-flow meter is located between the air cleaner and the inlet manifold mounted throttle butterfly. The flap in the air-flow meter is opened when the air is drawn into the engine. The E.C.U. uses the flap angle to compute fuel requirements.

Remove and refit 19.22.25

Disconnect the battery.
Slacken the two clips which secure the air-intake hoses on each side of the air-flow meter (1, Fig. 16).
Disconnect the electrical connector from the air-flow meter.
Remove the three screws which secure the air-flow meter to its mounting bracket (2, Fig. 16), remove the air-flow meter and withdraw the air-intake hoses.
After refitting reset idle mixture screw using correct equipment.



J19-064

Fig. 16

COLD START SYSTEM

Test 12.22.32

WARNING: This test results in fuel vapour being present in the engine compartment. It is therefore imperative that all due precautions are taken against fire and explosion.

NOTE: The ambient temperature and the engine temperature must be below 35°C in order for the system to work and be testable.

Remove the electrical connector from the cold start injector.
Connect a voltmeter across the terminals of the connector.
Crank the engine: battery voltage should be obtained.
Remove the setscrew and washer securing the cold start injector to the inlet manifold. Remove the cold start injector.
Arrange a container to collect sprayed fuel, and refit the connector.
Check for fuel leaking past the nozzle.
Crank the engine. The cold start injector should spray fuel out for a few seconds until the Thermotime switch switches off the injector. When the engine is warm the injector should not spray fuel during engine cranking.

ELECTRONIC CONTROL UNIT (E.C.U.)

Description

The E.C.U. is mounted in the luggage compartment against the front bulkhead (Fig. 17). The E.C.U. receives all electrical input signals from the various sensors. This information is used to determine the correct period of time for which the injectors are held open in each engine cycle.

continued

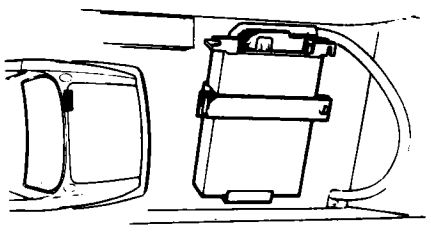

J19-065

Fig. 17

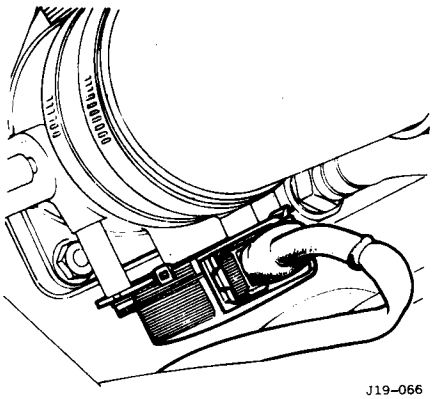
Remove and refit **19.22.34**

Disconnect the battery.
At the forward end of the luggage compartment, remove the E.C.U. cover.
Remove the retainer band and cable clamp clip.
Unclip the end cover.
Locate handle on the harness plug and withdraw the plug, lift out the unit.

THROTTLE SWITCH (FEDERAL CARS)

Description

The throttle switch (Fig. 18) is located on the end of the throttle spindle. The switch closes when the throttle nears the wide-open position and provides information to the E.C.U. of fuel quantity required by the injector for maximum power output at full throttle.



J19-066

Fig. 18

Remove and refit **19.22.36**

Disconnect the battery.
Pull the electrical connector from the throttle switch.
Remove the two screws, plain and shakeproof washers securing the throttle switch and lift the switch from the spindle. Collect spacers.
Refit by reversing the above procedure.

Test **19.22.37**

NOTE: Before commencing the following tests ensure that the throttle butterfly valve and throttle linkage are correctly adjusted.

Disconnect the battery.
Remove the electrical connector from the throttle switch.
Connect a powered test lamp between terminals 3 and 18 of the throttle switch.
Open the throttle; the bulb should light up when the throttle nears the wide open position.
If the bulb does not light, replace the throttle switch.
Refit the electrical connector to the switch.
Re-connect the battery.

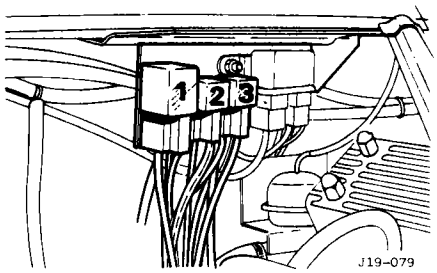
THROTTLE SWITCH (U.K. and EUROPE)—Manual Gearbox only

A micro-switch actuated by the throttle is fitted to U.K. and European cars. This switch replaces the Federal switch. A full load vacuum switch is also fitted all European cars.

MAIN RELAY/PUMP RELAY/ DIODE UNIT

Description

Three relays, main relay cold start (2, Fig. 19), pump relay (3, Fig. 19), diode unit (1, Fig. 19) are mounted on the engine rear bulkhead next to the vehicle battery. When the ignition key is turned, the main relay is activated, connecting the battery circuit to the ballast resistors and the injectors. The relay also allows current to flow to the E.C.U. and the pump switch on the air-flow meter.
When the engine is cranked for starting, the diode unit is activated and thus energizes the auxiliary air valve, the cold start system and the fuel pump.



J19-079

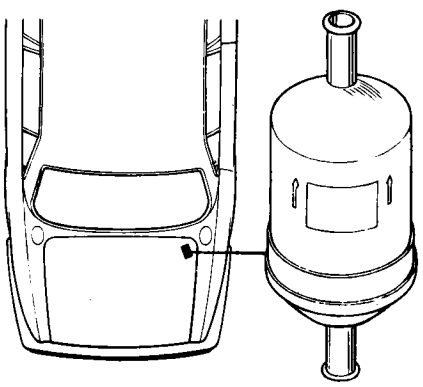
Fig. 19

FUEL LINE FILTER

Remove and refit **19.25.01**

WARNING: The spilling of fuel is unavoidable during this operation. It is therefore imperative that all due precautions are taken against fire and explosion.

The fuel filter (Fig. 20) is located in the luggage compartment mounted on the right-hand side under the floor.



J19-067

Fig. 20

NOTE: Early Series III cars were built with the fuel filter mounted in the engine compartment on the R.H. valance under the air cleaner.

Disconnect the battery and remove the luggage compartment floor.
Remove the bolt securing the filter and draw the filter clear of the clamp.
Clamp the inlet and outlet pipes.
Slacken the pipe clips on either side of the filter and remove the filter unit.
Fit a new filter, observing the direction of flow denoted by arrows on the filter.
After fitting a new filter check for leakproof joints by running the engine before fitting the luggage compartment floor.

FUEL TANK CHANGE-OVER VALVE

Description

The change-over valve is located in the luggage compartment adjacent to the fuel pump. When energized by the change-over switch, the valve opens the outlet pipe from the right-hand fuel tank. When de-energized, the valve opens the outlet pipe from the left-hand fuel tank.

Remove and refit **19.40.31**

Disconnect the battery.
Remove the spare wheel.
Clamp the inlet and outlet pipes, release the pipe clips and pull the pipes from the change-over valve.
Disconnect the cable to the valve.
Remove the valve by unscrewing the clamp securing screws.

Refitting

When refitting ensure that the ground lead is secured by one foot of securing clamp.

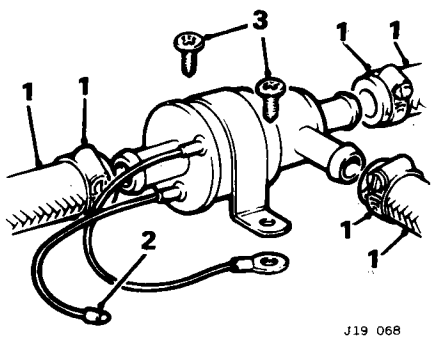


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Fig. 21

FUEL TANK CHANGE-OVER VALVE

Test **19.40.32**

Depressurize the fuel system and disconnect the battery.
Remove the spare wheel.
Clamp the inlet and outlet pipes, release the pipe clips and pull the pipes from the change-over valve.
Disconnect the cable to the valve.
Push a suitable length of rubber pipe on the centre inlet port of the valve.
Blow through the rubber pipe. Air should flow from the outlet union through the body of the solenoid.
Apply 12V d.c. to the valve cable.
Blow through the rubber pipe. Air should flow from the outlet union towards the opposite side.
If the results are satisfactory, reverse the above procedure.
If the results are not satisfactory, fit new valve.

FUEL COOLER

Remove and refit **19.40.40**

Removing

WARNING: Refrigerant gas can cause blindness. It is therefore essential to depressurize the air conditioning system prior to disconnecting refrigerant hose to fuel cooler. See Air Conditioning System.

Depressurize the fuel and air conditioning systems.
Disconnect refrigerant inlet and outlet hoses (1, Fig. 22). Plug hoses.
Clamp the fuel hoses and disconnect (2, Fig. 22).
Remove setscrews, washers and Spire nuts securing the fuel cooler to the compressor (3, Fig. 22).

Refitting

Test systems after refitting.

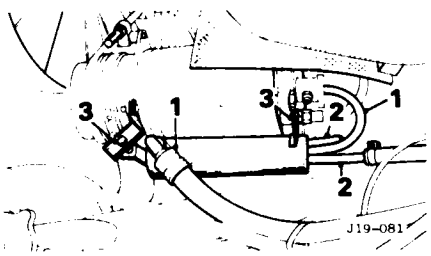

Fig. 22

FUEL RETURN VALVES

Remove and refit **19.40.44**

Removing

Depressurize the fuel system.
Place the vehicle on stands and remove the rear wheel(s).
Remove the valve cover (1, Fig. 23).
Remove screws securing valve to body (2, Fig. 23).
Fit hose clamps both sides of the valve and slacken the hose to valve clips (3, Fig. 23).
Disconnect the solenoid cables from the valve and remove valve (4, Fig. 23).

Refitting

Reverse the above procedure, ensuring tight connections. Check for fuel leaks.

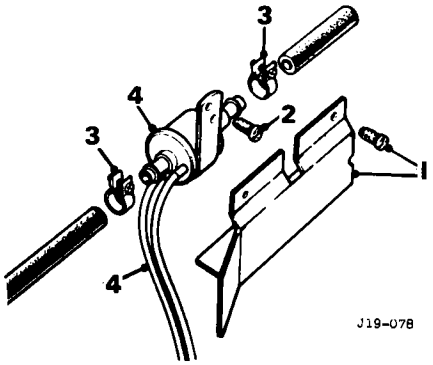

Fig. 23

FUEL PUMP

Description

The fuel pump is located beneath the luggage compartment floor. It is flexibly mounted and secured using noise- and shock-absorbing material. The pump is a roller-type machine delivering a continuous flow of fuel under pressure.

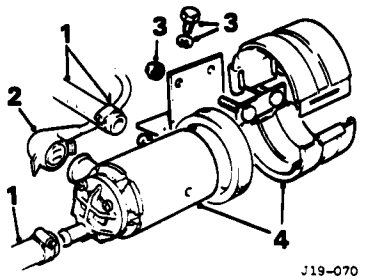

Fig. 24

Remove and refit **19.45.08**

Disconnect the battery
Remove the spare wheel.
Clamp the inlet and outlet pipes, release the clips and pull the pipes from the pump unions (1, Fig. 24).
Remove the electrical connector (2, Fig. 24).
Remove the screws securing the pump mounting bracket (3, Fig 24).
Remove securing nuts from clamp and withdraw the pump (4, Fig. 24).
Reverse above procedure to refit, locating the earth wire on bright metal beneath one securing screw.

FUEL PRESSURE REGULATOR

Description

The fuel pressure regulator is mounted on the inlet manifold and is connected to the fuel rail on one side and inlet manifold depression on the other (Fig. 25). The regulator maintains the correct fuel pressure in the fuel rail.

Remove and refit **19.45.11**

Depressurize the fuel system and disconnect the battery.
Remove two setscrews and washers (1, Fig. 25) securing the pressure regulator mounting bracket and carefully pull regulator and brackets upwards. Note orientation of regulator in bracket.

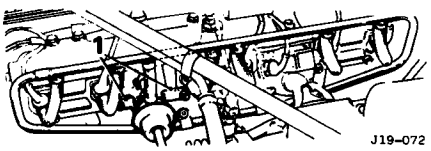

Fig. 25

Clamp inlet and outlet pipes of regulator, release the clips and pull the pipes from the regulator unions.
Remove the nut and washer and release the regulator from the bracket.
When refitting, locate the regulator in the bracket orientated as noted; ensuring that pipes are not kinked or twisted.

Check **19.45.12**

Depressurize the fuel system:
Slacken the pipe clip securing the cold start injector supply pipe to the fuel rail and pull the pipe from the rail.
Connect the pressure gauge pipe to the fuel rail and tighten the pipe clip.

CAUTION: The pressure gauge must be checked against an approved standard at regular intervals.

Pull the '−ve' L.T. lead from the ignition coil and switch ignition on.
Check reading on pressure gauge: reading must be 2,55 ± 0,05 kgf/cm² (36.25 ± 0.725 lbf/in²).

NOTE: The pressure reading may drop slowly through either the regulator valve seating or the pump non-return valve. A slow, steady drop is permissible; a rapid fall MUST be investigated.

Operate fuel change-over switch on centre instrument panel.
Re-check the pressure gauge reading.

NOTE: If satisfactory results have been obtained, depressurize the fuel system. Disconnect the pressure gauge. If satisfactory results have not been obtained replace the regulator with a new unit.

FUEL SYSTEM

Depressurize 19.50.02

CAUTION: The fuel system MUST always be depressurized before disconnecting any fuel system component.

Remove the fuel pump relay socket.
Switch on and crank the engine for a few seconds.
Switch the ignition off and re-connect the pump relay socket.

INJECTORS

Description

The six injectors are mounted on the induction ram pipes so that the fuel jet is directed onto the back of each inlet valve. The injectors are solenoid-operated valves which are controlled by the E.C.U.

Remove and refit 19.60.01

Depressurize the fuel system, and then disconnect the battery.
Clamp the fuel inlet pipe adjacent to the fuel rail.
Pull the electrical connector from the injector(s) to be removed.
Remove the two setscrews securing the fuel rail to the inlet manifold.
Release the clips securing the supply rail to the return rail.
Pull the manifold pressure pipe from the inlet manifold.
Remove the six nuts and spring washers securing the injector clamps to the induction ram pipes.
Carefully lift the fuel rail complete with injectors sufficient for injectors to clear the induction ram pipes. Ensure that adequate material is to hand to absorb spilled fuel.
Suitably plug or cover the injector holes in ram pipes to prevent ingress of dirt or foreign matter.
Slacken the pipe clip(s) of injector(s) to be removed.
Note position of electrical sockets and pull injector(s) from fuel rail.
Remove two rubber sealing 'O' rings from ALL injectors.
When refitting the injectors the sealing rings MUST be renewed.

INJECTORS — SET

Injector winding check 19.60.02

Use an ohmmeter to measure the resistance value of each injector winding, which should be 2.4 ohms at 20°C (68°F).
Check for short-circuit to earth on winding by connecting ohmmeter probes between either injector terminal and injector body. Meter should read ∞ (infinity).
If any injector winding is open-circuited or short-circuited, replace the injector.

FUEL RAIL

Remove and refit 19.60.04

Depressurize the fuel system and disconnect the battery.
Pull the manifold pressure pipe from the inlet manifold.
Clamp the fuel pipe adjacent to the supply fuel rail.
Release the clips securing the return fuel rail to the supply rail and the return fuel rail to the regulator outlet hoses and fuel return pipe. Pull the hoses from the rail.
Release the clips securing the supply fuel rail to main fuel rail, cold start injector and regulator inlet hoses. Pull the hoses from the supply rail.
Remove supply and return fuel rails.
Pull electrical connectors from injectors and cold start injector.
Remove the six nuts and spring washers securing the injector clamps to the induction ram pipe.
Carefully lift the fuel rail complete with injectors from the induction ram pipes. Ensure that adequate material is to hand to absorb spilled fuel.
Suitably plug or cover the injector holes in the ram pipes to prevent the ingress of dirt or foreign matter.
Slacken the clips securing the injectors to the fuel rail stubs, pull the injectors from fuel rail.

NOTE: If necessary, transfer clips and insulation to replacement fuel rail.

When refitting fit new 'O' rings to each injector and test for leaks.

COLD START INJECTOR

Description

A cold start injector (Fig. 26) is mounted in the inlet manifold, aligned to spray a finely atomized mist of fuel towards the throttle butterfly valve. The injector is controlled by the cold start relay and the Thermotime switch and is only operative during the first few seconds of a cold engine starting cycle.

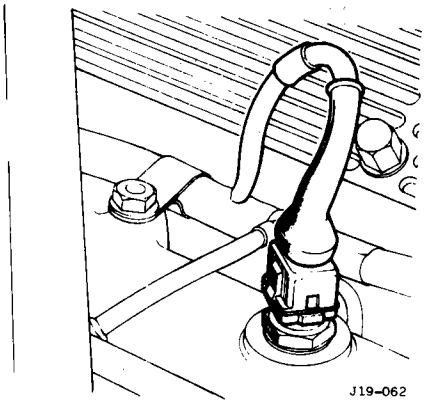

Fig. 26

Remove and refit 19.60.06

Depressurize the fuel system and disconnect the battery.
Pull the electrical connector from the injecto
Fit clamp on the supply pipe to the injecto slacken the clips and pull pipe from the injector
Remove the two setscrews securing the injector to the inlet manifold.
Check the condition of the gasket, and renew as necessary.
To test the system see operation 19.22.32, 'Cold start system — test'.

CONTENTS

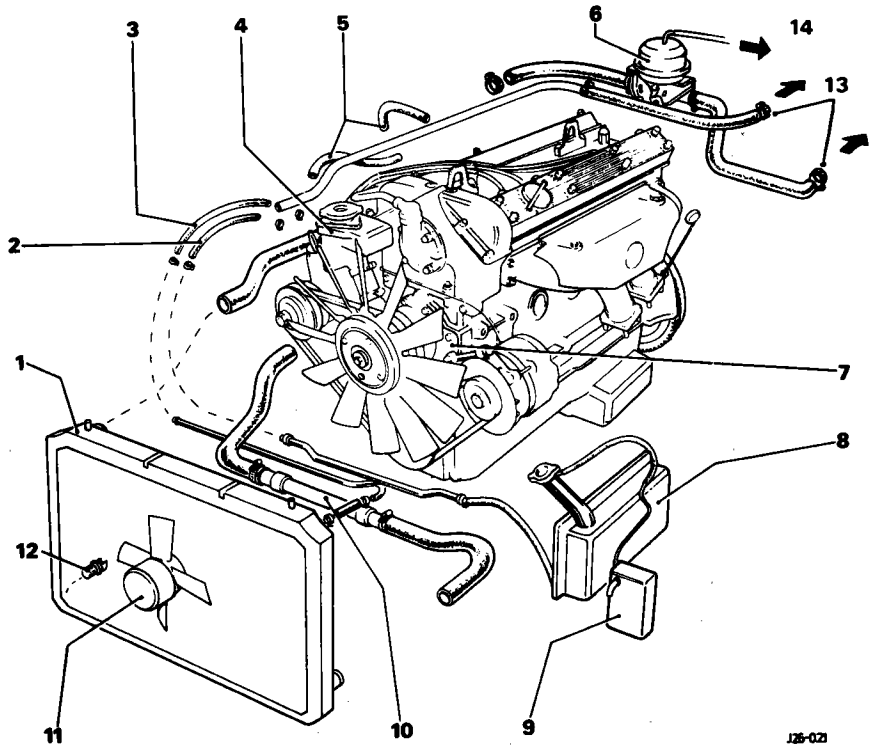

Fig. 1

1. Radiator matrix
2. Radiator vent. pipe
3. Expansion pipe
4. Header tank (Thermostat housing)
5. Fuel injection throttle housing heater pipe
6. Water control valve.
7. Water pump
8. Remote header tank
9. Atmospheric tank
10. Transmission oil cooler
11. Single or twin fan
12. Fan thermostat
13. To heater matrix
14. To vaccum control

COOLING SYSTEM

Description 26.00.00

The cooling system consists of a radiator matrix, A; a water pump, B—belt driven by the engine crankshaft; a header tank, C, and a remote header or expansion tank, D; a thermostatic valve located in the header tank is fitted to ensure a rapid warm-up from cold.

Air-conditioned cars are fitted with either single or twin electric fans, E, mounted in front of the condenser and radiator, in addition to the engine-driven fan. The electric fans are thermostatically controlled and it is possible, in very hot conditions, for them to continue to operate after the engine has been switched off. They will switch off automatically when the coolant temperature drops to 92°C. Under cold start condition coolant is forced by the water pump through the cylinder block, cylinder head, and the induction manifold to the thermostatic valve housing, C. The valve is closed and the coolant is therefore returned via a by-pass drilling, to the water pump suction inlet.

The heater matrix, K, is purged during this period by opening the heater control valve, L, at the matrix inlet and allowing pump suction to remove trapped air. The radiator has a vent pipe, M, through which, during the initial cold filling, the radiator is vented. When engine temperature rises to a predetermined level the thermostatic valve opens and allows hot coolant to flow into the top of the radiator. Full pump suction then draws coolant from the base of the radiator and starts the full cooling circuit; coolant expansion due to the rise in temperature is accommodated by the expansion tank, D, via expansion pipe, N.

Cars fitted with automatic transmission have a cooling tube, O, included in the centre section of the radiator bottom hose.

We use and recommend BP Type H21 or Union Carbide UT184 or Unipart Universal anti-freeze which should be used at the specified concentration whenever the cooling system is refilled. For topping-up purposes, only reputable brands of anti-freeze, formulated and approved for 'mixed metal' engines be used.

IMPORTANT NOTE: The concentration of anti-freeze must not be allowed to fall below the recommended strength as sediment may be formed in the cooling system by certain types of anti-freeze at low concentrates.

A 40% solution by volume in the United Kingdom (55%, U.S.A./Canada and all other countries) must be used at all times, either by topping-up or replenishing the cooling system. For maximum corrosion protection, the concentration should never be allowed to fall below 25%. Always top-up with recommended strength of anti-freeze, NEVER WITH WATER ONLY.

In countries where it is unnecessary to use anti-freeze, Marston SQ 35 Corrosion Inhibitor must be used in the cooling system in the proportion of 1 part SQ 36 to 24 parts water. CHANGE COOLANT EVERY TWO YEARS. The system should be drained, flushed and refilled with fresh anti-freeze (or Corrosion Inhibitor), mixed with 1 satchet of 'Barrs Leaks'.

An alternative coolant known as CARBUROL FORLIFE is recommended where temperatures below 10°C (14°F) are not encountered. Before Carburol Forlife is used, the coolant already present in the system must be drained out and the system flushed before filling with Carburol Forlife. Once in use the system should be topped-up with Carburol Forlife only, and a label giving this information should be affixed in an appropriate and prominent position.

TORQUE WRENCH SETTINGS

NOTE: Set the torque wrench to the mean of the figures quoted unless otherwise specified.

ITEM	DESCRIPTION	TIGHTENING TORQUE		
		Nm	kgf m	lbf ft
Radiator to front cross-member	3/8 in U.N.F. nut	29,8 to 35,2	3,05 to 3,59	22 to 26
Retainer to radiator cross-member	5/16 in U.N.F. nut	19 to 24,4	1,94 to 2,48	14 to 18
Fan cowl upper bracket to body	1/4 in U.N.F. nut	8,1 to 9,5	0,83 to 0,96	6 to7
Expansion tank to valance	5/16 in U.N.F. nut	10,8 to 13,6	1,10 to 1,38	8 to 10
Engine oil cooler pipes	1 1/16 in U.N.S. nut	54,3 to 61	5,53 to 6,22	40 to 45
Deflector and bracket to cowl	1/4 in U.N.F. bolt	8,1 to 9,5	0,83 to 0,96	6 to 7
Lower bracket to cowl	1/4 in U.N.F. nut	6,1 to 7,5	0,62 to 0,76	4.5 to 5.5
Lower cowl bracket to body	1/4 in U.N.F. bolt	8,1 to 9,5	0,83 to 0,96	6 to 7

COOLANT

Drain and refill **26.10.01**

Draining

With the engine cold, remove the pressure cap at the expansion tank and the sealing cap at the engine header tank. Check the condition of the seals on the pressure caps, renew seals or caps.

Remove the radiator drain plug, and drain the radiator.

Remove the engine block drain plug, and drain the engine block.

Insert a water hose in the remote header tank, and regulate the flow so that the tank remains full with a minimum of overflow. Start the engine and run it at fast idle (about 1000 rev/min) until the water from the drain holes becomes clear. Stop the engine, turn off the tap and allow the system to empty.

Refilling

Refit the radiator and engine drain plugs.

Set the heater control to 'DEF' ('HIGH' non-air conditioned cars only).

Slowly pour the recommended coolant mixture into the engine header tank.

When the header tank is completely full with coolant refit the sealing cap.

Start and run engine at fast idle (1 000 rev/min) for approximately five minutes.

Switch off the engine, carefully remove the pressure cap from expansion tank, and if necessary add coolant to bring level to the base of filler neck. Refit the cap.

NOTE: It is not important if coolant is above this level as excess liquid will be ejected through the vent pipe.

When the engine is cold, remove the header tank cap to check that it is full. If not top it up and run the engine for another five minutes and check the coolant level in the header tank again, after the engine has cooled. If the tank is not full a leak has developed in the system which must be traced and rectified.

TOPPING-UP AND CHECKING COOLANT LEVEL

NOTE: This procedure must only be carried out when the engine is cold.

Remove the pressure cap from expansion tank, and if coolant is below the base of filler neck add specified coolant mixture to correct level. Refit the pressure cap.

EXPANSION TANK

Remove and refit **26.15.01**

Removing

Remove the pressure cap and sealing cap.

Remove windscreen washer reservoir and the bracket rear upper securing screw.

Disconnect the expansion pipe from the bottom of the expansion tank and the overflow pipe from the filler neck.

Remove expansion tank securing nut and bolt, carefully displace windscreen reservoir bracket, and lift the tank clear.

Refitting

Carefully displace the windscreen washer reservoir and locate the expansion tank to the inner wing.

Fit and tighten nut and bolt to secure.

Refit the expansion pipe to the bottom of expansion tank and the overflow pipe to the filler neck.

Fit and tighten the windscreen washer reservoir bracket securing screws.

Refit the washer reservoir.

Top-up cooling system.

Refit pressure cap and sealing cap.

FAN/STEERING PUMP BELT TENSION

Check and adjust **26.20.01**

Slacken the power steering pump adjuster link trunnion bolt (1, Fig. 2).
Slacken adjuster link eye-bolt (2, Fig. 2) at power-assisted steering pump and pump pivot bolt (3, Fig. 2).
Slacken the adjuster link locknut (4, Fig. 2).

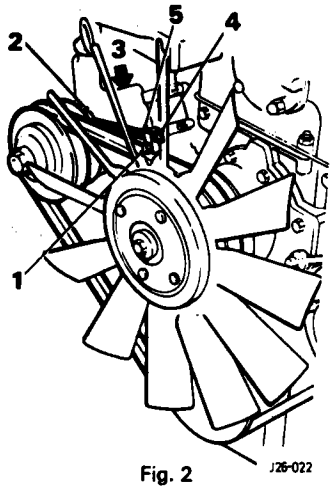

Fig. 2

Tighten the adjuster nut (5, Fig. 2), and check the tension. Deflecting force 2,9 kgf (6.4 lbf). Deflection longest run 4,3 mm (0.17 in).
Tighten the locknut.
Tighten the adjuster link trunnion bolt.
Tighten adjuster link eye-bolt and tighten pump pivot bolt nut.

FAN/STEERING PUMP BELT

Remove and refit **26.20.07**

Removing

Slacken the power steering pump adjuster link trunnion bolt (1, Fig. 2).
Slacken adjuster link eye-bolt (2, Fig. 2) at the power-assisted steering pump.
Slacken the pump pivot bolt nut (3, Fig. 2).
Slacken the adjuster link locknut (4, Fig. 2) and press the pump towards the engine.
Remove the belt.

Refitting

Manoeuvre the belt over the fan blades and pulleys.
Tighten the adjuster nut (5, Fig. 2).
Check the belt tension. Deflecting force 2,9 kgf (6.4 lbf). Deflection on longest run 4,3 mm (0.17 in).
Tighten the locknut, adjuster link trunnion bolt, adjuster link eye-bolt and pump pivot bolt nut.

FAN AND TORQUATROL UNIT

Remove and refit **26.25.19**

Removing

Remove the top fan cowl from the top rail and from the main cowl.
Restrain pulley with a suitable spanner, and remove the Torquatrol securing bolt (1, Fig. 3).

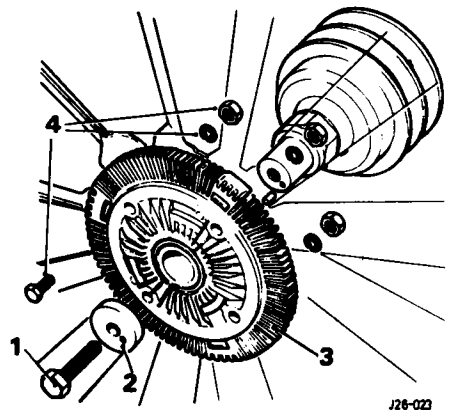

Fig. 3

Remove the pegged washer (2, Fig. 3).
Gently tap Torquatrol unit (3, Fig. 3) forward from pulley spigot and lift unit from car.
Remove nuts and bolts (4, Fig. 3) securing fan assembly.
Remove fan assembly.

Refitting

Locate fan to Torquatrol unit, secure with the nuts and bolts, lightly grease the spigot and offer Torquatrol unit on to pulley.
Secure the Torquatrol unit using the pegged washer and centre bolt.

NOTE: Ensure that the washer locates on pin in pulley spigot before tightening bolt.

Sit the top cowl to the main cowl assembly, and secure to top rail.

FAN MOTOR

Remove and refit **26.25.22**

Removing

Remove the radiator lower grille, and unclip the harness from the fan motor mounting cross-beam.
Disconnect the fan motor harness at the block connector.
Remove the cross-beam to body securing bolts, spacers and washers.
Remove the fan motor mounting frame to cross-beam securing nuts and bolts.
Displace the motor for access and remove the mounting frame to cross-beam spacing washers.
Remove the cross-beam and the fan assembly.
Remove the fan blades.
Remove the fan motor securing nuts and bolts.
Remove the fan motor and fan motor mounting rubbers.

Refitting

Fit fan motor and fan mounting rubber to frame, secure with fixing nuts and screws.
Fit and align the fan blades; secure with circlip.
Fit the fan motor assembly to vehicle.
Fit and align the mounting cross-beam.
Fit the spacers and washers to body, fit but do not tighten the cross-beam to body securing bolts.
Fit mounting rubber to cross-beam washers.
Align the mounting frame to cross-beam.
Secure with the fixing nuts and bolts.
Connect the fan motor harness block connector, and clip the harness to the cross-beam.
Tighten the cross-beam securing bolts.
Refit the radiator grille.

FAN MOTOR RELAY

Remove and refit **26.25.31**

Removing

Remove the screw securing the relay cover to the wing valance and remove the cover.
Note and disconnect the cables from the relay.
Remove the relay.

Refitting

Identify and re-connect the cables to the relay.
Refit the relay to its mounting position.
Refit the relay cover.
Fit and tighten screw to secure.

THERMOSTATIC SWITCH

Remove and refit **26.25.35**

Removing

Drain the radiator, see operation 26.10.01
Jack up vehicle and place two stands.
Note and disconnect the cables from switch.
Remove the switch.

Refitting

Fit and tighten the thermostatic switch.
Identify and connect cable to the switch.
Remove stands, lower the vehicle, and refill the radiator, see operation 26.10.01.

RADIATOR BLOCK

Cars fitted with Air Conditioning

Remove and refit **26.40.04**

WARNING: Under no circumstances must any portion of the air conditioning system be disconnected by anyone other than a qualified refrigeration engineer. Blindness can result if the gas contained within the system comes into contact with eyes.

Removing

Drain the coolant from the radiator, see operation 26.10.01.
Disconnect the battery.
Remove the bonnet.
Slacken the clips securing the top hose, bottom hose and expansion pipe to the radiator.
Disconnect the hoses from the radiator.
Unclip the cable harness from the top rail.
Remove the top rail to body and top rail to fan cowl securing nuts/bolts.
Reposition the cowl from top rail.
Remove top rail to air conditioning condenser securing bolts and remove the spacers.
Unclip the receiver/drier from top rail.
Remove the receiver/drier to top rail securing bolts and remove the spacers.
Reposition the top rail from radiator location.
Remove the air cleaner ram pipe.

Disconnect the coolant level probe.
Displace the radiator to gain access to thermostatic switch.
Note and disconnect cables from switch.
Lift radiator from car, and recover the foam rubber padding.

Refitting

Locate radiator in a position to reconnect the thermostatic switch.
Reposition the radiator into its mounting rubbers and reposition the air conditioning pipes.
Reconnect the coolant level probe.
Refit the air cleaner ram pipe.
Align the top rail to the radiator, and fit but do not tighten the securing nuts and bolts.
Fit the top rail to condenser spacers, and fit but do not tighten the securing nuts and bolts.
Locate the fan cowl to the top rail.
Fit nuts and bolts to secure.
Tighten all the nuts and bolts.
Align the receiver drier with the top rail, fit the spacers and secure the receiver drier with the fixing bolts.
Clip the air conditioning pipe and cable harness to the top rail.
Connect bottom hose, top hose, and the expansion pipe to the radiator.
Tighten hose clips.
Refill the radiator with coolant, see operation 26.10.01.
Reconnect the battery.
Refit the bonnet.

RADIATOR BLOCK

Cars fitted with Heater only

Remove and refit **26.40.04**

Removing

Drain the coolant from the radiator, see operation 26.10.01.
Disconnect the battery.
Remove the bonnet.
Slacken clips and remove the top hose, bottom hose and expansion pipe from the radiator.
Unclip the cable harness from the top rail.
Remove the top rail to body securing nuts and bolts.
Remove the top rail to fan cowl securing nuts and bolts.
Displace the cowl from the top rail, and the top rail from the radiator location.
Remove the air cleaner ram tube.
Disconnect the coolant level probe, and lift the radiator from car.
Recover the rubber foam padding.

Refitting

Fit radiator to the mounting rubbers, and reconnect the coolant level probe.
Fit and secure the air cleaner ram pipe.
Align the top rail to the radiator.
Fit but do not tighten the securing nuts and bolts.
Secure the fan cowl to top rail, and tighten all securing nuts and bolts.
Reclip the cable harness to the top rail.
Fit and secure bottom hose, top hose and expansion pipe to the radiator.
Refill the radiator with coolant, see operation 26.10.01.
Reconnect the battery.
Refit the bonnet.

THERMOSTAT

Remove and refit **26.45.01**

Removing

Partially drain the coolant from the radiator.
Disconnect the battery.
Slacken the vent pipe clips and remove the pipe from the filler neck.
Slacken the top hose clips and disconnect the hose from the filler housing.
Slacken water pump to the filler housing clip.
Remove the filler housing securing bolts (1, Fig. 4).

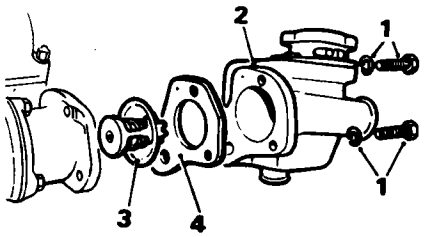

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Fig. 4

Displace the engine breather pipe clip bracket and remove the spacing washer.
Carefully break the joint and remove the thermostat housing (2, Fig. 4) from the water pump hose.
Remove the thermostat (3, Fig. 4) from the thermostat housing.
Discard the old gasket (4, Fig. 4) and clean the sealing faces.
Remove all sludge or scale present.

Refitting

Refit the thermostat into the thermostat housing.
Replace the filler housing gasket and fit the filler housing.
Fit the spacing washers and align the engine breather pipe bracket.
Fit and tighten the filler housing securing bolts.
Refit the water pump to filler housing hose, top hose and vent pipe.
Tighten all the clips.
Refill the radiator with coolant, see operation 26.10.01.
Reconnect the battery.

WATER PUMP

Remove and refit **26.50.01**

Removing

Drain the coolant, see operation 26.10.01.
Remove the fan cowl and the Torquatrol assembly (Fig. 5).

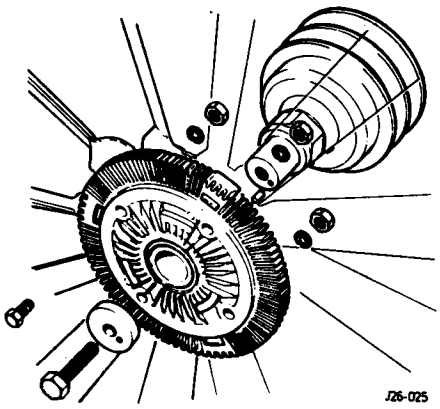


Fig. 5

Release and screw back inner locknut (1, Fig. 6) at the power-assisted steering pump adjuster trunnion.
Slacken the nut of the pivot bolt (2, Fig. 6) and slacken the bolt (3, Fig. 6) securing the adjusting link to the pump.
Slacken the bolt securing the trunnion block (4, Fig. 6) and swing the pump towards the engine.
Remove the belt.
Remove the trunnion bolt and pivot the pump away from the engine.

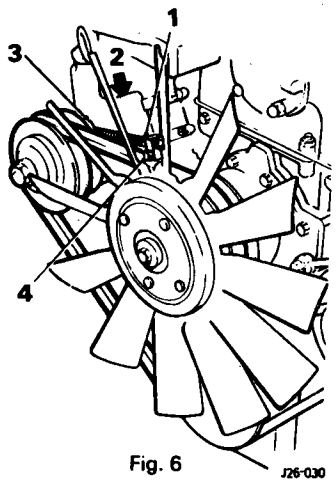


Fig. 6

Cars fitted with heater only

Slacken the alternator adjuster trunnion bolt (1, Fig. 7), remove the alternator adjuster pivot bolt (2, Fig. 7) and slacken the alternator mounting bolt (3, Fig. 7).
Pivot the alternator adjuster from the engine, and release the tension from the belt.

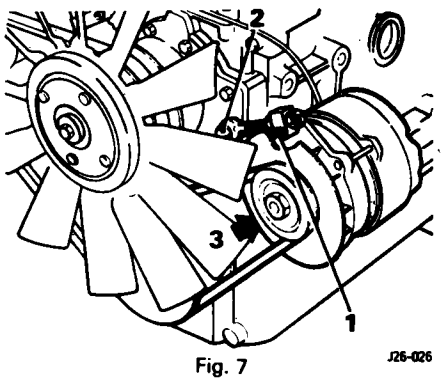


Fig. 7

Cars fitted with air conditioning
Slacken the two compressor pivot bolts on front and rear flanges.
Slacken the compressor trunnion bolt and remove the adjuster pivot bolt.
Pivot the adjuster from the water pump and release the tension from drive belt.

All cars
Disconnect the oil cooler to water pump hose at the water pump.
Disconnect the throttle housing to water pump hose at the water pump.
Loosen the clips on the heater return pipe and the filler housing hose.
Remove the nuts and bolts securing the water pump.
Disconnect the water pump hose from the pump. Displace the pump from the studs and disconnect from the filler housing. Remove the pump assembly.
Remove and discard the gasket.

Refitting

Fit a new gasket to the timing cover.
Fit the pump to the filler housing.
Locate the pump onto the timing cover, and into the water pipe hose.
Tighten the clips.
Fit and tighten securing the nuts and bolts 'by diagonal selection'.
Connect the throttle housing hose, and oil cooler hose to the water pump.

Cars fitted with air conditioning
Pivot the compressor to tighten the drive belt.
Pivot the adjuster to the water pump and fit the adjuster pivot bolt.
Adjust and check for correct drive belt tension, refer to Drive Belt Tension Data.
Tighten locknut and all bolts.

Cars fitted with heater only
Pivot the alternator and tighten the drive belt.
Pivot the adjuster towards the engine, and refit the adjuster pivot bolt.
Adjust and check for correct drive belt tension, refer to Drive Belt Tension Data.
Tighten the locknut and all the bolts.

All cars
Pivot the power-assisted steering pump towards the engine.
Fit but do not tighten the trunnion bolt.
Refit the drive belt, and adjust the nuts on the links to obtain the correct belt tension, refer to Drive Belt Tension Data.
Retighten all bolts and nuts.
Refit the Torquatrol assembly and fan cowl.
Refill the radiator with coolant, see operation 26.10.01

ADDITIONAL WORK FOR WATER PUMP RENEWAL — FEDERAL VEHICLES

Remove the air pump — 17.25.07.
Release the air conditioning compressor belt tension 82.10.01 and remove the link arm pivot bolt.
Undo and remove the air pump mounting bracket to the timing cover securing bolt.
Displace and remove the bracket spacer.

On removal of water pump securing bolts:-
Remove the air pump mounting bracket.

On refitting of the water pump securing bolts:-
Fit the air pump mounting bracket.
Fit the bracket spacer.
Fit and tighten the bracket securing bolt.
Refit the compressor link arm pivot bolt and re-adjust the belt tension.
Refit the air pump assembly.

DRIVE BELT TENSION DATA

Driving belt for	Deflection force kg	lb	Deflection mm	in
P.A.S. pump and water pump	2,9	6.4	4,3	0.17
Alternator	1,45	3.2	3,8	0.15
Compressor	2,9	6.4	4,3	0.17

WATER PUMP

Overhaul **26.50.06**

Remove water pump, see operation 26.50.01.

Dismantling

Use extractor bolt (⅜" U.N.F. X 2 in).
Slacken the locknut (1, Fig. 8) and remove the bearing lockscrew (2, Fig. 8).
Support the body of the pump on press bed, close around impeller.
Using a suitable mandrel acting against the case of bearing, press the bearing/spindle and impeller assembly (3, Fig. 8) from the body of the pump.
Press the bearing/spindle assembly from the impeller (Fig. 9).

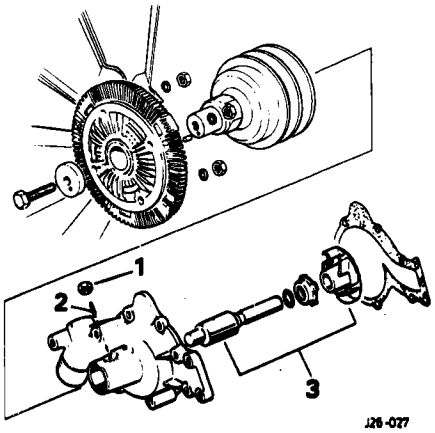


Fig. 8

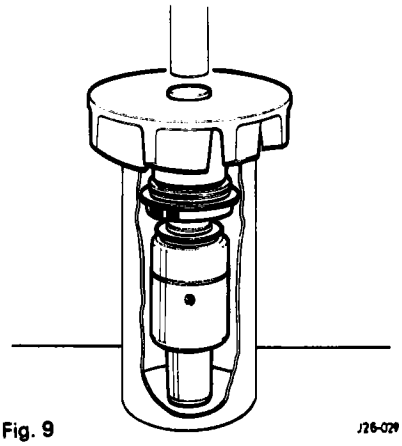


Fig. 9

Inspection

Thoroughly clean all parts of the pump except the bearing/spindle assembly in a suitable cleaning solvent.
Inspect the bearing for excessive play and remove any burrs, rust or scale from the shaft using fine emery cloth.

NOTE: Wrap the bearing in a clean cloth to prevent contamination by emery dust.

If signs of wear or corrosion are evident in bearing bore or on the face in front of the impeller, the body of the pump must be replaced.

Reassembling

Align the location hole in the bearing with the tapped hole in the pump body and press the bearing/spindle assembly into the body until the holes coincide.
Fit the bearing lockscrew and secure using the locknut.
Coat the outside of the brass seal housing with a suitable sealing compound, and fit into the recess in the pump body.
Carefully press the impeller onto the spindle until the dimension (A) shown on illustration (Fig. 10) is obtained. A = 0.381 ± 0.07 mm (0.015 ± 0.003 in)
Press pulley onto spindle, taking care to ensure that impeller is not moved from dimensions given above.
Refit the water pump, see operation 26.50.01.

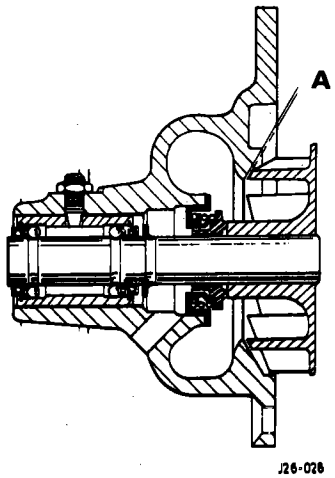


Fig. 10

CONTENTS

KEY TO EXHAUST SYSTEM

1. Catalyst
2. Down-pipe
3. Front silencer
4. Rear intermediate pipe
5. Front intermediate pipe
6. Tail pipe and silencer
7. Exhaust trim

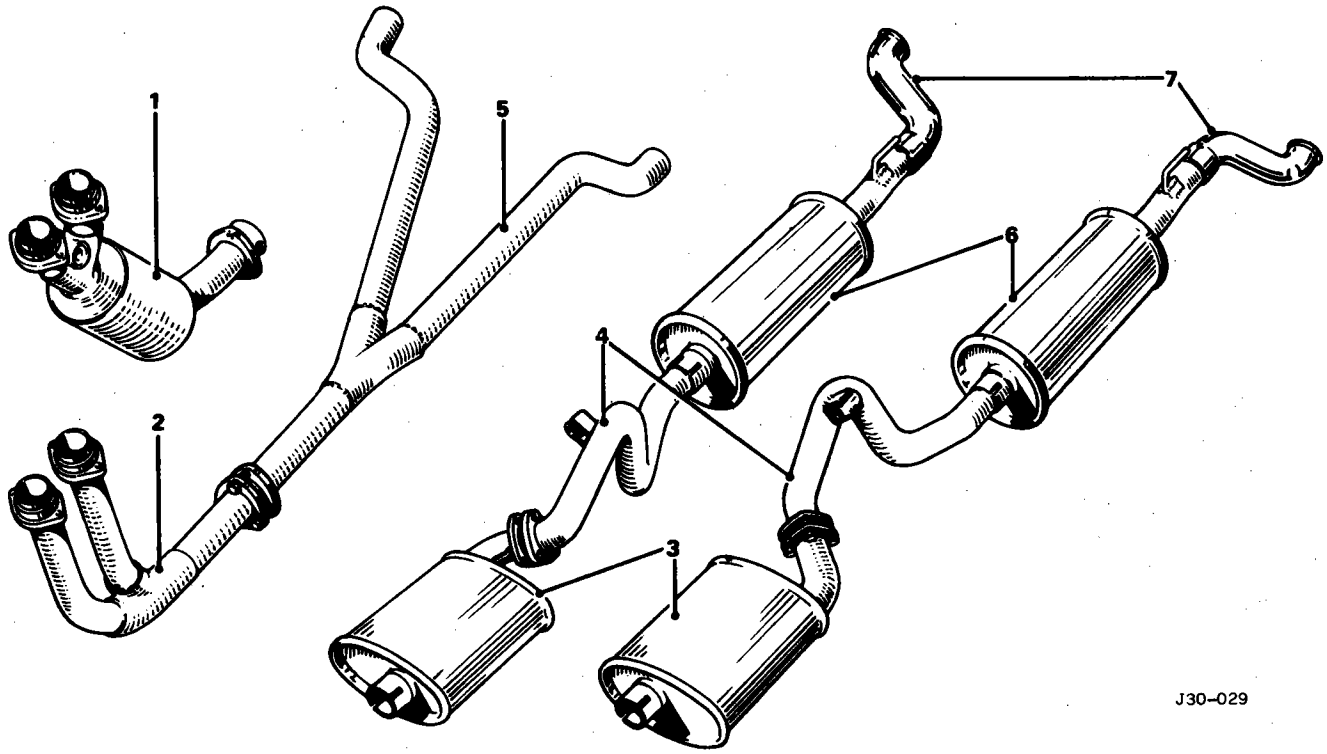


Fig. 1

EXHAUST SYSTEM COMPLETE

Remove and refit **30.10.01**

Removing

In the luggage compartment, remove the two self-locking nuts securing each rear silencer mounting (1, Fig. 2).
Remove the three nuts, bolts and washers securing the down-pipe/intermediate pipe flange (2, Fig. 2).
Release the clamp at the rear of forward silencer assembly (3, Fig. 2).
Separate the intermediate pipe and the forward silencer assemblies from the rear intermediate pipes, taking care to avoid damage to the catalyst unit, if fitted.
Release the clamp at the tail pipe and silencers and from the rear intermediate pipes (4, Fig. 2).
Draw the rear intermediate pipes rearwards from the mounting rubbers and suspension unit (5, Fig. 2).
Remove the screws and separate the trim from the tail pipe and silencers (6, Fig. 2).
Draw the tail pipe and the silencer forwards from the body (7, Fig. 2).
Remove the nuts, bolts and washers securing the heat shield at exhaust manifold/front pipe joint (8, Fig. 2).
Remove the special nuts and plain washers at each exhaust manifold and draw the front pipe downwards. Recover the heat shield brackets.

CAUTION: Take great care to avoid damaging steering rack gaiter.

Check the condition of the mounting rubbers in the rear suspension unit and mounting brackets and renew as necessary.

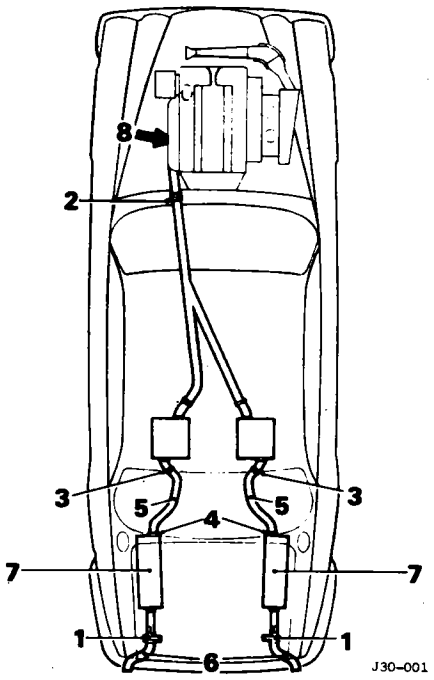


Fig. 2

Refitting

When refitting use Firegum on all joints, assemble the components completely before tightening all clamps and screws.

FRONT PIPE

Remove and refit **30.10.09**

Removing

Remove the nuts, bolts and washers securing the heat shield at exhaust manifold/front pipe joint (1, Fig. 3).
Remove the special nuts and plain washers at each exhaust manifold (2, Fig. 3).
Beneath the car remove the three nuts, bolts and washers securing front pipe/intermediate pipe flange (3, Fig. 3).
Draw the front pipe downwards and remove.

CAUTION: Take great care to avoid damaging the steering rack gaiter.

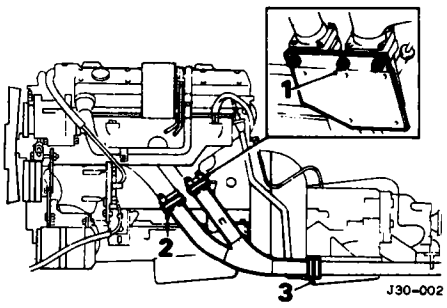


Fig. 3

Refitting

Reverse the above procedure to refit, using new seals. Apply Firegum at front pipe/intermediate pipe joint.

INTERMEDIATE PIPE

Remove and refit **30.10.11**

Removing

Remove the nuts, bolts and washers securing the flange (1, Fig. 4).
Release the clamp at the front end of both forward silencer and assemblies (2, Fig. 4).
Remove the pipe, taking care to avoid damage to catalyst unit, if fitted (3, Fig. 4).

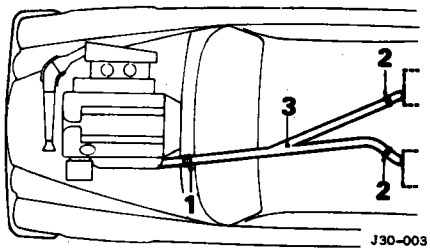


Fig. 4

Refitting

When refitting, use Firegum to seal joint to silencer and front pipe. Use new seal at front pipe/intermediate pipe flange.

SILENCER ASSEMBLY

Remove and refit
Left-hand **30.10.15**
Right-hand **30.10.16**

Removing

Remove the intermediate pipe.
Slacken the clamp and draw the silencer from the rear intermediate pipe (1, Fig. 5).

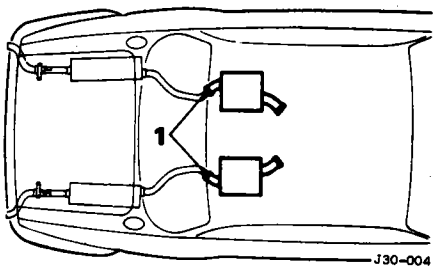


Fig. 5

Refitting

When refitting use Firegum to seal the joints.

TAIL PIPE AND SILENCER

Remove and refit
Left-hand or Right-hand **30.10.22**

Removing

Remove the Allen grub screw and separate the trim from tail pipe (1, Fig. 6).
Release the clamp to the rear intermediate pipe and separate (2, Fig. 6).
Draw the tail pipe and silencer forwards down through the tunnel to clear the mounting rubber (3, Fig. 6).
Check the condition of the mounting, and renew as necessary.

continued

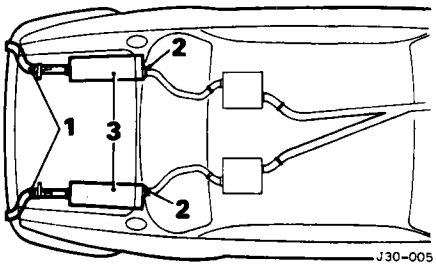


Fig. 6

Refitting

When refitting coat the joint with Firegum.

NOTE: Cars to U.S.A. Federal Specification must have a distance of 38 mm (1.5 in) between top surface of exhaust trim and lower surface of energy absorbing beam.

EXHAUST TRIM

Remove and refit **30.10.23**

Remove the grub screw using an Allen key and separate trim from tail pipe and silencer (1, Fig. 7).
Use Firegum to seal the joint when refitting.

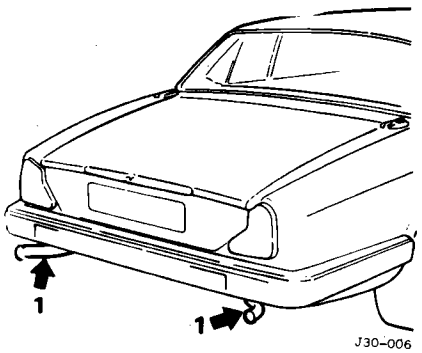


Fig. 7

NOTE: Cars to U.S.A. Federal Specification must have a distance of 38 mm (1.5 in) between the top surface of exhaust trim and lower surface of energy absorbing beam.

REAR INTERMEDIATE PIPE

Remove and refit
Left-hand 30.10.24
Right-hand 30.10.25

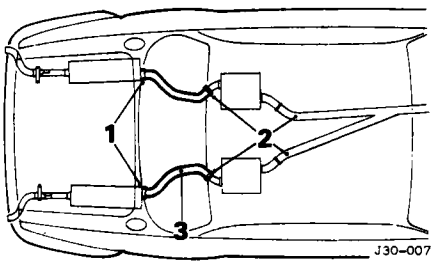


Fig. 8

Release the clamp to the tail pipe and silencer and separate (1, Fig. 8).
Support the intermediate pipe, release the clamp to silencer and separate (2, Fig. 8).
Draw the rear intermediate pipe from the suspension unit (3, Fig. 8).
Check the condition of mounting rubbers, and renew as necessary.

Reverse above procedure to refit. Always use Firegum to seal the joints.

INDUCTION MANIFOLD

Remove and refit **30.15.02**

Remove the radiator header tank cap and open the radiator drain tap to drain coolant.

NOTE: Conserve coolant if anti-freeze is in use.

Depressurize the fuel system.
Remove the air cleaner and the air-flow meter from the throttle housing.
Remove the servo hose from NR valves, hoses from throttle housing. Disconnect the cables from the air-flow meter throttle switch.
Remove the throttle cable, kick-down cable and service interval counter (if fitted).
Remove the breather pipe and fuel feed pipe from the fuel rail. Remove the thermostat housing.
Remove the ignition amplifier coil and harness.
Remove the distributor cap and H.T. cables.
Remove the connector from the auxiliary air valve cold start injector, coolant temperature sensor, and Thermotime switch.
Remove the F.I. harness, disconnect the fuel hoses from the cold start injector regulator and fuel rail.
Remove the nuts and withdraw the induction manifold.
Clean gasket surfaces.

To refit reverse above procedure. Use new gaskets.

EXHAUST MANIFOLD

Remove and refit **30.15.10**

Removing

Cars fitted with emission control only
Remove the two cross-head screws and washers securing the hot air duct to the camshaft covers (1, Fig. 9).
Pull the hot air duct from the exhaust manifold heat shield (2, Fig. 9).

Cars to U.S.A. Federal Specification only
Remove the nut, washers, spacer and bolt securing the air delivery pipe clip to the exhaust manifold heat shield (3, Fig. 9).
Pull the air delivery pipe from the air pump outlet elbow (4, Fig. 9).
Slacken the locknuts on the air pump belt

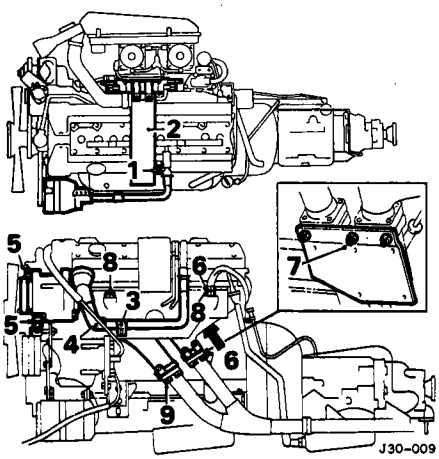


Fig. 9

adjustment, remove the air pump belt from the pulley and draw pump as far as possible away from the cylinder head (5, Fig. 9).
Restrain the adaptor and release the nut securing the E.G.R. pipe.

Rear manifold only on cars with SU carburetters
Slacken the pipe clip and pull hot air pipe from the A.E.D. hot air pick-up unit (6, Fig. 9).

Left-hand-drive cars only
Remove the three 2 B.A. nuts, bolts and washers securing the steering pinion heat shield (7, Fig. 9).

Remove the setscrews/adaptor and washers securing the exhaust manifold heat shield to the exhaust manifolds (8, Fig. 9).

NOTE: Do not mislay the restrictor from the E.G.R. adaptor (fixed orifice system only).

Cars fitted with air conditioning only
Remove the compressor heat shield.

Remove the eight nuts and the washers securing the exhaust manifolds to the exhaust front pipes (9, Fig. 9).
Remove the eight nuts and washers securing each exhaust manifold to the cylinder head.
Remove the three screws securing the hot air pick-up unit to the rear exhaust manifold.
Clean all traces of gaskets from the joint faces.

Refitting

Reverse the above procedures as appropriate, using new gaskets and seals throughout.

NOTE: After loosely securing the exhaust manifolds to the cylinder head, locate the exhaust front pipe on studs before finally tightening manifold nuts.

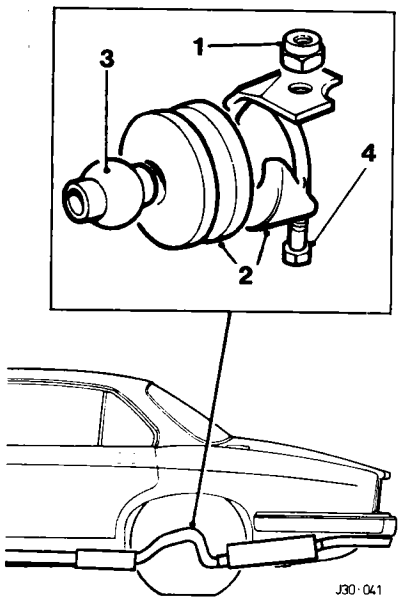
MOUNTING RUBBER — FRONT

Remove and refit **30.20.02**

Removing

Reach over the rear suspension unit and release the self-locking nut and bolt securing the rear mounting bracket (1, Fig. 10).
Slide the bracket from the spigot on the rear intermediate pipe and remove.

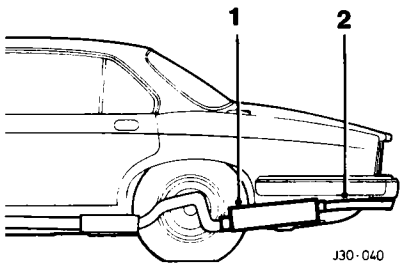
When refitting locate the replacement mounting rubber in the bracket ring, noting that the brackets are handed (2, Fig. 10).
Smear the bush with soft soap and press into the mounting rubber (3, Fig. 10).
Locate the bush on the spigot and secure using the bolt from below and self-locking nut (4, Fig. 10).



MOUNTING RUBBER — REAR

Remove and refit **30.20.04**

Remove the tail pipe and silencer (1, Fig. 11).
In the luggage boot, remove the two self-locking nuts securing the rear mounting (2, Fig. 11).



CONTENTS

TORQUE WRENCH SETTINGS

ITEM	DESCRIPTION	TIGHTENING TORQUE		
		Nm	kgf m	lbf ft
Clutch lever pivot bolt	—	40,7	4,15	30
Bottom cover to bell housing	6 mm setscrew	9,5	0,96	7
Tie plate to bell housing	10 mm setscrew	50,2	5,12	37
Bell housing to gear case	12 mm bolt and setscrew	80	8,16	59
Bell housing to cylinder block	8 mm bolt and dowel bolt	28,5	2,90	21
Cover plate to bell housing	8 mm bolt	20,3	2,07	15
Slave cylinder to bell housing	3/8 in nut	14,9 to 17,6	1,53 to 1,79	11 to 13
Master cylinder to pedal box	5/16 U.N.F. nut	14,9 to 17,6	1,53 to 1,79	11 to 13
Pedal box to body	5/16 U.N.F. nut	14,9 to 17,6	1,53 to 1,79	11 to 13
Hydraulic connections	—	8,2 to 9,5	0,87 to 0,96	6.3 to 7

HYDRAULIC SYSTEM

Bleed 33.15.01

WARNING: Only Castrol/Girling Universal Brake Fluid may be used in the clutch hydraulic system. This fluid exceeds S.A.E. J1703/D

Bleeding

Attach one end of a tube (1, Fig. 1) to the slave cylinder bleed nipple.
Partially fill a clean container with hydraulic fluid and immerse the other end of the bleed tube in the fluid.

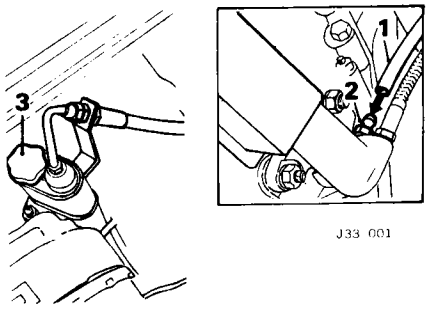


Fig. 1

Slacken the bleed nipple (2, Fig. 1) and pump the clutch pedal firmly up and down, pausing between each stroke.

CAUTION: The fluid should be topped up after every three pedal strokes.

Pump the clutch pedal until the fluid issuing from the bleed tube is free from air bubbles; tighten the bleed nipple.
Top up the reservoir (3, Fig. 1) and apply working pressure to the clutch pedal for two or three minutes then examine the system for leaks.

WARNING: Do not use fluid bled from system for topping up purposes as this will contain air. If fluid has been in use for some time it should be discarded. Fresh fluid bled from system may be used after allowing it to stand for a few hours to allow air bubbles to disperse.

FLUID HOSE

Remove and refit—R.H.D. only 33.15.13

Removing

Remove the nut securing the hose clip to the bell housing bolt.
Release the union nut (1, Fig. 2) securing the hose to the master cylinder pipe.

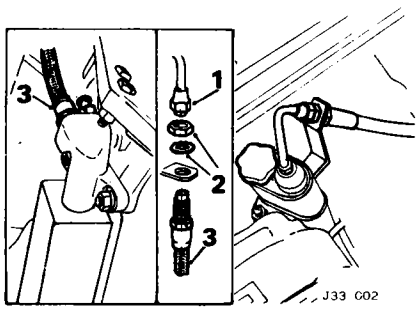


Fig. 2

Restrain the hose union at the bracket and remove the locknut and shakeproof washer (2, Fig. 2).
Unscrew the hose (3, Fig. 2) from the slave cylinder; plug or tape broken connections to prevent the ingress of dirt.

Refitting

CAUTION: Take great care to ensure that unions are not overtightened when refitting a flexible hose.

Connect the hose to the slave cylinder and ensuring that hose is not kinked or twisted, locate the other end in the bracket (1, Fig. 3).
Fit the shakeproof washer and locknut (2, Fig. 3); connect the master cylinder pipe (3, Fig. 3).
Remove the filler cap from the fluid reservoir and top up fluid to the correct level.

WARNING: Only Castrol/Girling Universal Brake Fluid may be used in the clutch hydraulic system. This fluid exceeds S.A.E. J1703/D.

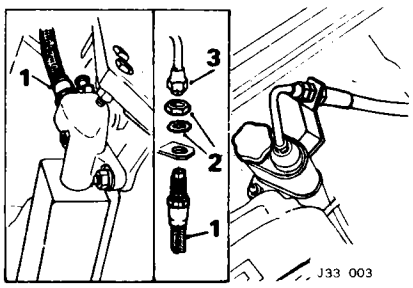


Fig. 3

Attach one end of a bleed tube (1, Fig. 4) to the slave cylinder bleed nipple.
Partially fill a clean container with hydraulic fluid and immerse the other end of the bleed tube in the fluid.

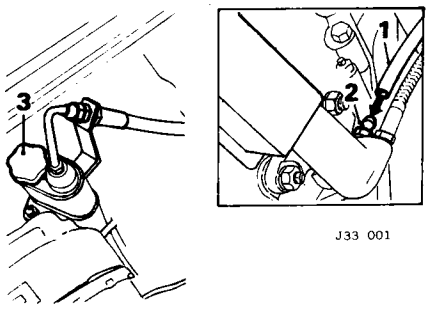


Fig. 4

Slacken the bleed nipple (2, Fig. 4) and pump the clutch pedal firmly up and down, pausing between each stroke.

CAUTION: The fluid should be topped up after every three pedal strokes.

Pump the clutch pedal until the fluid issuing from the bleed tube is free from air bubbles; tighten bleed nipple.
Top up the reservoir (3, Fig. 4) and apply working pressure to the clutch pedal for two to three minutes then examine the system for leaks.

WARNING: Do not use fluid bled from system for topping up purposes as this will contain air. If fluid has been in use for some time it should be discarded. Fresh fluid bled from system may be used after allowing it to stand for a few hours to allow air bubbles to disperse.

FLUID HOSE

Remove and refit—L.H.D. only **33.15.13**

Removing

Remove the banjo bolt and washer (1, Fig. 5) securing the flexible hose (2, Fig. 5) to the master cylinder.

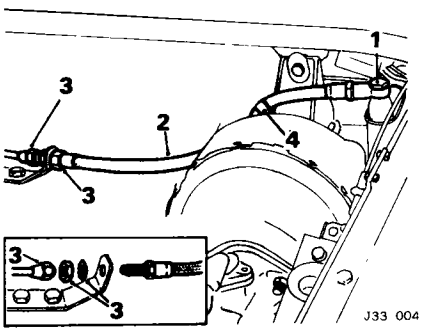


Fig. 5

Disconnect the bundy pipe and hose (3, Fig. 5) at the bracket.
Restrain the hose union and remove the locknut and shakeproof washer also the clip (4, Fig. 5) securing hose to brake servo stud.
Withdraw the hose and plug or tape all broken connections to prevent the ingress of dirt.

Refitting

CAUTION: Take great care to ensure that unions are not overtightened when refitting a flexible hose.

Locate threaded end of hose connector in the bracket and fit the shakeproof washer and locknut (1, Fig. 6).
Connect the bundy pipe (2, Fig. 6) and ensuring that the hose is not kinked or twisted, refit the banjo bolt and washer (3, Fig. 6); fit the clip (4, Fig. 6) to the brake servo mounting stud.

Remove the filler cap from the fluid reservoir and top up fluid to the correct level.

WARNING: Only Castrol/Girling Universal Brake Fluid may be used in the clutch hydraulic system. This fluid exceeds S.A.E. J1703/D.

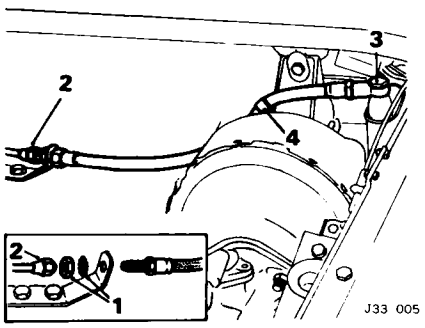


Fig. 6

Attach one end of a bleed tube (1, Fig. 7) to the slave cylinder bleed nipple.

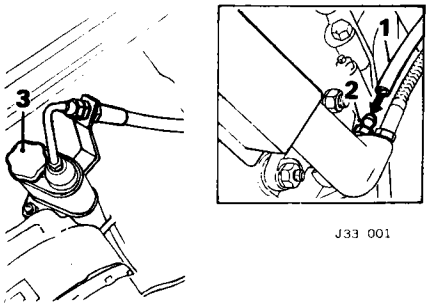


Fig. 7

Partially fill a clean container with hydraulic fluid and immerse the other end of the bleed tube in the fluid.
Slacken the bleed nipple (2, Fig. 7) and pump the clutch pedal slowly up and down, pausing between each stroke.

CAUTION: The fluid should be topped up after every three pedal strokes.

Pump the clutch pedal until the fluid issuing from the bleed tube is free from air bubbles; tighten the bleed nipple.
Top up the reservoir (3, Fig. 7) and apply working pressure to the clutch pedal for two to three minutes then examine the system for leaks.

WARNING: Do not use fluid bled from system for topping up purposes as this will contain air. If fluid has been in use for some time it should be discarded. Fresh fluid bled from system may be used after allowing it to stand for a few hours to allow air bubbles to disperse.

MASTER CYLINDER

Remove and refit **33.20.01**

Removing

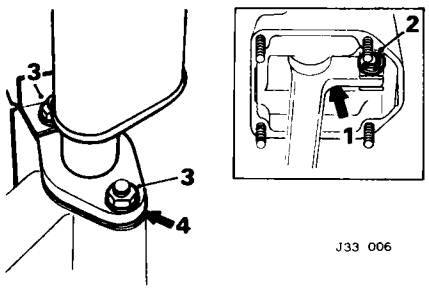


Fig. 8

Remove clevis pin clip (2, Fig. 8); withdraw clevis pin.
Remove the nuts and spring washers (3, Fig. 8) securing the master cylinder to the pedal box.
Lift off the master cylinder and retrieve any shims (4, Fig. 8) that may be fitted.

Refitting

Locate the master cylinder (1, Fig. 9), together with any shims (2, Fig. 9) that were removed, on the mounting studs.

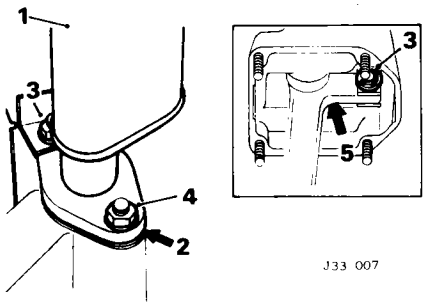


Fig. 9

Connect the master cylinder push-rod to the clutch pedal by means of the clevis pin (3, Fig. 9); refit the clevis clip.

NOTE: Should hole in the clevis not align with hole in pedal, add or subtract shims as necessary until the correct relationship is obtained.
(4, Fig. 9). Secure master cylinder with spring washers and nuts.

SLAVE CYLINDER

Remove and refit—R.H.D. only **33.35.01**

Removing

Remove the setscrews securing slave cylinder cover (1, Fig. 10) to the bell housing.
Slacken the union (3, Fig. 10) but DO NOT attempt to remove the flexible hose. Slide the rubber boot (4, Fig. 10) off the slave cylinder and along the push rod.
Remove the nuts and spring washers (5, Fig. 10) securing the slave cylinder to the bell housing; withdraw the slave cylinder until it can be drawn off the push rod.
Restrain the hose (6, Fig. 10) and screw the cylinder off the union; plug or tape all broken connections to prevent the ingress of dirt.
Release the push-rod from the withdrawal lever.

continued

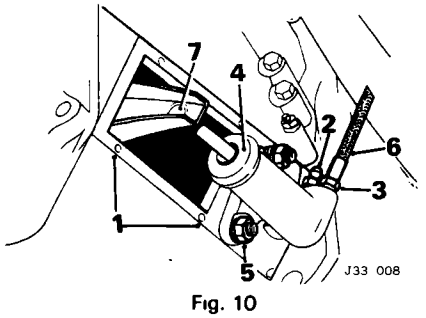


Fig. 10

Refitting

Restrain the hose (1, Fig. 11) and screw slave cylinder on to union.
Fit push-rod on to the withdrawal lever (2, Fig. 11) and slide the rubber boot (3, Fig. 11) along the rod.

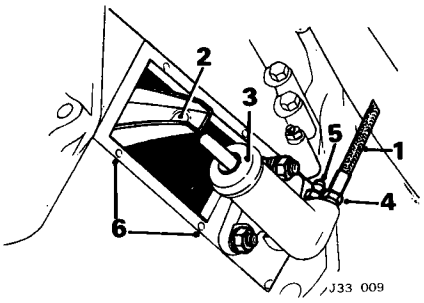


Fig. 11

Position push-rod inside the slave cylinder.
Refit the cylinder and tighten the hose union (4, Fig. 11).
Position the rubber boot on the cylinder.
Ensure that the cover is located correctly and secure it with the four setscrews (6, Fig. 11).

WARNING: Only Castrol/Girling Universal Brake Fluid may be used in the clutch hydraulic system. This fluid exceeds S.A.E. J1703/D.

Attach one end of a bleed tube (1, Fig. 12) to the slave cylinder bleed nipple.
Partially fill a clean container with hydraulic fluid and immerse the other end of the bleed tube in the fluid.

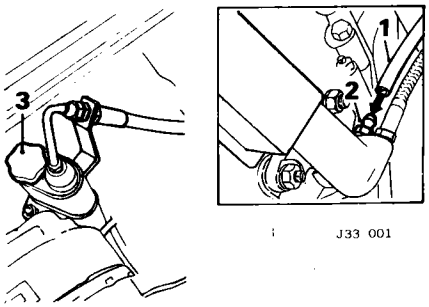


Fig. 12

Slacken the bleed nipple (2, Fig. 12) and pump the clutch pedal firmly up and down, pausing between each stroke.

CAUTION: The fluid should be topped up after every three pedal strokes.

Pump the clutch pedal until the fluid issuing from the bleed tube is free from air bubbles; tighten the bleed nipple.
Top up the reservoir (3, Fig. 12) and apply working pressure to the clutch pedal for two to three minutes then examine the system for leaks.

WARNING: Do not use fluid bled from system for topping up purposes as this will contain air. If fluid has been in use for some time it should be discarded. Fresh fluid bled from the system may be used after allowing it to stand for a few hours to allow air bubbles to disperse.

SLAVE CYLINDER

Remove and refit—L.H.D. only **33.35.01**

Removing

Remove the setscrews securing slave cylinder cover to the bell housing (1, Fig. 13).
Slide the rubber boot (2, Fig. 13) off the slave cylinder and along the push-rod.

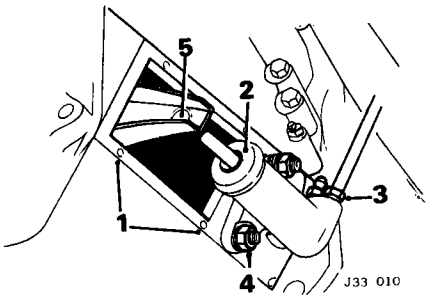


Fig. 13

Disconnect the hydraulic pipe (3, Fig. 13) and plug or tape all broken connections to prevent the ingress of dirt.
Remove the nuts and washers (4, Fig. 13) securing slave cylinder to the bell housing; withdraw cylinder slightly until it can be drawn off the push-rod.
Release the push-rod from the withdrawal lever (5, Fig. 13).

Refitting

Fit the push-rod on to the withdrawal lever (1, Fig. 14), slide rubber boot onto rod.
Position the push-rod inside the cylinder, refit cylinder.

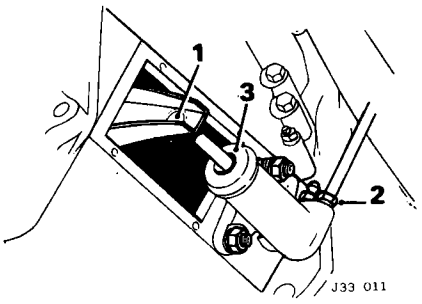


Fig. 14

Reconnect the hydraulic pipe (2, Fig. 14) and position the rubber boot (3, Fig. 14) on the cylinder.
Ensure that the cover is located correctly and secure it with the four setscrews.

WARNING: Only Castrol/Girling Universal Brake Fluid may be used in the clutch hydraulic system. This fluid exceeds S.A.E. J1703/D.

Attach one end of a bleed tube (1, Fig. 15) to the slave cylinder bleed nipple (2, Fig. 15).
Partially fill a clean container with hydraulic fluid and immerse the other end of the bleed tube in the fluid.

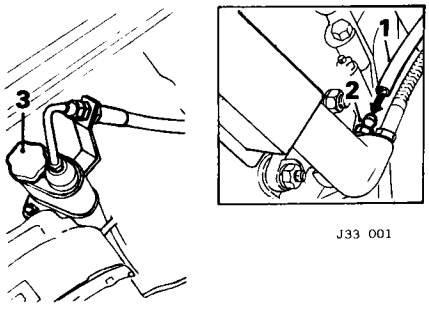


Fig. 15

Slacken the bleed nipple and pump the clutch pedal slowly up and down, pausing between each stroke.

CAUTION: The fluid should be topped up after every three pedal strokes.

Pump the clutch pedal until the fluid issuing from the bleed tube is free from air bubbles; tighten the bleed nipple.
Top up the reservoir (3, Fig. 15) and apply working pressure to the clutch pedal for two to three minutes then examine the system for leaks.

WARNING: Do not use fluid bled from system for topping up purposes as this will contain air. If fluid has been in use for some time it should be discarded. Fresh fluid bled from system may be used after allowing it to stand for a few hours to allow air bubbles to disperse.

CLUTCH ASSEMBLY

Remove and refit **33.10.01**

Service tools: Engine support tool MS 53A; Tangye Epco V.1000 transmission hoist; ST 1136 Offset spanner.

Removing

Drive the vehicle onto a ramp and disconnect the battery.
Unscrew the gear knob and withdraw the cigar lighter.

Remove the screws (1, Fig. 16) securing the centre console and raise console (2, Fig. 16) slightly to gain access to the electric window switches.

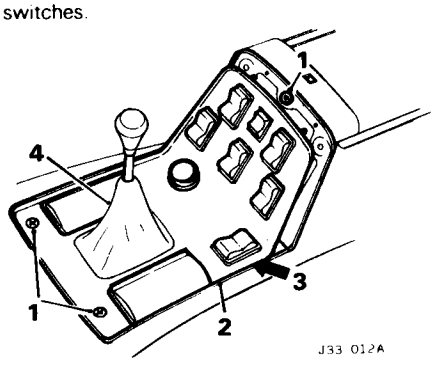


Fig. 16

Disconnect the harnesses at the multi-plug connectors and withdraw the console followed by the gear lever gaiter (4, Fig. 16) and rubber finisher.
Place gear lever in third gear position.

Position engine support tool MS 53A across engine compartment and attach hook to rear engine lifting eye. Take the engine weight.
Disconnect the exhaust intermediate pipe at the front flange and secure pipe to one side.
Remove screws securing the intermediate heat shield to the body; withdraw heat shield.
Remove bolts securing tie plate to bell housing and sump.
Position a suitable ramp jack and wooden block (1, Fig. 17) beneath the rear engine mountings and remove the body cross-member and rear engine mounting securing bolts (2, Fig. 17).
Lower ramp jack and remove the rear engine mounting and body cross-member.

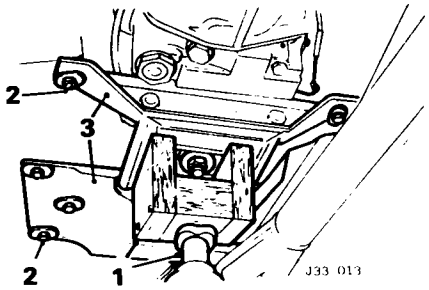


Fig. 17

Disconnect the speedometer cable from the gearbox.
Disconnect the slave cylinder from the gearbox, secure to one side.
Remove nuts, bolts and washers securing the propeller shaft to the gearbox output flange; move shaft away from flange.
Lower rear of engine using MS 53A.

CAUTION: Ensure that engine does not damage the water valve during this operation.

Remove bolts securing the starter motor to the bell housing (2, Fig. 18); withdraw motor and secure to one side.

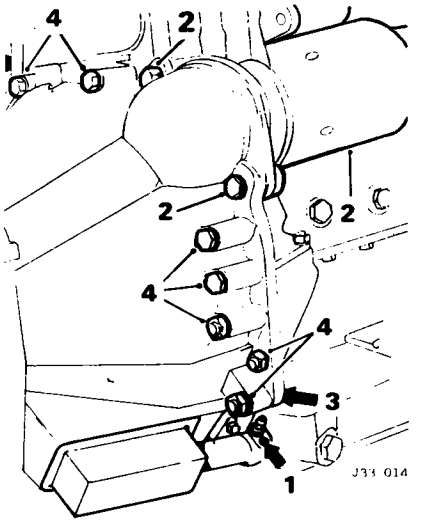


Fig. 18

Remove bolts securing the flywheel cover plate (3, Fig. 18); withdraw plate.
Disconnect reverse light wires from top of gearbox.
Position transmission hoist beneath gearbox and ensure that angle of platform matches that of the gearbox. Secure gearbox to platform.
Remove nuts, bolts and washers securing the bell housing (4, Fig. 18), noting fitted position of earth lead.
Withdraw gearbox and bell housing.

CAUTION: When a suitable hoist is not available, the gearbox may still be removed but care must be taken to ensure that the input shaft is not allowed to take the weight of the gearbox.

Recover foam pad from top of gearbox.
Mark relative positions of clutch cover to flywheel and balance weights to clutch cover (1, Fig. 19).

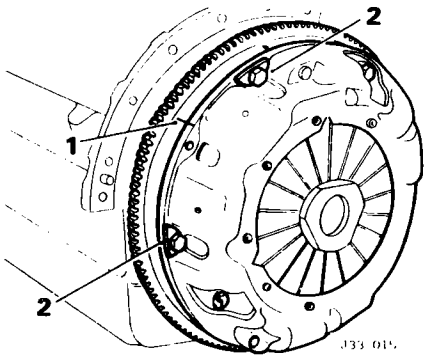


Fig. 19

Remove bolts and spring washers securing clutch cover to flywheel; (2, Fig. 19) withdraw cover together with clutch plate.
Examine flywheel face for scoring. If scoring is found to be excessive, the flywheel must be renewed.
Examine the clutch plates for oil contamination or evidence of slipping.
If oil contamination is evident, crankshaft or gearbox oil seals are suspect and should be examined and if necessary, renewed.

WARNING: Do not use compressed air to remove dust from the clutch assembly. If dust contamination is evident, wash assembly in Gamlen 265 or Rochem Electrosol quick dry solvent.

CAUTION: It is always advisable when renewing the clutch to fit a new release bearing. To do this, proceed as follows:

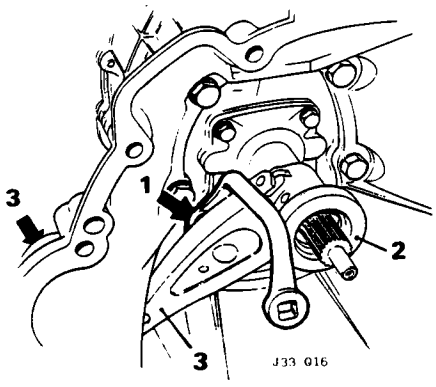


Fig. 20

Using tool ST 1136, remove the pivot bolt (1, Fig. 20) and carefully release withdrawal lever taking care not to bend the spring clip. DO NOT pull lever off the bolt. Slide release bearing (2, Fig. 20) off the input shaft. Remove the shield from over the slave cylinder and disconnect the withdrawal lever (3, Fig. 20) from the push-rod.

Refitting

Smear the input shaft with lithium based grease and fit the release bearing (1, Fig. 21). Refit the pivot bolt (2, Fig. 21).

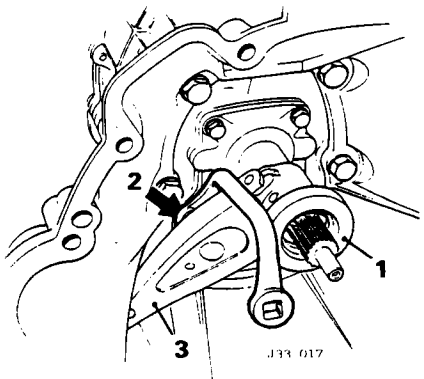


Fig. 21

Engage the lugs of the withdrawal lever in the groove of the release bearing and press withdrawal lever on to the pivot bolt.
Connect the withdrawal lever (3, Fig. 21) to the push-rod but do not fit the cover at this stage.
Position the clutch plate and cover (1, Fig. 22) on the flywheel ensuring that the reference marks made during dismantling are in alignment.

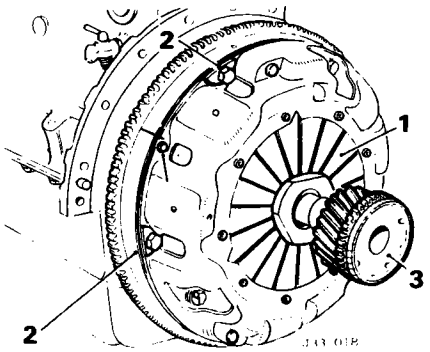


Fig. 22

Fit the balance weights, bolts and washers but do not tighten the bolts (2, Fig. 22) at this stage.
Using a dummy input shaft (3, Fig. 22), align the clutch plate ensuring that the clutch cover is correctly located.
Tighten the securing bolts by diagonal selection to the specified torque figure.
Position the foam pad on top of gearbox casing.
Refit the gearbox and bell housing, reconnect the reverse light switch and tighten the bell housing securing bolts to the specified torque figure.
Refit the starter motor.

continued

Refit the flywheel cover plate and remove the transmission hoist.
Raise engine using MS 53A or a ramp jack and wooden block (1, Fig. 23) positioned under the gearbox and re-connect the propeller shaft.
Refit slave cylinder.

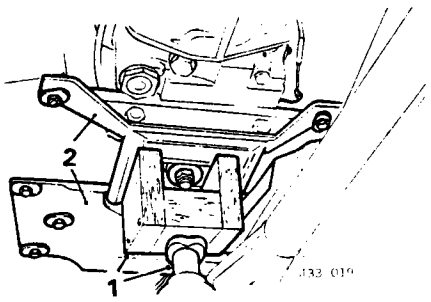


Fig. 23

CAUTION: Always use new self-locking nuts to secure the propeller shaft.

Connect the speedometer drive cable; refit the rear engine mounting and body cross-member (2, Fig. 23).
Refit the heat shield and exhaust intermediate pipe.

CAUTION: Always use a new olive, coated with 'Firegum' when refitting the exhaust pipe.

Refit the tie-plate between the oil sump and the bell housing.
Refit the flexible pipe to the slave cylinder.
Remove the engine support tool MS 53A.
Refit the gear lever gaiter (1, Fig. 24) and centre console (2, Fig. 24), followed by the gear knob (3, Fig. 24).

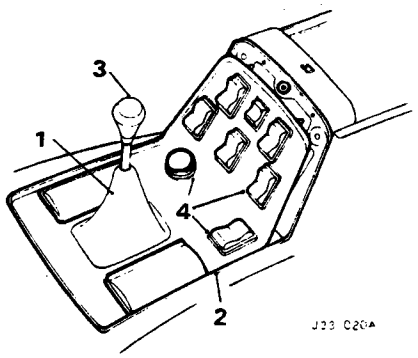


Fig. 24

Reconnect the battery and check operation of electric windows, cigar lighter and electric door locks where fitted (4, Fig. 24).
If the clutch fluid pipes were disconnected:
Remove the filler cap from the fluid reservoir and top up fluid to the correct level.

WARNING: Only Castrol/Girling Universal Brake Fluid may be used in the clutch hydraulic system. This fluid exceeds S.A.E. J1703/D.

Attach one end of a bleed tube (1, Fig. 25) to the slave cylinder bleed nipple.
Partially fill a clean container with hydraulic fluid and immerse the other end of the bleed tube in the fluid.
Slacken the bleed nipple (2, Fig. 25) and pump the clutch pedal slowly up and down, pausing between each stroke.

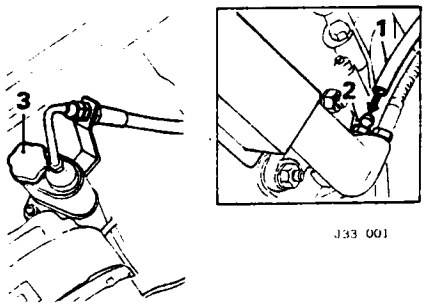


Fig. 25

CAUTION: The fluid should be topped up after every three pedal strokes.

Pump the clutch pedal until the fluid issuing from the bleed tube is free from air bubbles; tighten the bleed nipple.
Top up the reservoir (3, Fig. 25) and apply working pressure to the clutch pedal for two to three minutes then examine the system for leaks.

WARNING: Do not use fluid bled from system for topping up purposes as this will contain air. If fluid has been in use for some time it should be discarded. Fresh fluid bled from system may be used after allowing it to stand for a few hours to allow air bubble to disperse.

MASTER CYLINDER

Overhaul **33.20.07**

WARNING: Use only clean brake fluid or Girling cleaning fluid for cleaning. All traces of cleaning fluid must be removed before reassembly. All components should be lubricated with clean brake fluid and assembled using the fingers only.

Dismantling

Remove master cylinder as detailed in operation 33.20.01
Detach rubber boot (1, Fig. 26) from end of barrel and move boot along push-rod.
Depress push-rod and remove circlip (2, Fig. 26).

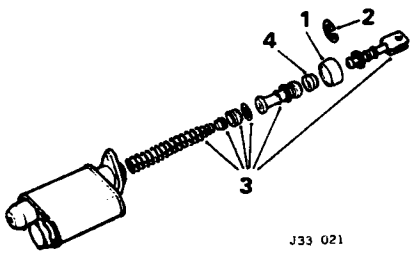


Fig 26

Withdraw push-rod, piston, piston washer, main cup, spring retainer and spring (3, Fig. 26)
Remove secondary cup (4, Fig. 26) from piston

Inspection

Examine cylinder bore for scores.
Thoroughly wash out reservoir and ensure by-pass hole in cylinder bore is clear. Dry using compressed air or lint-free cloth.
Lubricate replacement seals with clean brake fluid.

Reassembling

If necessary, fit end plug on new gasket.
Fit spring retainer (1, Fig. 27) to small end of spring. If necessary, bend over retainer ears to secure.

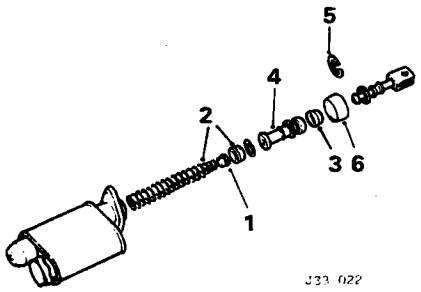


Fig. 27

Insert spring, large end leading, into cylinder bore; follow with main cup (2, Fig. 27), lip foremost. Ensure lip is not damaged on the circlip groove.
Using fingers only, stretch secondary cup (3, Fig. 27) onto piston with small end towards drilled end and groove engaging ridge.
Gently work round cup with fingers to ensure correct bedding.
Insert piston washer into bore, curved edge towards main cup.
Insert piston in bore (4, Fig. 27), drilled end foremost.
Fit rubber boot (5, Fig. 27) to push-rod.
Offer push-rod to piston and press into bore until circlip can be fitted behind push-rod stop ring.

CAUTION: It is important to ensure that circlip is correctly fitted in groove.

Locate rubber boot in groove (6, Fig. 27).

RELEASE BEARING

Remove and refit **33.25.12**

To carry out this operation proceed as described in Operation 33.10.01.

SLAVE CYLINDER

Overhaul **33.35.07**

Dismantling

Prior to overhaul, the slave cylinder must be removed as detailed in Operation 33.35.01.

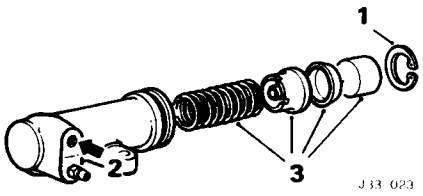


Fig. 28

Remove the circlip (1, Fig. 28) and applying low air pressure (2, Fig. 28) to the inlet port expel the piston, cup, cup filler and spring (3, Fig. 28); discard the cup.

Inspecting Components

WARNING: Use only clean brake fluid or Girling cleaning fluid for cleaning. All traces of cleaning fluid must be removed before reassembly. All components should be lubricated with clean brake fluid and assembled using the fingers only.

Examine the piston and slave cylinder bore for signs of scoring. Should scoring be evident, components must be renewed.
Examine the spring for signs of distortion and renew it if necessary.
Check that the rubber boot is not distorted or perished.

Reassembling

Press spring, cup filler, a new cup and the piston (3, Fig. 28) into the cylinder; refit the circlip (1, Fig. 28).
Check that piston moves freely and refit the cylinder as detailed in Operation 33.35.01.

CONTENTS

DESCRIPTION

The five-speed gearbox was introduced on the Jaguar 3.4 and 4.2 and Daimler Sovereign Series III saloons as an option to automatic transmission. The fifth gear, in effect, replaces the overdrive as fitted to the four-speed gearbox on Series II cars. Fifth gear is engaged as a normal gear. Reverse is engaged by lifting the lever and moving it as far as possible to the left then forward.

The gearbox oil capacity (from dry) is 2 litres (3½ pints, 4½ U.S. pints). To check the level, raise the car on a ramp or place it over a pit and remove the filler/level plug on the left-hand side of the box. Oil should reach the bottom of the threaded hole. If additional oil is required, S.A.E. 75W hypoid oil should be used. If this is unobtainable S.A.E. 80W hypoid oil may be used for topping-up.

No routine oil change is required but if a refill is necessary the recommended lubricant is Shell E3766 gearbox oil which is used for the initial factory fill. This oil is available under part number RTC1896. If this oil cannot be obtained it is permissible to use an S.A.E. 75W hypoid oil, but S.A.E. 80W oil should NOT be used as it will impair gear change quality.

The internal gear ratios are given in GENERAL DATA. The gearbox is recognised as the '77 mm' gearbox and is derived from the dimension between the mainshaft and the layshaft.

GENERAL DATA

5 Speed Manual Gearbox

Gearbox type	5 speed with baulk-ring synchromesh on all forward gears.
Ratios	First gear 3.321 : 1 Second gear 2.087 : 1 Third gear 1.396 : 1 Fourth gear 1.00 : 1 Fifth gear 0.883 : 1 Reverse 3.428 : 1
Capacity	2 litres (3½ pints, 4½ U.S. pints)

TORQUE WRENCH SETTINGS

ITEM	DESCRIPTION	TIGHTENING TORQUE		
		Nm	kgf m	lbf ft
Clutch lever pivot bolt	12 mm threaded pin	40,6	4,15	30
Bell housing to gearcase	12 mm bolt and setscrew	80	8,16	59
Cover plate to bell housing	8 mm bolt	20,3	2,07	15
5th gear interlock spool retainer to gearbox extension	5 mm setscrew	6,1	0,62	4.5
Output flange to mainshaft	18 mm Nyloc nut	203,4	20,74	150
Dust cap assembly to extension housing	6 mm setscrew	9,5	0,96	7
Extension and centre plate to main case	8 mm bolt	28,5	2,90	21
5th gear selector fork pivot bracket to centre plate	8 mm setscrew	28,5	2,90	21
Front cover to main case	8 mm setscrew	28,5	2,90	21
Interlock spool retainer to main case	6 mm setscrew	9,5	0,96	7
'J' coupling pin to main selector shaft	8 mm threaded pin	20,3	2,07	15
Mounting bracket	8 mm bolt and setscrew	28,5	2,90	21
Drain plug	16 mm	35	3,59	26
Oil pump body to extension	6 mm screw	9,5	0,96	7
Oil inlet access hole blanking	8 mm setscrew	20,3	2,07	15
Propeller shaft to output flange	10 mm bolt	51	5,12	37
Reverse lever mounting pin to centre plate	10 mm threaded pin	28,5	2,90	21
Reverse baulk plate to gearbox extension	6 mm bolt	9,5	0,96	7
Remote control housing to main case rear extension	8 mm setscrew	20,3	2,07	15
Speedometer cable clip to gearbox	6 mm setscrew	9,5	0,96	7
Torsion spring brackets to gearbox extension	6 mm screws	9,5	0,96	7
Torsion spring adjuster locking screw	8 mm setscrew	20,3	2,07	15

GEAR LEVER BIAS SPRING

Adjust **37.16.01**

Service tool: Engine support tool MS 53A

Adjustment

Disconnect the battery, withdraw the cigar lighter and remove the gear lever knob.
Remove the screws securing the centre console; raise the console slightly and disconnect the window and cigar lighter harnesses.
Remove the gear lever gaiter.
Position engine support tool MS 53A so that lifting hook of tool engages with the rear engine lifting eye.
Disconnect the intermediate exhaust pipe at the front.
Remove the nuts and bolts securing the gearbox crash bracket. Lower the bracket and position a jack and suitably shaped piece of wood beneath the gearbox mounting.
With the mounting supported by the jack, remove the mounting bolts.
Lower the jack and remove mounting. Using tool MS 53A, lower the rear of the engine.

CAUTION: Ensure that heater valve and clutch flexible pipe are not damaged during this operation.

Slacken abutment plate bolts.
Select 1st gear and move the gear lever as far as possible to the left.

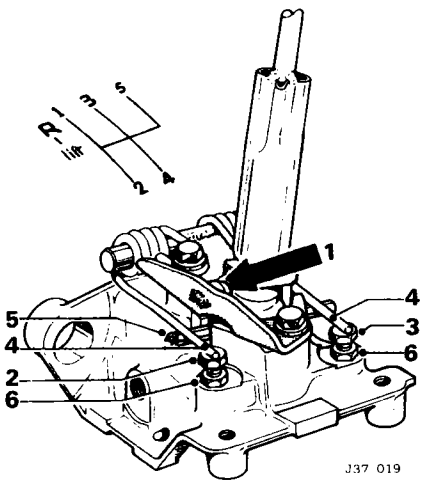


Fig. 1

Check the gap (1, Fig. 1) between the abutment and gear lever pads, the measurement should be 0,35 to 0,75 mm (0.014 to 0.030 in).
If this dimension is not obtained, slacken the location bracket securing bolt and adjust position of bracket until clearance is correct.
Slacken the locknuts (6, Fig. 1).
Select third gear, i.e., the gear lever will be eight degrees to the right of the vertical.
Adjust screws (2 and 3, Fig. 1) until each spring leg (4, Fig. 1) is approximately 0,5 mm (0.020 in) clear of the cross pin (5, Fig. 1). This will allow radial movement of the lever to take place before contact is made between cross-pin and springs.
Applying a light load, move the lever to the left and position it at the extremity of radial movement.
Adjust bolt (3, Fig. 1) until the right-hand spring just touches the cross-pin.
Now move the lever to the right and position it at the extremity of radial movement.
Adjust bolt (2, Fig. 1) until the left-hand spring just touches the cross-pin.
Screw both bolts in an equal amount until all radial movement is eliminated.
Return the lever to the neutral position then move it through the gate several times. When released, the lever should return to the 3rd/4th plane.
When adjustment is correct, tighten the locknuts (6, Fig. 1). Using tool MS 53A, raise the rear of the engine.
Position a jack and suitably shaped block of wood beneath the gearbox mounting and refit the rear engine mounting and crash bracket.
Remove the jack and tool MS 53A.
Connect the intermediate exhaust pipe; coat the olive with 'Firegum' prior to fitting.
Refit the gear lever gaiter, centre console and gear knob. Ensure full movement of gear lever.
Reconnect the battery and test electric windows and cigar lighter for correct operation.

GEAR LEVER BIAS SPRING

Remove and refit **37.16.02**

Service tool: Engine support tool MS 53A

Removing

Disconnect the battery, withdraw the cigar lighter and remove the gear lever knob.
Remove the screws securing the centre console; raise the console slightly and disconnect the electric window, and cigar lighter harnesses.
Remove the gear lever gaiter.
Position engine support tool MS 53A so that lifting eye of tool engages with the rear engine lifting eye.
Disconnect the intermediate exhaust pipe at the front.
Remove the nuts and bolts securing the gearbox crash bracket. Lower the bracket and position a jack and suitably shaped piece of wood beneath the gearbox casing.
With the gearbox supported by the jack remove the rear engine mounting.
Remove the jack and using tool MS 53A lower the rear of the engine.

CAUTION: Ensure that heater water valve and clutch flexible pipe are not damaged during this operation.

Select 4th gear, remove bias spring securing bolt followed by the spring.

Refitting

Grease the spring and mounting, refit the spring.
Fit and tighten the spring securing bolt.
Select 1st gear and move the gear lever as far as possible to the right.
Check the gap (1, Fig. 1) between the abutment and gear lever pads, the measurement should be 0,35 to 0,75 mm (0.014 to 0.030 in).
If this dimension is not obtained, slacken the location bracket securing bolt and adjust position of bracket until clearance is correct.
Slacken the locknuts (6, Fig. 1).
Select third gear i.e. the gear lever will be eight degrees to the right of the vertical.
Adjust screws (2 and 3, Fig. 1) until each spring leg (4, Fig. 1) is approximately 0,5 mm (0.020 in) clear of the cross-pin (5, Fig. 1). This will allow radial movement of the lever to take place before contact is made between cross-pin and springs.
Applying a light load, move the lever to the left and position it at the extremity of radial movement.
Adjust bolt (3, Fig. 1) until the right-hand spring just touches the cross-pin.
Now move the lever to the right and position it at the extremity of radial movement.
Adjust bolt (2, Fig. 1) until the left-hand spring just touches the cross-pin.
Screw both bolts in an equal amount until all radial movement is eliminated.
Return the lever to the neutral position then move it through the gate several times. When released, the lever should return to the 3rd/4th plane.
When adjustment is correct, tighten the locknuts (6, Fig. 1).
Using tool MS 53A, raise the rear of the engine.
Position a jack and suitably shaped block of wood beneath the gearbox casing and refit the rear engine mounting and crash bracket.
Remove the jack and tool MS 53A.
Refit the intermediate exhaust pipe; coat the olive with 'Firegum' prior to fitting.
Refit the gear lever gaiter, centre console and gear knob. Ensure full movement of gear lever.
Reconnect the battery and test electric windows and cigar lighter for correct operation.

REAR OIL SEAL

Remove and refit **37.23.01**

Service tool: Engine support tool MS 53A

Removing

Position engine support tool MS 53A so that lifting hook of tool engages with the rear engine lifting eye.
Disconnect the intermediate exhaust pipe and olive.
Remove the nuts and bolts securing the gearbox crash bracket. Lower the bracket and position a jack and suitably shaped piece of wood beneath the gearbox mounting.

continued

Lower the rear engine mounting.
Remove the intermediate heat shield.
Remove the jack followed by the propeller shaft securing bolts; swing shaft to one side.
Remove the output flange securing nut and slide flange off output shaft.
Prise the oil seal out of the gearbox casing.

Refitting

Smear the new oil seal with clean gearbox oil.
Fit the seal ensuring that it is correctly seated.
Refit the output flange; reconnect the propeller shaft.

CAUTION: Always use new self-locking nuts when refitting the propeller shaft.

Support the mounting with a jack and suitably shaped piece of wood; refit the rear engine mounting.
Remove the jack and refit the intermediate heat shield.
Reconnect the intermediate exhaust pipe; coat the olive with 'Firegum' prior to fitting.
Remove tool MS 53A.
Remove the filler/level plug and top up gearbox oil level to the bottom of the filler plug hole; refit the filler plug.

FIRST MOTION SHAFT OIL SEAL

Remove and refit **37.23.06**

Service tools: Offset spanner ST 1136

Removing

Prior to renewing the first motion shaft oil seal, it will be necessary to remove the gearbox as detailed in Operation 37.20.01.
Using tool ST 1136, unscrew and remove the clutch pivot bolt, withdrawal lever and release bearing.

CAUTION: Do not pull the withdrawal lever off the pivot bolt prior to removal

Remove the bolts and washers securing the front cover plate to the gearbox, withdraw the plate; discard the gasket.
Remove the oil seal from the front cover.

CAUTION: Ensure that the spacers for the first motion shaft and the layshaft bearings are not intermixed.

Refitting

Smear the replacement oil seal with clean gearbox oil and position the oil seal on the front cover plate with the lip of the seal facing towards the gearbox.
Fit the front cover plate, together with a new gasket, to the gearbox.
Refit the clutch pivot bolt and the release bearing; press the withdrawal lever on to the pivot bolt.
Refit the gearbox to the car, see Operation 37.20.01.
Remove the filler/lever plug and top up gearbox oil level to the bottom of the filler plug hole; refit the filler plug.

SPEEDOMETER DRIVE PINION

Remove and refit **37.25.05**

Removing

Remove the bolt and washer (1, Fig. 2) securing the clamp plate (2, Fig. 2) to the gearcase.
On later models with electronic speedometer, disconnect 2 pin connector.

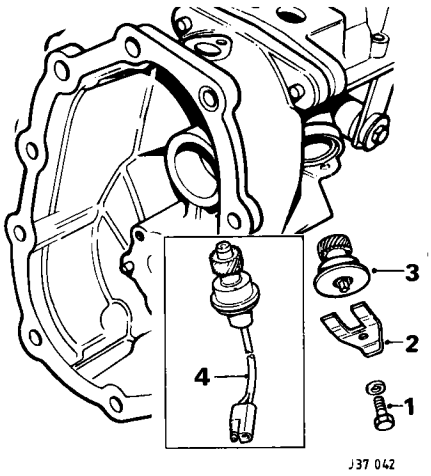


Fig. 2

Withdraw the pinion drive, transducer and cable (4, Fig. 2).
Withdraw the speedometer cable followed by the pinion housing (3, Fig. 2) (early models).
Remove the pinion from the housing; discard the 'O' ring and oil seal.

Refitting

Fit the replacement 'O' ring and oil seal, smear both components with clean gearbox oil.
Refit the pinion into the housing.
Refit the pinion housing, speedometer drive cable, drive cable, transducer and (clamp plate early models).
Connect the cable connectors (later models).

REVERSE LIGHT SWITCH

Check and adjust **37.27.02**

Disconnect the battery and remove the gear lever knob
Remove the screws securing the centre console slightly and disconnect the electric window and cigar lighter.
Remove the gear lever gaiter.
Connect a test lamp and battery to the switch and select reverse gear (Fig. 3).

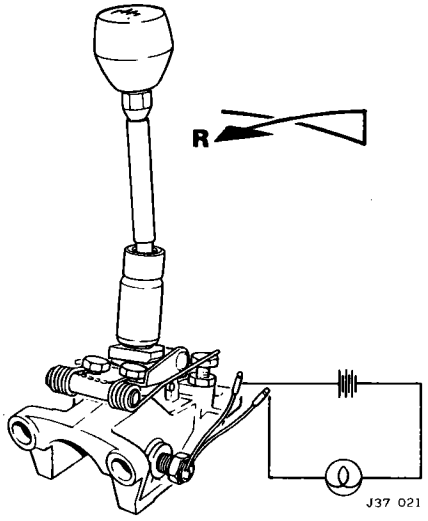


Fig. 3

Slacken the locknut and screw the switch in until the lamp lights.
Screw the switch in a further 180° and tighten the locknut.
Reconnect the battery, switch on the ignition and check that reverse lights are only illuminated when reverse gear is selected. Remove the test lamp and battery.
Switch off the ignition and disconnect the battery.
Refit the gear lever gaiter and centre console.
Reconnect the battery and test the electric windows and cigar lighter for correct operation.

GEARBOX ASSEMBLY

Remove and refit **37.20.01**

Service Tools: Engine support tool MS 53A; Tangye Epco V1000 Transmission Hoist; ST 1136 Offset spanner.

Removing

Drive the vehicle onto a ramp and disconnect the battery.
Unscrew the gear knob and withdraw the cigar lighter
Remove the screws securing the centre console and raise console slightly to gain access to the electric window.
Disconnect the harnesses at the multi-plug connectors and withdraw the console followed by the gear lever gaiter.
Place gear lever in third gear position.
Position engine support tool MS 53A across engine compartment and attach hook to rear engine lifting eye. Take the engine weight.
Disconnect the exhaust intermediate pipe at the front flange and secure pipe to one side.
Remove screws securing the heat shield to the body; withdraw the shield.
Remove bolts securing tie plate to bell housing and sump.

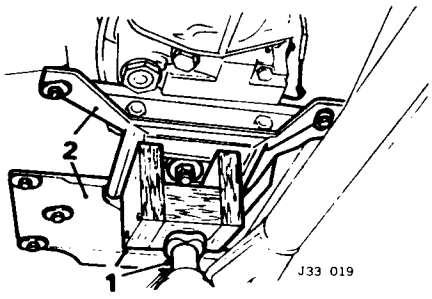


Fig. 4

Position a suitable ramp jack and wooden block (1, Fig. 4) beneath the rear engine mounting and remove the body cross member and rear engine mounting securing bolts.
Lower ramp jack and remove the rear engine mounting and body cross member (2,Fig. 4).
Disconnect the speedometer cable from the gearbox.

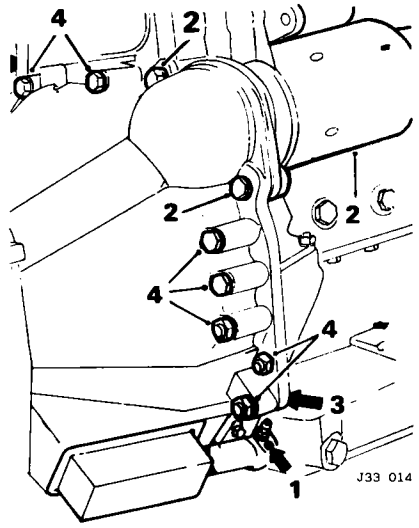


Fig. 5

Disconnect the slave cylinder from the gearbox, secure to one side.
Remove nuts, bolts and washers securing the propeller shaft to the gearbox output flange; move shaft away from flange.
Lower rear of engine using MS 53A.

CAUTION: Ensure that engine does not damage the water valve during this operation.

Remove bolts securing the starter motor to the bell housing (2, Fig. 5); withdraw motor and secure to one side.
Remove bolts securing the flywheel cover plate (3, Fig. 5); withdraw plate.
Disconnect reverse light wires from top of gearbox.
Position transmission hoist beneath gearbox and ensure that angle of platform matches that of the gearbox. Secure gearbox to platform.
Remove nuts, bolts and washers securing the bell housing (4, Fig. 5), noting fitted position of earth lead.
Withdraw gearbox and bell housing.

CAUTION: When a suitable hoist is not available the gearbox may still be removed but care must be taken to ensure that the input shaft is not allowed to take the weight of the gearbox.

Recover foam pad from top of gearbox.

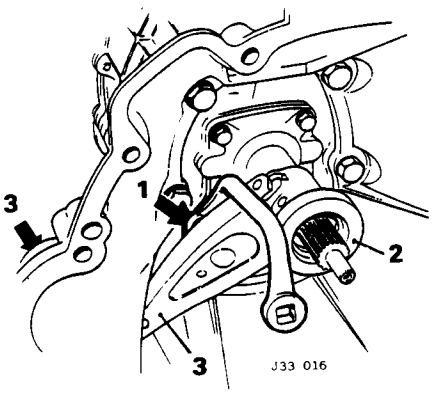


Fig. 6

Using tool ST 1136, remove the pivot bolt (1, Fig. 6) and carefully release withdrawal lever taking care not to bend the spring clip. DO NOT pull the lever off the bolt. Slide release bearing (2, Fig. 6) off the input shaft. Remove the shield from over the slave cylinder and disconnect the withdrawal lever (3, Fig. 6) from the push-rod.

Refitting

Position the bell housing on the gearcase and secure it with six bolts, plain and spring washers.
Smear the input shaft with lithium based grease and fit the release bearing. Refit the pivot bolt.
Engage the lugs of the withdrawal lever in the groove of the release bearing and press withdrawal lever onto pivot bolt.
Position the foam pad on top of gearbox casing.
Refit the gearbox and bell housing, reconnect the reverse light switch and tighten the bell housing securing bolts to the specified torque figure.
Refit the flywheel cover plate and remove the transmission hoist.
Raise engine using MS 53A or a ramp jack and wooden block positioned under the gearbox and reconnect the propeller shaft.
Refit the slave cylinder.

CAUTION: Always use new self-locking nuts to secure the propeller shaft.

Connect the speedometer drive cable; refit the rear engine mounting and body cross member.
Refit the heat shield and exhaust intermediate pipe.

CAUTION: Always use a new olive, coated with 'Firegum' when refitting the exhaust pipe.

Refit the tie-plate between the oil sump and the bell housing.
Refit the slave cylinder.
Remove the engine support tool MS 53A.
Refit the gear lever gaiter and centre console followed by the gear knob. Ensure full movement of the gear lever.
Reconnect the battery and check operation of electric windows, cigar lighter and electric door locks (where fitted).
If the slave cylinder pipes were disconnected remove the filler cap from the clutch fluid reservoir and top up fluid to the correct level.

WARNING: Only Castrol/Girling Universal Brake Fluid may be used in the clutch hydraulic system. This fluid exceeds SAE J1703/D.

Attach one end of a bleed tube to the slave cylinder bleed nipple.
Partially fill a clean container with hydraulic fluid and immerse the other end of the bleed tube in the fluid.
Slacken the bleed nipple and pump the clutch pedal slowly up and down, pausing between each stroke.

CAUTION: The fluid should be topped up after every three pedal strokes.

Pump the clutch pedal until the fluid issuing from the bleed tube is free from air bubbles; tighten the bleed nipple.
Top up the reservoir and apply working pressure to the clutch pedal for two to three minutes then examine the system for leaks.

WARNING: Do not use fluid bled from system for topping up purposes as this will contain air. If fluid has been in use for some time it should be discarded. Fresh fluid bled from system may be used after allowing it to stand for a few hours to allow air bubbles to disperse.

GEARBOX

Overhaul 37.20.04

Service tools: 47, 18G 47-1, 18G 47-5, 18G 284, 18G 284 AAH, 18G 705, 18G 705-1, 18G 1205, ST 1136

Dismantling

Place the gearbox on a bench or gearbox stand, ensuring that the oil is first drained.
Using tool ST 1136, unscrew the clutch withdrawal lever pivot bolt and remove the clutch withdrawal lever complete with the pivot bolt and release bearing slippers.
Remove the bell housing.
Remove the nut and connecting pin linking the selector shaft to the remote control shaft.
Remove the four bolts, spring and plain washers—two top, one either side—securing the remote control housing to the gear-case rear cover.
Remove the nut and plain washer securing the output flange to the mainshaft. Use tool RG 421 or 18G 1205 to prevent shaft rotation.
Withdraw the output flange.

continued

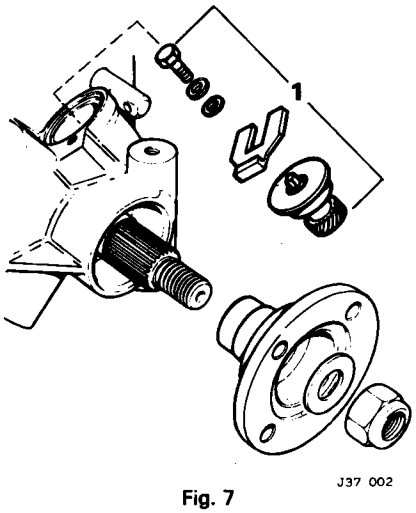


Fig. 7

Remove the speedometer driven gear and housing. (1, Fig. 7)
Remove the two bolts and spring washers securing the locating boss for the selector rear spool and withdraw the locating boss.
Remove the 10 bolts, spring and plain washers securing the rear cover to the gearcase; withdraw the rear cover.
Remove and discard the gasket.
Withdraw the oil pump drive (1, Fig. 8).

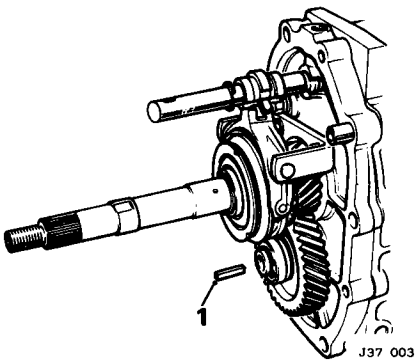


Fig. 8

Remove the 2 bolts and spring washers (1, Fig. 9) securing the fifth gear selector fork and bracket (2, Fig. 9).
Remove the circlip (3, Fig. 9) from the selector shaft.
Withdraw the fifth gear selector spool (4, Fig. 9). Note that the longer cam of the spool is fitted towards the bottom of the gearbox.

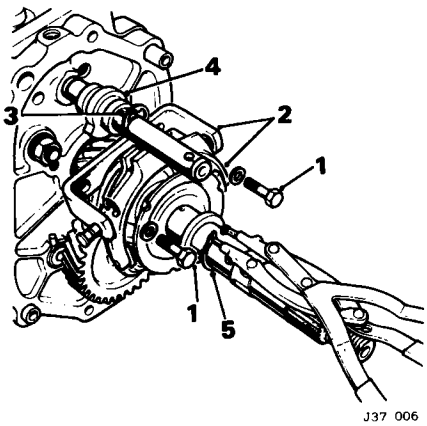


Fig. 9

Remove the circlip (5, Fig. 9) retaining the fifth gear synchromesh assembly to the mainshaft (Fig. 10).
Withdraw the synchromesh assembly, fifth gear-driven, and spacer from the mainshaft.

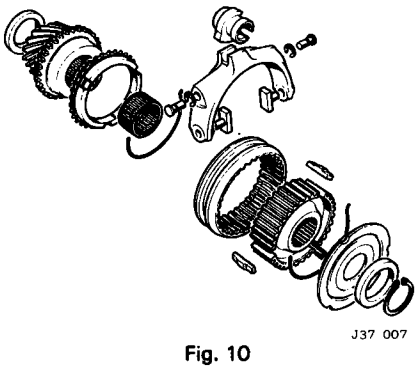


Fig. 10

Remove the circlip (1, Fig. 11) retaining the fifth gear-driving, from the layshaft.
Using tool 18G 705 and adaptors 18G 705-1 remove the fifth gear and spacer from the layshaft.

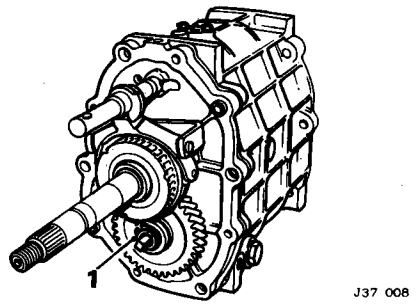


Fig. 11

Remove the front cover (1, Fig. 12).
Remove and discard the gasket.
Remove the input shaft selective washer, bearing track, (2, Fig. 12) layshaft selective washer and bearing track (3, Fig. 12) from the gearcase.

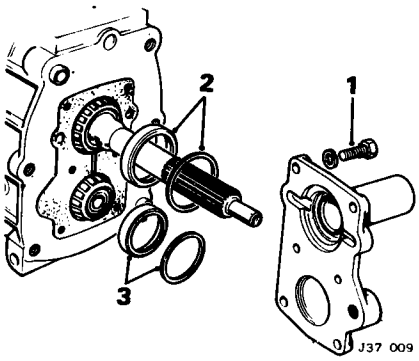


Fig. 12

Remove the two bolts and spring washers securing the locating boss for the selector shaft front spool; withdraw the locating boss.
Remove the plug, spring and ball from the centre plate.
Supporting the gearbox on the centre plate withdraw the gear-case.
Remove the input shaft and synchromesh cone.
Withdraw the layshaft cluster.
Support the centre plate complete with gears in protected vice jaws.

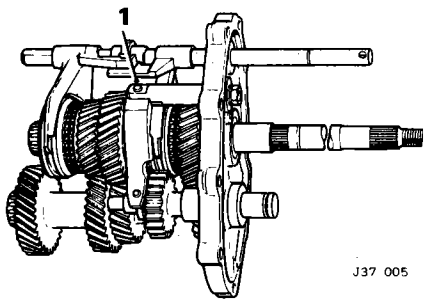


Fig. 13

Remove the reverse lever, circlip and pivot pin (1, Fig. 13).
Remove the reverse gear lever and slipper pad.
Slide the reverse shaft rearwards and withdraw the reverse gear spacer, mainshaft, selector shaft, selector shaft fork and spool in a forward direction clear of the centre plate.
Withdraw the selector fork and spool.

NOTE: The shorter cam of the spool is fitted towards the bottom of the gearbox.

If renewal of the pivot shaft and/or the centre plate is intended, remove the nut and spring washers securing the reverse gear pivot shaft and remove the pivot shaft.
If renewal of the dowels and/or centre plate is intended, remove the centre plate from the vice and extract the two dowels.

Input shaft and front cover

Using tools 47 and adaptors 18G 47-5, remove the external bearing.
Using tools 18G 284 AAH and 18G 284, withdraw the internal bearing track.
Remove and discard the oil seal from the front cover.

Layshaft

Using tools 47 and adaptors 18G 47-1, remove the layshaft bearings.

Mainshaft

Remove the pilot bearing and spacer.
Remove the 3rd and 4th speed synchronizer hub and sleeve (1, Fig. 14).
Remove the 3rd speed gear (2, Fig. 14).
Remove the circlip securing the mainshaft bearing (3, Fig. 14).
Remove the bearing, 1st gear and bush, 1st and 2nd speed hub, sleeve and synchromesh cones, and 2nd gear (4, Fig. 14).

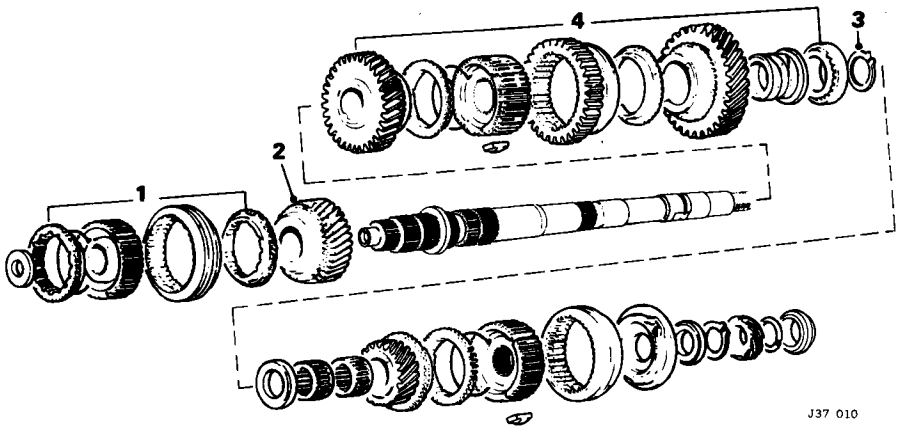


Fig. 14

Rear cover

Remove the oil seal (1, Fig. 15), bearing (2, Fig. 15), oil seal (3, Fig. 15), spacer, and speedometer gear (4, Fig. 15). Remove the oil pump drive, pump cover (5, Fig. 15) and gears (6, Fig. 15).

Thoroughly clean and examine all components; obtain new parts as necessary.

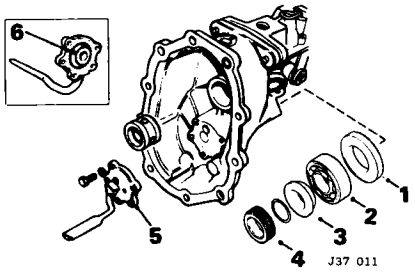


Fig. 15

Layshaft

Fit the bearings to the layshaft.

Mainshaft

Synchromesh assemblies. With the outer sleeve held, a push-through load applied to the outer face of the synchromesh hub should register 8,2–10 kgf m (18–22 lbf ft) to overcome spring detent in either direction.

Checking 1st speed bush end-float. Fit 2nd gear, 1st/2nd speed synchromesh hub and 1st gear bush to the mainshaft.

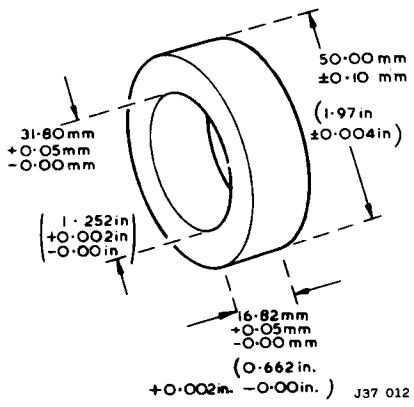


Fig. 16

Manufacture a spacer to the dimensions shown in Fig. 16 and slide the spacer on the mainshaft. This represents a slave bearing.

Using an old circlip and feeler gauges check the clearance existing between the spacer and the circlip, which should be within 0,005 to 0,055 mm (0.0002 to 0.002 in). The first speed bush is available with collars of different thickness. Select a 1st speed bush with a collar which will give the required end-float.

Remove the circlip, spacer, bush, synchromesh hub and 2nd gear from the mainshaft.

Checking 5th gear end-float. Fit the 5th gear assembly to the mainshaft, i.e. front spacer, 5th gear, synchromesh hub, rear plate and spacer. Fit an old circlip and using feeler gauges check the end-float which should be within 0,005 to 0,055 mm (0.0002 to 0.002 in). The rear spacer is available in a range of sizes. Select a rear spacer which will ensure the required clearance.

Remove the circlip spacer and 5th gear assembly.

Assembly

It is important that 1st/2nd synchromesh is assembled correctly with the short splines of inner member towards 2nd gear. Fit 2nd gear baulk ring, which is different to the other three, synchromesh hub and sleeve with the selector fork annulus to the rear of the gearbox, baulk ring 1st gear, selective bush, bearing and a new circlip (Fig. 17). When fitting the circlip care must be taken to ensure that it is not stretched beyond the minimum necessary to pass over the shaft. The internal diameter of an expanded circlip must not exceed 32,30 mm (1.272 in).

Fit 3rd gear, baulk ring, synchromesh hub and sleeve, with the longer boss of synchromesh hub to front of gearbox, to the mainshaft.

Fit the spacer and bearing to front of the mainshaft.

Fit the layshaft bearing track to the centre plate.

Fit the layshaft to the centre plate and fit the fifth gear, spacer and a new circlip. When fitting the circlip care must be taken to ensure that it is not stretched beyond the minimum necessary to obtain entry. The internal diameter of an expanded circlip must not exceed 22,5 mm (0.886 in).

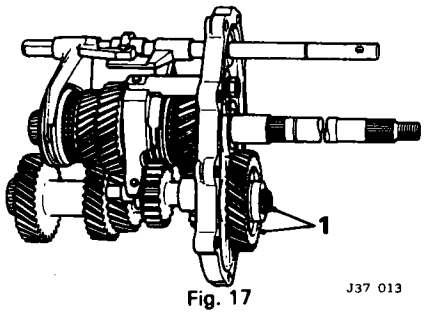


Fig. 17

Fit the mainshaft bearing track to the centre-plate.

Locate the centre plate in protected vice jaws.

Take the selector shaft complete with 1st and 2nd selector fork, front spool and 3rd and 4th selector fork and engage both forks in their respective synchromesh sleeves on the mainshaft. Simultaneously engage the selector shaft and mainshaft assemblies in the centre-plate.

Fit the spacer, 5th gear, baulk ring, synchromesh hub and sleeve end-plate, selective spacer, and a new circlip.

CAUTION: WHEN FITTING THE CIRCLIP CARE MUST BE TAKEN TO ENSURE THAT IT IS NOT STRETCHED BEYOND THE MINIMUM NECESSARY TO OBTAIN ENTRY. THE INTERNAL DIAMETER OF AN EXPANDED CIRCLIP MUST NOT EXCEED 27,63 mm (1.088 in). ENSURE THAT THE CIRCLIP IS FULLY SEATED IN THE GROOVE.

Fit the reverse gear with lip for slipper pad to front of box, front and rear spacers and the reverse shaft.

Fit the reverse lever, slipper pad, pivot pin and circlip. If a new reverse gear pivot shaft is to be fitted it is necessary to ensure that its radial location is consistent with reverse pad slipper engagement/clearance.

Radial location is determined on assembly.

Secure with spring washer and nuts, subsequently checking movement of reverse lever and ensuring slipper pad is properly engaged.

Remove the centre-plate and gear assembly from the vice and locate on a suitable stand with the front of the mainshaft uppermost.

Ensure that the reverse shaft does not slide out of position.

Fit the centre plate front gasket.

Fit the external bearing and internal bearing track to the input shaft.

Fit the input shaft to the gearcase.

Carefully slide the gearcase and input shaft into position over the gear assemblies. DO NOT USE FORCE. Ensure that the centre plate dowels and selector shaft are engaged in their respective locations.

Fit the layshaft and input shaft front bearing outer tracks.

Using slave bolts and plain washers to prevent damaging the rear face of the centre-plate, evenly draw the gearcase into position on the plate.

continued

Place a layshaft spacer of nominal thickness 1,02 mm (0.040 in) on the layshaft bearing track, fit the front cover and a new gasket, securing with six bolts.
Using a dial gauge, check layshaft end-float.
Remove the front cover and provisional spacer.
The required layshaft end-float is 0,005 to 0,055 mm (0.0002 to 0.002 in). Check the thickness of the provisional spacer. Spacer thickness required is: provisional spacer thickness, plus end-float obtained, minus 0,055 mm (0.002 in).
Again fit the front cover and gasket, this time with the correct spacer arrived at in previous operation.
Check layshaft end-float to ensure it is within the limits specified previously.
Place a ball bearing in the centre of the input shaft. This facilitates checking mainshaft end-float.
Mount a dial gauge on the gearcase with the stylus resting on the ball; zero the gauge.
Check the mainshaft and input shaft combined end-float. Care must be taken when checking dial gauge readings to ensure that end-float only—as distinct from side movement of the input shaft—is recorded. If difficulty is encountered in differentiating between end-float and side movement, remove the front cover and wrap the plain portion of the input shaft below the splines with six turns of masking tape. Refit the front cover and again check end-float ensuring that rise and fall of the input shaft is not restricted by the tape.
Having ascertained end-float, select the spacer required as follows:
End-float minus 0,055 mm (0.002 in) = spacer thickness required.
Fit the spacer thus determined and again check end-float which must be within 0,005 to 0,055 mm (0.0002 to 0.002 in).
Remove the front cover and tape, if used.
Fit the oil seal to the front cover and lubricate the seal lips.
Mask the splines and fit the front cover; remove the spline masking.
Place the gearbox on a bench or stand and remove the slave bolts and washers from the centre-plate.
Fit the 5th gear spool and circlip to the selector shaft.

NOTE: The longer cam of the spool is fitted towards the bottom of the gearbox.

Fit the 5th gear selector fork and bracket.
Renew the selector shaft 'O' ring in the rear cover and fit the oil ring bush.
Fit a new rear gasket to the centre-plate and engage the oil pump shaft in the layshaft.
Fit the oil pump gears and cover to the gearbox rear cover.
Fit the rear cover ensuring that the oil pump drive engages the oil pump.
Fit the selector shaft ball, spring and plug to the centre-plate.
Fit the two spool locating bosses to both the 1st/2nd spool and 5th gear spool.
Fit the speedometer driving gear to the mainshaft ensuring that it engages the flats on the mainshaft.
Fit the spacer and ball race to the mainshaft.
Fit a new rear oil seal, lubricate the seal lip with gearbox oil.
Fit the output flange, washer and nut.
Fit the speedometer driven gear and housing.*
Refit the bell housing.
Refit the clutch pivot bolt.
Assemble the release bearing to the withdrawal lever and press the retaining clip over the head of the pivot bolt.
Fit the remote control housing.

***Later models**

Speedo drive pinion for electronic speedometer vehicles.