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 their Distributor or Dealer.

The manufacturers reserve the right to vary their specifications with or without notice, and at such times and in such 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 nor the Distributor or 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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INTRODUCTION

The purpose of this Manual is to assist skilled mechanics in the efficient repair and maintenance of Triumph TR8 vehicles. Using the appropriate service tools and carrying out the procedures as detailed will enable the operations to be completed in the time stated in the ‘Repair Operations Times’.

Indexing
The contents page lists the titles and reference numbers of the divisions in numerical order. A complete index of operations, together with their page numbers, is given in the introductory pages of this manual.

Operation Numbering
A master index of numbered operations has been compiled for universal application to all vehicles manufactured by BL Cars and, therefore, because of the different specifications of various models, continuity of the numbering sequence cannot be 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 Operations Times’. The number consists of six digits arranged in three pairs.

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

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. An illustrated list of all necessary tools is included in ‘SERVICE TOOLS’.

References
References to the left- or right-hand side in the Manual 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 on page v.

Where the specification of the vehicle is varied, the operation will detail which variant is concerned, i.e. U.S.A. and Canada for full emission vehicles. The fuel system section has alternative footlines to cater for the major variations.

REPAIRS AND REPLACEMENTS
When service parts are required it is essential that only genuine Triumph or Unipart replacements are used.

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

Safety features embodied in the car may be impaired if other than genuine parts are fitted. In certain territories, legislation prohibits the fitting of parts not to the vehicle manufacturer’s specification. Torque wrench setting figures given in the Repair Operation Manual must be strictly adhered to. Locking devices, where specified, must be fitted. If the efficiency of a locking device is impaired during removal it must be renewed. Owners purchasing accessories while travelling abroad should ensure that the accessory and its fitted location on the car conform to mandatory requirements in their country of origin.

The car warranty may be invalidated by the fitting of other than genuine manufacturer’s parts or parts approved by the manufacturer. All Unipart replacements have the full backing of the factory warranty.

BL Cars Distributors and Dealers are obliged to supply only genuine service parts.
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<td>After bottom dead centre</td>
<td>A.B.D.C.</td>
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<td>After top dead centre</td>
<td>A.T.D.C.</td>
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<td>Alternating current</td>
<td>a.c.</td>
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<td>Ampere</td>
<td>amp</td>
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<td>Ampere-hour</td>
<td>Ah</td>
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<td>Atm</td>
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<tr>
<td>Before bottom dead centre</td>
<td>B.B.D.C.</td>
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<td>Before top dead centre</td>
<td>B.T.D.C.</td>
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<td>Bottom dead centre</td>
<td>B.D.C.</td>
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<td>b.h.p.</td>
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<tr>
<td>Brake mean effective pressure</td>
<td>b.m.e.p.</td>
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<tr>
<td>British Standards</td>
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<tr>
<td>Carbon monoxide</td>
<td>CO</td>
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<tr>
<td>Centigrade (Celsius)</td>
<td>C</td>
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<tr>
<td>Centimetres</td>
<td>cm</td>
</tr>
<tr>
<td>Cubic centimetres</td>
<td>cm³</td>
</tr>
<tr>
<td>Cubic inches</td>
<td>in³</td>
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<tr>
<td>Cycles per minute</td>
<td>c/min</td>
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<tr>
<td>Degree (angle)</td>
<td>deg. or °</td>
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<td>Degree (temperature)</td>
<td>deg. or °</td>
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<td>Diameter</td>
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<td>Feet</td>
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<td>Feet per minute</td>
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<td>Left-hand steering</td>
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<td>Maximum</td>
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<td>Metres</td>
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<td>Microfarad</td>
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<td>Miniature Edison Screw</td>
<td>MES</td>
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<td>Miles per gallon</td>
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<td>Millimetres of currency</td>
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<td>Minimum</td>
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<td>Minute (of angle)</td>
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<td>oz</td>
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<td>Part Number</td>
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<td>Pints (U.S.)</td>
<td>U.S.pt</td>
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<tr>
<td>Plus or minus</td>
<td>±</td>
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<td>Plus (tolerance)</td>
<td>+</td>
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<tr>
<td>Pounds (mass)</td>
<td>lb</td>
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<tr>
<td>Pounds feet (torque)</td>
<td>lbf ft</td>
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<td>Pounds inches (torque)</td>
<td>lbf in</td>
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<td>Pounds per square inch</td>
<td>lb/in²</td>
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<tr>
<td>Radius</td>
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<td>Ratio</td>
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<td>Revolutions per minute</td>
<td>rev/min</td>
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<td>Right-hand</td>
<td>R.H.</td>
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<td>Right-hand steering</td>
<td>R.H.Stg.</td>
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<tr>
<td>Second (angle)</td>
<td>°</td>
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<tr>
<td>Second (numerical order)</td>
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<tr>
<td>Society of Automobile Engineers</td>
<td>S.A.E.</td>
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<tr>
<td>Specific gravity</td>
<td>sp.gr.</td>
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<tr>
<td>Square centimetres</td>
<td>cm²</td>
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<tr>
<td>Squares inches</td>
<td>in²</td>
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<tr>
<td>Standard</td>
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<td>Standard wire gauge</td>
<td>s.w.g.</td>
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<td>Synchronizer/synchromesh</td>
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<tr>
<td>Third</td>
<td>3rd</td>
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<td>Twin carburetters</td>
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<td>United Kingdom</td>
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Receiver-drier — remove and refit

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WINDSCREEN WIPERS AND WASHERS

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Windscreen wiper system

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ELECTRICAL SYSTEM

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Battery — remove and refit

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Cigarette lighter — remove and refit

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Flasher units

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Fuel pump inertia cut-out switch — remove and refit

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**Fuse system** — fuse — remove and refit

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**Ignition coil and ballast resistor**
- Ballast resistor — remove and refit
- Ignition coil — remove and refit

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**Ignition distributor**
- Data
- Ignition timing — adjust
- Overhaul
- Remove and refit

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**Lamps**
- Fascia switch panel illumination lamp — remove and refit
- Front flasher repeater lamp — remove and refit
- Front marker lamp — remove and refit
- Front parking and flasher lamp — remove and refit
- Hazard warning light — remove and refit
- Headlight control illumination lamp — remove and refit
- Instrument illumination lamps — remove and refit
- Map/courtesy lamp
- Brake line failure lamp — remove and refit
- Rear lamp assembly — remove and refit
- Rear marker lamp — remove and refit
- Warning light — remove and refit

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**Radio** — door speaker — remove and refit

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**Relays**
- Heated rear window
- Headlamp flash relay — remove and refit
- Horn relay — remove and refit
- Starter motor relay — remove and refit

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**Seat belt warning system**
- Buzzer/timer module — remove and refit
- Fasten belts warning light — remove and refit

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**Starter motor**
- Bench test
- Data
- Remove and refit
- Overhaul
- Solenoid — remove and refit
- Solenoid — test

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**Switches**
- Braking line failure switch — remove and refit
- Door switch — remove and refit
- Driver’s belt switch — remove and refit
- Fascia switch panel — remove and refit
- Front fog lamp switch — remove and refit
- Handbrake switch — remove and refit
- Hazard switch — remove and refit
- Heated back-light switch — remove and refit
- Ignition/starter switch — remove and refit
- Key switch — remove and refit
- Master light switch — remove and refit
- Oil pressure switch — remove and refit
- Panel rheostat — remove and refit
- Passenger’s belt switch — remove and refit
- Rear fog lamp switch — remove and refit
- Reverse lamp switch — remove and refit
- Steer column multi-purpose switch — remove and refit
- Stop lamp switch — remove and refit

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<td>- fuel tank unit — remove and refit</td>
<td>88.25.32</td>
<td>356</td>
</tr>
<tr>
<td><strong>Instrument panel</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- description</td>
<td>88.20.00</td>
<td>352</td>
</tr>
<tr>
<td>- lens — remove and refit</td>
<td>88.20.17</td>
<td>354</td>
</tr>
<tr>
<td>- printed circuit — remove and refit</td>
<td>88.20.19</td>
<td>354</td>
</tr>
<tr>
<td>- remove and refit</td>
<td>88.20.21</td>
<td>353</td>
</tr>
<tr>
<td>- warning light — remove and refit</td>
<td>refer to 6.45.60</td>
<td></td>
</tr>
<tr>
<td><strong>Speedometer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- remove and refit</td>
<td>88.30.01</td>
<td>357</td>
</tr>
<tr>
<td>- trip reset cable — remove and refit</td>
<td>88.30.02</td>
<td>357</td>
</tr>
<tr>
<td><strong>Tachometer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- remove and refit</td>
<td>88.30.21</td>
<td>357</td>
</tr>
<tr>
<td><strong>Temperature indication</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- data</td>
<td>88.25.00</td>
<td>354</td>
</tr>
<tr>
<td>- description</td>
<td>88.25.01</td>
<td>355</td>
</tr>
<tr>
<td>- temperature indicator — remove and refit</td>
<td>88.25.14</td>
<td>356</td>
</tr>
<tr>
<td>- temperature transmitter — remove and refit</td>
<td>88.25.20</td>
<td>356</td>
</tr>
</tbody>
</table>

**SERVICE TOOLS**                  |               | 358      |
### GENERAL SPECIFICATION DATA

#### ENGINE
- **Number of cylinders**: V8
- **Bore of cylinders**: 88.90 mm (3.50 in)
- **Stroke of crankshaft**: 71.12 mm (2.80 in)
- **Engine capacity**: 3528 cm³ (215 in³)
- **Compression ratio**: 8.15 : 1 nominal

#### COOLING SYSTEM
- **Type**: Pressurized "no loss" system incorporating a separate expansion tank
- **Circulation**: Impeller-type pump. Thermostatically controlled flow
- **Fan**: number of blades: 7, diameter: 406 mm (16 in), drive: Viscous coupled
- **Pressure cap**: 1.05 kgf/cm² (15 lbf/in²)
- **Thermostat**: 88 °C (190 °F)

#### LUBRICATION SYSTEM
- **Pump**: High capacity rotor pump
- **Pressure at 2000 rev/min**: 1.97 kgf/cm² (28 lbf/in²)
- **Oil filter**: Disposable "full flow" type
- **Oil filter**: Sealed cap on rocker cover

#### IGNITION SYSTEM
- **Coil**: Lucas 22C12, electronic
- **Ballast resistor**: 9 BR
- **Distributor**: Lucas electronic, type 35DE8

#### FUEL SYSTEM—Carburetters
- **Carburettor**: Refer to 'ENGINE TUNING DATA'
- **Fuel pump**: Mechanically-operated, diaphragm-type
- **Operating pressure**: 0.17 to 0.24 kgf/cm² (2.5 to 3.5 lbf/in²)

#### FUEL SYSTEM—Fuel Injection
- **Make/type**: Lucas/digital
- **Pump**: Electric beneath car floor
- **Operating pressure**: Approximately 2.5 kgf/cm² (36 lbf/in²)
- **Fuel filter(s)**: In line, renewable
- **Air cleaner**: Replaceable element

#### TRANSMISSION (MANUAL)
- **Clutch**: Single dry plate diaphragm type
- **Diameter**: 240 mm (9.5 in)
- **Gearbox (5 speed)**: Synchronesh on all forward gears
- **Final drive ratio**: 3.08 : 1

<table>
<thead>
<tr>
<th>Gearbox ratios to 1</th>
<th>5th</th>
<th>4th</th>
<th>3rd</th>
<th>2nd</th>
<th>1st</th>
<th>Rev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall ratios to 1</td>
<td>0.833</td>
<td>1.000</td>
<td>1.396</td>
<td>2.087</td>
<td>3.321</td>
<td>3.428</td>
</tr>
<tr>
<td>Gearbox rev/min at 10 m.p.h.</td>
<td>380</td>
<td>457</td>
<td>639</td>
<td>955</td>
<td>1517</td>
<td>1517</td>
</tr>
<tr>
<td>Engine speed at 1000 rev/min: m.p.h.</td>
<td>26.3</td>
<td>21.9</td>
<td>42.4</td>
<td>35.2</td>
<td>93.8</td>
<td>15.1</td>
</tr>
<tr>
<td>Road speed at 1000 engine rev/min: km/h</td>
<td>15.1</td>
<td>62.8</td>
<td>39.5</td>
<td>93.8</td>
<td>101.1</td>
<td>63.6</td>
</tr>
</tbody>
</table>
GEARBOX — AUTOMATIC

<table>
<thead>
<tr>
<th>Type</th>
<th>3rd</th>
<th>2nd</th>
<th>1st</th>
<th>Rev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borg-Warner 65</td>
<td>1.00-2.08</td>
<td>1.45-3.02</td>
<td>2.39-4.97</td>
<td>2.09-4.35</td>
</tr>
</tbody>
</table>

Transmission conversion range

| Overall ratios to 1 | 3.08-6.41 | 4.47-9.30 | 7.36-15.31 | 6.44-13.40 |

Road speed corresponding to 1000 engine rev/min:

<table>
<thead>
<tr>
<th>m.p.h.</th>
<th>km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.9</td>
<td>35.2</td>
</tr>
</tbody>
</table>

AUTOMATIC TRANSMISSION SHIFT SPEEDS

<table>
<thead>
<tr>
<th>Throttle position</th>
<th>Zero throttle</th>
<th>Light throttle</th>
<th>Part throttle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selector</td>
<td>1</td>
<td>2</td>
<td>D</td>
</tr>
<tr>
<td>Shift</td>
<td>2-1</td>
<td>1-2</td>
<td>2-3</td>
</tr>
</tbody>
</table>

Road speed:

<table>
<thead>
<tr>
<th>m.p.h.</th>
<th>km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>26-37</td>
<td>42-59</td>
</tr>
<tr>
<td>9-13</td>
<td>14-21</td>
</tr>
<tr>
<td>13-17</td>
<td>21-27</td>
</tr>
<tr>
<td>44 max.</td>
<td>71 max.</td>
</tr>
</tbody>
</table>

SUSPENSION

<table>
<thead>
<tr>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent, McPherson strut telescopic damper units with coaxial coil springs and anti-roll bar</td>
<td>Four link system. Lower trailing arms, upper trailing radius rods with telescopic damper units, coil springs and anti-roll bar</td>
</tr>
</tbody>
</table>

STEERING

<table>
<thead>
<tr>
<th>Make/type</th>
<th>Alford &amp; Alder, rack and pinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steering wheel diameter:</td>
<td>368 mm (14.5 in)</td>
</tr>
<tr>
<td>Later models:</td>
<td>355 mm (14.0 in)</td>
</tr>
<tr>
<td>Steering wheel turns, lock-to-lock</td>
<td>3.875</td>
</tr>
<tr>
<td>Steering angles and dimensions:</td>
<td>Zero to 1.5 mm (0.062 in) toe-in</td>
</tr>
<tr>
<td>Camber angle</td>
<td>( \frac{1}{4} )° positive ± 1°</td>
</tr>
<tr>
<td>Castor angle</td>
<td>( 3 \frac{1}{2} )° positive ± 1°</td>
</tr>
<tr>
<td>King pin inclination</td>
<td>( 11 \frac{1}{2} )° positive ± 1°</td>
</tr>
</tbody>
</table>

| Check with the vehicle in the curb condition |

| Camber angle | \( \frac{1}{4} \)° negative ± 1° |
| Castor angle | \( 3 \frac{1}{2} \)° negative ± 1° |
| King pin inclination | \( 11 \frac{1}{2} \)° negative ± 1° |

BRAKES

<table>
<thead>
<tr>
<th>Foot brake</th>
<th>Divided hydraulic system with discs at front and drums at rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>Hydraulic, servo-assisted, boost ratio 2.3 : 1 nominal</td>
</tr>
</tbody>
</table>

| Front brake | Hub-mounted discs with two pistons |
| Type | |
| Disc diameter | 247.6 mm (9.75 in) |
| Front swept area | 127.4 cm² (197.5 in²) |

<table>
<thead>
<tr>
<th>Rear brake</th>
<th>Drums, hand brake actuated, self-adjusting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>Drum dimensions</td>
<td>229 X 44.5 mm (9 X 1.75 in)</td>
</tr>
<tr>
<td>Rear swept area</td>
<td>390 cm³ (60.4 in³)</td>
</tr>
<tr>
<td>638 cm³ (98.9 in³)</td>
<td></td>
</tr>
<tr>
<td>Hand brake</td>
<td>Mechanical, operation on rear shoes</td>
</tr>
</tbody>
</table>

PROPELLER SHAFT

<table>
<thead>
<tr>
<th>Type</th>
<th>One-piece straight tube</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal joints</td>
<td>Constant velocity at both ends</td>
</tr>
</tbody>
</table>

FINAL DRIVE

<table>
<thead>
<tr>
<th>Type</th>
<th>Hypoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratio</td>
<td>3.08 : 1</td>
</tr>
</tbody>
</table>
### WHEELS
**Size/type** 5½J x 13 in dia., cast alloy

### TYRES AND TYRE PRESSURES
**Size** 185/70 HR13
**Pressures (all loading conditions):**
- **Front** 1.7 bar 1.6 kgf/cm² 24 lbf/in²
- **Rear** 2.0 bar 1.97 kgf/cm² 28 lbf/in²

### ELECTRICAL EQUIPMENT
**System** 12 volt, negative earth
**Fuses** See 86.70.00
**Battery capacity** 40 amp-hour at 20 hr rate
**Alternator** Lucas 17ACR or 25ACR
**Starter motor** Lucas 2M 100 PE
**Wiper motor** Lucas 16W
**Windscreen washer pump** Lucas 103J
**Headlamp actuator** Lucas 15W
**Distributor** See 86.35.00
**Bulb chart** See 86.00.00

### CAPACITIES (NOMINAL)

<table>
<thead>
<tr>
<th>Metric</th>
<th>Imperial</th>
<th>U.S.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel tank</td>
<td>54.5 litres</td>
<td>12.0 gal</td>
</tr>
<tr>
<td>Engine sump and filter</td>
<td>4.4 litres</td>
<td>7.75 pt</td>
</tr>
<tr>
<td>Gearbox from dry</td>
<td>1.5 litres</td>
<td>2.7 pt</td>
</tr>
<tr>
<td>Rear axle from dry</td>
<td>0.9 litres</td>
<td>1.6 pt</td>
</tr>
<tr>
<td>Cooling system, including reservoir and heater:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expansion tank system</td>
<td>9.9 litres</td>
<td>21.5 pt</td>
</tr>
<tr>
<td>Header tank system</td>
<td>10.9 litres</td>
<td>23.2 pt</td>
</tr>
<tr>
<td>Automatic transmission with oil cooler</td>
<td>6.96 litres</td>
<td>14.9 pt</td>
</tr>
<tr>
<td>Power steering reservoir</td>
<td>0.6 litres</td>
<td>1.0 pt</td>
</tr>
</tbody>
</table>

### GENERAL DIMENSIONS (APPROXIMATE)
**Overall length** 4203 mm (165.4 in)
**Overall width** 1681 mm (66.2 in)
**Overall height** 1258 to 1268 mm (49.5 to 49.9 in) dependent on market and model year
**Wheelbase** 2160 mm (85.0 in)
**Track, front** 1409 mm (55.5 in)
**Track, rear** 1404 mm (55.3 in)
**Ground clearance** 90 to 114 mm (3.5 to 4.5 in) depending on market, model year and load condition
**Turning circle: Between kerbs** 9.6 m (31.6 feet)
**Between walls** 10.4 m (34.3 feet)

### WEIGHTS (APPROXIMATE)

<table>
<thead>
<tr>
<th>Metric</th>
<th><strong>Showroom: Minimum</strong></th>
<th><strong>Unladen: Maximum</strong></th>
<th><strong>Gross vehicle weight</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Roof rack capacity</strong></td>
<td>50 kg (110 lb)</td>
<td>70 kg (154 lb)</td>
<td>500 kg (1102 lb)</td>
</tr>
<tr>
<td><strong>Max. axle load: Front</strong></td>
<td>731 to 765 kg (1612 to 1686 lb)</td>
<td>800 to 850 kg (1764 to 1874 lb)</td>
<td>1400 kg (3091 lb)</td>
</tr>
<tr>
<td><strong>Rear</strong></td>
<td>687 to 695 kg (1515 to 1532 lb)</td>
<td>750 to 800 kg (1654 to 1764 lb)</td>
<td>1200 kg (2646 lb)</td>
</tr>
<tr>
<td><strong>Towing capacity—braked trailer</strong></td>
<td>2800 to 2928 lb</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* These figures must be taken as a guide only and vary according to market, model year and equipment fitted.
PAINT AND TRIM CODING SYSTEM

The commission number plate bears symbols for identification of the vehicle’s exterior and trim colours.

**Colour Code**

The basic colours are allocated a letter as shown in the table. Shades of these colours are allocated two suffix letters. For example, a commission number plate stamped 'Paint JAA, Trim PAA', denotes that the vehicle is painted 'French Blue' and trimmed 'Black'.

<table>
<thead>
<tr>
<th>Basic Colour</th>
<th>Basic Colour Letter</th>
<th>Paint Trim Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown/Buff</td>
<td>A</td>
<td>AAA Geneva</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AAB Sebring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AAC Siena</td>
</tr>
<tr>
<td>Bronze</td>
<td>B</td>
<td>AAD Venice</td>
</tr>
<tr>
<td>Red/Maroon</td>
<td>C</td>
<td>AAE Atlantic</td>
</tr>
<tr>
<td>Pink</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>Orange</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>Yellow</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>Gold</td>
<td>G</td>
<td></td>
</tr>
<tr>
<td>Green</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td>Blue</td>
<td>J</td>
<td></td>
</tr>
<tr>
<td>Mauve/Purple</td>
<td>K</td>
<td></td>
</tr>
<tr>
<td>Grey</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>Silver/Aluminium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White/Ivory/Cream</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>Multi-coloured</td>
<td>R</td>
<td></td>
</tr>
</tbody>
</table>
## ENGINE TUNING DATA

### ENGINE

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>V8</td>
</tr>
<tr>
<td>Cylinder bore</td>
<td>88.90 mm (3.5 in)</td>
</tr>
<tr>
<td>Crank stroke</td>
<td>71.12 mm (2.80 in)</td>
</tr>
<tr>
<td>Capacity</td>
<td>3528 cm³ (215 in³)</td>
</tr>
<tr>
<td>Compression ratio</td>
<td>8.15:1</td>
</tr>
<tr>
<td>Firing order</td>
<td>1 — 8 — 4 — 3 — 6 — 7 — 2</td>
</tr>
</tbody>
</table>
| Number 1 cylinder                | Front left: Left bank 1, 3, 5, 7  
|                                 | Right bank 2, 4, 6, 8  |
| Cylinder pressures at 15 °C (60 °F) ambient temperature, 150 to 200 rev/min | 9.1 kgf/cm² (130 lbf/in²) minimum  
|                                 | 750 to 900 rev/min     |
| Fuel octane requirement          | 91 R.O.N. — unleaded   |
| Ignition timing: Carburettor: Static | 7° B.T.D.C.         |
|                                 | Dynamic                |
| Fuel injection: Static Dynamic   | T.D.C. with vacuum pipe disconnected  
|                                 | Crankshaft damper with pointer on timing cover |
| Location of timing marks         |                        |
| Valve timing:                    |                        |
| Inlet opens                       | 30° B.T.D.C.           |
| exhaust opens                     | 37° A.T.D.C.           |
|                           | 75° A.B.D.C.           |
|                           | 68° B.B.D.C.           |
| DISTRIBUTOR                      |                        |
| Make/type                        | Lucas 35 DE 8          |
| Rotation - viewed on rotor       | Clockwise              |
| Pick-up air gap                  | 0.36 to 0.41 mm (0.014 to 0.016 in)  
| Refer to 86.33.00                |                        |

### SPARK PLUGS

<table>
<thead>
<tr>
<th>Type</th>
<th>Champion or Unipart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make</td>
<td>N12Y or GSP 13</td>
</tr>
<tr>
<td>Gap: Carburettor engines</td>
<td>0.8 mm (0.030 in)</td>
</tr>
<tr>
<td>Fuel injection engines</td>
<td>0.88 mm (0.035 in)</td>
</tr>
</tbody>
</table>

### COIL

<table>
<thead>
<tr>
<th>Primary winding resistance</th>
<th>Lucas 22C12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance</td>
<td>1.2 to 1.5 ohms</td>
</tr>
</tbody>
</table>

### BALLAST RESISTOR

| 9 BR                        |                      |

### CARBURETTERS

<table>
<thead>
<tr>
<th>Make/arrangement</th>
<th>Twin side-draught Stromberg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Stromberg 175 CDSET with auto-choke</td>
</tr>
<tr>
<td>Needle: Federal 1979</td>
<td>B.I.E.H.</td>
</tr>
<tr>
<td>California 1979</td>
<td>B.I.E.M.</td>
</tr>
<tr>
<td>Federal 1980</td>
<td></td>
</tr>
<tr>
<td>Idle mixture: Federal specification</td>
<td>5% CO ± 2% (1979), 4% CO ± 1½% (1980)</td>
</tr>
<tr>
<td>California specification</td>
<td>4% CO ± 1½% (1979)</td>
</tr>
</tbody>
</table>

### FUEL INJECTION

<table>
<thead>
<tr>
<th>Make/type</th>
<th>Lucas digital electronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating pressure</td>
<td>2.5 kgf/cm² (36 lbf/in²) approximate</td>
</tr>
</tbody>
</table>
## TORQUE WRENCH SETTINGS

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Specified Torque Nm lbf ft</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENGINE</strong></td>
<td>Air intake adaptor to carburetters</td>
<td>$\frac{3}{16}$ U.N.F. nut 24 17</td>
</tr>
<tr>
<td></td>
<td>Alternator mounting bracket to cylinder head</td>
<td>$\frac{1}{4}$ U.N.C. bolt 34 25</td>
</tr>
<tr>
<td></td>
<td>Alternator to mounting bracket</td>
<td>$\frac{3}{16}$ U.N.F. nut 24 17</td>
</tr>
<tr>
<td></td>
<td>Alternator to adjusting link</td>
<td>M8 bolt 34 17</td>
</tr>
<tr>
<td></td>
<td>Chain wheel to transmission</td>
<td>61 $\times$ 20</td>
</tr>
<tr>
<td></td>
<td>Connecting rod bolt</td>
<td>47 35</td>
</tr>
<tr>
<td></td>
<td>Clutch attachment to flywheel</td>
<td>27.5 20</td>
</tr>
<tr>
<td></td>
<td>Cylinder head bolts</td>
<td>Nos. 1 to 10 95 70</td>
</tr>
<tr>
<td></td>
<td>Cylinder head bolts</td>
<td>Nos. 11 to 14 67.5 50</td>
</tr>
<tr>
<td></td>
<td>Distributor clamp bolt</td>
<td>15 $\times$ 16 8 14</td>
</tr>
<tr>
<td></td>
<td>Exhaust manifold to cylinder heads</td>
<td>$\frac{1}{4}$ U.N.C. bolt 22 16</td>
</tr>
<tr>
<td></td>
<td>Fan attachment</td>
<td>11.5 9</td>
</tr>
<tr>
<td></td>
<td>Flexible drive plate to starter ring</td>
<td>11 $\times$ 30</td>
</tr>
<tr>
<td></td>
<td>Flexible drive plate to crankshaft</td>
<td>$\frac{1}{4}$ U.N.C. bolt 81 60</td>
</tr>
<tr>
<td></td>
<td>Flywheel to crankshaft</td>
<td>$\frac{1}{4}$ U.N.C. bolt 81 60</td>
</tr>
<tr>
<td></td>
<td>Inlet manifold to cylinder heads</td>
<td>40 $\times$ 30</td>
</tr>
<tr>
<td></td>
<td>Lifting eye to cylinder heads</td>
<td>$\frac{1}{4}$ U.N.C. bolt 24 17</td>
</tr>
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<td>Oil sump to cylinder block</td>
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<td>Rocker cover to cylinder head</td>
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<td>Rocker shaft bracket to cylinder head</td>
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<td>Sensing unit to bracket</td>
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<td>Starter motor attachment</td>
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<td>Timing cover to cylinder block</td>
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<td>Timing cover to cylinder block</td>
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<td>Water/pump/timing cover to cylinder block</td>
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<td>Water outlet elbow to inlet manifold</td>
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<td>Water outlet pipe assembly to inlet manifold</td>
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<td>Air cleaner bracket to body</td>
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<td>Air cleaner to bracket</td>
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<td>Air-flow meter to mounting bracket</td>
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<td>Cold start injector to plenum</td>
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<td>Decelerator valve to plenum</td>
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<td>Extra air valve mounting</td>
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<td>Exhaust pipe to manifold</td>
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<td>Exhaust silencer</td>
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<td>Exhaust silencer to rear silencer and tail pipe</td>
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<td>$\frac{1}{4}$ U.N.F. dowel bolt 43 32</td>
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<td>Clutch housing and front exhaust support bracket to rear engine plate</td>
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<td>Clutch housing to cylinder block</td>
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<td>Clutch master cylinder to dash</td>
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<td>Driving flange to mainshaft</td>
<td>18 mm Nyloc nut 200 150</td>
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<td>Dust cap assembly to extension housing</td>
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<td>8 mm X 55 mm bolt 28 21</td>
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<td>8 mm X 25 mm 28 21</td>
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<td>8 mm X 25 mm setscrew 28 21</td>
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<td>Interlock spool retainer to gearbox case</td>
<td>6 mm X 16 mm setscrew 10 7</td>
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<td>Interlock spool retainer to gearbox case</td>
<td>8 mm on pin 20 15</td>
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<td>8 mm X 30 mm setscrew 28 21</td>
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<td>8 mm X 30 mm bolt 28 21</td>
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<td>Interlock spool retainer to gearbox case</td>
<td>16 mm plug 35 26</td>
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<td>Interlock spool retainer to gearbox case</td>
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<td>Interlock spool retainer to gearbox case</td>
<td>8 mm X 8 mm socket Locweld setscrew 20 15</td>
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<td>Propeller shaft to gearbox and rear axle</td>
<td>$\frac{1}{4}$ U.N.F. bolt 46 34</td>
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<td>Propeller shaft safety strap attachment</td>
<td>8 mm bolt 28 21</td>
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<td>Reverse lever mounting pin to centre plate</td>
<td>10 mm on pin 28 21</td>
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<td>Reverse lever mounting pin to centre plate</td>
<td>6 mm X 40 mm bolt 10 7</td>
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### TORQUE WRENCH SETTING

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<td>8 mm x 40 mm setscrew</td>
<td>20 15</td>
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<tr>
<td>Speedometer cable clip to gearbox extension</td>
<td>6 mm x 20 mm setscrew</td>
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<td>Torsion spring brackets to gearbox extension</td>
<td>8 mm x 20 mm setscrew</td>
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<tr>
<td>Torsion spring adjuster screw locking</td>
<td>8 mm x 25 mm setscrew</td>
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<td>REAR SUSPENSION</td>
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<tr>
<td>Rear cover to axle case</td>
<td>8 mm setscrew</td>
<td>28 21</td>
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<tr>
<td>Pinion oil seal housing to axle case</td>
<td>10 mm setscrew</td>
<td>50 37</td>
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<tr>
<td>Differential unit bearing caps to axle case</td>
<td>12 mm bolt</td>
<td>100 75</td>
</tr>
<tr>
<td>Crown wheel to differential unit (with Loctite)</td>
<td>12 mm bolt</td>
<td>122 90</td>
</tr>
<tr>
<td>Pinion flange to pinion</td>
<td>16 mm Nyloc nut</td>
<td>160 120</td>
</tr>
<tr>
<td>Axle shaf/s/bbackplacets to axle casing</td>
<td>10 mm setscrew</td>
<td>50 37</td>
</tr>
<tr>
<td>FRONT SUSPENSION</td>
<td></td>
<td></td>
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<tr>
<td>Anti-roll bar clamp bolts</td>
<td>10 mm bolt</td>
<td>40 30</td>
</tr>
<tr>
<td>Anti-roll bar to cross-member</td>
<td>10 mm bolt</td>
<td>50 37</td>
</tr>
<tr>
<td>Anti-roll bar to lower link</td>
<td>12 mm on bar</td>
<td>80 59</td>
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<tr>
<td>Sub-frame attachment front fixing</td>
<td>12 mm bolt</td>
<td>80 59</td>
</tr>
<tr>
<td>Sub-frame attachment rear fixing</td>
<td>12 mm bolt</td>
<td>80 59</td>
</tr>
<tr>
<td>Damper unit closure nut</td>
<td>1.75&quot; x 24 U.N.F.</td>
<td>100 74</td>
</tr>
<tr>
<td>Hub to stub-axle</td>
<td>9/16 U.N.F. on axle</td>
<td>Tighten to 5 lbf ft (0.69 kgm), unscrew one flat and insert pin</td>
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<tr>
<td>Lower link to cross-member</td>
<td>12 mm bolt</td>
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<tr>
<td>Lower link to strut assembly</td>
<td>9/16 U.N.F. on ball joint</td>
<td>61 45</td>
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<td>Strut mounting to body</td>
<td>8 mm on mounting studs</td>
<td>28 21</td>
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<tr>
<td>Strut to mounting</td>
<td>12 mm on cartridgn</td>
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<tr>
<td>Tie-rod lever to stub axle</td>
<td>12 mm bolt</td>
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<tr>
<td>Wheel attachment</td>
<td>12 mm stud</td>
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<td>Alloy wheel attachment</td>
<td>12 mm stud</td>
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<td>REAR SUSPENSION</td>
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<td>Anti-roll bar to lower link</td>
<td>10 mm x 30 bolt</td>
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<tr>
<td>Clamp nut</td>
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<td>27 20</td>
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<tr>
<td>Damper to trailing arm</td>
<td>9/16 U.N.F. on damper locknut</td>
<td>19 14</td>
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<td>Clamp nut</td>
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<td>27 20</td>
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<tr>
<td>Lower link to body and axle</td>
<td>9/16 U.N.F. bolt</td>
<td>65 48</td>
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<tr>
<td>Upper link to body and axle</td>
<td>9/16 U.N.F. bolt</td>
<td>65 48</td>
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<td>REAR AXLE</td>
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<td>Rear cover to axle case</td>
<td>8 mm setscrew</td>
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<tr>
<td>Pinion flange to pinion</td>
<td>10 mm setscrew</td>
<td>50 37</td>
</tr>
<tr>
<td>Differential unit bearing caps to axle case</td>
<td>12 mm bolt</td>
<td>100 75</td>
</tr>
<tr>
<td>Crown wheel to differential unit (with Loctite)</td>
<td>12 mm bolt</td>
<td>122 90</td>
</tr>
<tr>
<td>Pinion flange to pinion</td>
<td>16 mm Nyloc nut</td>
<td>160 120</td>
</tr>
<tr>
<td>Axle shaf/s/bbackplacets to axle casing</td>
<td>10 mm setscrew</td>
<td>50 37</td>
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<td>STEERING</td>
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<tr>
<td>Rack (pinion side) to cross-member</td>
<td>10 mm bolt</td>
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<tr>
<td>Rack to cross-member</td>
<td>10 mm bolt</td>
<td>40 30</td>
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<tr>
<td>Steering column clamp to upper column</td>
<td>8 mm bolt</td>
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<tr>
<td>Steering column lock shear head bolt</td>
<td>Shear bolt</td>
<td>Tighten to shear</td>
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<td>Steering column to body</td>
<td>Shear bolt</td>
<td>Tighten to shear</td>
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<td>Steering column clamp locating plate attachment</td>
<td>9/16 U.N.F. grub screw</td>
<td>20 15</td>
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<td>Steering column clamp locating plate attachment</td>
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<td>Brake and clutch pedal mounting bracket attachment</td>
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<td>Brake master cylinder attachment</td>
<td>8 mm stud</td>
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<tr>
<td>Caliper assembly attachment</td>
<td>12 mm bolt</td>
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<td>Disc to hub</td>
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<td>Disc shield assembly to stub axle</td>
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<td>Front hose to caliper</td>
<td>10 mm nut</td>
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<td>Handbrake cable to lever on backplate</td>
<td>9/16 U.N.F. fork-end</td>
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<td>Handbrake compensator lever to abutment box</td>
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<td>Master cylinder to pressure reducing valve</td>
<td>10 mm male tube nut</td>
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<tr>
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<td>Rear wheel cylinder to L.H. rear wheel cylinder</td>
<td>10 mm female tube nut</td>
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<td>R. H. rear wheel cylinder</td>
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**NOTE:** The specified torque values are given in Newton meters (Nm) and pounds force feet (lbf ft). Some values are also given in kilograms force meters (kgf m).
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<td>Accelerator mounting bracket to dash</td>
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<td>Bonnet buffer fixing</td>
<td>8 mm jam nut</td>
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<td>Bonnet hinge to front panel assembly</td>
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<td>Bonnet lock striker to bonnet</td>
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<td>Bonnet lock to body</td>
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<td>Bonnet release cable to fascia support</td>
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<td>Deflector to reinforced steering column</td>
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<td>Door division channel to door</td>
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<td>Door glass run channel to door</td>
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<td>Door hinge to door</td>
<td>8 mm stud on hinge assembly</td>
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<td>Door striker to 'B' post</td>
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<td>Fascia attachment brackets (upper) to dash top</td>
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<td>Fascia support bracket (lower) to support rail</td>
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<td>Front bumper assembly to body</td>
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<td>Front tie-down bracket to front cross-member panel</td>
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<td>Front upper assembly to front fenders</td>
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<td>Rear bumper assembly to body</td>
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<td>Rear bumper corner struts to body</td>
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<td>Rear bumper corner struts to rear bumper</td>
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<td></td>
<td>Relay plate to bracket on dash front</td>
<td>6 mm setscrew</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Seat belt buckle assembly to seat slide</td>
<td>5/16&quot; U.N.F. setscrew</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>Seat belt to wheel arch</td>
<td>5/16&quot; U.N.F. setscrew</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>Seat belt to mounting bracket</td>
<td>5/16&quot; U.N.F. setscrew</td>
<td>43</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BODY</th>
<th>Operation</th>
<th>Description</th>
<th>Specified Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Seat belt warning switch to gearbox extension</td>
<td>1/4&quot; U.N.C. switch</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Seat slides to floor</td>
<td>8 mm cap screw</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Seat slides to seat frame</td>
<td>6 mm cap screw</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Sidemirror and headlamp cables to radiator closing panel</td>
<td>6 mm setscrew</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Trunk lid hinges to trunk lid</td>
<td>8 mm setscrew</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Trunk lid support to support bracket toneau</td>
<td>6 mm setscrew</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Trunk lock to lid</td>
<td>6 mm setscrew</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Trunk lock striker to body</td>
<td>7/16&quot; U.N.F. setscrew</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Window regulator attachment</td>
<td>7/16&quot; setscrew</td>
<td>12</td>
</tr>
</tbody>
</table>

**ELECTRICAL**

**NOTE:** Refer to Section 86 for additional torque settings on proprietary items

<table>
<thead>
<tr>
<th>BODY</th>
<th>Operation</th>
<th>Description</th>
<th>Specified Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Battery attachment</td>
<td>1/4&quot; on fixing rod</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Battery earth to body</td>
<td>6 mm setscrew</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Headlamp box to hinge arm</td>
<td>6 mm weld bolt</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Headlamp hinge arm to pivot bracket</td>
<td>10 mm</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Headlamp hinge arm to bracket assemblies</td>
<td>8 mm setscrew</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Headlamp hinge arm pivot pin</td>
<td>8 mm</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Headlamp mechanism to body</td>
<td>8 mm weld bolt</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Headlamp mechanism crank arm to gearbox</td>
<td>6 mm nut</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Headlamp raising link adjustment</td>
<td>6 mm jam nut</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Headlamp tension spring attachment</td>
<td>6 mm shouldered bolt</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Heater mountings</td>
<td>6 mm setscrew</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Horn attachment</td>
<td>6 mm setscrew</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Ignition coil to mounting plate</td>
<td>6 mm setscrew</td>
<td>10</td>
</tr>
</tbody>
</table>

**AIR CONDITIONING**

<table>
<thead>
<tr>
<th>BODY</th>
<th>Operation</th>
<th>Description</th>
<th>Specified Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Compressor mounting bracket to cylinder head</td>
<td>7/16&quot; U.N.F. bolt</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Compressor mounting bracket to cylinder block</td>
<td>7/16&quot; U.N.F. bolt</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Compressor mounting bracket to compressor</td>
<td>7/16&quot; U.N.F. setscrew</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Compressor mounting bracket to compressor</td>
<td>7/16&quot; U.N.C. setscrew</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Compressor mounting bracket to compressor</td>
<td>7/16&quot; U.N.C. stud</td>
<td>32</td>
</tr>
<tr>
<td>Operation</td>
<td>Description</td>
<td>Specified Torque</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>---------------------------</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td>Compressor belt tension adjustment</td>
<td>3/8&quot; U.N.F. locknut</td>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td>Condenser fan motor attachment</td>
<td>5 mm setscrew</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Hose — compressor to condenser</td>
<td>5/8&quot; crimp back nut</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Hose — condenser to receiver drier</td>
<td>3/8&quot; crimp back nut</td>
<td>28</td>
<td>21</td>
</tr>
<tr>
<td>Hose — evaporator to compressor</td>
<td>5/8&quot; crimp back nut</td>
<td>50</td>
<td>37</td>
</tr>
<tr>
<td>Hose — evaporator to receiver drier</td>
<td>7/8&quot; flare nut</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Ranco valve to receiver drier</td>
<td>7/8&quot; flare nut</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Rotalock valve to compressor</td>
<td>1&quot; U.N.S.</td>
<td>50</td>
<td>37</td>
</tr>
</tbody>
</table>
## RECOMMENDED LUBRICANTS AND ANTI-FREEZE SOLUTIONS — ALL SEASONS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>BP</th>
<th>CASTROL</th>
<th>DUCKHAMS</th>
<th>ESSO</th>
<th>MOBIL</th>
<th>PETROFINA</th>
<th>TEXACO</th>
<th>SHELL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine, Carburettor, Dashpots and Oil Can</td>
<td>BP Super Vaco-Static 20W-50</td>
<td>Castrol GTX</td>
<td>Duckhams Q Motor Oil</td>
<td>Esso Uniflo</td>
<td>Mobil Super 15W/50</td>
<td>Fina Super Grade Motor Oil S.A.E. 30W—50</td>
<td>Havoline Motor Oil 20W—50</td>
<td>Shell Super Multigrade 20W—50</td>
</tr>
<tr>
<td>Oils must meet Leyland Cars Specification BLS—OL—02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front and Rear Hubs, Brake Cables, Grease Gun</td>
<td>BP Energrease L2</td>
<td>Castrol LM Grease</td>
<td>Duckhams LD 10 Grease</td>
<td>Esso Multi-Purpose Grease H</td>
<td>Mobilgrease Super</td>
<td>Fina Marson HTL 2 Grease</td>
<td>Marfak All-purpose Grease</td>
<td>Shell Retinax A Grease</td>
</tr>
<tr>
<td>Borg-Warner Transmission and Power Steering</td>
<td>BP Autran B</td>
<td>Castrol TQF</td>
<td>Duckhams &quot;Q&quot;-Mate</td>
<td>Esso Glide</td>
<td>Mobil ATF 210</td>
<td>Fina Paristimatic 33F</td>
<td>Texamatic Type &quot;F&quot;</td>
<td>Shell Donax T7</td>
</tr>
<tr>
<td>Clutch and Brake Reservoirs</td>
<td>Unipart Universal Brake Fluid or other brake fluids having a minimum boiling-point of 260°C (500°F) and complying with FMVSS 116 DOT3 or S.A.E. J1703 specification.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approved Anti-freeze</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Unipart Universal Anti-freeze</td>
<td></td>
</tr>
</tbody>
</table>

* Manual gearbox, if drained, MUST be refilled with Hypoid 75W gear oil. For Service top-up use Hypoid 75W gear oil, or where this oil is not available, the Hypoid 80W oils shown above may be used.
# RECOMMENDED LUBRICANTS AND ANTI-FREEZE SOLUTIONS

<table>
<thead>
<tr>
<th>SERVICE CLASSIFICATION</th>
<th>AMBIENT TEMPERATURE °C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENGINE</strong></td>
<td></td>
</tr>
<tr>
<td>Oils must meet Leyland Cars' Specification</td>
<td></td>
</tr>
<tr>
<td>BLS.OL.02 and/or the European Motor Manufacturers' requirements and/or A.P.I.-SE Performance Level</td>
<td></td>
</tr>
<tr>
<td>5W/20</td>
<td>+10 +20</td>
</tr>
<tr>
<td>5W/30</td>
<td></td>
</tr>
<tr>
<td>5W/40</td>
<td></td>
</tr>
<tr>
<td>10W/30</td>
<td>+10 +20</td>
</tr>
<tr>
<td>10W/40</td>
<td></td>
</tr>
<tr>
<td>15W/40</td>
<td>+10 +20</td>
</tr>
<tr>
<td>15W/50</td>
<td></td>
</tr>
<tr>
<td>20W/40</td>
<td>+10 +20</td>
</tr>
<tr>
<td>20W/50</td>
<td></td>
</tr>
<tr>
<td><strong>FINAL DRIVE</strong></td>
<td></td>
</tr>
<tr>
<td>A.P.I. - GL5</td>
<td>HYPOID 90</td>
</tr>
<tr>
<td>MIL-L-2105B</td>
<td></td>
</tr>
<tr>
<td><strong>MANUAL GEARBOX†</strong></td>
<td>HYPOID 75W</td>
</tr>
<tr>
<td>A.P.I. - GL4</td>
<td></td>
</tr>
<tr>
<td>MIL-L-2105</td>
<td></td>
</tr>
<tr>
<td><strong>AUTOMATIC GEARBOX POWER STEERING</strong></td>
<td></td>
</tr>
<tr>
<td>ATF TYPE F</td>
<td></td>
</tr>
<tr>
<td><strong>HUBS AND CHASSIS GREASE POINTS</strong></td>
<td></td>
</tr>
<tr>
<td>N.L.G.I. - 2 Multi-purpose Grease</td>
<td></td>
</tr>
<tr>
<td><strong>BRAKE &amp; CLUTCH RESERVOIRS</strong></td>
<td></td>
</tr>
<tr>
<td>LOCKHEED 3295 UNIVERSAL BRAKE FLUID or other brake fluids having a minimum boiling point of 260°C (500°F) and complying with FMVSS 116 DOT3 specifications.</td>
<td></td>
</tr>
<tr>
<td><strong>ANTI-FREEZE</strong></td>
<td></td>
</tr>
<tr>
<td>Permanent type ethylene glycol base with suitable inhibitor for ALUMINIUM ENGINES.</td>
<td></td>
</tr>
<tr>
<td><strong>WINDSHIELD WASHER</strong></td>
<td></td>
</tr>
<tr>
<td>Windshield Washer Anti-Freeze Fluid (Proprietary Brands).</td>
<td></td>
</tr>
</tbody>
</table>

† Manual gearbox, if drained, MUST be refilled with Hypoid 75W gear oil. For Service top-up use Hypoid 75W gear oil, or where this oil is not available, Hypoid 80W oils may be used.
‡ Front hub grease = N.L.G.I. No. 2 high melting-point grease.
### ANTI-FREEZE SOLUTIONS

<table>
<thead>
<tr>
<th>ANTI-FREEZE CONCENTRATION</th>
<th>25%</th>
<th>30%</th>
<th>35%</th>
<th>50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIFIC GRAVITY OF COOLANT AT 15.5°C (60°F)</td>
<td>1.039</td>
<td>1.048</td>
<td>1.054</td>
<td>1.076</td>
</tr>
<tr>
<td>ANTI-FREEZE QUANTITY</td>
<td>Litres</td>
<td>2.5</td>
<td>2.9</td>
<td>3.5</td>
</tr>
<tr>
<td>EXPANSION TANK SYSTEM</td>
<td>U.K. pints</td>
<td>4.4</td>
<td>5.2</td>
<td>6.1</td>
</tr>
<tr>
<td>ANTI-FREEZE QUANTITY</td>
<td>Litres</td>
<td>2.7</td>
<td>3.3</td>
<td>3.8</td>
</tr>
<tr>
<td>HEADER TANK SYSTEM</td>
<td>U.K. pints</td>
<td>4.8</td>
<td>5.8</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td>U.S. pints</td>
<td>5.8</td>
<td>6.9</td>
<td>8.1</td>
</tr>
</tbody>
</table>

#### Complete
- Car may be driven away immediately from cold
- **Safe Limit**
  - Coolant in mushy state. Engine may be started and driven away after short warm-up period
- **Lower Protection**
  - Prevents frost damage to cylinder head, block and radiator. Thaw out before starting engine.

<table>
<thead>
<tr>
<th>DEGREE OF PROTECTION</th>
<th>Complete</th>
<th>Safe Limit</th>
<th>Lower Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car may be driven away immediately from cold</td>
<td>-12°C/10°F</td>
<td>-18°C/0°F</td>
<td>-26°C/15°F</td>
</tr>
<tr>
<td></td>
<td>-16°C/3°F</td>
<td>-22°C/-8°F</td>
<td>-32°C/-15°F</td>
</tr>
<tr>
<td></td>
<td>-20°C/-4°F</td>
<td>-28°C/-18°F</td>
<td>-37°C/-35°F</td>
</tr>
<tr>
<td></td>
<td>-36°C/-33°F</td>
<td>-41°C/-42°F</td>
<td>-47°C/-53°F</td>
</tr>
</tbody>
</table>
# Fault Finding Chart — North America, Federal and California Specification Carburetted Engine Vehicles

This chart indicates the possible areas of fault causes. Progressively work through the 'possible causes' in the order given until the fault is rectified. Extra checks shown in brackets refer only to the specific condition shown in brackets after the fault.

<table>
<thead>
<tr>
<th>FAULT</th>
<th>POSSIBLE CAUSE IN ORDER OF CHECKING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will not start (Warm engine)</td>
<td>1, 2, 18, 19, 38, (39), 9, 10, 11, 12, 23.</td>
</tr>
<tr>
<td>Poor or erratic idle</td>
<td>18, 32, 22, 27, 16, 10, 11, 12, 14, 21, 25, 39, 26, 40, 43, 44, 45, 42, 6, 4, 21, 29, 40, 43, 35, 36, 37, 25, 39, 23, 31, 26, 24, 29, 47, 46, 34, 39, 45, 14, 51, 52, 8, 3.</td>
</tr>
<tr>
<td>Hesitation or flat spot</td>
<td>18, 19, 30, (38), 27, 35, 5, 24, 25, 39, 26, 11, 13, 16, 12, 15, 47, 46, 31, 22, 27, 16, 10, 11, 12, 23.</td>
</tr>
<tr>
<td>Lack of engine braking or high idle speed</td>
<td>35, 32, 15, 34, 12, 27, 5, 23, 25, 39, 26.</td>
</tr>
<tr>
<td>Engine overheating</td>
<td>7, 12, 15, 27, 26, 8, 14, 46.</td>
</tr>
<tr>
<td>Engine misfires</td>
<td>18, 19, 11, 13, 16, 12, 37, 4, 27, 25, 39, 26, 21, 15, 29, 40, 43, 44, 45, 42, 28, 31, 14, 3, 46.</td>
</tr>
<tr>
<td>Fuel smells</td>
<td>20, 33, 25, 44, 41, 43, 45, 42, 39, 27, 26, 37.</td>
</tr>
<tr>
<td>Engine ‘runs on’</td>
<td>18, 32, 35, 34, 37, 4, 6, 12, 15, 25, 27, 26, 39, 8, 14, 46.</td>
</tr>
<tr>
<td>Engine knock or ‘pinking’</td>
<td>18, 12, 15, 7, 5, 27, 26, 14, 8, 46.</td>
</tr>
<tr>
<td>Arcing at plugs</td>
<td>13, 16.</td>
</tr>
<tr>
<td>Lean running (Low CO)</td>
<td>27, 18, 19, 25, 26, 6, 21, 15, 29, 40, 43, 44, 45, 42, 47.</td>
</tr>
<tr>
<td>Rich running (Excess CO)</td>
<td>27, 45, 25, 39, 26, 51, 52, 48, 50, 49.</td>
</tr>
<tr>
<td>Backfiring in exhaust</td>
<td>18, 19, 37, 4, 6, 12, 15, 21, 40, 47, 29, 34.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FAULT</th>
<th>POSSIBLE CAUSE IN ORDER OF CHECKING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noisy air injection pump</td>
<td>48, 50, 49</td>
</tr>
<tr>
<td>Engine cuts out or stalls (at idle)</td>
<td>18, 19, (32), (38), 37, 4, 11, 13, 16, 12, 39, 27, 25, 6, 21, 15, 29, 40, 43, 44, 45, 42, 47, 23, 24, 28, 31, 51, 52, 14, 46, 3.</td>
</tr>
</tbody>
</table>

## Key to Possible Causes

### Basic Engine Checks


### E.G.R. System Checks

40. Engine oil filter cap loose or leaking.<br>41. Fuel filter cap defective.<br>42. Vapour separator blocked.<br>43. Restrictors missing or blocked.<br>44. Hoses or filter leaking or blocked.<br>45. Charcoal canister restricted or blocked.<br>46. E.G.R. valve malfunction.<br>47. Leaks at E.G.R. vacuum control lines.<br>48. Incorrectly tensioned air pump driving belt.<br>49. Relief valve malfunctioning or insufficient pump pressure.<br>50. Check valve sticking.<br>51. Hot air inlet hose, loose, adrift or blocked.<br>52. Flap valve jammed.
<table>
<thead>
<tr>
<th>POSSIBLE CAUSE</th>
<th>CHECK AND REMEDIAL ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Low battery condition or poor</td>
<td>Check battery condition with hydrometer. Recharge, clean and secure terminals or</td>
</tr>
<tr>
<td>condition</td>
<td>renew as necessary. (If battery is serviceable but discharged, trace and rectify cause</td>
</tr>
<tr>
<td></td>
<td>of flat battery, e.g. short-circuit or insufficient charge from alternator.)</td>
</tr>
<tr>
<td>2 Starter system deficient</td>
<td>If starter fails to turn engine briskly, check engagement circuit and connections.</td>
</tr>
<tr>
<td></td>
<td>Check and clean main starter circuit and connections.</td>
</tr>
<tr>
<td>3 Poor compressions</td>
<td>Check compressions with proprietary tester. If compressions are low or uneven,</td>
</tr>
<tr>
<td></td>
<td>remove appropriate cylinder head for further examination and rectification.</td>
</tr>
<tr>
<td>4 Exhaust system leaking or blocked</td>
<td>Check and rectify as necessary.</td>
</tr>
<tr>
<td>5 Faults on areas of vehicle other</td>
<td>Check for binding brakes, slipping clutch, etc.</td>
</tr>
<tr>
<td>than engine</td>
<td></td>
</tr>
<tr>
<td>6 Air leaks at inlet manifold</td>
<td>Check inlet manifold/cylinder head joints. Renew gaskets if necessary. Check manifold</td>
</tr>
<tr>
<td></td>
<td>tappings for leaks, seal as necessary.</td>
</tr>
<tr>
<td>7 Cooling system blocked or leaking</td>
<td>Flush system and check for blockage. Check hoses and connections for security</td>
</tr>
<tr>
<td></td>
<td>and leakage. Renew as necessary. Check thermostat and renew if faulty.</td>
</tr>
<tr>
<td>8 Cylinder head gaskets leaking</td>
<td>Check cylinder block/head joints for signs of leakage. Renew gaskets if necessary.</td>
</tr>
<tr>
<td>9 H.T. circuit faults</td>
<td>Disconnect king lead at distributor and position the end approximately 3/4&quot; (5 mm)</td>
</tr>
<tr>
<td></td>
<td>from earthed metal. Switch on ignition, disconnect white/blue lead and check for spark</td>
</tr>
<tr>
<td></td>
<td>at king lead end each time white/blue lead is disconnected. If spark is</td>
</tr>
<tr>
<td></td>
<td>non-existent or weak, renew king lead and re-test. If spark is satisfactory, check H.T.</td>
</tr>
<tr>
<td></td>
<td>leads for fraying, deterioration and security, distributor cap for cracks,</td>
</tr>
<tr>
<td></td>
<td>tracking, dirt or condensation, distributor rotor for deterioration and spark plugs</td>
</tr>
<tr>
<td></td>
<td>(16). Renew leads, cap, rotor or plugs as necessary.</td>
</tr>
</tbody>
</table>

### POSSIBLE CAUSE

<table>
<thead>
<tr>
<th>CHECK AND REMEDIAL ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>a Ensure ignition switch on and check supply voltage. If less than 11 volts, check ignition switch, wiring and connections. If more than 11 volts, check voltage at coil '+' terminal. If this is in the range 4 to 8 volts, proceed to (b) below. If it is not 4 to 8 volts, renew the ballast resistance wire.</td>
</tr>
<tr>
<td>b Check voltage at coil '-' terminal. If less than 2 volts, proceed to (c) below. If more than 2 volts, check the drive resistor (8 to 11 ohms) and renew if necessary.</td>
</tr>
<tr>
<td>c Disconnect the white/blue lead and re-check the coil '-' terminal voltage. If this is more than 9 volts, check the coil by substitution. If less than 9 volts, disconnect coil '-' lead and again check voltage on coil '-' terminal. If the voltage is then 9 volts, check the coil by substitution, but if more than 9 volts, refer to 17.</td>
</tr>
<tr>
<td>Ensure ignition off and check pick-up gap in distributor. This should be 0.014 to 0.016 in (0.36 to 0.41 mm). Adjust if necessary.</td>
</tr>
<tr>
<td>Check ignition timing and adjust as necessary.</td>
</tr>
<tr>
<td>Check ignition wiring for fraying, chafing and deterioration. Check distributor cap for cracks and tracking and rotor for condition. Renew leads, cap or rotor as necessary.</td>
</tr>
<tr>
<td>Check operation of advance mechanism against figures, using a stroboscopic timing light. Lubricate or renew as necessary.</td>
</tr>
<tr>
<td>Check operation of retard unit. Renew or secure vacuum pipes if necessary.</td>
</tr>
<tr>
<td>Remove spark plugs, clean, reset gap and test on proprietary spark plug testing machine. Renew if in doubt.</td>
</tr>
</tbody>
</table>
### POSSIBLE CAUSE

<table>
<thead>
<tr>
<th>16. DISTRIBUTOR FAILURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Distributor failure</td>
</tr>
<tr>
<td>a. Ensure that the distributor is earthed.</td>
</tr>
<tr>
<td>b. With the distributor cap removed, crank the engine and check that the distributor shaft rotates. If not, investigate and rectify.</td>
</tr>
<tr>
<td>c. Re-check as detailed in 9, 10, 11 and 16.</td>
</tr>
<tr>
<td>d. As the last resort, renew the distributor complete.</td>
</tr>
<tr>
<td>18. Insufficient or incorrect fuel</td>
</tr>
<tr>
<td>a. Check and record fuel level.</td>
</tr>
<tr>
<td>b. Ensure that the fuel tank has an adequate amount of the correct type and grade of fuel.</td>
</tr>
<tr>
<td>19. Fuel starvation</td>
</tr>
<tr>
<td>a. Ensure that the fuel tank has an adequate amount of the correct type and grade of fuel.</td>
</tr>
<tr>
<td>b. Insert a pressure gauge into the pump to carburettor fuel line and check the pressure with the engine running. If not satisfactory, check fuel feed and breather pipes for leaks or blockage (see also 33 and 24). Renew connectors if damaged or deteriorated. If contamination of fuel is discovered, flush fuel system and clean or renew the tank filter. If necessary, renew the pump to rectify low pressure.</td>
</tr>
<tr>
<td>20. Fuel leaks</td>
</tr>
<tr>
<td>a. Check fuel system for leaks and rectify as necessary. Renew any doubtful connectors.</td>
</tr>
<tr>
<td>21. Air leak at carburettor manifold joints</td>
</tr>
<tr>
<td>a. Check joints. Renew gaskets if necessary. Check CO.</td>
</tr>
<tr>
<td>22. Unbalanced air flow</td>
</tr>
<tr>
<td>a. Check/adjust carburettor airflow for balance.</td>
</tr>
<tr>
<td>23. Air valve sticking</td>
</tr>
<tr>
<td>a. Clean air valve and guide and reassemble. Check free movement by hand; unit should move freely and return to carburettor bridge with an audible 'click'. Follow this procedure for each carburettor.</td>
</tr>
<tr>
<td>24. Obstructed float chamber ventilation holes</td>
</tr>
<tr>
<td>a. Ensure that gaskets, piping or dirt are not blocking the holes.</td>
</tr>
<tr>
<td>25. Incorrect fuel level in float chambers</td>
</tr>
<tr>
<td>a. Reset float heights and clean or renew needle valves and/or floats as necessary.</td>
</tr>
</tbody>
</table>

### POSSIBLE CAUSE

| 26. Metering needle faulty |
| 27. Mixture incorrectly set |
| 28. Temperature compensator faulty |
| 29. Leakage at throttle spindles |
| 30. Piston damper inoperative |
| 31. Air valve spring missing, or incorrect |
| 32. Idle speed incorrectly set |
| 33. Leakage from fuel connections, joints or seals |
| 34. Faulty by-pass valve |
| 35. Sticking throttle |
| 36. Throttle linkage inhibited or incorrectly set |
| 37. Dirty or blocked air cleaner |
| 38. Choke inoperative |
| 39. Choke sticking on |

### CHECK AND REMEDIAL ACTION

| 26. Metering needle faults |
| a. Check that needle is correct type in both carburettors. Ensure that shoulder of needle is flush with face of air valve and that needle bias is correct. |
| 27. Mixture incorrectly set |
| a. Check/adjust CO at idle. |
| 28. Temperature compensator faulty |
| a. If a compensator is faulty, the idle CO level will steadily increase over a period of 10 minutes. If doubt exists, renew the complete unit and seals. |
| 29. Leakage at throttle spindles |
| a. Check spindles and seals - renew as necessary. |
| 30. Piston damper inoperative |
| a. Check/top up damper oil levels. Check damper operation by raising pistons by hand. Resistance should be felt. |
| 31. Air valve spring missing, or incorrect |
| a. Check that springs are correct (colour code) and refill/renew as necessary. |
| 32. Idle speed incorrectly set |
| a. Check/adjust idle speed. |
| 33. Leakage from fuel connections, joints or seals |
| a. Check fuel inlet connections – renew connectors if necessary. Inspect float chamber joints, and renew if necessary. |
| 34. Faulty by-pass valve |
| a. Renew appropriate throttle plate. |
| 35. Sticking throttle |
| a. Check throttle operation – free off and reset as necessary. |
| 36. Throttle linkage inhibited or incorrectly set |
| a. Check that throttle linkage and accelerator pedal are not inhibited by carpets, mats, sound insulation pads, etc., and that full throttle is obtainable. Lubricate and reset if necessary. |
| 37. Dirty or blocked air cleaner |
| a. Inspect air cleaner element. Fit new element of correct type if necessary. |
| 38. Choke inoperative |
| a. Check position of datum mark on side of heat mass. Reset, if necessary, to line up with fixed mark on starter body. Open throttle and check that the head of the fast idle pin is level with the outer end of the guard. Check attachment screws for tightness (40 to 45 lbf in, 46 to 52 kgf cm torque). If still unsatisfactory, renew auto-choke unit. |
| 39. Choke sticking on |
| a. Check as in 38 above. |

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*NOTE: Regular use of unleaded/low lead fuel in Federal Specification vehicles or leaded fuel in catalytic converter specification vehicles may cause difficulties with the engine and will result in malfunctions of the emission control system.*
<table>
<thead>
<tr>
<th>POSSIBLE CAUSE</th>
<th>CHECK AND REMEDIAL ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 Engine oil filler cap loose or leaking</td>
<td>Check cap for security. Renew cap if seal is deteriorated.</td>
</tr>
<tr>
<td>41 Fuel filler cap defective</td>
<td>Check seal for condition; renew if deteriorated. Check filler cap for security; rectify or renew as necessary.</td>
</tr>
<tr>
<td>42 Vapour separator blocked</td>
<td>Check and clear, or renew as necessary.</td>
</tr>
<tr>
<td>43 Restrictors missing or blocked</td>
<td>Check and clear, or renew as necessary.</td>
</tr>
<tr>
<td>44 Hoses or filter leaking or blocked</td>
<td>Check and clear as necessary. Renew any deteriorated hoses.</td>
</tr>
<tr>
<td>43 Charcoal canister restricted or blocked</td>
<td>Inspect, and renew if necessary.</td>
</tr>
<tr>
<td>46 E.G.R. valve malfunction</td>
<td>Check the function of the E.G.R. valve on the vehicle. If not satisfactory, remove and clean valve and pipework. Renew valve if spring is broken, diaphragm ruptured or other fault obvious.</td>
</tr>
<tr>
<td>47 Leaks at E.G.R. vacuum control lines</td>
<td>Check security and condition of control lines. Renew connectors or lines as necessary.</td>
</tr>
<tr>
<td>48 Incorrectly tensioned air pump driving belt</td>
<td>Check/adjust belt tension. Renew belt if necessary.</td>
</tr>
<tr>
<td>49 Relief valve malfunctioning or insufficient pump pressure</td>
<td>Check that the relief valve operates at the correct pressure by using a pressure gauge between the diverter/relief valve and outlet pipe to measure the point at which air pressure ceases to rise with engine speed. If any deviation is apparent, renew the valve. If the pump does not produce enough pressure to operate the relief valve, check 48, and renew pump if necessary.</td>
</tr>
<tr>
<td>50 Check valve sticking</td>
<td>Disconnect air hose at check valve and blow through valve. If the valve obstructs flow from the pump to the manifold or allows flow from the manifold towards the pump, renew the valve after checking hoses for blockage.</td>
</tr>
<tr>
<td>51 Hot air inlet hose loose, adrift or blocked</td>
<td>Check hot air inlet hose for condition and security. Renew if necessary.</td>
</tr>
<tr>
<td>52 Flap valve jammed</td>
<td>Check operation of valve. Renew valve if performance is unsatisfactory.</td>
</tr>
</tbody>
</table>
### MAINTENANCE SUMMARY — CARBURETTER ENGINED VEHICLES

These service schedules are based on annual mileage of approximately 12,500. Should the vehicle complete substantially less miles than this per annum, it is recommended that a 'C' and 'D' Service should be completed at six- and twelve-monthly intervals respectively.

<table>
<thead>
<tr>
<th>Mileage × 1,000 Miles</th>
<th>A = 1</th>
<th>B = 3, 9, 16, 22, 28, 34, 41, 47</th>
<th>C = 6, 19, 31, 44</th>
<th>D = 12.5, 37.5</th>
<th>E = 25, 50</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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</thead>
<tbody>
<tr>
<td>ENGINE</td>
<td></td>
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<tr>
<td>Check/top-up engine oil</td>
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<tr>
<td>Check/top-up cooling system</td>
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<tr>
<td>Check, adjust and operation of all washers and top-up reservoir(s)</td>
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<tr>
<td>Renew engine oil</td>
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<tr>
<td>Renew engine oil filter</td>
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<tr>
<td>Renew engine breather filter</td>
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<tr>
<td>Lubricate accelerator control linkage and pedal pivot — check operation</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Check cooling/heater systems for leaks and hoses for security and condition</td>
<td></td>
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</tr>
<tr>
<td>Check for oil leaks</td>
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<tr>
<td>Check/adjust torque of cylinder head nuts/bolt</td>
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<tr>
<td>Check driving belts; adjust or renew</td>
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<tr>
<td>Check security of engine mountings</td>
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<tr>
<td>Check/adjust carburetter idle settings</td>
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<tr>
<td>Top-up carburetter piston dampers</td>
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<tr>
<td>Renew carburetter/air intake air cleaner element(s)</td>
<td></td>
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<tr>
<td>Check security of E.G.R. valve operating lines</td>
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<tr>
<td>Check E.G.R. system</td>
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<tr>
<td>Check air intake temperature control system</td>
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<tr>
<td>Check crankcase breathing and evaporative loss control systems</td>
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<tr>
<td>Check crankcase breathing and evaporative loss control systems</td>
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<tr>
<td>Check hoses/pipes and restrictors for blockage, security and condition</td>
<td></td>
<td></td>
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<tr>
<td>Check air injection system, pipes/hoses for security and condition</td>
<td></td>
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<tr>
<td>Clean engine flame trap</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Renew adsorption canisters</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGNITION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check security of distributor vacuum units, lines and operation of vacuum retard unit</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Lubricate distributor (Lucas units only)</td>
<td></td>
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</tr>
<tr>
<td>Check/adjust ignition timing using electronic equipment</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Check ignition wiring for fraying, chafing and deterioration</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Clean distributor cap; check cracks and tracking</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGNITION—continued</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renew spark plugs</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Check coil performance on oscilloscope</td>
<td></td>
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</tbody>
</table>

| TRANSMSION | | | | | |
| Check/top-up gearbox | | | | | |
| Check/top-up rear axle/final drive oil | | | | | |
| Check for oil leaks | | | | | |
| Check tightness of propeller shaft coupling bolts | | | | | |
| Check/top-up automatic gearbox fluid | | | | | |
| Renew automatic gearbox oil and filter | | | | | |
| Lubricate automatic gearbox exposed selector linkage | | | | | |
| Check clutch pipes for leaks and chafing | | | | | |
| Check/top-up clutch fluid reservoir | | | | | |
| Lubricate clutch pedal pivots | | | | | |

| STEERING AND SUSPENSION | | | | | |
| Check steering rack/gear for oil/liquid leaks | | | | | |
| Check security of suspension fixings | | | | | |
| Check condition and security of steering unit, joints and gaiters | | | | | |
| Check/adjust front wheel alignment | | | | | |
| Check brake system warning light | | | | | |
| Check brake system warning light | | | | | |
| Check power steering system for leaks, hydraulic pipes and unions for chafing and corrosion | | | | | |
| Check/top-up fluid in power steering reservoirs | | | | | |

| BRAKES | | | | | |
| Check handbrake | | | | | |
| Check brake fluid reservoir(s) | | | | | |
| Check handbrake operation; adjust to manufacturer's instructions (self-adjusting) | | | | | |
| Lubricate brake pedal pivot(s) | | | | | |
| Lubricate hydraulic mechanical linkage and cable guides | | | | | |
| Check visually, hydraulic pipes and unions for cracks, chafing, leaks and corrosion | | | | | |
| Check brake servo hoses(s) for security and condition | | | | | |
| Check brake system warning light | | | | | |

| ELECTRICAL | | | | | |
| Check function of original equipment, i.e. interior and exterior lamps, horns, wipers and warning indicators | | | | | |
| Check/top-up battery electrolyte | | | | | |
| Clean and grease battery connections | | | | | |
| Check/adjust headlamp alignment | | | | | |
| Check, if necessary renew, wiper blades | | | | | |
| Check output of charging system | | | | | |
### Description

**ENGINE**
- Exhaust and Fuel Pipes
  - Check exhaust system for leaks and security
  - Check fuel system for leaks, pipes and unions for chafing and corrosion
  - Renew fuel filter
  - Check condition of fuel filler cap seal

**WHEELS AND TYRES**
- Check/adjust tyre pressures, including spare
- Check that tyres comply with manufacturer's specification
- Check tightness of road wheel fastenings
- Check tyres for external cuts in tyre fabric, exposure of ply or cord structure, lumps or bulges or uneven wear
- Check tyres for tread depth, and visually for external cuts in fabric, exposure of ply or cord structure, lumps or bulges or uneven wear

**BODY**
- Lubricate all locks, hinges and door check mechanisms (not steering lock)
- Check condition and security of seats and seat belts
- Check rear-view mirrors for cracks and crazing
- Check operation of all door, bonnet and boot locks
- Check operation of seat belt warning system
- Check operation of seat belt inertia reel mechanism
- Check operation of window controls
- Check tightness of sub-frame/body mountings

**GENERAL**
- Road/roller test and check function of all instrumentation
- Report additional work required

### Intervals

<table>
<thead>
<tr>
<th>Description</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXHAUST AND FUEL PIPES</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>WHEELS AND TYRES</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</tr>
<tr>
<td>BODY</td>
<td>X</td>
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</tr>
<tr>
<td>GENERAL</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</tr>
</tbody>
</table>

**ADDITIONAL RECOMMENDATIONS**

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

It is recommended that:
1. Disc brake pads, drum brake linings, hoses and pipes should be examined at intervals no greater than those laid down in the 'MAINTENANCE SUMMARY'.

2. Brake fluid should be changed completely every 18 months or 19,000 miles whichever is the sooner.

3. All fluid seals in the hydraulic system and all flexible hoses should be renewed every 3 years or 37,500 miles whichever is the sooner. At the same time the working surfaces of the piston and of the bores in the master cylinder, wheel cylinders and other slave cylinders should be examined and new parts fitted where necessary.

Care must be taken to observe the following points:
- At all times use the recommended brake fluid.
- Never leave fluid in unsealed containers. It absorbs moisture quickly and can be dangerous if used in the braking system in this condition.
- Fluid drained from the system or used for bleeding should be discarded.
- The necessity for absolute cleanliness throughout cannot be over-emphasized.
MAINTENANCE SUMMARY — NORTH AMERICAN CARBURETTER SPECIFICATION

ENGINE

Check/top-up engine oil

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

1. Withdraw the dipstick, wipe it clean and push fully home again before withdrawing it for reading.
2. Add oil via the filler cap until the level reaches the 'High' mark on the dipstick. DONOTOVERFILL and ensure that the dipstick and filler cap are replaced.

Check/top-up cooling system

WARNING: Do NOT remove cooling system filler caps or plugs when engine is hot.
1. Slowly turn the pressure cap anti-clockwise until the resistance of the safety stop is felt. Leave the cap in this position until all pressure is released. Press the cap downwards against the spring to clear the safety stops and continue turning until it can be lifted off.
2. Maintain the level of the coolant, see 26.10.01.
NOTE: Ensure that the specific gravity of the coolant is maintained — see 'LUBRICANTS, FLUIDS AND FUEL'.

Check/adjust operation of all washers and top-up reservoirs
1. Replenish the container with clean soft water. The addition of a small amount of mild detergent will prevent smearing on the windscreen.
2. During freezing conditions it is beneficial to fill the container with a mixture of one part methylated spirits (wood alcohol) to two parts of water. This will assist in the dispersal of snow and ice from the screen.
3. Do not add anti-freeze solutions to the container as this will discolour the paintwork and damage wiper blades and sealing rubber.

Renew engine oil

NOTE: This operation is best carried out when the engine is warm and with the vehicle standing level on a ramp or over a pit.
To drain the sump, unscrew the drain plug three complete turns to direct the oil stream into a receptacle while the engine is warm. When the rate of flow lessens, remove the plug completely. Refit the plug and refill the sump with the appropriate grade of engine oil. The use of additives is unnecessary.

Renew engine breather filter

1. Locate the filter by referring to 17.00.00.
2. Release the filter from the clamp.
3. Disconnect, from the filter, the two hoses and remove the filter.
4. Fit the filter into the clamp ensuring that the word 'IN' is towards the rocker cover.
5. Tighten the clamp screw and fit the hoses.

Lubricate accelerator linkage/pedal pivot — check operation

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

Check operation
Check carburettor throttle response to initial movement of the accelerator pedal. If required, adjust the throttle cable at the carburettor.
Check carburettor throttle position with accelerator pedal fully depressed, by observing that the carburettor lever(s) move to a positive stop. If the throttle movement is not satisfactory, investigate the cause and rectify as necessary, proceeding in the following order.
Check that the throttle pedal movement is not restricted by floor mats or carpet, etc. Check the carburettor lever(s) for correct position and settings, see 19.15.01 or 19.15.02, as applicable.
Check the throttle cable location and condition, see 19.20.06.
Check cooling/heater systems for leaks and hoses for security and condition
1. Check for leaks from engine and radiator drain taps/plugs (where fitted).
2. Check for leaks from water hose joints.
3. Check for leaks from water hoses through damage or porosity.
4. Check for leaks from the water pump thermostat housing, radiator and heater unit.
5. Report any leaks found.

Check for oil leaks
Report any found.

Check/adjust torque of cylinder head nuts/bolts
See 22.29.27.

Check driving belts: adjust or renew
Check condition where belt is visibly worn or damaged. Fit new belt if necessary.
Check and adjust:
- Alternator drive belt, see 86.10.05.
- Air pump drive belt, see 17.25.13.
- Compressor drive belt (where applicable), see 82.10.01.

Check security of engine mountings
Check/adjust carburetter idle settings
See 19.15.02.

Top-up carburetter piston dampers
1. Remove the air cleaner assembly, see 19.10.01.
2. Remove the carburetter damper assembly from the carburetter by unscrewing the plastic plug in the top of the carburetter.
3. Raise the piston by inserting a finger into the carburetter air intake hole. With the piston raised, top-up the hollow damper guide with a recommended engine oil until the oil level is 6 mm (¼ in) below the top of the guide.
4. Release the piston and refit the damper assembly, screwing down the plastic plug.
5. To ensure correct location of the oil retaining cup in the damper guide, again raise and lower the piston. A certain amount of pressure will be felt when lifting the piston, but it is essential that the piston is lifted to its maximum height to ensure correct location of the oil retaining cup.
6. Refit the air cleaner assembly.

Renew carburetter air intake air cleaner elements
1. Disconnect the air inlet hose(s) from the air cleaner.
2. Release the two air cleaner cover clips and remove the cover.
3. Withdraw the filter element and discard.
4. Refit a new filter element and reverse instructions 1 to 4.

Check security of E.G.R. valve operating lines
Check E.G.R. valve operating pipe lines for security of push-fit connections at the following units:
- E.G.R. valve.
- Cut-off valve.
- Tee-piece (Canada only).
- Fuel trap.
- Carburetter.
Renew any pipes that show signs of deterioration.

Check E.G.R. system
1. Disconnect the vacuum pipe from the top of the E.G.R. valve.
2. Release the nut securing the E.G.R. valve to the exhaust manifold and withdraw the valve.
3. Clean the base of the valve with a wire brush.
Check air intake temperature control system, excluded on catalytic converter vehicles
See 17.30.01.

Check crankcase breathing and evaporative loss system hoses for security
1 Visually check the following hoses for security, and rectify as necessary.
   2 Crankshaft purge line.
   3 Carburettor float chamber vent pipe.
   4 Adsorption canister purge line.
   5 Fuel tank vent pipe.
   6 Manifold vacuum line.

Check crankcase breathing and evaporative loss control systems
Check hoses and restrictors for blockage, security and condition
1 Inspect all hoses illustrated for condition and renew any hoses that show signs of deterioration, including slackness or cracking.
2 Completely disconnect the crankcase purge line and the adsorption canister purge line, then using a low pressure air supply, blow through these hoses to check for blockage. Investigate and clear any blockage, paying particular attention to the restrictors.
3 Refit the purge lines, ensuring that all connections are secure and tight. Renew any doubtful hose.

Check air injection system, hoses/pipes for security and condition

Clean engine flame trap
1 Detach the hose from the flame trap.
2 Unscrew the flame trap.
3 Clean the flame trap thoroughly, renew it if satisfactory cleaning is not possible or there are signs of deterioration or damage.
4 Refit the flame trap and reconnect the hose.
5 Run the engine until it is at normal operating temperature and, if necessary, adjust the carburetters.

Renew adsorption canister
See 17.15.13.

IGNITION
Check security of distributor vacuum unit line and operation of vacuum unit
1 Check security of distributor vacuum unit operating line connections at carburettor, fuel trap and distributor.
2 Start the engine and warm it to normal running temperature.
3 When the engine is idling steadily, disconnect the vacuum unit pipe at the distributor.
4 A noticeable rise in engine speed (approximately 500 rev/min) should be apparent if the vacuum unit is functioning.
5 When satisfied that the vacuum unit is operating correctly, reconnect the vacuum unit pipe to the distributor, ensuring a secure connection.

Lubricate distributor (Lucas only)
1 Remove the distributor cap and rotor arm. Using an oil can, apply three drops of a clean, recommended engine oil into the reservoir in the rotor carrier.
2 Remove flash-over shield and lubricate pick-up centre bearing plate with a drop of the same oil in each of the two holes provided. DO NOT disturb the screw securing the base plate. Refit the flash-over shield.
3 Refit the rotor arm and distributor cap.

Clean distributor cap, check for cracks and tracking
1 Using a nap-free cloth, wipe the distributor cap and rotor arm clean. Inspect the cap and rotor, internally and externally, for cracks and any trace of tracking.
2 Refit the rotor arm and cap if serviceable, otherwise, fit new components as necessary.

Check/adjust ignition timing using electronic equipment
See 86.35.15.

Check ignition wiring for fraying, chafing and deterioration
Low tension circuit
1 Check connections of the ballast resistor wire, drive resistor, distributor, coil and ignition switch.
2 Check ignition coil connections.
3 Check wiring between coil and distributor.
4 Check distributor external connections.
5 Remove distributor cap and check internal wiring.
6 Check distributor internal connections.
7 Refit distributor cap.

High tension circuit
8 Check lead between coil and distributor.
9 For each spark plug in turn:
   Check lead between plug and distributor.
10 Check high tension lead connections.
11 Report wiring condition.

Clean distributor cap, check for cracks and tracking
1 Using a nap-free cloth, wipe the distributor cap and rotor arm clean. Inspect the cap and rotor, internally and externally, for cracks and any trace of tracking.
2 Refit the rotor arm and cap if serviceable, otherwise, fit new components as necessary.
Renew spark plugs
For each plug in turn
1 Withdraw ignition high tension lead from plug.
2 Unscrew plug from engine using a special plug spanner or a suitable tube spanner.
3 Discard the plug.
4 Visually check new plug for damage to body and electrodes, discard plug if damaged.
5 Check electrode gap on new plug, which when correct, will just allow a 0.80 mm (0.030 in) feeler gauge to slide slowly between the electrodes under light pressure.
6 If adjustment is necessary, using a suitable tool, carefully move the side electrode. Recheck the gap and repeat this procedure until the gap is correct.
7 Check sealing washer for cracks and distortion, and renew washer if necessary.
8 Fit new plug to engine.
9 Tighten plug to 16 Nm (12 lbf ft).
10 Refit the high tension lead to the plug.

TRANSMISSION
Check/top-up gearbox oil
1 With the vehicle standing in a level position, remove the oil level/filler plug and, using a suitable dispenser filled with the correct grade oil, see 'LUBRICANTS AND ANTI-FREEZE SOLUTIONS', top up the gearbox until the oil is level with the bottom of the filler hole threads.
2 Allow surplus oil to drain away, then refit the filler plug and wipe clean.

Check/top-up rear axle/final drive oil
1 With the vehicle standing in a level position, remove the oil level/filler plug and top-up the final drive unit with the correct grade of oil, see 'LUBRICANTS AND ANTI-FREEZE SOLUTIONS', until the oil is level with the bottom of the filler hole threads. Allow surplus oil to drain away, then refit the filler plug and wipe clean.

Check for oil leaks
Report any found.

Check tightness of propeller shaft coupling bolts
Refer to 'TORQUE WRENCH SETTINGS' for data.

Check/top-up automatic gearbox fluid
Check the fluid level as follows:
1 Stand the car on level ground and apply the handbrake firmly. Start the engine from cold and, with the footbrake firmly applied, run the engine at idle speed for two to three minutes, passing the selector lever through the complete range of positions to ensure that the transmission is primed.
2 Select the 'P' (Park) position and apply the handbrake. Leave the engine running at idle speed.
3 Remove the transmission dipstick and wipe it with a clean, non-fluffy cloth.
4 Replace the dipstick, ensuring that it is pushed fully into the tube and withdraw it immediately for reading.
5 Check the fluid level on the side of the dipstick marked 'COLD' and if necessary, add fluid; see Lubrication Recommendations.
6 Repeat instructions 1 to 5 until the fluid level is correct.

Do not overfill the transmission.

Where the reverse side of the dipstick carries marks denoted 'HOT', the fluid level check may be carried out with the transmission at normal operating temperature. The procedure is as described above except that the vehicle must be driven for 25 to 30 km (15 miles) to warm the transmission. The check is then carried out using the ‘HOT’ side of the dipstick. When operating at high ambient temperatures and on unmetalled roads, periodically inspect and remove dust and mud deposits from the slots and screen on the underside of the torque converter housing, and from the underside of the transmission oil sump. These deposits can adversely affect proper cooling of the unit.

Renew automatic gearbox oil and filter
1 Remove the automatic gearbox sump, see 44.24.04.
2 Remove and discard the filter.
3 Fit a new filter.
4 Replace the sump, see 44.24.04.
5 Refill the gearbox with new oil.
6 Run the engine, prime the automatic gearbox and check for oil leaks.

Check coil performance on oscilloscope
Using proprietary electronic testing equipment, in accordance with the equipment instructions, check the resistance of the ignition coil primary winding, which must be 1.2 to 1.5 ohms. If necessary, fit a new ignition coil.
Lubricate automatic gearbox exposed selector linkage

Check clutch pipes for leaks and chafing

Check/top-up clutch fluid reservoir
To prevent dirt entering the system, clean the cap and surrounding area prior to removing the cap. Top-up the fluid until it is level with the line on the side of the reservoir.

Lubricate clutch pedal pivots

STEERING AND SUSPENSION

Check steering rack/for oil/leaks
Report any found.

Check security of suspension fixings
Refer to ‘TORQUE WRENCH SETTINGS’ for data.

Check condition and security of steering unit, joints and gaiters

Check/adjust front wheel alignment
See 57.65.01.

Lubricate steering rack and pinion

Earlier models
1. Wipe clean the plug and surrounding area.
2. Remove the plug.
3. Fit a suitable grease nipple in place of the plug.
4. Apply a grease gun, filled with the correct grade of grease, see ‘LUBRICANTS AND ANTI-FREEZE SOLUTIONS’, to the grease nipple and give five strokes only. CAUTION: Over-greasing can cause damage to the protective bellows.
5. Remove the grease nipple.
6. Refit the plug.
7. Wipe away any surplus grease.

Later models
Using a recommended grease, lubricate the steering rack and pinion as follows:
1. Wipe clean the plug and surrounding area.
2. Remove the grease nipple plug, taking care not to disturb the larger damper plug.
3. Fit a suitable grease nipple in place of the plug.
4. Turn the steering wheel to full right-hand lock.
5. Apply a grease gun to the grease nipple and give five strokes only. CAUTION: Over-greasing can cause damage to the protective gaiters and/or seals.
6. Remove the grease nipple and refit the plug.
7. Wipe away any surplus grease.

Adjust front hub bearing end-float
1. Remove road wheel.
2. Check hub for end-float.
3. If adjustment is required, remove hub cap and split pin.
4. Tighten slotted nut as required to eliminate end-float. A torque of 0.691 kgf m (5 lbf ft), must not be exceeded or damage may be caused to bearings and bearing tracks. Slacken nut to permit entry of split pin.
5. Insert and lock split pin.
6. Clean hub cap and refit.
7. Fit road wheel.
Check shock absorbers for fluid leaks
Report any found.

Check power steering system for leaks, hydraulic pipes and unions for chafing and corrosion

Check/top-up fluid in power steering reservoir
Stand the vehicle on level ground.
1 Wipe clean the reservoir cap and surrounding area.
2 Remove the reservoir cap and dipstick.
3 Wipe the dipstick clean and replace it in position.
4 Withdraw the dipstick again and note the fluid level.

If topping-up is necessary:
5 Add recommended fluid via the filler cap to bring the level just below the high mark on the dipstick. Do not overfill.
6 Replace the reservoir cap.

BRAKES
Inspect brake pads for wear and discs for condition
1 Jack up the front of the car and support the body on stands.
2 Remove the road wheel.
3 Remove the disc brake pads, as follows:
   a Withdraw the two spring pins from the brake pad retaining pins.
   b Withdraw the brake pad retaining pins.
   c Lift out the brake pads complete with damping shims.
   CAUTION: Do not depress the brake pedal whilst the pads are removed.

4 Check the pad condition. If the friction lining has been reduced to 3 mm (0.125 in) or if there is not sufficient material to provide a thickness of 3 mm (0.125 in) at the completion of a further 3,000 miles (5,000 km) motoring, the pads should be renewed.
5 Check the brake disc for excessive scoring and run-out and report if this is present.
6 If new brake pads are being fitted press the caliper pistons into their respective bores.
7 Clean the brake pad locations in the caliper.
8 Fit the brake pads complete with damping shims.
9 Fit the brake pad retaining pins to the caliper and secure with spring pins.
10 Fit the front wheel and lower the car off the stands.
11 Firmly depress the footbrake several times to correctly locate the friction pads.

Inspect the brake linings/pads for wear, drums/discs for condition
1 Jack up the rear of the car and support the body on stands.
2 Remove the car road wheels.
3 Remove the rear brake drum, as follows:
   a Release the handbrake.
   b Remove the countersunk screws securing the brake drum to the hub and withdraw the brake drum.
4 Check the brake linings for wear. If they are excessively worn, damaged, or contaminated by oil or grease the linings should be replaced. Remove any surplus oil, grease or dust from the linings and drum.
5 Replace the brake drum.
6 Fit the rear road wheels and lower the car.
Check/top-up brake fluid reservoir
Top-up when required with new fluid of the correct type recommended — see 'LUBRICANTS AND ANTI-FREEZE SOLUTIONS.' Do not allow the fluid level to drop below the danger mark on the reservoir.
WARNING: Use only new brake fluid of the correct specification. DO NOT use fluid of unknown origin, or fluid that has been exposed to the atmosphere, or discharged during bleeding operations. If significant topping is required, check the hydraulic system for leaks.
CAUTION: Paintwork can be damaged by direct contact with brake fluid.

Check footbrake operation; adjust to manufacturer's instructions (self-adjusting)
1 With the handbrake off, check the brake pedal for spongy operation.
2 If the pedal has spongy operation, bleed and adjust the brakes, see 70.25.02 and 70.25.03.

Check handbrake operation; adjust to manufacturer's instructions
1 If the handbrake travel is excessive, adjust the handbrake, see 70.35.10.

Lubricate brake pedal pivot
1 Using an oil can, lubricate the brake pedal pivot.
2 Wipe away the surplus oil to prevent staining the carpet.

Electrical

Lubricate handbrake mechanical linkage and cable guides
1 Smear grease around the handbrake compensator, working it well into the clevis pins.
2 Smear grease around the rear brake drum clevis pins.
3 Grease all exposed sections of the inner cable to resist corrosion.

Check visually, hydraulic pipes and unions for cracks, chafing, leaks and corrosion

Check brake servo hoses for security and condition

Check brake system warning light
Report faulty operation.

Lubricate handbrake mechanical linkage and cable guides

Clean and grease battery connections
1 Check the battery and surrounding area for corrosion from battery chemicals.
2 Clean off any corrosion found.
3 Check visually for any cracks in the battery case and report on any case cracks found.
4 Check security of terminal connections.
5 Coat terminals with petroleum jelly.

Check/adjust headlamp alignment
See 86.40.17.

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

Check output of charging system

Check/top-up battery electrolyte
Using DISTILLED WATER ONLY top-up; the electrolyte level is correct when it just covers the separators.
EXHAUST AND FUEL PIPES
Check exhaust system for leaks and security
1. Check security of exhaust pipe to manifold nuts.
2. Check security of exhaust pipe joint clips.
3. Check security of exhaust system mounting bolts.
4. Using a second operator, run engine at fast idle speed.
5. Check exhaust system joints for leaks.
6. Check exhaust pipes for leaks arising from damage or deterioration.
7. Stop engine.
8. Report any defects found.

Check fuel system for leaks, pipes and unions for chafing and corrosion
Report any defects found.

Renew fuel filter
1. Locate the fuel filter, referring to the emission and evaporative loss control section of this manual.
2. Disconnect the inlet and outlet pipes from the filter, taking precautions to collect any fuel spill.
3. Remove the filter, noting its position for refitting.
4. Fit a new filter and reverse instructions 1 and 2.

Check condition of fuel filter cap seal
1. Make a visual check of the seal for the fuel tank filler cap.
2. Renew the seal if its condition is doubtful.

WHEELS AND TYRES
Check/adjust tyre pressures, including spare Refer to Driver's Handbook for pressure settings.
Check that tyres comply with manufacturer's specification
See Driver's Handbook.
Report any deviations that may influence the car's performance or the accuracy of the speedometer.
Check tightness of wheel fastenings
Refer to 'TORQUE WRENCH SETTINGS' for data.
Check tyres for external cuts in tyre fabric, exposure of ply or cord structure, lumps or bulges or uneven wear

BODY
Lubricate all locks, hinges, and door check mechanisms (not steering lock)
Check condition and security of seats and seat belts
Check rear-view mirror for cracks and crazing
Check operation of all door, bonnet and boot locks
Check operation of seat belt warning system
Check operation of seat belt inertia reel mechanism
Check operation of window controls

Check tightness of sub-frame/body mountings
Refer to 'TORQUE WRENCH SETTINGS' for data.

GENERAL
Road/roller test and check function of all instrumentation

PREVENTIVE MAINTENANCE
In addition to the recommended periodical inspection of brake components it is advisable as the car ages and as a precaution against the effects of wear and deterioration to make a more searching inspection and renew parts as necessary.
It is recommended that:
1. Disc brake pads, drum brake linings, hoses and pipes should be examined at intervals no greater than those laid down in the Maintenance Summary Chart.
2. Brake fluid should be changed every 18 months or 19,000 miles whichever is the sooner.
3. All fluid seals in the hydraulic system should be renewed and all flexible hoses should be examined and renewed if necessary every 3 years or 37,500 miles whichever is the sooner. At the same time, the working surface of the piston and of the bores of the master cylinder, wheel cylinders and other slave cylinders should be examined and new parts fitted where necessary.
Care must be taken always to observe the following points:
a. Always use the recommended brake fluid.
b. Never leave fluid in unsealed containers. It absorbs moisture quickly and can be dangerous if used in your braking system in this condition.
c. Fluid drained from the system or used for bleeding should be discarded.
d. The necessity for absolute cleanliness throughout cannot be over-emphasized.

Replacing brake-shoes
When it becomes necessary to renew the brake-shoes, it is essential that only genuine shoes, with the correct grade of lining, are used. Always fit new shoes as complete sets, never individually or as a single wheel set. Serious consequences could result from out-of-tolerance braking due to the mixing of lining.
# MAINTENANCE SUMMARY — FUEL INJECTION ENGINED VEHICLES

<table>
<thead>
<tr>
<th>Operation No.</th>
<th>Miles × 1000</th>
<th>Kilometres × 1000</th>
<th>Service</th>
</tr>
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<tbody>
<tr>
<td>10.10.03</td>
<td>1</td>
<td>1.6</td>
<td>A</td>
</tr>
<tr>
<td>10.10.15</td>
<td>7.5, 22.5, 37.5, 72.5, 27.5</td>
<td>12.36, 60, 92, 116, 140, 164, 188, 212, 24, 72, 104, 152, 200</td>
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<td>10.10.30</td>
<td>15, 45, 65, 95, 125</td>
<td>24, 72, 104, 152, 200</td>
<td>C</td>
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<td>10.10.60</td>
<td>30, 80, 110, 140</td>
<td>48, 128, 176, 224</td>
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</tr>
<tr>
<td>10.10.99</td>
<td>50</td>
<td>80</td>
<td>E</td>
</tr>
</tbody>
</table>

To meet U.S.A. legislative requirements:
Items marked thus † are applicable up to 50,000 miles only.
Items marked thus †† are applicable at 50,000 miles and onwards.

## SERVICE

### ENGINE
- Renew engine oil
- Check for oil leaks
- Renew engine oil filter
- Lubricate accelerator control linkage (and pedal pivot) — check operation
- Renew fuel filter(s)
- Renew air intake air cleaner element
- Check/adjust all driving belts; renew as necessary
- Check cooling and heater systems for leaks and hoses for security and condition
- Renew crankcase breather filter
- Check/adjust operation of all washers and top-up reservoirs
- Check crankcase breathing and evaporative loss control systems
- Check hoses/pipes and restrictors for blockage, security and condition
- Check/adjust engine idle speed
- Clean crankcase breather flame trap
- Check/top-up cooling system

### IGNITION
- Lubricate distributor
- Check/adjust ignition timing, using electronic equipment
- Clean/adjust spark plugs; renew as necessary
- Renew spark plugs
- Check security of distributor vacuum line and operation of vacuum unit
- Check ignition wiring (including electric fuel pump wiring) for security, fraying, chafing and deterioration

### TRANSMISSION
- Check for oil leaks
- Check/top-up gearbox oil
- Check/top-up automatic gearbox oil
- Renew automatic gearbox oil and filter
- Check clutch pipes for cracks, chafing, leaks and corrosion
- Check/top-up rear axle/final drive oil
- Check/top-up clutch fluid reservoir
- Check tightness of propeller shaft coupling bolts

### STEERING AND SUSPENSION
- Check condition and security of steering unit, joints and gaiters
- Check steering rack/rod for oil/leakage
- Check/top-up fluid in power steering reservoir
- Lubricate steering rack and pinion
- Check/adjust front wheel alignment
- Check shock absorbers for fluid leaks
- Check power steering system for leaks, hydraulic pipes and unions for chafing and corrosion
- Check/adjust front hub bearing end-flange
### SERVICE

<table>
<thead>
<tr>
<th>BRAKES</th>
<th></th>
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<tbody>
<tr>
<td>Check visually hydraulic pipes and unions for cracks, chafing, leaks and corrosion</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Check/top-up brake fluid reservoir(s)</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Inspect brake pads/linings for wear, discs/drums for condition; adjust brakes as necessary</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Check brake servo hose(s) for security and condition</td>
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<tr>
<td>Renew hydraulic brake fluid</td>
<td>22,500 miles (36 000 km) or 18 months, whichever is the sooner</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Renew air filter in brake servo unit</td>
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<thead>
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<tbody>
<tr>
<td>Check function of original equipment, i.e. interior and exterior lamps, horns, wipers and all warning indicators</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Check/adjust headlamp alignment</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Check, if necessary renew, wiper blades</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Check/top-up battery electrolyte</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Clean and grease battery connections</td>
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<th>FUEL AND EXHAUST SYSTEMS</th>
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<tbody>
<tr>
<td>Check exhaust system for leaks and security</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Check fuel system for leaks, pipes and unions for chafing and corrosion</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>Check condition of fuel filler cap seal</td>
<td>X</td>
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<tr>
<td>Renew lambda (oxygen) sensors and reset service interval counter</td>
<td>X</td>
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<tr>
<th>WHEELS AND TYRES</th>
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<tbody>
<tr>
<td>Check/adjust tyre pressures, including spare</td>
<td>X</td>
<td>X</td>
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<td>Check tightness of road wheel fastenings</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Check that tyres comply with manufacturer’s specification</td>
<td>X</td>
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<tr>
<td>Check tyres for tread depth and visually for external cuts in fabric, exposure of ply or cord structure, lumps or bulges</td>
<td>X</td>
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<tbody>
<tr>
<td>Lubricate all locks and door check mechanisms (not steering lock)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Check operation of all door, bonnet, boot and steering column locks</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>Check condition, security and operation of seats and seat belts</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Check operation of window controls</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>ROAD/ROLLER TEST; Check brake operation and function of all instrumentation</td>
<td>X</td>
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<td>X</td>
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</tr>
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<td>Report additional work required</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</tbody>
</table>

### ADDITIONAL RECOMMENDATIONS

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

It is recommended that:

1. Disc brake pads, drum brake linings, hoses and pipes should be examined at intervals no greater than those laid down in the Maintenance Summary.
2. Brake fluid should be changed completely every 18 months or 30 000 km whichever is the sooner.
3. All fluid seals in the hydraulic system and all flexible hoses should be examined and renewed if necessary every three years or 60 000 km whichever is sooner. At the same time the working surface of the pistons and of the bores of the master cylinder, wheel cylinders and other slave cylinders should be examined and new parts fitted where necessary.

Care must be taken always to observe the following points:

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 your braking system in this condition.
c. Fluid drained from the system or used for bleeding should be discarded.
d. The necessity for absolute cleanliness throughout cannot be over-emphasized.
MAINTENANCE SUMMARY — FUEL INJECTION VEHICLES

ENGINE

Check/top-up engine oil

Check the level of oil in the engine sump, first making sure that the car is standing on level ground. If the engine has been running, wait a few minutes to allow the oil to drain back into the sump.

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

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

Renew engine oil

1. Run the engine to warm up the oil; switch off the ignition.

2. Place an oil tray under the engine.

3. Unscrew and discard the filter. The use of a strap spanner or similar tool may be necessary.

4. Smear clean engine oil on the rubber washer of the new filter.

5. Fill the new filter with new oil as far as possible, noting the angle at which the filter is to be fitted. Screw on the filter until the sealing ring touches the oil pump cover face, then tighten it a further half-turn by hand only. Do not overtighten.

Lubricate accelerator control linkage (and pedal pivot)—check operation.

Renew fuel filter(s)

A single filter or twin filters may be fitted. They are located at the right-hand rear of the vehicle, mounted beneath the car floor forward of the rear axle. A cover may be fitted to later models, see 19.25.03.

The fuel system must be depressurised before commencing this operation, see 19.50.02.

1. Disconnect the fuel pipes from each end of the filter(s).

2. Slacken the clip securing the filter(s).

3. Withdraw and discard the filter(s).

4. Fit the new filter with the end marked 'IN' connected to the fuel supply pipe. (Alternatively, arrow markings denote fuel flow direction.)

5. Tighten the securing clip and fuel connections.
Renew air intake air cleaner element
Refer to operation 19.10.08.

Check/adjust all driving belts
1 Examine all driving belts for wear, damage and deterioration.
2 Each belt should be sufficiently tight to drive the appropriate auxiliary without undue load on the bearings.

Correct tension:
This is measured by allowing 0.4 mm movement on the slack side of the belt per 25.4 mm between pulley centres. E.g. Distance between pulley centres = 254 mm.

Tension = 254 mm × 0.4 mm
= 101.6 mm

Should adjustment be necessary:
Slacken, but do not remove, the appropriate unit mounting nuts/bolts. Slacken, but do not remove, the unit pivot bolts/nuts. Adjust the position of the unit to achieve correct belt tension. Re-tighten the pivot and mounting bolts/nuts.

To renew a drive belt, follow the procedure under instruction 3, noting that other drive belts may have to be removed for access.

Alternatively, if the equipment is available, the following can be used:

<table>
<thead>
<tr>
<th>Drive belt</th>
<th>Borroughs gauge reading</th>
<th>Robinair gauge reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternator</td>
<td>New: 110 to 120</td>
<td>New: 77 to 85</td>
</tr>
<tr>
<td></td>
<td>Replacement: 80 to 85</td>
<td>Replacement: 50 to 54</td>
</tr>
<tr>
<td>Compressor</td>
<td>New: 110 to 120</td>
<td>New: 77 to 85</td>
</tr>
<tr>
<td></td>
<td>Replacement: 90 to 100</td>
<td>Replacement: 58 to 68</td>
</tr>
<tr>
<td>Power steering</td>
<td>New: 110 to 120</td>
<td>New: 77 to 85</td>
</tr>
<tr>
<td></td>
<td>Replacement: 90 to 100</td>
<td>Replacement: 58 to 68</td>
</tr>
</tbody>
</table>

Check cooling and heater systems for leaks, and hoses for security and condition

Renew crankcase breather filter
1 Using the fingers and thumb, prise the filter upwards to release it from the rocker cover.
2 Discard the filter.
3 Fit a new filter, pressing it gently onto the rocker cover until it clips into place.

Check/adjust operation of all washers and top-up reservoirs

Check crankcase breathing and evaporative loss control systems

Check hoses/pipes and restrictors for blockage, security and condition

Check/adjust engine idle speed
Refer to operation 19.20.18.

Check crankcase breather flame trap
1 Lift off the top hose leading into the flame trap.
2 Disconnect the clamp securing the H.T. leads.
3 Unscrew the flame trap.
4 Wash the flame trap in petrol.
5 Reverse instructions 1 to 3 above.

Check/top-up cooling system
WARNING: When it is necessary to remove the pressure/filler cap from a hot engine, exercise great care by protecting the hands against escaping steam. Slowly turn the pressure cap anti-clockwise until resistance of the safety stop is felt. Leave the cap in this position until all pressure is released. Press the cap downwards against the spring to clear the safety stops, and continue turning until it can be lifted off.

The pressurised cooling system incorporates a header tank which provides a single point for coolant filling and level checking. The coolant level should be maintained at 25 mm (1 inch) below the neck of the header tank. If the cooling system has been drained, the procedure for refilling the system is as follows:

1 Remove the header tank filler cap.
2 Set the interior heater controls to the maximum heat position.
3 Fill the system until the coolant level is 25 mm (1 inch) below the neck of the header tank.
4 Refit the header tank filler cap and run the engine at approximately 1500 rev/min until the coolant temperature rises sufficiently to open the thermostat.
5 Stop the engine and, observing the warning below, remove the header tank filler cap.
6 Top up the coolant level as necessary until it is 25 mm (1 inch) below the header tank filler neck.
7 Refill the filler cap.
IGNITION

Lubricate distributor
1 Disconnect the spark plug leads from the right-hand bank of cylinders and remove the distributor cap. Take off the rotor arm and flash-over shield.
2 Apply two drops of clean engine oil to the felt pad (A) and five drops of the same oil to the automatic timing mechanism (B).
3 Wipe the inside and outside of the distributor cap with a soft dry cloth. Ensure that the carbon brush works freely in its holder.
4 Refit the flash-over shield, rotor arm, distributor cap and plug leads.

Clean/adjust spark plugs
1 Remove the spark plugs, see below.
2 Clean the plugs using proprietary sand/grit blasting equipment following the manufacturer's instructions.
3 Reset the electrode gap.
4 Refit the spark plugs.

Renew spark plugs
1 Remove the leads from the spark plugs.
2 Using the special spark plug spanner and tommy bar, remove the plugs and washers.
3 It is important that only the correct type spark plugs are used for replacements.
4 Set the electrode gap to the recommended clearance.
5 Take great care when fitting spark plugs not to cross-thread the plug, otherwise costly damage to the cylinder head will result.
6 Refit the leads to the spark plugs.

Check security of distributor vacuum line and operation of vacuum unit

Check ignition wiring (including electric fuel pump wiring) for security, fraying, chafing and deterioration
1 A careful examination should be carried out on all high-tension leads, including the coil to distributor lead.
2 Look for any signs of insulation cracking or deterioration and corrosion at the end contacts.
3 Replace any faulty leads.
4 High-tension leads must be replaced in the correct relationship to each other, as well as ensuring correct firing order. Failure to do this will result in cross-firing.
5 Check all wiring connections on the low-tension circuit for security and condition.
6 Check fuel pump wiring.

NOTE: The electrical leads to the ignition coil are fitted with male and female connectors; ensure that they are fitted to the correct blade on the coil.

TRANSMISSION

Check for oil leaks

Check/top-up gearbox oil
With the vehicle standing on level ground:
1 Remove the oil level plug.
2 Using a suitable dispenser such as a pump-type oil can with flexible nozzle filled with a recommended lubricant, top-up the gearbox until the oil is level with the bottom of the filler plug threads.
3 Allow surplus oil to drain away before refitting the level plug and wiping clean.
Check/top-up automatic gearbox oil

1. Stand the car on level ground and apply the handbrake firmly. Start the engine from cold and, with the footbrake firmly applied, run the engine at idle speed for two to three minutes, passing the selector lever through the complete range of positions to ensure that the transmission is primed.
2. Select the "P" (Park) position and apply the handbrake. Leave the engine running at idle speed.
3. Remove the transmission dipstick and wipe it with a clean, non-fluffy cloth.
4. Replace the dipstick, ensuring that it is pushed fully into the tube and withdrawn immediately for reading.
5. Check the fluid level on the side of the dipstick marked 'COLD' and, if necessary, add fluid; see Lubrication Recommendations.
6. Repeat instructions 1 to 5 until the fluid level is correct. **DO NOT OVERFILL THE TRANSMISSION.**

Where the reverse side of the dipstick carries marks denoted 'HOT', the fluid level check may be carried out with the transmission at normal operating temperature. The procedure is as described above except that the vehicle must be driven for 25 to 30 km (15 to 20 miles) to warm the transmission. The check is then carried out using the 'HOT' side of the dipstick.

Renew automatic gearbox oil and filter

1. Remove the automatic gearbox sump, see 44.24.04.
2. Remove and discard the filter.
3. Fit a new filter.
4. Replace the sump, see 44.24.04.
5. Refill the gearbox with new oil.
6. Run the engine, prime the automatic gearbox and check for oil leaks.

Check clutch pipes for cracks, chafing, leaks and corrosion

Check/top-up rear axle/final drive oil

1. Remove the oil level plug.
2. Top-up the rear axle until the oil is level with the bottom of the filler plug thread.
3. Allow surplus oil to drain before fitting the plug and wiping clean.

Check clutch fluid reservoir

1. Wipe clean the area around the reservoir cap.
2. Unscrew the cap.
3. If necessary, top-up the reservoir to within 6 mm (¼ in) of the top with new brake fluid taken from a sealed container.
4. Replace the reservoir cap.

Check/tightness of propeller shaft coupling bolts

Check the following fastenings for tightness: Propeller shaft to gearbox and rear axle: 5/8" U.N.F. bolt: 46 Nm (34 lbf ft).

Check/top-up clutch fluid reservoir

1. Wipe clean the area around the reservoir cap.
2. Unscrew the cap.
3. If necessary, top-up the reservoir to within 6 mm (¼ in) of the top with new brake fluid taken from a sealed container.
4. Replace the reservoir cap.

STEERING AND SUSPENSION

Check condition and security of steering unit, joints and gaiters

Refer to Torque Wrench Settings as applicable.

Check steering rack/gear for oil/fluid leaks

Check/top-up fluid in power steering reservoir

Stand the vehicle on level ground.
1. Wipe clean the reservoir cap and surrounding area.
2. Remove the reservoir cap and dipstick.
3. Wipe the dipstick clean and replace it in position.
4. Withdraw the dipstick again and note the fluid level.
5. Add recommended fluid via the filler cap to bring the level just below the 'high' mark on the dipstick. **Do not overfill.**
6. Replace the reservoir cap.
Lubricate steering rack and pinion

1. Wipe clean the plug and surrounding area.
2. Remove the grease nipple plug, taking care not to disturb the larger damper plug.
3. Fit a suitable grease nipple in place of the plug.
4. Turn the steering wheel to full right-hand lock.
5. Apply a grease gun to the grease nipple and give five strokes only.

CAUTION: Overgreasing can cause damage to the protective gaiters and/or seals.

6. Remove the grease nipple and refit the plug.

BRAKES

Check visually hydraulic pipes and unions for cracks, chafing, leaks and corrosion

Check/top-up brake fluid reservoir

Maintain the fluid level above the 'DANGER' mark on the side of the reservoir.

If topping-up is necessary:
1. Wipe clean the reservoir cap and surrounding area.
2. Unscrew the reservoir cap and add fluid as necessary.
3. Replace the reservoir cap.

Care must be taken always to observe the following points:

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 your braking system in this condition.

c. Fluid drained from the system or used for bleeding should be discarded.

d. The necessity for absolute cleanliness throughout cannot be over-emphasized.

Inspect brake pads/lining for wear, discs/drums for condition, adjust brakes as necessary.

Front brakes
1. Remove the brake pads, see 70.40.02.
2. Renew the pads if the lining thickness is likely to be below 3 mm (⅛ in) before the next service.

Rear brakes
1. Remove the brake drums, see 70.10.03.
2. Renew the brake linings if they are likely to have worn near the rivets or be less than 1.5 mm (⅜ in) thick before the next service.

Brake shoe renewal

When it becomes necessary to renew the brake shoes, it is essential to use only genuine shoes, with the correct grade of lining. Always fit new shoes as complete sets, never individually or as a single wheel set. Serious consequences could result from out-of-balance braking due to the mixing of linings.

Adjustment

The front and rear brakes are self-adjusting, but the handbrake may be adjusted following instructions in operation 70.35.10.

Check brake servo hose(s) for security and condition

Renew hydraulic brake fluid

Refer to notes following ‘Check/top-up brake fluid reservoir’.

Renew air filter in brake servo unit.

Refer to operation 70.50.25.

ELECTRICAL

Check function of original equipment i.e. interior and exterior lamps, horns, wipers and all warning indicators

Check/adjust headlamp alignment

Refer to operation 86.40.17.

Check, if necessary renew, wiper blades

Refer to operation 84.15.05.

Check/top-up battery electrolyte

1. Lift the cover.
2. Check the electrolyte level, which if correct should just cover the separators.
3. Add distilled water as necessary.

CHECK SHOCK ABSORBERS FOR FLUID LEAKS

Check power steering system for leaks, hydraulic pipes and unions for chafing and corrosion.

Check/adjust front hub bearing end-float

Refer to operation 60.25.13.

Clean and grease battery connections.
FUEL AND EXHAUST SYSTEMS
Check exhaust system for leaks and security

1. Place the car on a ramp or over a pit.
2. Check the exhaust systems fixings for security, paying particular attention to heat shields, flexible mounting plates and clamps.
3. Using a second operator, run the engine at fast idle speed.
4. Check exhaust system joints for leaks.
5. Check exhaust pipes for leaks arising from damage or deterioration.
6. Check exhaust silencers for leaks arising from damage or deterioration.
7. Stop the engine.
8. Report any defects found. Silencers or pipes found to be leaking or badly corroded should be renewed.
9. Fit new parts as necessary.

Check fuel system for leaks, pipes and unions for chafing and corrosion
Visually check the fuel feed system for leaks as follows:
1. Check for leaks from fuel system connections.
2. Check the fuel pipes for chafing, corrosion and damage.
3. Check for leaks from the fuel and expansion tanks, pump, rails and injectors.
4. Renew any items which show signs of deterioration.

Check condition of fuel filler cap seal
Renew lambda (oxygen) sensor and reset service interval counter
1. Disconnect the electrical lead from the sensor.
2. Unscrew the sensor from the exhaust pipe, taking care not to strain the exhaust system.
3. Lubricate the threads of the new sensor and fit it to the exhaust pipe. Tighten the sensor sufficient to make a gas-tight seal, but do not overtighten.

4. Reconnect the electrical leads to the sensor.
5. Reset the service interval counter using the special tool necessary for this purpose.

WHEELS AND TYRES
Check/adjust tyre pressures, including spare
Refer to General Specifications.

Check tightness of road wheel fastenings
Refer to Torque Wrench Settings.

Check that tyres comply with manufacturer's specification
Refer to General Specifications.

Check tyres for tread depth and visually for external cuts in fabric, exposure of ply or cord structure, lumps or bulges

BODY
Lubricate all locks, hinges and door check mechanisms (not steering lock)

Check operation of all door, bonnet, boot and steering column locks

Check operation of window controls

Check condition, security and operation of seats and seat belts
The seat belt inertia reel mechanism may be checked using the following procedure:

1. IMPORTANT: The following road test must be carried out only under maximum safe road conditions, i.e. on a dry, straight, traffic-free road.
   With the safety harness fitted to the driver and front seat passenger drive the car at 8 km/h (5 m.p.h.); ensuring that it is safe to do so, brake sharply. The safety harness should lock automatically, holding both driver and passenger securely in position.
   It is important when braking that the reactions of both driver and passenger are normal, i.e. the body must not be thrown forward in anticipation, thus causing a 'snatching' action of the belt which would operate the locking mechanism.

2. Snatch test: Whilst seated, fasten the seat belt and grip the shoulder belt at approximately shoulder level with the opposite hand. Pull the belt sharply in a downwards direction; the belt should lock.
   If the belt fails to lock on either test the seat belt should be replaced, see 76.73.10 and 76.73.18.

GENERAL

Road/roller test. Check brake operation and function of all instrumentation

Brake operation:
The operation of the footbrake and handbrake independently should be sufficient to stop the vehicle without pull to one side, within a distance required by any local territory legislation.
In addition, the footbrakes and/or the handbrake must prevent vehicle movement on a steep incline. Again reference should be made to any applicable local territory legislation.

Report additional work required.
CAMSHAFT (Air conditioning model)

Remove and refit 12.13.01

NOTE: For non air conditioning models ignore references to air conditioning components.

Removing
1. Disconnect the battery.
2. Remove the bonnet, see 76.16.01.
3. Remove the radiator, see 26.40.01.
4. Remove the fan frame assembly, see 26.25.30.
5. Remove the induction manifold gasket, see 30.10.08.
6. Remove the timing chain and gears, see 12.65.12.
8. Remove the rocker shaft assemblies.

Refitting
12. Lubricate the five camshaft journals and carefully insert the camshaft into the cylinder block.
13. Fit the timing chain and gears, see 12.65.12.
14. Fit the timing gear cover, see 12.65.01.
15. Fit a new timing gear cover oil seal, see 12.65.05.
16. Fit the eight hydraulic tappets.
17. Insert the push-rods.
18. Fit the rocker shafts.
19. Fit the induction manifold using a new gasket, see 30.10.08.
20. Fit the radiator, see 26.40.00.
21. Fit the bonnet, see 76.16.01.
22. Connect the battery.

CONNECTING RODS AND PISTONS

Remove and refit 12.17.01

Special tools: MS 53/3, 605351

Removing
1. Drive car onto a ramp and disconnect the battery.
2. Remove the right-hand cylinder head and gasket, see 12.29.44.
3. Remove the left-hand cylinder head and gasket, see 12.29.43.
4. Modify two engine lifting eyes as illustrated. $A = 30°$, $B = 0.3$ in (12.7 mm).

9. Raise the engine 1.5 in (38 mm) by turning the nut as in instruction 7.
10. Raise the ramp.
11. Drain the sump oil.
12. Remove the sump coupling plate bolts.
13. Remove the sump retaining bolts.
14. Withdraw the sump.
15. Remove the oil pick-up strainer, see 12.60.20, instructions 3 to 5.
16. Remove the sump baffle plate, see 12.60.46, instructions 4 and 5.

NOTE: Since the connecting rods and caps are not marked for reassembly, it is important that the caps are marked and assembled to their respective rods immediately after removal from the engine. Similarly, the pistons and connecting rod assemblies are not marked with their respective bore numbers and must therefore be suitably identified if they are to be refitted to the engine.

17. Remove the connecting rod caps.
18. Screw the guide bolts 605351 on to the connecting rod bolts.

5. Secure the modified lifting eyes to the second inboard cylinder head stud holes on the L.H. and R.H. bank of the cylinder block.
6. Position special support tool MS 53/3 across the engine bay as illustrated and link the hook and brackets together with a length of lifting chain.
7. Support the weight of the engine by turning the special elongated nut clockwise.
8. Remove the four (two both sides) engine mounting to sub-frame nuts and bolts.

continued
19 Push the connecting rod and piston assembly up the cylinder bore and withdraw from the top.
20 Remove the guide bolts.

Refitting
21 Locate the applicable crankshaft journal at B.D.C.
22 Place the bearing upper shell in the connecting rod.
23 Retain the upper shell by screwing the guide bolts 605351 on to the connecting rods.
24 Insert the connecting rod and piston assembly into its respective bore, noting that the domed shape boss on the connecting rod must face towards the front of the engine on the right-hand bank of cylinders and towards the rear on the left-hand bank. When both connecting rods are fitted, the bosses will face inwards towards each other.
25 Position the oil control piston rings so that the ring gaps are all at one side, between the gudgeon pin and piston thrust face. Space the gaps in the ring rails approximately 25 mm (1 in) each side of the expander ring joint.
26 Position the compression rings so that their gaps are on opposite sides of the piston between the gudgeon pin and piston thrust face.
27 Using a piston ring compressor, locate the piston into the cylinder bore.
28 Place the bearing lower shell in the connecting rod cap.
29 Locate the cap and shell on to the connecting rod, noting that the rib on the edge of the cap must be towards the front of the engine on the right-hand bank of cylinders and towards the rear on the left-hand bank.
30 Secure the connecting rod cap. Torque 54 Nm (40 lbf ft).

CONNECTING RODS AND PISTONS

Overhaul 12.17.10
Service tools: 605350—Tool for removing and refitting gudgeon pin.

Dismantling
1 Remove the connecting rods and pistons, see 12.17.01.
2 If the same piston is to be refitted, add location marks to ensure reassembling in the same relative position.
3 Locate the piston and connecting rod assembly on tool 605350.

Overhauling pistons
Original pistons
6 Remove carbon and deposits, particularly from the ring grooves.
7 Examine the pistons for damage or excess wear—see DATA for clearances—fit new replacements as necessary.
NOTE: The temperature of the piston and cylinder block must be the same to ensure accurate measurements.

New pistons
NOTE: A single standard piston 0.0254 mm (0.001 in) oversize is available only for service purposes. Should it be necessary to fit a new piston to a standard bore, the bore must be honed to accommodate the piston with the correct clearance—see Data.
8 Check the cylinder bore dimension at right angles to the gudgeon pin, 90 to 100 mm (3.5 to 4.0 in) from the top.

Overhaul 12.17.10
Service tools: 605350—Tool for removing and refitting gudgeon pin.

Dismantling
1 Remove the connecting rods and pistons, see 12.17.01.
2 If the same piston is to be refitted, add location marks to ensure reassembling in the same relative position.
3 Locate the piston and connecting rod assembly on tool 605350.

8 Check the cylinder bore dimension at right angles to the gudgeon pin, 90 to 100 mm (3.5 to 4.0 in) from the top.
9 Check the piston dimension at right angles to the gudgeon pin, at the bottom of the skirt.

10 The piston dimension must be 0.018 to 0.033 mm (0.0007 to 0.0012 in) smaller than the cylinder.

11 If new piston rings are to be fitted without reboring, deglaze the cylinder walls with a hone, without increasing the bore diameter.

NOTE: A deglazed bore must have a cross-hatch finish.

12 Check the compression ring gaps in the applicable cylinder, held square to the bore with the piston. Gap limits: 0.46 to 0.60 mm (0.017 to 0.022 in.) Use a fine-cut flat file to increase the gap if required. Select a new piston ring if the gap exceeds the limit.

NOTE: Gapping does not apply to oil control rings.

13 Temporarily fit the compression rings to the piston with the chrome compression ring in the top groove and the stepped ring in the second groove with the marking 'T' or 'TOP' uppermost.

14 Check the compression ring clearance in the piston groove. Clearance limits: 0.08 to 0.13 mm (0.003 to 0.005 in).

15 Fit the expander ring into the bottom groove making sure that the ends abut and do not overlap.

16 Fit two ring rails to the bottom groove, one above and one below the expander ring.

17 Fit the chrome compression ring in the top groove and the stepped ring in the second groove with the marking 'T' or 'TOP' uppermost.

18 Check the alignment of the connecting rod.

19 Check the connecting rod small-end; the gudgeon pin must be an interference fit.

20 Locate the bearing upper shell into the connecting rod.

21 Locate the connecting rod and bearing on to the applicable crankshaft journal, noting that the domed shape boss on the connecting rod must face towards the front of the engine on the right-hand bank of cylinders and towards the rear on the left-hand bank. When both connecting rods are fitted, the bosses will face inwards towards each other.

22 Place a piece of Plastigauge 605238, across the centre of the lower half of the crankshaft journal.

23 Locate the bearing lower shell into the connecting rod cap.

continued
24 Locate the cap and shell on to the connecting rod. Note that the rib on the edge of the cap must be the same side as the domed shape boss on the connecting rod.

25 Secure the connecting rod cap. Torque 41 to 47 Nm (30 to 35 lbf ft).

NOTE: Do not rotate the crankshaft while the Plastigauge is fitted.

26 Remove the connecting rod cap and shell.

Using the scale printed on the Plastigauge packet, measure the flattened Plastigauge at its widest point. The graduation that most closely corresponds to the width of the Plastigauge indicates the bearing clearance.

28 The correct bearing clearance with new or overhauled components is 0.015 to 0.055 mm (0.0006 to 0.0022 in).

29 If a bearing has been in service, it is advisable to fit a new bearing if the clearance exceeds 0.08 mm (0.003 in).

30 If a new bearing is being fitted, use selective assembly to obtain the correct clearance.

31 Wipe off the Plastigauge with an oily rag. DO NOT scrape it off.

NOTE: The connecting rods, caps and bearing shells must be retained in sets, and in the correct sequence.

Reassembling
32 Locate the guide for the gudgeon pin on tool 605350.

33 Locate the piston and connecting rod on tool 605350.

34 Insert the gudgeon pin into the piston and locate it over the guide.

35 Locate the drift, part of 605350, on to the gudgeon pin.

36 Using a hydraulic press—8 tonne (8 ton) capacity—press in the gudgeon pin until it abuts the shoulder of the guide.

37 Check that the piston moves freely on the gudgeon pin and that no damage has occurred during pressing.

38 Fit the connecting rods and pistons, see 12.17.01, carrying out the following checks during fitting.

39 Check that the connecting rods move freely sideways on the crankshaft. Tightness indicates insufficient bearing clearance or a mis-aligned connecting rod.

40 Check the end-float between the connecting rods on each crankshaft journal. Clearance limits: 0.15 to 0.37 mm (0.006 to 0.014 in).

DATA

Connecting rod
Length ..................................................
Bearings:
Material and type ..................................
Clearance .............................................
End-play .............................................
Overall length .....................................
Pistons Type ...........................................
Clearance: Top land ...................................
Skirt top .............................................
Skirt bottom ........................................
Gudgeon pins Length ..................................
Diameter ..............................................
Fit in rod .............................................
Clearance in piston ................................
Piston rings Number of compression .............
Number of oil ........................................
No. 1 compression ring ...................................
No. 2 compression ring ..................................
Width of compression rings ....................
Compression ring gap ................................
Oil ring type ........................................
Oil ring width ......................................
Oil ring gap .........................................

Centres 143.81 to 143.71 mm (5.662 to 5.658 in)
Vandervell VP lead-indium
0.015 to 0.055 mm (0.0006 to 0.0022 in)
0.15 to 0.37 mm (0.006 to 0.014 in)
18.60 to 18.85 mm (0.732 to 0.742 in)
Aluminium alloy—"W" slot skirt
0.73 to 0.88 mm (0.0296 to 0.0350 in)
0.040 to 0.071 mm (0.0016 to 0.0028 in)
0.018 to 0.033 mm (0.0007 to 0.0013 in)
72.67 to 72.79 mm (2.861 to 2.866 in)
22.215 to 22.220 mm (0.8746 to 0.8749 in)

Press fit
0.002 to 0.007 mm (0.0001 to 0.0003 in)

2
1

Chrome parallel faced
Stepped to "L" shape and marked "T" or "TOP"

1.56 to 1.59 mm (0.0615 to 0.0625 in)
0.44 to 0.57 mm (0.017 to 0.022 in)
Perfect circle, type 98–6
4.811 mm (0.1894 in) max.
0.38 to 1.40 mm (0.015 to 0.055 in)
CRANKSHAFT PULLEYS (Air conditioning model)

Remove and refit 12.21.01

Removing
1. Drive car onto ramp and disconnect the battery.
2. Remove the alternator drive belt, see 86.10.03.
3. Remove the air conditioning compressor drive belt, see 82.10.02.
4. Remove the power steering pump drive belt, see 57.20.02.
5. Remove the belt from the compressor idler pulley.
6. Select a gear and apply the handbrake.
7. Remove the three Allen bolts and nuts securing the crankshaft alternator pulley to the pulley cluster and remove the pulley.
8. Remove the crankshaft pulley retaining bolt and spacer.
9. Withdraw the remaining crankshaft pulleys and damper.

Refitting
10. Assemble the pulleys to the damper, less the alternator pulley, ensuring that they locate over the hollow dowels.
11. Check that the crankshaft is in position.
12. Lubricate with engine oil the area of the damper shaft that runs in the timing cover oil seal.
13. Fit the pulley assembly to the crankshaft and secure with the special bolt and spacer. Tighten to 257 to 285 Nm (190 to 210 lbf ft).
14. Fit the crankshaft alternator pulley, locating it over the hollow dowel.
15. Fit the reinforcing plate in position over the dowel.
16. Fit the three pulley retaining bolts and nuts with the heads towards the radiator.
17. Reverse instructions 1 to 6.

CRANKSHAFT REAR OIL SEAL

Remove and refit 12.21.20

Special tools: MS 53

Removing
1. Drive car onto ramp and disconnect the battery.
2. Remove the fresh air duct.
3. Remove the exhaust system, see 30.10.01.
4. Remove the catalys.
5. Remove the gear box, see 37.20.01.
6. Remove the clutch assembly.
7. Remove the flywheel.
8. Drain the engine sump.
9. Fit engine support bracket MS 53 and a chain sling from the engine lifting eyes to support the weight of the engine.
10. Disconnect engine mountings from sub-frame.
11. Remove jack from under sump.
12. Remove sump by raising engine if necessary and rotating crankshaft.
13. Remove the oil pick-up.
14. Remove sump baffle plate, see 12.60.46.
15. Remove rear main bearing cap bolts.
16. Remove main bearing cap.
17. Remove cross seals from cap.
18. Remove the rear main oil seal.

Refitting
19. Fit the side seals to the grooves both sides of the rear main bearing cap.
20. Do not cut out the side seals to length; they must protrude approximately 1.5 mm (0.062 in) above the bearing cap parting face.
21. Apply Hylomar PL 32M jointing compound to the rearmost half of the rear main bearing cap parting face or, if preferred, to the equivalent area on the cylinder block, as illustrated.
22. Lubricate the bearing half and bearing cap side seals with clean engine oil.
23. Fit the bearing cap assembly to the engine. Do not tighten the fixings at this stage but ensure that the cap is fully home and squarely seated on the cylinder block.
24. Tension the cap bolts equally by one-quarter turn approximately, then back off one complete turn on each fixing bolt.

continued
Position the seal guide Re 1014 on the crankshaft flange.

Ensure that the oil seal guide and the crankshaft journal are scrupulously clean, then coat the seal guide and oil seal journal with clean engine oil.

NOTE: The lubricant coating must cover the seal guide outer surface completely to ensure that the oil seal lip is not turned back during assembly.

Position the oil seal, lipped side towards the engine, on the seal guide. The seal outside diameter must be clean and dry.

Push home the oil seal fully and squarely by hand into the recess formed in the cap and block until it abuts against the machined step in the recess.

Withdraw the seal guide.

Tighten the rear main bearing cap fixings fully and evenly. Torque: 88 to 93 Nm (65 to 70 lbf ft).

CRANKSHAFT

Remove and refit 12.21.33

Service tools: 605351 and RO 1014

Removing
1 Remove the engine and gearbox assembly, see 12.37.01.
2 Remove the gearbox from the engine.
3 Drain the sump.
4 Remove the timing gear cover, see 12.65.01.
5 Remove the timing chain and gears, see 12.65.12.
6 Remove the clutch.
7 Remove the flywheel.

Refitting
14 Locate the upper bearing shells into the cylinder block. Ensure that the oil hole in the bearing corresponds with the drilling in the block.

15 Locate the flanged upper main bearing shell into the centre main bearing.

continued
16 Place suitable blocks, approximately 12.5 mm (0.500 in) thick, on to each end of the cylinder block so that they cover the front and rear upper main bearing shells.

17 Lift the crankshaft into position with the ends supported on the blocks.

18 Lubricate the crankshaft journals and bearing shells with engine oil.

19 Holding the connecting rods in position, remove one of the blocks and lower the crankshaft on to the connecting rod bearings. Repeat for the opposite end.

20 Where necessary, use the guide bolt 605351 to draw the connecting rods up to the crankshaft journal.

21 Locate the bearing caps and lower shells on to the connecting rods, noting that the rib on the edge of the cap must be towards the front of the engine on the right-hand bank of cylinders, and towards the rear on the left-hand bank.

22 Secure the connecting rod caps. Torque 25 to 29 Nm (35 to 40 lbf ft).

23 Lubricate the lower main bearing shells with engine oil.

24 Fit numbers one to four main bearing caps and shells leaving the bolts slack.

25 Align the thrust faces of the centre main bearing by tapping the crankshaft with a mallet, forward and rearward.

26 Tighten Nos. 1 to 4 main bearing bolts to 67 to 74 Nm (50 to 55 lbf ft).

27 Fit the side seals to the grooves each side of the rear main bearing cap.

28 Do not cut the side seals to length; they must protrude approximately 1.5 mm (0.062 in) above the bearing cap parting face.

29 Apply Hylomar PL 32M jointing compound to the rearmost half of the rear main bearing cap parting face, or, if preferred, to the equivalent area on the cylinder block, as illustrated.

30 Lubricate the bearing half and bearing cap side seals with clean engine oil.

31 Fit the bearing cap assembly to the engine. Do not tighten the fixings at this stage but ensure that the cap is fully home and squarely seated on the cylinder.

32 Tension the cap bolts equally by one-quarter turn approximately, then back off one complete turn on each fixing bolt.

33 Position the seal guide RO 1014 on the crankshaft flange.

34 Ensure that the oil seal guide and the crankshaft journal are scrupulously clean then coat the seal guide and oil seal journal with clean engine oil. NOTE: The lubricant coating must cover the seal guide outer surface completely to ensure that the oil seal lip is not turned back during assembly. CAUTION: Do not handle the seal lip at any time, visually check that it is not damaged and ensure that the outside diameter remains clean and dry.

35 Position the oil seal, lipped side towards the engine, on to the seal guide.

36 Push home the oil seal fully and squarely by hand into the recess formed in the cap and block until it abuts against the machined step in the recess.

37 Withdraw the seal guide.

38 Tighten the rear main bearing cap fixings fully and evenly. Torque: 88 to 95 Nm (65 to 70 lbf ft).

39 Check the crankshaft end-float. If not within the limits, check the components and assembly procedure for faults. Should adjustment be necessary. NOTE: End-float 0.10 to 0.20 mm (0.004 to 0.008 in).

40 Reverse instructions 1 to 10.
MAIN BEARINGS — SET

Remove and refit 12.21.39

Removing Nos. 2, 3 and 4 main bearings
1 Remove the sump, see 12.60.44.
2 Remove the oil pick-up strainer, see 12.60.20, instructions 4 and 5.
3 Remove the sump baffle plate, see 12.60.46, instructions 4 and 5.
4 Remove two bolts, withdraw the clutch slave cylinder and move it aside keeping the hydraulic pipe attached.
5 Remove six bolts and remove the flywheel cover-plate.
6 Release the bolts retaining Nos. 2, 3 and 4 main bearing caps and withdraw the caps complete with lower shells.

CAUTION: Do not remove all five main bearing caps at once since the unsupported weight of the crankshaft may cause distortion of the front and rear seals.

NOTE: Nos. 2, 3 and 4 main bearing caps only are identified by numbers.
7 With the keeper tag leading carefully remove the upper shells.

Refitting Nos. 2, 3 and 4 main bearings
CAUTION: It is important to note that the bearing shells with a central oil hole are the upper shells and must therefore be fitted to the crankcase.
8 Lubricate No. 3 upper shell, noting that it combines the crankshaft thrust bearing and with the keeper tag trailing, carefully fit it to the crankcase.
9 Lubricate and fit Nos. 2 and 4 upper shells.
10 Assemble the lower shells to the bearing caps, lubricate and fit to the crankcase ensuring that the keeper slots in the crankcase and caps are together on the right-hand side of the engine.
11 Fit and tighten the retaining bolts evenly to 75 Nm (55 lbf ft).

Removing Nos. 1 and 5 main bearings
12 Release the retaining bolts and withdraw the caps complete with lower shells.
13 With the keeper tag leading, remove the upper shells.
14 Remove and discard the rear main bearing cap side seals.

Refitting Nos. 1 and 5 main bearings
15 Fit the upper bearing shells. See cautionary note following instruction 7.
16 Assemble the lower shells to the caps and fit number one to the crankcase ensuring that the keeper slots are together on the right-hand side of the engine.
17 Fit and evenly tighten the bolts to 75 Nm (55 lbf ft).
18 Fit new side seals to the rear main bearing cap. Do not cut the seals to length; they must protrude approximately 1.5 mm (0.062 in) above the bearing cap parting face.
19 Apply Hylomar PL 32M jointing compound to the rear-most half of the bearing cap parting face or, if preferred, to the equivalent area on the crankcase.
20 Lubricate the side seals and fit the bearing cap.
21 Fit and evenly tighten the retaining bolts to 95 Nm (70 lbf ft).
22 Reverse instructions 1 to 5.
Checking
1 Run the engine until it attains normal operating temperature.
2 Remove all the spark plugs.
3 Secure the throttle in the fully open positions.
4 Check each cylinder in turn as follows:
5 Insert a suitable pressure gauge into the spark plug hole.
6 Crank the engine with the starter motor for several revolutions and note the highest pressure reading obtainable.
7 If the compression is appreciably less than the correct figure, the piston rings or valves may be faulty.
8 Low pressure in adjoining cylinders may be due to a faulty cylinder head gasket.

Checking temperature
12.25.01

Checking CYLINDER PRESSURES
Cylinders - L.H. - remove and refit

Removing
1 Remove the induction manifold gasket, see 30.15.08.
2 Release the spark plug leads from the rocker cover clamp.
3 Move the check valve aside.
4 Release the dipstick tube bracket from the rocker cover.
5 Remove the rocker cover screws.
6 Remove the rocker cover assemblies.
7 Remove the four bolts and remove the rocker shaft assembly.
8 Withdraw the push-rods.
9 Disconnect leads from spark plugs.
10 Remove the air temperature control valve and hoses.

Checking CYLINDER HEAD GASKET
12.29.02

Cylinders - L.H.

Removing
1 Remove and refit which includes cylinder head - L.H. - remove and refit

Removing
1 Remove the induction manifold gasket, see 30.15.08.
2 Release spark plug leads from the rocker cover clamp.
3 Move the check valve aside.
4 Release the dipstick tube bracket from the rocker cover.
5 Remove the rocker cover screws.
6 Remove the rocker cover assemblies.
7 Remove the four bolts and remove the rocker shaft assembly.
8 Withdraw the push-rods.
9 Disconnect leads from spark plugs.
10 Remove the heat chamber from the exhaust manifold.
11 Remove the three bolts securing the air conditioning compressor bracket to the cylinder head.
12 Remove the dipstick bracket from cylinder head.
13 Remove the dipstick and tube.
14 Remove the exhaust manifold bolts for access to the cylinder head bolts.
15 Slacken and remove the fourteen cylinder head bolts, reversing the tightening sequence, see 12.29.03, instruction 24.
16 Lift the cylinder head.
17 Remove and discard the gasket.

Refitting
20 Follow 12.29.03, instructions 17 to 19.
21 Reverse instructions 1 to 15.

Refitting
19 Clean the cylinder head and cylinder block mating faces.
20 Fit a new gasket with word 'TOP' uppermost. DO NOT use a sealant.
21 Locate the cylinder head in position over the dowel pins in the cylinder block.
22 Coat the threads of the cylinder head bolts with 3M EC 776 Lubricant-sealant.
23 Using the bolt tightening sequence diagram, insert the bolts into their correct holes as follows:
Long bolts - 97.03 mm (3.820 in) Nos. 1, 3 and 9.
Medium bolts - 66.55 mm (2.620 in) Nos. 2, 4, 5, 6, 7, 8, 9 and 10.
Short bolts - 54.86 mm (2.160 in) Nos. 11, 12, 13 and 14.

24 Tighten the bolts evenly a little at a time in the sequence shown in the diagram to the following torque:
Bolt Nos. 1 to 10, 83 to 95 Nm (65 to 70 lbf ft).
Bolt Nos. 11 to 14, 54 to 61 Nm (40 to 45 lbf ft).

25 Reverse instructions 1 to 13.

---

Compression ratio (nominal) 8.15:1
Compression pressure (minimum) 9.5 kgf/cm² (135 lbf/in²)
Cranking speed at 15°C (60°F) ambient temperature 150 to 200 rev/min

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Removing CYLINDER HEAD GASKET - R.H.
Cylinders - Carburettor Engines
Remove and refit which includes cylinder head - R.H. - remove and refit

Removing
1 Remove the induction manifold gasket, see 30.15.08.
2 Release spark plug leads from the rocker cover clamp.
3 Move the air temperature control valve and hoses.
4 Remove the heat chamber from exhaust manifold.
5 Remove the rocker cover retaining screws.
6 Lift off rocker cover.
7 Remove four bolts and lift off rocker shaft assembly.
8 Withdraw the push-rods.
9 Disconnect the leads from the spark plugs.
10 Disconnect the hose from air pump to check valve.
11 Release air pump drive belt tension.
12 Remove the three bolts retaining the combined air pump and alternator mounting bracket to the cylinder head.
13 Disconnect the exhaust front pipe from the exhaust manifold.
14 Slacken and remove the fourteen cylinder head bolts, reversing the tightening sequence, see instruction 24.
15 Lift off the cylinder head and exhaust manifold.
16 Remove and discard the gasket.
17 Wash and wipe brush the cylinder head bolts in 3M Solvent No. 2 to remove sealant.
NOTES: If the above solvent is not available, trichloroethylene petrol or paraffin may be used. It is important, however, that the sealant used on previous assembly should be removed immediately to prevent it hardening. After four assembly operations renew all bolts.
CYLINDER HEAD GASKET — L.H.
— Fuel Injection Engines
Remove and refit 12.29.02
which includes cylinder head
— L.H. — remove and refit 12.29.11
Removing
1 Remove the induction manifold gasket, see 30.15.08.
2 Release the spark plug leads from the rocker cover clamp.
3 Release the dipstick tube bracket from the rocker cover.
4 Remove the rocker cover screws.
5 Remove the rocker cover.
6 Remove the four bolts and remove the rocker shaft assembly.
7 Withdraw the push-rods.
8 Disconnect leads from spark plugs.
9 Remove the three bolts securing the air conditioning compressor bracket to the cylinder head.
10 Remove the dipstick bracket from cylinder head.
11 Remove the dipstick and tube.
12 Remove the exhaust manifold bolts for access to the cylinder head bolts.
13 Slacken and remove the fourteen cylinder head bolts, reversing the tightening sequence, see 12.29.03, instruction 24.
14 Lift off the cylinder head.
15 Remove and discard the gasket.
16 Follow 12.29.03, instruction 17 to 18.
Refitting
17 Follow 12.29.03, instructions 19 to 24.
18 Reverse instructions 1 to 12.

CYLINDER HEAD GASKET — R.H.
— Fuel Injection Engines
Remove and refit 12.29.03
which includes cylinder head
— R.H. — remove and refit 12.29.12
Removing
1 Drain the cooling system, see 26.10.01.
2 Remove the plenum chamber, see 19.22.46.
3 Remove the air-flow meter, see 19.22.25.
4 Remove the extra air valve, see 19.20.16.
5 Remove the induction manifold gasket, see 30.15.08.
6 Release spark plug leads from the rocker cover clamp.
7 Remove the rocker cover retaining screws.
8 Lift off rocker cover.
9 Remove four bolts and lift off rocker shaft assembly.
10 Withdraw the push-rods.
11 Disconnect the leads from the spark plugs.
12 Remove the three bolts retaining the combined air pump and alternator mounting bracket to the cylinder head.
13 Disconnect the exhaust front pipe from the exhaust manifold.
14 Slacken and remove the fourteen cylinder head bolts, reversing the tightening sequence, see instruction 24.
15 Lift off the cylinder head and exhaust manifold.
16 Remove and discard the gasket.
17 Wash and wire brush the cylinder head bolts in 3M Solvent No. 2 to remove
sealant.
NOTE: If the above solvent is not available, trichlorethylene petrol or paraffin may be used. It is important, however, that the sealant used on previous assembly should be removed immediately to prevent it hardening. After four assembly operations renew all bolts.
18 Examine the bolts and renew any which show signs of thread damage or elongation.

Refitting
19 Clean the cylinder head and cylinder block mating faces.
20 Fit a new gasket with word "TOP" uppermost. DO NOT use a sealant.
21 Locate the cylinder head in position over the dowel pins in the cylinder blocks.
22 Coat the threads of the cylinder head bolts with 3M EC 776 Lubricant-sealant.
23 Using the bolt tightening sequence diagram, insert the bolts into their correct holes as follows:
Long bolts — 97.03 mm (3.820 in) Nos. 1, 3 and 5.
Medium bolts — 66.55 mm (2.620 in) Nos. 2, 4, 6, 7, 8, 9 and 10.
Short bolts — 54.86 mm (2.160 in) Nos. 11, 12, 13 and 14.
24 Tighten the bolts evenly a little at a time in the sequence shown in the diagram to the following torque:
Bolt Nos. 1 to 10, 88 to 95 Nm (65 to 70 lb ft).
Bolt Nos. 11 to 14, 54 to 61 Nm (40 to 45 lb ft).
25 Reverse instructions 1 to 13.
CYLINDER HEADS

Overhaul 12.29.18
Left-hand 12.29.19
Right-hand 12.29.30

Service tools:
276102—Valve spring compressor
274401—Valve guide remover
600959—Valve guide drift
605774—Distance piece for valve guide drift

Dismantling
1 Remove the cylinder heads, see 12.29.11, 12.29.12.
2 Using valve spring compressor 276102, remove the valves and retain in sequence for refitting.

Inspecting
3 Clean the combustion chambers with a soft wire brush.
4 Clean the valves.
5 Clean the valve guide bores.
6 Regrind, or fit new valves as necessary.

7 If a valve must be ground to a knife-edge to obtain a true seat, fit a new valve.
8 The correct angle for the valve face is 45 degrees.
9 The correct angle for the seat is 46 + ¼ degrees, and the seat witness should be towards the outer edge.
10 Check the valve guides and fit replacements as necessary, see instructions 11 to 15.
11 Using the valve guide remover 274401, drive out the old guides from the combustion chamber side.
12 Locate the distance piece for the valve guide drift 605774 on the valve spring seat in the top of the cylinder head.
13 Lubricate the new valve guide and insert it into the distance piece.
14 Using the valve guide drift 600959, drive the valve guide into the cylinder head until the drift bottoms on the distance piece.
15 The fitted guide should stand 19 mm (0.750 in) above the step surrounding the valve guide boss in the cylinder head.
NOTE: Service valve guides are 0.02 mm (0.001 in) larger on the outside diameter than the original equipment to ensure interference fit.
16 Check the valve seats and fit replacements as necessary, see instructions 17 to 19.
17 Remove the old seat inserts by grinding them away until they are thin enough to be cracked and prised out.
18 Heat the cylinder head evenly to approximately 65°C (150°F).
19 Press the new insert into the recess in the cylinder head.
NOTE: The outside diameter of standard size valve seat inserts is as follows:
Inlet: 42.768 to 42.735 mm (1.6838 to 1.6825 in)
Exhaust: 36.918 to 36.994 mm (1.453 to 1.4545 in).
Service valve seat inserts are available in two oversizes 0.25 mm and 0.30 mm (0.010 in and 0.020 in) larger on the outside diameter than standard in order to obtain a good press fit in the cylinder head.
20 If necessary, cut the valve seats to 46 + ¼ degrees.
21 The nominal seat width is 1.575 mm (0.062 in). If the seat exceeds 2.0 mm (0.078 in) it should be reduced to the specified width by the use of 20 and 56 degree stones.
Angles: A-56 ± 1°, B-46° + ¼, C-20°.
22 The inlet valve seat is 36.93 mm (1.454 in) dia. and the exhaust seat is 31.49 mm (1.240 in) dia.
23 Check the height of the valve stems above the outer valve spring seat surface of the cylinder head. This MUST NOT exceed 47.63 mm (1.875 in). If necessary grind the end of the valve stem or fit new parts.

continued
### Cylinder head thread insert salvage instructions

24. These four holes may be drilled 0.261 in dia. x 0.675 + 0.040 in deep. Tapped with Helicoil Tap No. 4CPB or 6CS x 0.625 in (min.) deep (¼ U.N.C. 1½D insert).

25. These six holes may be drilled 0.3906 in dia. x 0.937 + 0.040 in deep. Tapped with Helicoil Tap No. 6 CPB or 6CS x 0.875 in (min.) deep (¼ U.N.C. 1½D insert).

**CAUTION:** Any attempt to salvage the sparking plug threads in the cylinder head may result in breaking into the water jacket, rendering the head scrap.

### Reassembling

29. Lubricate the valve stems and guides with engine oil and fit each valve as follows:
30. Insert the valve into its guide.
31. Place the valve springs in position.
32. Locate the cap on the springs.
33. Using the valve spring compressor 276102, fit the valve collets.
34. Refit the cylinder heads, see 12.29.11, 12.29.12.

### DATA

**Cylinder heads**

- **Material**: Aluminium alloy
- **Type**: Two heads with separate alloy inlet manifold
- **Brico Alloy 318**: 46 + ¼ degrees

<table>
<thead>
<tr>
<th>Inlet</th>
<th>Exhaust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>30° B.T.D.C.</td>
</tr>
<tr>
<td>Close</td>
<td>75° A.B.D.C.</td>
</tr>
<tr>
<td>Dur</td>
<td>285°</td>
</tr>
<tr>
<td>Valve peak</td>
<td>112.5°</td>
</tr>
</tbody>
</table>

### Valves

<table>
<thead>
<tr>
<th>Valves, inlet</th>
<th>Valves, exhaust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall length</td>
<td>116.58 to 117.34 mm (4.590 to 4.620 in)</td>
</tr>
<tr>
<td>Actual overall head diameter</td>
<td>39.75 to 40.00 mm (1.565 to 1.575 in)</td>
</tr>
<tr>
<td>Angle of face</td>
<td>8.640 to 8.666 mm (0.3402 to 0.3412 in)</td>
</tr>
<tr>
<td>Steam diameter</td>
<td>8.679 mm (0.3407 to 0.3417 in)</td>
</tr>
<tr>
<td>Stem clearance in guide</td>
<td>Top 0.02 to 0.07 mm (0.001 to 0.003 in)</td>
</tr>
<tr>
<td>Bottom 0.013 to 0.0635 mm (0.0005 to 0.0025 in)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Valves, exhaust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall length</td>
</tr>
<tr>
<td>Actual overall head diameter</td>
</tr>
<tr>
<td>Angle of face</td>
</tr>
<tr>
<td>Steam diameter</td>
</tr>
<tr>
<td>Stem clearance in guide</td>
</tr>
<tr>
<td>Bottom 0.05 to 0.10 mm (0.002 to 0.004 in)</td>
</tr>
</tbody>
</table>

### Valve lift

- 9.9 mm (0.39 in) both valves
- 40.05 mm (1.577 in) at a pressure of 154.35 kgf ± 7.2 kgf (34.29 mm (1.350 in) at a pressure of 286.6 kgf ± 14.3 kgf (30.15 mm (1.187 in) at a pressure of 388.0 kgf ± 16.5 kgf (176 lbf ± 7.5 lbf)

### Valve spring length

- 40.05 mm (1.577 in) at a pressure of 154.35 kgf ± 7.2 kgf (34.29 mm (1.350 in) at a pressure of 286.6 kgf ± 14.3 kgf (30.15 mm (1.187 in) at a pressure of 388.0 kgf ± 16.5 kgf (176 lbf ± 7.5 lbf)
VALVE GEAR

Remove and refit 1 to 7, 15 to 21 and 29 to 37

Rocker shafts—remove and refit—instructions 2, 4, 5 and 30 to 37

Rocker shafts—overhaul—instructions 2, 4, 5, 8 to 13, 22 to 28 and 30 to 37

Removing
1 Drain the cooling system, see 26.10.01.
2 Remove the fresh air duct.
3 Remove the induction manifold, see 30.10.08.
4 Remove the rocker covers, see 12.29.43/44.
5 Remove the rocker shaft assemblies.

Withdraw the tappets and retain with respective push-rods.

NOTE: If a tappet cannot be withdrawn, remove the camshaft and withdraw the tappet from the bottom.

Inspection of hydraulic tappets and push-rods

14 Hydraulic tappet: Inspect inner and outer surfaces of body for blow holes and scoring. Replace hydraulic tappet if body is roughly scored or grooved, or has a blow hole extending through the wall in a position to permit oil leakage from lower chamber.

15 The prominent wear pattern just above lower end of body should not be considered a defect unless it is definitely grooved or scored; it is caused by side thrust of cam against body while the tappet is moving vertically in its guide.

Inspection of hydraulic tappets and push-rods

14 Hydraulic tappet: Inspect inner and outer surfaces of body for blow holes and scoring. Replace hydraulic tappet if body is roughly scored or grooved, or has a blow hole extending through the wall in a position to permit oil leakage from lower chamber.

15 The prominent wear pattern just above lower end of body should not be considered a defect unless it is definitely grooved or scored; it is caused by side thrust of cam against body while the tappet is moving vertically in its guide.

16 Inspect the cam contact surface of the tappets. Fit new tappets if the surface is excessively worn or damaged.

17 A hydraulic tappet body that has been rotating will have a round wear pattern and a non-rotating tappet body will have a square wear pattern with a very slight depression near the centre.

18 Tappets MUST rotate and a circular wear condition is normal, and such bodies may be continued in use if the surface is free of defects.

19 In the case of a non-rotating tappet, fit a new replacement and check camshaft lobes for wear; also ensure new tappet rotates freely in the cylinder block.

20 Fit a new hydraulic tappet if the area where the push-rod contacts is rough or otherwise damaged.

21 Push-rod. Replace with new, any push-rod having a rough or damaged ball-end or seat.

Refitting

Reassembling rocker shafts, instructions 22 to 28

NOTE: If new rocker arms are being fitted, ensure that the protective coating is removed from the oil feed hole and push-rod seat.

22 Fit a split pin one end of the rocker shaft.

23 Slide a plain washer over the long end of the shaft to abut the split pin.

24 Fit a wave washer to abut the plain washer.

NOTE: Two different rocker arms are used and must be fitted so that the valve ends of the arms slope away from the brackets.

25 Assemble the rocker arms, brackets and springs to the rocker shaft.

26 Compress the springs, brackets and rocker, and fit a wavy washer, plain washer and split pin to the end of the rocker shaft.

27 Fit the bolts through the brackets and shaft so that the notch on the one end of the shaft is uppermost and towards the front of the engine on the right-hand side, and towards the rear on the left-hand side.

continued
28 Fit the tappets and push-rods in the original sequence.

NOTE: The rocker shafts are handed and must be fitted correctly to align the oilways.

29 Each rocker shaft is notched at one end and on one side only. The notch must be uppermost and towards the front of the engine on the right-hand side, and towards the rear on the left-hand side.

30 Fit the rocker shaft assemblies. Ensure that the push-rods engage the rocker cups and that the baffle plates are fitted to the front of the left-hand side, and to the rear on the right-hand side. Tighten the bolts evenly. Torque: 34 to 40 Nm (25 to 30 lbf ft).

31 Fit the rocker covers.

32 Reverse instructions 1 to 3.

NOTE: Tappet noise
It should be noted that tappet noise can be expected on initial starting-up after an overhaul due to oil drainage from the tappet assemblies or indeed if the vehicle has been standing over a very long period. If excessive noise should be apparent after an overhaul, the engine should be run at approximately 2,500 rpm for a few minutes when the noise should be eliminated.

ROCKER COVER — R.H.

Remove and refit 12.29.43

Removing
1 Carburettor engines: Remove the right-hand air cleaner assembly, see 19.10.00.

or

Fuel injection engines: Remove the plenum chamber, see 19.22.46.

2 Release the spark plug leads from the clip attached to the flame trap.

3 Disconnect the engine breather hose from the flame trap.

4 Disconnect the purge air filter line from the charcoal canister — for access.

5 Remove the rocker cover four retaining screws.

6 Lift off the rocker cover complete with gasket.

Refitting
8 Clean and dry the gasket mounting surface using Bostik cleaner 6001.

9 Apply Bostik 1775 impact adhesive to the seal face and the gasket, using a brush to ensure an even film.

10 Allow the adhesive to become touch-dry approximately fifteen minutes.

NOTE: The gasket fits one way round only and must be fitted accurately first time; any subsequent movement would destroy the bond.

11 Place one end of the gasket into the cover recess with the edge firmly against the recess wall; at the same time hold the remainder of the gasket clear; then work around the cover, pressing the gasket into place, ensuring that the outer edge abuts the recess wall.

12 Allow the cover to stand for thirty minutes before fitting it to the engine.

13 Clean the cylinder head mating face.

14 Fit the rocker cover, noting that the short screws are fitted inboard and the long ones outboard. Use plain and spring washers and tighten evenly.

15 Reverse instructions 1 to 4.
ROCKER COVER — L.H.

Remove and refit 12.29.44

Removing
1 Carburettor engines: Remove the left-hand air cleaner assembly, see 19.10.01.
2 Carburettor engines: Slacken the clips securing the hose linking the diverter valve and left-hand check valve.
3 Carburettor engines: Pull off the hose from the diverter valve and pivot the hose aside.
4 Release the spark plug leads from the clip and disconnect the dipstick tube bracket from the cover.
5 Carburettor engines: Disconnect the purge air hose from the left-hand rocker cover.
6 Carburettor engines: Remove the asbestos lagged E.G.R. valve pipe.
7 Carburettor engines: Disconnect the vacuum pipe from the E.G.R. valve.
8 Remove the rocker cover retaining screws.
9 Lift off the cover complete with gasket.
10 Remove and discard the gasket.

Refitting
11 Follow 12.29.44, instructions 8 to 14.
12 Reverse instructions 1 to 7.

ROCKER SHAFTS

Remove and refit 12.29.54
See operation 12.29.34

ROCKER SHAFTS

Remove and refit 12.29.55
See operation 12.29.34

ENGINE AND GEARBOX ASSEMBLY

Remove and refit 12.37.01

Removing
1 Disconnect the battery.
2 Drain the coolant, see 26.10.01.
3 Remove the bonnet, see 76.16.01.
4 Remove the fresh-air duct, see 80.15.31.
5 Remove the alternator drive belt, see 86.10.03.
6 Remove the alternator, see 86.10.02.
7 Without disturbing the compressor hoses remove the compressor from the engine following 82.10.20, instructions 8 to 13, and tie the unit to one side.
8 Remove the gear-change lever draught excluder, see 37.16.05.
9 Carburettor engines: Remove the cold air inlet hoses from the temperature control valves.

or

Fuel injection engines: Remove the airflowmeter, disconnecting the pipe at the plenum chamber.
10 Carburettor engines: Remove the air temperature control valves.

or

Carburettor engines: Remove the hot air hoses from the air boxes.
12 Disconnect the heater hoses at the bulkhead connections.
13 Disconnect the throttle cable from the throttle linkage.
14 Disconnect the brake servo hose at the inlet manifold plenum chamber connection, and release the clips securing the hose to the air boxes.
15 Carburettor engines: Disconnect the float-chamber vent pipe from the adsorption canister.
16 Disconnect the engine breather pipe from the adsorption canister.
17. Remove the rubber cover from the starter motor lead, body connection, and remove the nut retaining the lead to the terminal.

18. Disconnect the starter motor and alternator harness multi-plug, situated adjacent to the radiator overflow bottle.

19. Disconnect the cooling system hoses from the thermostat housing.

20. Disconnect the L.T. and H.T. leads from the ignition coil.

21. Carburettor engines: Disconnect the fuel inlet pipe at the filter.

22. Fuel injection engines: Disconnect the fuel inlet pipe at the fuel rail.

23. Remove the plug-in connector from the cooling fan switch.

24. Jack up the rear of the car and support on stands.

25. Drain the engine oil.

26. Disconnect the reverse light wires from the multi-plug connector.

27. Slacken the silencer front joint and balance pipe clamps.

28. Remove the rear rubber 'O' rings from their brackets and release the silencer and tail-pipe assembly from the front down-pipes.

29. Mark the position of the propeller shaft and gearbox drive flanges.

30. Remove the four bolts and Nyloc nuts securing the propeller shaft drive flange to the gearbox drive flange.

31. Remove the speedometer cable clamp bolt and remove the cable.

32. Disconnect the clutch slave cylinder hydraulic pipe from the clutch hydraulic hose.

33. Remove the bolt securing the clutch hose bracket to the bell housing.

34. Remove the intermediate steering shaft lower two pinch-bolts.

35. Slacken the locknuts securing the brake hoses to the front suspension struts.

36. Slacken the steering arm front bolt and remove the rear steering-arm/lower caliper bolt, both sides.

37. Remove the remaining bolts securing the brake calipers to the stub axle assemblies, detach and support the calipers.

38. Remove the Nyloc nuts, three each side, securing the damper and spring assemblies to the inner wing valances.

39. Remove the bolt securing the power steering pipe bracket to the sub-frame.

40. Drain the power steering fluid into a suitable receptacle and seal all pipes and housing ports.

41. Lower the rear of the vehicle.

42. Position a jack under the sub-frame and raise to take the weight.

43. Fit an engine lifting harness to the lifting hooks and attach to a mobile crane.

44. Raise the hoist to support the weight of the engine.

45. Remove the engine mounting nuts and bolts.

46. Remove the sub-frame nuts, lower rubber bushes and spacers.

47. Lower the sub-frame and suspension assemblies, withdraw from the vehicle.

48. Remove the steering intermediate shaft.

49. Position a jack under the gearbox, support the weight, remove the nuts securing the engine rear mounting cross-member to the body.

50. Lower the engine and gearbox assembly, withdraw from underneath the vehicle.

Refitting

51. Reverse instructions 1 to 50. Refill and bleed power steering system, see 57.15.02.
ENGINE MOUNTING – L.H.

Removing
1. Disconnect the battery.
2. Carburettor engines: Disconnect the cold air intake hose from the control valve.
3. Carburettor engines: Remove the control valve complete with hot air hose.
4. Support engine under sump with a jack.
5. Remove the two nuts securing the mounting to the engine bracket.
6. Remove the two bolts and nuts securing mounting to sub-frame.
7. Raise the engine sufficiently to enable the engine mounting to be removed.

Refitting
8. Fit the mounting to the engine bracket leaving the retaining nuts slack.
9. With the two bolt heads to the rear, assemble the mounting to the sub-frame leaving the nuts slack.
10. Lower the engine slightly but maintain support.
11. Tighten the mounting to engine bracket nuts.
12. Tighten the mounting to sub-frame bolts and nuts.
13. Remove the jack.
14. Reverse instructions 1 to 2 as applicable.

Removing and refit 12.45.01

ENGINE MOUNTING – R.H.

Removing
1. Disconnect the battery.
2. Carburettor engines: Disconnect the cold air intake hose from the control valve.
3. Support engine under sump with a jack.
4. Remove the two nuts securing the mounting to the engine bracket.
5. Remove the two bolts and nuts securing mounting to sub-frame.
6. Raise the engine and remove the mounting.

Refitting
7. Fit the mounting to the engine bracket but leave the retaining nuts slack.
8. With the two bolt heads to the rear, assemble the mounting to the sub-frame but leave the nuts slack.
9. Lower the engine slightly but maintain a support.
10. Tighten the mounting to engine bracket nuts.
11. Tighten the mounting to sub-frame nuts and bolts.
12. Remove the jack.
13. Reverse instructions 1 and 2.

Removing and refit 12.45.03

FLYWHEEL — Synchronesh Gearbox Models

Removing
1. Remove exhaust system, see 30.10.01.
2. Remove the catalysts, see 17.50.01.
3. Remove the gearbox, see 37.20.01.
4. Remove the clutch assembly, see 33.10.01.
5. Remove the starter motor retaining bolts.
6. Remove the six bolts and withdraw the flywheel.

Removing and refit 12.53.07

Refitting
7. Clean the flywheel and crankshaft mating faces.
8. Fit the flywheel and secure with the bolts tightening evenly to 74.6 to 81.3 Nm (55 to 60 lbf ft).
9. Lower the engine slightly but maintain support.
10. Tighten starter motor bolts.
11. Reverse instructions 1 to 4.

FLYWHEEL — Synchronesh Gearbox Models

Overhaul

Procedure
1. Remove the flywheel, see 12.53.07.
2. Measure the overall thickness of the flywheel. Fit a new flywheel if it is less than 29.33 mm (1.155 in).
3. If the flywheel is above the minimum thickness, the clutch face can be refaced as follows.
4. Remove the dowels.
5. Reface the flywheel over the complete surface.
6. Check the overall thickness of the flywheel to ensure that it is still above the minimum thickness.
7. Refit the flywheel, see 12.53.07.

Overhaul 12.53.10
DRIVE PLATE — Automatic Gearbox Models

Removing and refit 12.53.13

Removing
1. Disconnect the battery.
2. Remove the gearbox complete with the torque converter, see 44.20.01.
3. Remove the six bolts securing the drive plate to the crankshaft.
4. Remove the reinforcing plate.
5. Withdraw the drive plate and spacer.

Refitting
6. Reverse 1 to 5, noting the following:
7. The spacer ring and the reinforcing plate each have a chamfer on one outer edge and this chamfer must be fitted towards the drive plate.
8. The bolt holes are unevenly spaced so that the drive plate can only be fitted in one position, with the starter ring bolt heads towards the engine.
9. Before tightening the drive plate securing bolts, take up any clearance in the drive plate by rotating it in the direction of engine rotation then secure the bolts. Torque 7.0 to 8.5 kgf m (50 to 60 lb ft).
10. Replenish the gearbox fluid system, see 44.24.02.
11. Check the downshift cable setting.

STARTER RING GEAR
(Synchromesh gearbox models)

Removing and refit 12.53.19

Removing
1. Remove the flywheel, see 12.53.07.
2. Drill a 10 mm (0.375 in) diameter hole axially between the root of any tooth and the inner diameter of the starter ring sufficiently deep to weaken the ring. Do NOT allow the drill to enter the flywheel.
3. Secure the flywheel in a vice fitted with soft jaws.
4. Place a cloth over the flywheel to protect the operator from flying fragments.
5. Place a chisel immediately above the drilled hole and strike it sharply to split the starter ring gear.
6. Press the starter ring gear firmly against the flange until the ring contracts sufficiently to grip the flywheel.
7. Allow the flywheel to cool gradually. DO NOT hasten cooling in any way and thereby avoid the setting up of internal stresses in the ring gear which may cause fracture or failure.
8. Fit the flywheel, see 12.53.07.

Refitting
6. Heat the starter ring gear uniformly to between 170 and 175°C (338 to 347°F) but do not exceed the higher temperature.
7. Place the flywheel, flanged side down, on a flat surface.
8. Locate the heated starter ring gear in position on the flywheel, with the chamfered inner diameter towards the flywheel flange. If the starter ring gear is chamfered both sides, it can be fitted either way round.
9. Press the starter ring gear firmly against the flange until the ring contracts sufficiently to grip the flywheel.
10. Allow the flywheel to cool gradually. DO NOT hasten cooling in any way and thereby avoid the setting up of internal stresses in the ring gear which may cause fracture or failure.
11. Fit the flywheel, see 12.53.07.

Refitting
5. Fit the spigot bush flush with the end-face of the crankshaft or to a maximum of 0.063 in (1.6 mm) below the face.
6. Check, and if necessary, ream the spigot bearing to 0.7504 + 0.001 in (19.177 + 0.025 mm).
7. Reverse instructions 1 to 3.

SPIGOT BEARING

Remove and refit 12.53.20

Removing
1. Remove the gearbox, see 37.20.01.
2. Remove the clutch assembly.
3. Pack the spigot bore with grease and select a drift that has a close fit in the spigot bush.
4. Drive the drift into the bore, if necessary re-packing with grease, until the bush is forced out.

Refitting
5. Fit the spigot bush flush with the end-face of the crankshaft or to a maximum of 0.063 in (1.6 mm) below the face.
6. Check, and if necessary, ream the spigot bearing to 0.7504 + 0.001 in (19.177 + 0.025 mm).
7. Reverse instructions 1 to 3.
OIL FILTER ASSEMBLY—EXTERNAL

Remove and refit 12.60.01

NOTE: Refer to the Maintenance Section for correct oil and filter change intervals.

Removing
1. Unscrew the filter anti-clockwise and discard.
   NOTE: If the filter is difficult to remove, use a strap spanner.
2. Withdraw the sealing washer and discard.
   CAUTION: Do NOT delay fitting a new filter, otherwise the oil pump may drain and require priming (12.60.26) before running the engine.

Refitting
3. Smear a little clean engine oil on the rubber washer of the new filter.
4. Screw the filter on clockwise until the rubber sealing ring touches the oil pump cover face, then tighten a further half turn by hand only. Do not overtighten.
5. Top-up with oil of the correct grade through the screw on filler cap on the L.H. rocker cover to the high mark on the dipstick.
6. Start the engine and check that the oil pressure warning light goes out. If the light remains on, the engine must be stopped and the oil pump dismantled and primed, see 12.60.26.
7. Run the engine and check the filter joint for leaks.
8. Check the oil sump level after the engine has been stopped for a few minutes and replenish if necessary.

OIL PICK-UP STRAINER

Remove and refit 12.60.20

Removing
1. Disconnect the battery.
2. Drain and remove the sump, see 12.60.44.
3. Remove the central retaining nut and washer.
4. Remove the two bolts retaining the oil pick-up pipe flange to the crankcase.
5. Withdraw the oil strainer assembly complete with bracket.

Refitting
7. If required remove the two nuts and bolts securing the strainer to the bracket.
8. Using a new gasket, fit the oil pick-up pipe to the crankcase, securing with the two bolts and spring washers.
9. Secure the bracket to the baffle plate with the plain and spring washer and nut.
10. Reverse instructions 1 and 2 ensuring that the sump is filled before connecting the battery.

OIL PUMP

Remove and refit 12.60.26

Removing
1. Remove the oil filter assembly, see 12.60.01.
2. Disconnect the electrical lead from the oil pressure switch.
3. Remove the bolts from the oil pump cover.
4. Withdraw the oil pump cover.
5. Lift off the cover gasket.
6. Withdraw the oil pump gears.

Refitting
7. Fully pack the oil pump gear housing with petroleum jelly. Use only petroleum jelly; no other grease is suitable.
8. Fit the oil pump gears so that the petroleum jelly is forced into every cavity between the teeth of the gears. CAUTION: Unless the pump is fully packed with PETROLEUM JELLY it may not prime itself when the engine is started.
9. Place a new gasket on the oil pump cover.
10. Locate the oil pump cover in position.
11. Fit the special fixing bolts and tighten alternately and evenly. Torque: 12 Nm (9 lbf ft).
12. Reverse 1 and 2.
13. Check the oil level in the engine sump and replenish as necessary.
OIL PUMP

Overhaul 12.60.32

Dismantling
1. Remove the oil pump, see 12.60.26.
2. Unscrew the plug from the pressure relief valve.
3. Lift off the joint washer from the plug.
4. Withdraw the spring from the relief valve.
5. Withdraw the pressure relief valve.

Inspecting
6. Check the oil pump gears for wear or scores.
7. Fit the oil pump gears and shaft into the front cover.
8. Place a straight-edge across the gears.
9. Check the clearance between the straight-edge and the front cover. If less than 0.05 mm (0.0018 in) check the front cover gear pocket for wear.
10. Check the oil pressure relief valve for wear or scores. Check the relief valve spring for wear at the sides or signs of collapse.
11. Clean the gauze filter for the relief valve.

Reassembling
12. Check the fit of the relief valve in its bore. The valve must be an easy slide fit with no perceptible side movement.
13. Insert the relief valve spring.
14. Locate the sealing washer on to the relief valve plug.
15. Fit the relief valve plug. Torque: 41 to 47.5 Nm (30 to 35 lbf ft).
16. Refit the oil pump, see 12.60.26.

DATA
Pump operating pressure 35 lbf/in² at 2,400 rev/min.

SUMP

Remove and refit 12.60.44

Special tool: MS 53/A

Removing
NOTE: Modify MS 53/A as shown in drawing.
"A" = 111.125 mm (4.375 in).
Hole diameter = 17.5 mm (0.6875 in).

1. Drive car onto a ramp and disconnect the battery.
2. Drain the engine oil and refit sump plug.
3. Remove the fresh-air duct.
4. Raise ramp approximately 607 mm (24 in).
5. Place a jack in support under the sump and take the weight of the engine.
6. Carburettor engines: Disconnect the L.H. and R.H. air intake hoses from the temperature control valves.
7. Remove engine L.H. mounting to sub-frame bolts and nuts.
8. Remove engine R.H. mounting to sub-frame bolts and nuts.
9. Using the jack, raise the engine approximately 50 mm (2.0 in).
10. Position the engine support bar MS 53/A across the engine bay towards the rear and locate the supporting feet in the wing gutters and tighten the adjusting bolts.
11. Locate the two hooks in the engine rear lighting eyes.
12. Turn the adjusting nut on both hooks by the same amount until the entire weight of the engine is supported by the hooks.
13. Remove the jack.

continued
Raise the ramp to normal working height.

Rotate crankshaft until the timing scale on the crankshaft pulley damper is at 12 o'clock, when viewing the engine from the front.

NOTE: The above instruction is necessary to ensure that the crankshaft front web is well clear of the bottom face of the crankcase so that it will not inhibit the removal and refitting of the sump.

Remove the two bolts at the rear of the sump together with the reinforcing plate.

Remove the two coupling plate bolts.

Remove the remaining fourteen sump retaining bolts.

Remove the sump.

Remove the gasket.

Refitting

Clean the sump and crankcase mating faces.

Apply Hylomar PL 32/M Sealing Compound to both sides of a new gasket and place the gasket in position on the sump.

Check that the crankshaft is in the position described in instruction 15.

Offer up the sump to the crankcase and secure with the sixteen retaining bolts, noting that the two long bolts are fitted to the rear with the reinforcing plate.

Fit and tighten the coupling plate bolts.

Lower the ramp.

Clean the sump and crankcase mating faces.

Apply Hylomar PL 32/M Sealing Compound to both sides of a new gasket and place the gasket in position on the sump.

Check that the crankshaft is in the position described in instruction 15.

Offer up the sump to the crankcase and secure with the sixteen retaining bolts, noting that the two long bolts are fitted to the rear with the reinforcing plate.

Fit and tighten the coupling plate bolts.

Lower the ramp.

Turn the nut on the lifting hooks anti-clockwise by equal amounts and fit the L.H. and R.H. engine mounting to subframe bolts and nuts, noting that the bolt heads face the rear.

Finally slacken the lifting hooks and remove the engine support bar.

Carburettor engines: Fit the L.H. and R.H. air intake hoses to their respective control valves.

Fit the fresh air duct.

Fill the sump with engine oil of a recommended make and grade to the 'high' mark on the dipstick.

Connect the battery and drive car from ramp.

SUMP BAFFLE PLATE

Remove and refit 12.60.46

Removing

1 Disconnect the battery.

2 Drain and remove the sump, see 12.60.44.

3 Remove the oil pick-up strainer, see 12.60.20.

4 Remove the six baffle plate retaining bolts.

5 Lower the baffle plate together with the large plain washer and distance piece.

Refitting

6 Reverse instructions 1 to 5.
TIMING GEAR COVER
(Air conditioning model)

Removing and refit 12.65.01

Removing
1 Drive car onto ramp and disconnect battery.
2 Drain the cooling system, see 26.10.01.
3 Turn the crankshaft to T.D.C. No. 1 firing
4 Remove the crankshaft pulleys, see 12.21.01.
5 Remove the clamp bolt securing the alternator drive belt tension strap.
6 Disconnect the radiator bottom hose from the water pump.
7 Carburettor engines: Remove the air intake left-hand hose to gain access to the power-assisted steering bolts.
8 Remove the two bolts securing the power-assisted steering pump and bracket to the timing cover.
9 Remove the two bolts securing the power steering pump to the cylinder block.
10 Disconnect theLucar from the oil pressure switch.
11 Carburettor engines: Slacken the air pump belt tension and slip belt from water pump pulley.
12 Carburettor engines: Remove the air pump drive belt pump aside.
13 Disconnect the heater inlet hose from the water pump.
14 Disconnect the heater outlet hose from the rear of the timing cover.
15 Remove the water pump, see 26.50.01.
16 Disconnect the distributor L.T. leads, the ballast resistor and coil.
17 Disconnect the H.T. lead from the coil.
18 Remove the distributor cap and move aside.
19 Disconnect the vacuum pipe from the distributor capsule.
20 Disconnect the distributor L.T. leads, the ballast resistor and coil.
21 Remove the clamp bolt securing the alternator drive belt tension strap, and slacken the two adjoining bolts.
22 Withdraw the timing cover complete with distributor, oil pump and filter.
23 Remove the gasket.
24 Clean the threads of the timing cover bolts with 3M Solvent No. 2.

Refitting
26 Clean the cylinder block and timing cover mating faces and the bottom edge of the cover where it mates with the sump.
27 Coat both sides of a new gasket with Hylomar PL 32 M and place in position on the cylinder block or timing cover.
28 Apply thread Lubricant-Sealant 3M EC 776 to the timing cover bolt threads.
29 Locate the timing cover in position having first set the distributor rotor arm approximately 30° before the final position – i.e. T.D.C., No. 1 firing.
30 Secure the timing cover with the remaining bolts and one nut not committed to retaining other components.
31 Fit the two bolts securing the sump to the timing cover and tighten the two adjoining bolts.
32 Fit the water pump, see 26.50.01.
33 Secure the power steering bracket to the side of the cylinder block with two bolts.
34 Secure the power steering bracket and pump to the timing cover.
35 Fit alternative adjustment strap to the timing cover.
36 Carburettor engines: Fit the left-hand air intake hose.
37 Fit the crankshaft pulleys, see 12.21.01.
38 Fit the air conditioning compressor belt.
39 Carburettor engines: Fit the air pump drive belt.
40 Connect the oil pressure switch Lucar.
41 Fit bottom hose to water pump.
42 Tighten radiator bottom hose clip.
43 Fill the cooling system, see 26.10.01.
44 Connect the battery.

6 Disconnect the radiator bottom hose from the water pump.
7 Carburettor engines: Remove the air intake left-hand hose to gain access to the power-assisted steering bolts.
8 Remove the two bolts securing the power-assisted steering pump and bracket to the timing cover.
9 Remove the two bolts securing the power steering pump to the cylinder block.
10 Disconnect the Lucar from the oil pressure switch.
11 Carburettor engines: Slacken the air pump belt tension and slip belt from water pump pulley.
12 Carburettor engines: Remove the air pump drive belt pump aside.
13 Disconnect the heater inlet hose from the water pump.
TIMING GEAR COVER OIL SEAL

Remove and refit 12.65.05

Special tools: 18G 1328, 18G 1291/4

Removing
1. Remove the crankshaft pulleys, see 12.21.01.
2. Remove fan blades (non-air conditioning model only).
3. Remove the viscous coupling (non-air conditioning model only).
4. Screw extractor tool 18G 1328 into the seal.
5. Turn the central bolt clockwise to extract the seal.
6. Remove the seal from the extractor and discard.

Refitting
7. Clean the seal housing in the cover.
8. Using engine oil, lubricate the outside diameter of a new seal.
9. Taking care not to damage the seal lip, start the seal into the cover.
10. Fit adapter 18G 1291/5 to main tool 18G 1291/4 and screw bolt into crankshaft.
11. Turn the lock-nut clockwise to draw in the seal until flush with the cover.
12. Remove the tool and adaptor.
13. Lubricate, with engine oil, the seal lip before fitting the pulleys.
14. Reverse instructions 1 to 3.

TIMING CHAIN AND GEARS

Remove and refit 12.65.12

Removing
1. Set the engine — No. 1 piston at T.D.C.
2. Remove the timing chain cover, see 12.65.01.
3. Check that No. 1 piston is still at T.D.C.
4. Remove the distributor drive gear.

Refitting
NOTE: If the crankshaft and/or camshaft have not been rotated, commence at item 12. If they have been rotated, commence at item 8.
7. Remove the rocker shafts, see 12.29.54.
8. Set the engine — No. 1 piston at T.D.C.
9. Temporarily fit the camshaft chainwheel with the marking 'FRONT' outward.
10. Turn the camshaft until the mark on the camshaft chainwheel is at the six o'clock position, then remove the chain wheel without disturbing the camshaft.
11. Locate the chain wheels to the chain with the timing marks aligned.
12. Engage the chain wheel assembly on the camshaft and crankshaft key locations and check that the camshaft key is parallel to the shaft axis to ensure adequate lubrication of the distributor drive gear.

CAUTION: The space between the key and keyway acts as an oilway for lubrication of the drive gear. Ensure that the key is seated to the full depth of the keyway. The overall dimension of shaft and key must not exceed 30.15 mm (1.187 in).
13 Check that the timing marks line-up.
14 Fit the spacer with the flange to the front.
15 Fit the distributor drive gear ensuring that the ANNULAR GROOVED SIDE is fitted TO THE REAR, that is, towards the spacer.
16 Secure the drive gear with the washer and bolt. Torque to 54 to 61 Nm (40 to 45 lbf ft).
17 Fit the timing chain cover, see 12.65.01.

DATA

Timing chain and wheels
Timing chain type Inverted tooth
Number of links 54
Width 22.22 mm (0.875 in)
Pitch 9.52 mm (0.375 in)
Crankshaft chain wheel Sintered iron
Camshaft chain wheel Aluminium alloy, teeth covered with nylon

Valve timing
Opens Inlet 30° B.T.D.C.
Closes 75° A.B.D.C.
Duration 285°
Valve peak 112.5° A.T.D.C.

Exhaust 68° B.B.D.C.
37° A.T.D.C.
285°
105.5° B.T.D.C.
EMISSION AND EVAPORATIVE LOSS CONTROL SYSTEMS

NOTE: Where fitted, the electronic fuel injection system contributes to the exhaust emission control characteristics of the engine and reference should be made, as necessary, to the section of the Manual covering this equipment.

Except where stated, all operations in this section refer to carburettor fitted engines.

CRANKCASE EMISSION CONTROL — CARBURETTER ENGINES

Description 17.00.00

Emission control of the crankcase is achieved by a breathing cycle in which the crankcase fumes and blow-by gases are recirculated through the induction system and burned in the normal combustion process, instead of entering the atmosphere.

Blow-by gases from the crankcase are drawn through a flame trap on the right-hand rocker cover and piped to the constant depression area of the carburetters.

Purge air is drawn into the crankcase either from the air cleaner (earlier models) or from the charcoal canister (later models) via a filter into the left-hand rocker cover.

![Diagram of Crankcase Emission Control](image)

1. Breather filter
2. Flame trap
3. Carburettor inlet tubes
4. Inlet tube
5. Carburettor float chamber vent pipe
6. Canister purge line
7. Fuel tank vent pipe
8. Solenoid valve
9. Purge to canister
10. Carburettor inlet tubes 0.280 to 0.300 in dia.
11. Crankcase and canister purge line
12. Purge air filter
13. Large charcoal canister
14. Small charcoal canister
15. Carburettor float chamber vent pipe
16. Canister purge line
17. Large charcoal canister
18. Small charcoal canister
19. Fuel tank vent pipe
20. Purge to canisters
21. Flame trap
22. 0.280-0.300 in restrictor
23. 5/8 in restrictor
To ensure that piston blowby gases do not escape from the crankcase to the atmosphere, a depression is maintained in the crankcase under all operating conditions. This is achieved by connecting the crankcase breathing housing to a point between the air-meter flap and throttle plate, i.e., a constant depression region. Air is drawn in on the left-hand rocker cover via an air filter and restrictor and drawn off from the engine on the right-hand rocker cover. A flame trap is fitted in the draw-off housing.

**CRANKCASE BREATHING AND CANISTER PURGE SYSTEMS**

- **A** Air inlet to engine crankcase 0.040 in dia. restrictor fitted
- **B** 3/8 in restrictor fitted
1. Flame trap and engine crankcase purge point
2. Purge pipe engine crankcase to constant depression area
3. Charcoal canisters
4. Charcoal canister purge pipe to constant depression region

**ENGINE BREATHER FILTER**

**Remove and refit**

**Removing**
1. Locate the filter by referring to 17.00.00.
2. Release the filter from the clamp.
3. Disconnect from the filter the two hoses and remove the filter.

**Refitting**
4. Fit the filter into the clamp ensuring that the word 'IN' is towards the rocker cover.
5. Tighten the clamp screw and fit the hose.
Evaporative emission control is achieved by venting the carburetter float chambers and the fuel tank through charcoal adsorption canister(s) to atmosphere. The charcoal adsorption canister(s) are mounted in the engine compartment and consists of a filter bed of activated charcoal with an enclosed space above and below. The carburetter, fuel tank and purge lines are connected to the upper space. The lower space is vented to atmosphere. Vapour vented to the canister(s) is adsorbed by the charcoal when the engine is not running. When the engine is running carburetter depression purges the canister by drawing filtered air through the charcoal bed of the canister(s) into the carburetter inlets resulting in evaporative emissions being disposed of by the engine's normal combustion process. A limited-full mechanism ensures that thermal expansion of the contents of the tank cannot result in spillage of fuel via the control system. By the relative position of the fuel filler neck and the filler vent to the top of the tank, it is not possible to fully fill the fuel tank. A vapour separator is fitted to safeguard against any fuel being transferred to the charcoal adsorption canister due to splashage or thermal expansion. A restrictor is fitted to the separator line to restrict gas displacement during the fuel filling operation. The fuel tank filler is sealed by a non-vented pressure cap.

Charcoal canisters
2 Vapour feed line
3 Fuel feed line
4 Fuel vapour separator
5 Sealed filler cap
6 Limited fill fuel tank
7 Electric fuel pump
8 Fuel filter
EVAPORATIVE LOSS CONTROL SYSTEM ARRANGEMENTS

1. Charcoal canisters
2. Vapour feed line
3. Fuel feed line
4. Fuel vapour separator
5. Sealed filler cap
6. Limited fill fuel tank
7. Electric fuel pump
8. Fuel filter
The function of this control system is to prevent fuel hydrocarbon vapours from entering the atmosphere. This is achieved by providing no external fuel tank breathing system and as an alternative venting the tank through two adsorption canisters located in the engine compartment.

To prevent the canisters flooding due to thermal expansion of any fuel in the tank, the tank filler neck is entered well down into the tank, and a pipe let into the tank at maximum fuel level vents into the filler neck to allow for fuel expansion. A liquid vapour separator is incorporated into the fuel tank vent pipe to reduce the quantity of vapour passed to the canisters.

Any fuel vapour is purged from the canisters once the engine is running by means of a connection to a constant depression region between the air-meter flap and the plenum chamber throttle butterfly.

**WARNING:** The use of compressed air to clean an adsorption canister or clear a blockage in the evaporative system is very dangerous. An explosive gas present in a partly saturated canister may be ignited by the heat generated when compressed air passes through the canister.
VAPOUR SEPARATOR

Remove and refit 17.15.02

1. Open the boot and remove the four screws retaining the access panel.
2. Remove the fuel filler cap and filler assembly, see 19.55.08.
3. Pull off the two hoses from the vapour separator.
4. Pull the vapour separator laterally from its retaining clip.

Refitting

5. Push the vapour separator into its retaining clip.
6. Fit the hose from the tank to the L.H. connection.
7. Fit the hose to the adsorption canister to the R.H. connection.
8. Fit the fuel assembly and cap, see 19.55.08.
9. Refit the access panel.

ADSORPTION CANISTER

— Single Canister Specification

Remove and refit 17.15.13

Removing

1. Disconnect from the canister:
   i. Canister line to fuel tank
   ii. Canister purge line
   iii. Carburettor vent pipe.
2. Slacken the clamp nut screw.
3. Remove the canister.

Refitting

4. Secure the canister in the clamp.
5. Reverse instructions 1 and 2 above.

ADSORPTION CANISTERS

— Twin Canister Specification

Remove and refit 17.15.13

Removing

1. Disconnect from the primary canister:
   a. The canister purge pipe.
   b. The carburettor float chamber vent pipe.
   c. The fuel tank vent pipe.
   d. The connecting pipe from the lower canister.
2. Slacken the clamp nut.
3. Remove the canister.
4. Remove the connecting pipe between the primary and secondary canisters.
5. Remove the purge air canister pipe from the secondary canister.
6. Slacken the clamp nut.
7. Remove the canister.

Refitting

8. Reverse instructions 1 to 7.
AIR INJECTION SYSTEM

Description

An engine-driven, vane-type air pump draws air from within the engine compartment through a centrifugal filter and delivers it through a combined diverter and pressure relief valve and through one-way check valves to the air manifolds on each cylinder head and thence to the injectors in the individual exhaust ports just downstream of the exhaust valves. The injectors are directed towards the valve head and face upstream. The injected air mixes with the exhaust gas leaving each cylinder and promotes secondary combustion within the exhaust ports, manifolds and exhaust system. The air pump output is primarily controlled by engine speed/pulley ratio and pump capacity. Air delivery to the injectors is further controlled by exhaust back pressure, pressure relief valve setting and under certain transient conditions is further reduced by the use of a diverter valve. Under conditions of rapid throttle closure, air delivery to the exhaust ports is diverted to prevent back-fire in the exhaust system caused by the temporarily rich mixture in the exhaust system. The diverter valve, which is triggered by a rapid rise in manifold vacuum, ducts the pump output to atmosphere and hence no air is delivered to the injectors. This depends on the time cycle of the valve which is proportional to manifold vacuum change. The diverter valve is a spring-loaded, normally closed, two-way diaphragm valve with a small bleed hole through the diaphragm. The operating vacuum is applied to the diaphragm and acts against the spring. The inlet manifold provides the valve operating vacuum. Under steady-state conditions the small bleed hole equalises the vacua in the valve and the spring holds the valve closed. Under conditions of rapidly rising manifold vacuum the vacuum beneath the diaphragm exceeds that above it and opens the valve until the bleed hole equates the vacua again. The time cycle of the valve is therefore proportional to the applied vacuum, the size of the bleed hole and the volume of the valve base reservoir. Under conditions of rapidly falling manifold vacuum the vacuum above the diaphragm exceeds that below it and holds the valve closed. The check valves, which are simple one-way flap valves, prevent exhaust gas from passing back through the air pump under adverse pressure conditions, and protects the pump in the event of pump drive failure.
AIR PUMP
Remove and refit 17.25.07

Removing
1 Disconnect the two hoses from the pump.
2 Release the radiator right-hand top hose from the clip attached to the pump.
3 Slacken three bolts retaining the pulley.
4 Release the drive belt tension and slip the belt from the pulley.
5 Remove the bolts and withdraw the pulley.
6 Remove the drive belt tensioner clamp bolt.
7 Slacken the tensioner strap pivot bolt (one of the water pump bolts).
8 Remove the air pump pivot bolt.
9 Lift off the air pump.

Refitting
10 Position the air pump and fit, but do not tighten, the pivot bolt.
11 Fit, but do not tighten, the clamp bolt to the tensioner and air pump.
12 Fit the air pump pulley.
13 Reverse instructions 1 and 2.
14 Fit the air pump drive belt, see 17.25.15.

RELIEF VALVE
Check operation 17.25.10

Removing
1 The relief valve allows excessive air pressure at high engine speed to discharge to the atmosphere.
2 Run the engine at high speeds and check the valve operation.
3 The valve cannot be adjusted, and a defective unit should be replaced.

Refitting
4 Reverse instructions 1 to 3.

AIR PUMP DRIVE BELT
Remove and refit 17.25.15

Removing
1 Remove the alternator drive belt, see 86.10.02.
2 Slacken three bolts securing the water pump pulley to the spindle.
3 Slacken the air pump pivot bolt.
4 Release the drive belt tension.
5 Remove the water pump pulley retaining bolts.
6 Remove the pulley and air pump drive belt.

Refitting
7 Fit the air pump drive belt around the water pump pulley and fit the pulley.
8 Fit the air pump pulley.
9 Tension the drive belt as follows: By moving the air pump, set the drive belt tension at a point mid-way between the air pump and water pump to be either at an installed belt tension of 41 to 45 kgf (90 to 100 lb) or to Burroughs Gauge reading of 110 to 120 or to Robinair Gauge reading of 77 to 85. These values apply when a new drive belt is fitted. Should the original belt be replaced, the belt should be tightened to a reasonable tension, the engine run at fast idle speed for 3 to 5 minutes then the belt retensioned to an installed belt tension of 27 to 38 kgf (60 to 85 lb) or to Burroughs Gauge reading of 80 to 85 or to Robinair Gauge reading of 50 to 54.
10 Refit and tension the alternator drive belt, see 86.10.02.

AIR MANIFOLD
Remove and refit 17.25.17

Removing
1 Remove the carburettor air cleaners, see 19.10.01.
2 Release the manifold from the check valve.
3 Release the manifold from the cylinder head.
NOTE: It may be more convenient to release the centre branches at the manifold junction.
4 Lift off the manifold.

Refitting
5 Reverse instructions 1 to 4.
6 Run the engine and check for air leaks at the manifold.

CHECK VALVE
Remove and refit 17.25.21

Removing
1 Disconnect the air hose from the check valve.
2 Use two open-ended spanners — one on the air distribution manifold hexagon, to support the manifold, and the other to remove the check valve anti-clockwise. CAUTION: Do not impose any strain on the air manifold.

Refitting
3 Reverse instructions 1 to 2.

CHECK VALVE
Test 17.25.22

The check valve is a one-way valve positioned to protect the pump from back-flow of exhaust gases. The valve closes if the pump pressure falls while the engine is running, should, for example, the drive belt break.

Testing
CAUTION: Do not use a pressure air supply for this test.
1 Remove the check valve, see 17.25.21.
2 Blow through the valve orally in both directions in turn. Air should only pass through the valve when blown from the hose connection end. Should air pass through the valve when blown from the air manifold end, renew the valve.
3 Refit the check valve, see 17.25.21.
AIR INTAKE TEMPERATURE CONTROL SYSTEM

Description 17.30.00

The carburetters are tuned to function most efficiently at an air intake temperature of 100°F (38°C).

To maintain an efficient air intake temperature, two bi-metal flap valves are incorporated in the intake pipe to the air cleaners. A balance pipe links the two air cleaners. The flap permits cold air from forward of the radiator and/or hot air from a heat chamber around the exhaust manifold to mix in varying amounts to provide the required air temperature.

Function test 17.30.01

1. Inspect the condition and security of:
   a. the hot air inlet hose
   b. the cold air inlet hose

2. Disconnect the cold air inlet hose from the control valve and check that the flap valve is in the hot air position, that is, blanking the cold air inlet port.

3. Re-connect the cold air inlet hose, start the engine and run until normal operating temperature is reached.

4. Disconnect the hot air inlet hose and check that the flap valve has moved to the cold position, that is, blanking the hot air port thereby allowing only cold air (ambient) to enter the air cleaner.

5. Re-connect the hot air hose.

Remove and refit 17.30.03

Removing

1. Disconnect the pipes from the valve unit, noting their position for refitting.

2. Disconnect the hose to the air cleaner.

3. Disconnect the hot air box clamp (where fitted), and release the valve from the hot air box.

4. Release the valve from its support and lift it from the engine compartment.

Refitting

5. Reverse instructions 1 to 4.

HEAT CHAMBER
Remove and refit 17.30.31

Removing

1. Remove the air temperature control valve, see 17.30.01.

2. Disconnect the hot air hose from the heat chamber.

3. Remove the two cover retaining bolts.

4. Remove the cover.

Refitting

5. Reverse instructions 1 to 4.
EXHAUST GAS RECIRCULATION

Description 17.45.00

Carburettor and fuel injection fitted engines.

To reduce the nitric oxide content in the exhaust, the peak combustion temperatures are lowered by recirculating a controlled quantity of the exhaust gases through the combustion process.

The E.G.R. valve is mounted on the left-hand exhaust manifold (right-hand on fuel injection engines). A control signal, taken from a throttle edge tapping in the carburettor or plenum chamber gives no recirculation at idle or full load, but does allow an amount of recirculation, dependent on the vacuum signal and a metering profile of the valve, under part load conditions.

EXHAUST GAS RECIRCULATION VALVE

Remove and refit 17.45.01

Removing
1. Disconnect the vacuum pipe from the valve.
2. Disconnect the asbestos lagged pipe from the valve.
3. Unscrew the valve from the manifold.

Refitting
4. Reverse instructions 1 to 3, ensuring that the valve is securely sealed to the manifold.

EXHAUST GAS RECIRCULATION VALVE

Check operation 17.45.20

Warm the engine to normal running temperature.
2. Ensure that the auto-choke control is fully off.
3. Open and close the throttle several times and observe or feel the E.G.R. valve (beware hot E.G.R. valve), which should:
a. open and close with changes in engine speed,
b. close instantly when the throttle is closed.

CATALYTIC CONVERTER

Remove and refit 17.50.01

Removing
1. Disconnect the battery and raise the car on a ramp, and allow converter to cool.
2. Fuel injection engines: Disconnect the lambda (oxygen) sensor.
3. Remove the three nuts and bolts at both ends of the converter.
4. Ease converter and extract the olives from the exhaust pipe.
5. Withdraw the converter.

Refitting
6. Position the olives in the down-pipe and main pipe.
7. Ease the two pipes apart and insert the catalyst converter ensuring that the deflection plate is facing towards the front of the car.
8. Secure the converter with three nuts and bolts at both ends of the converter.
9. Fuel injection engines: Reconnect the lambda (oxygen) sensor.
10. Lower the ramp and reconnect the battery.
AIR CLEANER ASSEMBLY—L.H.
Remove and refit 19.10.01
Removing
1 Disconnect the balance pipe from the left-hand air cleaner.
2 Disconnect the air temperature control valve from the air cleaner.
3 Release the spark plug leads from the clip.
4 Remove the four nuts securing the air cleaner to the carburettor.
5 Withdraw the air cleaner assembly.
6 Remove the gasket.
Refitting
7 Using a new gasket, reverse instructions 1 to 6.

AIR CLEANER ASSEMBLY—R.H.
Remove and refit 19.10.02
Removing
1 Disconnect the spark plug leads from the clamps.
2 Disconnect the air temperature control valve from the air cleaner.
3 Disconnect the balance pipe from the right-hand air cleaner.
4 Remove the four nuts securing the air cleaner to the carburettor.
5 Withdraw the air cleaner assembly.
6 Remove the gasket.
Refitting
7 Using a new gasket, reverse instructions 1 to 6.

AIR CLEANER ELEMENT—L.H.
Renew 19.10.10
1 Release the spark plug from the clamp.
2 Disconnect the air temperature control valve from the air cleaner assembly.
3 Remove the dipstick.
4 Release the air cleaner box fasteners.
5 Manoeuvre the lower part of the box to a position to enable the filter element to be withdrawn.
6 Discard the old element.
7 Clean inside the air cleaner box.
8 With the seal face uppermost insert a new filter element in position and secure the box together with the fasteners.
9 Reverse instructions 1 to 3.

AIR CLEANER ELEMENT—R.H.
Renew 19.10.11
1 Disconnect the air temperature control valve from the air cleaner assembly.
2 Release the spark plug leads from their clamps.
3 Release the air cleaner box fasteners.
4 Remove the lower half of the air cleaner box complete with the filter element.
5 Remove and discard the filter element.
6 Clean the two parts of the air cleaner box.
7 Insert a new filter element into the lower part of the box with the seal face uppermost and securing it with the fasteners to the upper part.
8 Reverse instructions 1 and 2.
CARBURETTERS

1. Tune and adjust 19.15.02

Special equipment:
- Mixture adjusting tool S 353
- Air-flow balance meter 605330
- Infra-red gas analyser

CAUTION: To ensure compliance with exhaust emission legislative requirements the following items must not be changed or modified in any way:

- The fuel jet assembly.
- The piston assembly.
- The depression cover.

The following items must not be adjusted in service but should be replaced completely by factory-set units:

- The temperature compensator.
- The piston assembly return spring.
- The temperature gauge in the instrument panel.
- The temperature compensator.
- The piston assembly return spring.

General requirements prior to tuning

A Accurate engine speed is essential during carburetter tuning; therefore the distributor pick-up air gap and ignition timing must be checked together with the vacuum advance system.

B Whenever possible, the ambient air temperature of the tuning environment should be between 15°C to 25°C (60°F to 80°F). When checking engine speed, use an independent and accurate tachometer. The rev/min indicator fitted to the car is not suitable.

C Vehicle conditions: Idling adjustment should be carried out on a fully warmed-up engine, that is, at least five minutes after the thermostat has opened. This should be followed by a run of one minute duration at an engine speed of approximately 2,500 rev/min before further adjustments or checks are carried out. This cycle may be repeated as often as required. It is important that the above cycle is adhered to, otherwise overheating may result and settings may be incorrect.

D Before any attempt is made to check settings a thorough check should be carried out on a fully warmed-up engine, that is, at least five minutes after the thermostat has opened. This should be followed by a run of one minute duration at an engine speed of approximately 2,500 rev/min before further adjustments or checks are carried out. This cycle may be repeated as often as required. It is important that the above cycle is adhered to, otherwise overheating may result and settings may be incorrect.

E Check the ignition timing.

F Top-up the damper oil level in both carburetters as follows: Unscrew the damper plug and inject engine oil into the dashpot. The oil level is correct when, using the damper as a dipstick, its threaded plug is ¼ in above the top of the dashpot.

G The fast idle cam gap adjustment screw position is factory-set and must not be adjusted.

Carburetter balance and idle speed adjustment

1 Run the engine until normal operating temperature is attained as indicated by the temperature gauge in the instrument panel.

2 Remove the air cleaners.

3 Disconnect the throttle connecting link rod.

4 Disconnect the throttle link rod between the two carburetters.

5 Turn the lost motion adjusting screw until clear of the spring-loaded pad.

6 Ensure that the automatic chokes are in the fully-off position. This is indicated by the throttle levers being in contact with the fast idle cam gap adjustment screw.

7 Turn both idle adjustment screws until they just touch the abutment on the choke lever, and then turn the screws four revolutions clockwise.

8 Using an air-flow meter, adjust the idle adjustment screw in both carburetters until a balanced flow is achieved at the correct idle speed, see DATA.

9 Re-connect the link rod between the carburetters, which will cause the loss of the throttle lever against its stop and turn the lost motion adjusting screw until it just contacts the spring-loaded pad.

10 To restore the balance, hold the left-hand carburetter throttle lever against its stop and turn the lost motion adjusting screw until it just contacts the spring-loaded pad.

11 Fit the throttle connecting link rod, whilst checking that the idle speed does not change.

12 Fit the air cleaners.

continued
Checking CO level and adjusting mixture

14 Disconnect the two hoses from the air pump and clamp the ends of the hoses. CAUTION: Damage to the air pump will result if the air-flow from it is obstructed.

15 Insert the gas analyser probe into either exhaust pipe a minimum of 18 in; note the reading and compare with DATA.

16 If adjustment of the mixture is necessary, remove the piston dampers from both carburetters.

17 Commencing with either carburetter insert the special tool S 353 into the piston guide rod, ensure that the peg on the outer barrel of the tool locates in the slot in the guide rod end. CAUTION: Failure to ensure that the tool is properly located may result in the diaphragm being twisted with consequent permanent damage.

18 Push the Allen key down until it engages in the hexagon of the metering needle housing.

19 Whilst holding the outer barrel, turn the Allen key clockwise to enrich the mixture and anti-clockwise to weaken.

NOTE: Both carburetters should be adjusted in turn by equal amounts until the fastest speed is attained and the CO reading is within limits. The adjusting tool must be removed from the guide rod after each adjustment to allow the engine to be run at approximately 2,000 rev/min for a few seconds to ‘clear-out’ and stabilize.

20 Check, and if necessary top-up, the damper oil level and fit the dampers.

21 Run the engine at 2,000 rev/min for twenty seconds before making final checks and, if required, adjustment to the idle speed and CO level.

22 Remove the analyser probe.

23 Fit the air hoses to the air pump.

CARBURETTER

Remove and refit L.H. 19.15.09 R.H. 19.15.10

Removing
1 Remove the air cleaner.
2 Drain the radiator.
3 Disconnect the engine breather hose.
4 Disconnect the inlet and outlet water hoses from the automatic choke.
5 Disconnect the carburettor float-chamber vent pipe from:
   a the L.H. carburettor.
   b the clips on the R.H. carburettor.
6 Disconnect the vacuum pipe.
7 Disconnect the fuel feed pipe to the carburettor.
8 Disconnect, from the appropriate carburettor, the rod linking the two units.
9 Disconnect the countershaft link rod – L.H. carburettor only.
10 Remove the two top nuts securing the carburettor to the manifold.
11 Remove the bottom front nut securing the carburettor to the manifold.
12 Remove the three screws retaining the automatic choke to the carburettor and remove the choke and joint washer.
13 Rotate the throttle lever assembly to gain access to the carburettor lower rear retaining nut and remove the nut.
14 Withdraw the carburettor from the engine.
15 Remove the outer joint washer.
16 Remove the liner.
17 Remove the insulator.
18 Remove the inner joint washer.

Refitting
19 Clean the carburettor and manifold mating faces.
20 Fit a new inner joint washer.
21 Fit the insulator with the arrow uppermost and pointing inwards.
22 Fit the liner ensuring that the lugs locate in the insulator and the blade points downwards.
23 Fit a new outer joint washer.
24 Fit the carburettor and secure with the four nuts and spring washers.
25 Using a new joint washer, fit the automatic choke.
26 Reverse instructions 2 to 9.
27 Tune and adjust the carburettor, see 19.15.02.

DATA

Carburettor type: Federal ................. Stromberg 175 CDSET
               California ................. Stromberg 175 CDSET
Idle speed
               Federal (1979) ................. 750 to 900 rev/min + 2%
               California (1979) and Federal (1980) 750 to 1,500 rev/min 4% ± 1.5%
Fast idle speed (check during warm-up) ......... 5% ± 2%
CO level: Federal (1979) ................. 4% ± 1.5%
CARBURETTORS

Overhaul 19.15.18

1 Remove the carburetters, see 19.15.11.

Dismantling
2 Remove the oil cap and damper.
3 Remove the top cover and spring.
4 Withdraw the air valve, shaft and diaphragm assembly.
5 Remove the metering needle, retained by a locking screw.
6 Remove the diaphragm from the air valve.
7 Remove the float chamber, gasket and needle valve, see 19.15.24.

Dismantling the carburetter body
8 Add location marks to the throttle butterfly and spindle.
9 Remove the throttle butterfly, taking care not to damage the poppet valve.
10 Remove the throttle levers.
11 Withdraw the throttle spindle.
12 If required, remove the throttle stop and fast idle lever.
13 Remove the autochoke assembly, see 19.15.38.

Carburetter cleaning
14 When cleaning fuel passages do not use metal tools (files, scrapers, drills, etc.) which could cause dimensional changes in the drillings or jets. Cleaning should be effected using clean fuel and where necessary, a moisture-free air blast.

Joint faces
15 Examine the faces for deep scores which would lead to leakage taking place when assembled.

Joint gasket and seals
16 New gaskets and seals should be used throughout carburetter rebuild. A complete set of gaskets is available for replacement purposes.

Inspect metering needle, it is machined to very close limits and should be handled with care. Examine for wear, bend and twist; renew if necessary.

Diaphragm
18 In common with other products made from rubber compounds, any contact of the diaphragm with volatile cleaners should be avoided; use only CLEAN RAG. Examine for damage and deterioration. Examine float for puncture or damage, and chamber for corrosion; examine retaining clips for wear.

Examine clamping screw for two positions; renew as necessary.

Reassembly
20 Reverse instructions 1 to 13.

KEY TO ILLUSTRATION

1 Damper cap rod and body
2 Fibre washer
3 Washer for damper
4 Bush for damper
5 Retaining ring
6 Cover screw
7 Cover
8 Specification tag
9 Retaining ring screw
10 Piston return spring
11 Retaining ring
12 Diaphragm
13 Piston assembly
14 Needle retaining screw assembly
15 Retaining clip
16 Adjuster and seal
17 Bias spring
18 Needle body
19 Needle
20 Nylon cover
21 Poppet valve
22 Poppet valve seat
23 Spring
24 Spring retainer
25 Float pivot
26 Float
27 Float needle valve
28 Float
29 Float chamber
30 Spring washer
31 Screw (short)
32 Screw (long)
33 Sealing plug
34 'O' ring
35 Gasket
36 Screw
37 Piston cover
38 Gasket
39 Piston and spring assembly
40 Metering needle
41 Dust cap
42 Auto choke body
43 Blanking plug
44 'O' ring
45 Metering jet
46 'O' ring
47 Welch plug
48 Cover
49 Spring
50 Fast idle pin
51 Needle actuating arm
52 Tension spring
53 Fast idle cam
54 Cardclip
55 Insulator
56 Bi-metal
57 Heat sink
58 Clamping ring
59 Seal
60 Heat sink cover
61 Bolt
62 Spring washer
63 Bolt
64 Nut
65 Shakesproof washer
66 Washer
67 Fast idle lever
68 Spring
69 Spacer
70 Spring
71 Idle speed adjuster
72 Throttle stop and pickup lever
73 Welch plug
74 Return spring
75 Throttle spindle
76 Spindle seal
77 Spindle bush
78 Screw
79 Throttle butterfly
80 Lock nut
81 Fast idle adjuster
82 Temperature compensator unit
83 Washer
84 Bolt
85 Temperature compensator cover
86 Screw
87 Sealing washer screw
88 Sealing washer
89 Carburetter body
FLOAT-CHAMBER NEEDLE VALVE

Remove and refit 19.15.24

Removing
1 Remove the carburetters, see 19.15.09 or 19.15.10.
2 Remove the six screws securing the float-chamber to the body.
3 Remove the float-chamber.
4 Remove the gasket.
5 Remove the float assembly by gently prising the spindle from the locating clips.
6 Remove the needle valve and washer.

Refitting
7 Fit the needle valve and renew the washer.
8 Fit the float assembly.
9 Check, and if necessary adjust, the height of both floats, see 19.15.32, instruction 6.
10 Renew the gasket and refit the float-chamber.
11 Refit the carburetters.

FLOAT-CHAMBER LEVELS

Check and adjust 19.15.32

Checking
1 Remove the carburetters, see 19.15.09.
2 Remove the six screws securing the float-chamber to the body.
3 Remove the float-chamber.
4 Remove the gasket.
5 With the carburetter in the inverted position check the distance between the gasket face on the carburetter body to the highest point of each float 'A'.

NOTE: The height of both floats must be the same, i.e. 0.625 to 0.627 in (16 to 17 mm).

Adjusting
6 Bend the tab that contacts the needle valve but ensure that it sits at right angles to the valve to prevent the possibility of sticking.
7 Fit a new gasket and reverse instructions 1 to 3.

DIAPHRAGM

Remove and refit 19.15.35

Removing
1 Remove the four screws securing the top cover to the carburetter body.
2 Lift off the top cover.
3 Remove the diaphragm spring.
4 Remove the diaphragm retaining plate.
5 Remove the diaphragm.

Refitting
6 Fit the diaphragm, locating the inner tag in the air valve recess.
7 Fit the retaining plate and ensure the correct diaphragm seating and tighten the screws.
8 Locate the diaphragm outer tag in the recess in the carburetter body.
9 Fit the top cover and evenly tighten the screw.
10 Check and if necessary top-up damper, see special instructions, 19.15.02.
AUTOMATIC CHOKE

Remove and refit 19.15.38

CAUTION: The automatic choke (auto choke) must only be renewed as a complete unit.

Removing
1. Drain the radiator.
2. Remove the air duct - R.H. carburetter only.
3. Disconnect the coolant hoses from the choke water bucket.
4. Open the throttle and prevent closure by inserting a suitable stop (plastic, rubber or soft wood) between the throttle bore and butterfly.
5. Remove the three retaining screws securing the auto choke to the carburetter, noting that the lower screw is shorter.

Refitting
7. Clean the carburetter and auto choke mating faces.
8. Remove the central bolt and washer on the water jacket and remove:
   a. the water jacket.
   b. the rubber sealing ring.
9. Remove the three screws and spring washers retaining the clamp ring.
10. Remove the clamp ring.
11. Carefully remove the finned aluminium heat mass, ensuring that the attached temperature-sensitive bi-metal coil does not become strained.
12. Remove the heat insulator.
13. Fit a new gasket to the carburetter.
14. Fit the auto choke body to the carburetter, tightening the retaining screws progressively and evenly to 40 to 45 lb in (46 to 52 kgf cm). Note the lower screw is shorter.
15. Adjust the fast idle screw until the gap between the base circle of the cam and the fast idle pin is within 0.025 in (0.635 mm), dimension 'A'.
16. Position the heat insulator ensuring that the bi-metal lever protrudes through the slot in the insulator.
   NOTE: Provided the auto choke is in the fully 'on' position, this insulator can only be fitted in one position; the back of it locating in the auto-choke body and the three holes aligned with the threaded holes in the starter body. Carefully position the aluminium heat mass with the fins facing outwards and in such a way that the rectangular loop on the outer end of the temperature-sensitive bi-metal coil fits over the bi-metal lever.
17. Without lifting the heat mass from its location (this is necessary to prevent the rectangular loop disengaging from the bi-metal lever), rotate it in both directions 30° to 40° ONLY and in both cases it should spring back to its static position. If not, repeat instruction 16.
18. Fit the clamp ring, locating it with the three screws and spring washers, but leaving the screws slack.
19. Fit the clamp ring, locating it with the three screws and spring washers, but leaving the screws slack.
20. Rotate the heat mass in an anti-clockwise direction to align the scribed line on its outermost edge with the datum mark on the insulator and auto-choke body. Whilst holding it in this position evenly tighten the clamp ring retaining screws to lock the heat mass in this position.
   CAUTION: It should only be necessary to turn the heat mass through some 30 to 40 degrees. Excessive rotation must be avoided to prevent permanent damage being caused to the temperature-sensitive coil.
21. Fit the sealing ring.
22. Fill the water jacket leaving the centre retaining bolt slack so that the water jacket may be rotated to line up with the water pipes.
23. Connect up the water pipes to the water jacket and tighten the centre retaining bolt.
24. Fill the radiator.
25. Check, and if necessary top-up, damper - see special instructions, 19.15.02.
26. Operate the throttle before attempting to start the engine to enable the auto-choke to reset itself.
27. Start the engine and run until normal operating temperature is reached.
28. Adjust the engine idle speed setting screw to give an idling speed of 800 to 850 rev/min.
29. Fit the air duct - R.H. carburetter only.
30. When the engine is cold check, and if necessary top-up, the cooling system.
TEMPERATURE COMPENSATOR

Remove and refit 19.15.59

CAUTION: This component must only be renewed as a complete new unit.

Removing
1. Remove the two screws and shakeproof washers securing the temperature compensator to the carburettor.
2. Withdraw the compensator complete.
3. Remove and discard the outer rubber washer.
4. Remove the inner rubber washer from the carburettor body and discard.

Refitting
5. Clean the carburettor and temperature compensator mating faces.
6. Insert a new inner rubber washer into the bore in the carburettor body.
7. Fit a new outer rubber washer.
8. Fit the compensator to the carburettor and secure with the two screws and shakeproof washers.

THROTTLE PEDAL ASSEMBLY

Remove and refit 19.20.01

Removing
1. Disconnect the battery.
2. Working from inside the car, remove the spring clip securing the throttle cable.
3. Remove the cable from the pedal.
4. Open the bonnet and remove the two bolts securing the pedal assembly to the bulkhead.
5. Remove the pedal assembly from the car.
6. Strip the pedal assembly, and discard worn parts.

Refitting
7. Locate the spring in the bracket.
8. Fit the pedal to the bracket.
9. Insert the clevis pin.
10. Fit the plain washer.
11. Secure the assembly with a new split pin.
12. Fit the pedal to the bulkhead and secure with the two bolts.
13. Fit the cable to the pedal and retain with the spring clip.
14. Re-connect the battery.

FUEL PUMP

Remove and refit 19.45.08

Removing
1. Disconnect battery.
2. Extract fuel from tank.
3. Raise rear-end of car on axle stands.
4. Disconnect main fuel feed from pump.
5. Disconnect the electrical leads.
6. Remove the pump retaining ring.
7. Withdraw pump from tank.
8. Remove sealing rubber.

Refitting
9. Reverse instructions 1 to 8.

DATA
Pump delivery pressure 3 lbf in².
FUEL TANK
Remove and refit 19.55.01

Removing
1. Drive the car onto a ramp and disconnect the battery.
2. Remove the fuel filler cap assembly, see 19.55.08.
3. Disconnect the pipe from the tank to the vapour separator.
4. Raise the ramp and drain the fuel tank.
5. Support the body with jacks both sides of the car forward of the trailing arm attachment points.
6. Disconnect the dampers at their lower attachment to the axle.
7. Disconnect the tank unit electrical leads.
8. Pull off the rubber connection to the main fuel line.
9. Disconnect the R.H. radius rod from the body bracket.
10. Remove the L.H. radius rod from the car.
11. Jack up the body sufficiently to remove both road springs.
   CAUTION: Care must be taken to ensure that whilst jacking up the body the brake hydraulic system jump hose — shown arrowed — is not stretched.
12. Remove the L.H. rear road wheel and allow the axle to drop having regard for the above cautionary note.
13. Support the axle with a jack to relieve any tension in the hydraulic jump hose.
14. Remove the tail pipe and silencer assembly, see 30.10.22.
15. Remove the L.H. bump stop.
16. Remove the four nuts and tank retaining straps.
17. Withdraw the tank from the L.H. side of the car.
18. Remove the filler hose.
19. Remove the breather hose.
20. Remove the tank unit, see 88.25.32, instructions 6 to 9.
   NOTE: Instructions 18 to 20 are only necessary if the tank is to be renewed.

Refitting
NOTE: If the tank is not being renewed ignore instructions 19 to 22. However, renew all hoses if any deterioration exists.
21. Using adhesive, fit new cushion strips to the tank, noting that thicker strips are fitted to the top of the tank.
22. Fit the filler hose.
23. Fit the breather hose.
24. Fit the tank unit, see 88.25.32, reversing instructions 6 to 9.
25. Manoeuvre the tank into position from the L.H. side of the car.
26. Fit the supporting straps, noting that the elongated holes in the straps are fitted to the rear studs in the body.
27. Fit and tighten the four retaining nuts.
28. Fit the L.H. radius rod to the axle — including the handbrake cable bracket — leaving the body-end free for the time being.
29. Fit the springs and jack up the axle both sides and connect the dampers to their axle locations.
30. Fit the L.H. bump stop.
31. Fit the L.H. and R.H. radius rods to their body locations.
32. Fit the tail pipe and silencer assembly, see 30.10.22.
33. Fit the L.H. rear road wheel.
34. Lower and remove the body and axle jacks.
35. Connect the fuel tank to the main line pipe with the rubber connector.
36. Fit the electrical leads to the tank unit, see 88.25.32, instruction 10.
37. Fit the breather pipe from the tank to the L.H. connection on the vapour separator.
38. Lower the ramp and fit the fuel filler assembly, see 19.55.08.
39. Fit the access panel.
40. Refill the fuel tank, connect the battery, start the engine and check for leaks.

FUEL FILLER NECK
Remove and refit 19.55.07

Removing
1. Remove the fuel filler cap.
2. Remove the three screws securing the filler neck and bezel to the body.
3. Withdraw the bezel.
4. Open the luggage compartment and remove the access panel — four screws.
5. Slacken the top hose clip.
6. Carefully push the filler neck downwards and remove it from the vehicle through the access aperture in the luggage compartment.

Refitting
7. Insert the filler neck into the filler hose and align the holes in the flange with those in the body.
8. Reverse instructions 1 to 5.
The electronic fuel injection system, fitted as an alternative to carburetters, comprises two parts: a fuel injection system, and an electronic control for the fuel injection system.

Fuel injection system components
Fuel is drawn from a tank at the rear of the vehicle and pressurized to approximately 2.5 kgf/cm$^2$ (36 lbf/in$^2$) by an electric fuel pump located beneath the car floor. The fuel pump will only operate when the ignition and/or the starter motor circuits are energized. From this pump fuel passes through fuel filter(s) located below the fuel pump to a pressure regulator, the spring chamber of which is connected to the engine intake manifold. As a result, the difference between the intake manifold pressure and the fuel pressure is held constant, excess fuel being returned to the fuel tank via an anti-surge pot.

A fuel rail links the pressure regulator with the fuel injectors, one injector being fitted to each inlet manifold spur. The injectors may be either 'open' or 'closed' and are solenoid-operated. The injector solenoids are energized through a relay actuated by the ignition circuit and are pulsed to 'open' by the electronic control unit (E.C.U.) completing a circuit to 'earth'. When 'open' the injectors spray fuel into the inlet manifold to be drawn into the engine cylinders at the next induction stroke of the working cycle.

Therefore there needs to be no fixed relationship between the injector timing and the engine ignition or valve timing.

The injectors are programmed to 'open' in banks of four, in unison, twice per engine operating cycle (two revolutions). On eight cylinder engines the two banks of four injectors operate alternately. The time that the injectors are 'open' governs the amount of fuel supplied to the engine and this 'open' time is computed by the electronic control unit from the input it receives from various sensors.

To assist cold starting, a separate cold start injector sprays a fine jet of fuel against the air stream entering the plenum chamber before fuel is added to it by the main injectors. The cold start injector is energized from the engine starter motor circuit and has in series with it a thermostime switch. This switch is dual activated by the engine coolant temperature (heat) and a heater coil around a bi-metal strip (time), the coil being again energized from the starter motor circuit. The purpose of the thermo-time switch is to ensure that the cold start injector will not be energized when the engine is at normal operating temperature or should the starter motor be used for prolonged periods when the engine is below normal operating temperature. Thus the switch prevents extra fuel being supplied to the engine when it is not required. The switch will isolate the cold start injector after approximately 8 to 12 seconds at $-20^\circ$C ($-4^\circ$F) decreasing this time as the engine approaches its normal operating temperature.
Electric fuel pump operation
The fuel pump is energized independent of the electronic control unit, from an output terminal on the combined relay. The combined relay is the component that provides an interface between the main vehicle electrical harness and those items that are specifically related to the electronic fuel injection system. An inertia switch is included in the circuit to isolate the fuel pump and prevent it from operating in the event of an impact type accident. The circuit is also routed through the electronic control system air-flow meter where a simple contact switch ensures that the fuel pump cannot operate when no air is flowing into the engine, i.e. the engine is not running. This contact switch is by-passed when the starter motor circuit is energized. Once the engine is running a circuit from the ignition switch passes through a relay to 'earth'. When energized this relay permits a circuit to be made to the air-flow meter contact switch. Providing the contact switch is closed a circuit is completed through a second relay to 'earth'. When energized this second relay completes the circuit to operate the fuel pump. Under engine starting conditions the air-flow meter contact switch would normally isolate the fuel pump as no air is flowing into the engine. To overcome this an input is taken directly from the starter motor circuit to energize the second relay and thus permit the fuel pump to operate during the engine starting operation.

Circuit principles of fuel pump operation

Electronic control of the fuel injection system
At the heart of the electronic control system is the electronic control unit (E.C.U.) which is a box approximately 23 × 18 × 5 cm (9 × 7 × 2 in) located beneath the passenger’s glove box. The E.C.U. receives input signals from various sensors and computes from these an output signal to the fuel injector solenoid circuits. When activated the solenoids 'open' the injectors to spray fuel into the engine inlet manifold, the injectors remaining open for between 1.5 and 10 milliseconds depending on engine running conditions.

The electronic control unit is sealed, it requires no maintenance and should not be opened or tampered with.

Engine speed
This input is very simply obtained by taking a tapping from the ignition coil low tension circuit output (–ive). Thus the ignition low tension circuit pulses are passed to the E.C.U. to be computed into an engine speed input.

Throttle switch
A throttle switch forms part of the electronic control for the fuel injection system and provides the E.C.U. with information on throttle operating conditions. It is located on the engine plenum chamber in line with the throttle input spindle. The switch is a simple electrical potentiometer (variable resistance) whose electrical signal to the E.C.U. depends upon the position of the throttle spindle and hence the accelerator pedal. In addition to detecting a high voltage output from the switch at the full throttle position, and in consequence giving a full load fuel condition, the E.C.U. will also detect changes in throttle position by the voltage output from the potentiometer. Using this together with information from the other sensors it will adjust the fuel input accordingly, either for degrees of acceleration and deceleration or for constant engine speed. When a sudden acceleration is signalled to the E.C.U. by the throttle potentiometer, all injectors are pulsed to operate once simultaneously to ensure adequate engine response.
Air-flow meter

To measure the air flow into the engine an air-flow meter is fitted in the engine compartment between the air cleaner and a plenum chamber above the engine. The plenum chamber acts as a collecting box for the ingoing air and helps to smooth out any rapid fluctuations in air flow that might upset the air-flow meter signals. The air-flow meter itself is basically a short tube in which there is a pivoted measuring flap that is moved by air flowing past it into the engine. To reduce excessive fluttering of this flap, such as would be caused by sudden changes or pulses in the air flow, a compensating flap is fitted as part of the same casting as the measuring flap. The position of the measuring flap is controlled by the air drawn into the engine and the action of a coil return spring. The mass of air drawn into the engine at any time is indicative of the engine load and a signal, proportional to the flap position, is passed to the E.C.U.

The air mass is related to air density which in turn is dependent upon air temperature. Therefore an air temperature sensor is incorporated into the air-flow meter and this sends a separate electrical signal to the E.C.U. Due to the action of the coil return spring, the air flow meter measuring flap is almost closed when the engine is idling and an idle air by-pass channel is provided to assist the engine to breathe at this low speed. Air passing through the by-pass channel is not registered by the air-flow meter measuring flap. An adjustment screw is fitted into the by-pass channel to regulate the air-flow thus providing some adjustment to the air/fuel ratio, and hence the exhaust gas CO level at idle speed but only when the lambda sensors are disconnected. This adjustment screw is normally sealed by a coloured plug in the screw recess. Adjustment of the screw settings and resealing is subject to normal legislative requirements.

Coolant temperature sensor

This sensor is located between the cylinder heads and provides coolant temperature information to the E.C.U. The signal from the sensor serves two purposes. First it causes the E.C.U. to slightly lengthen the time that the main injectors are open, reducing this time as the engine warms up and cutting it off when normal engine operating temperature is reached. Second, it completes and "earth" return circuit in the E.C.U. for the heater element in the extra air valve when the engine is running below normal operating temperature. In practice the sensor functions by modifying an output voltage from the E.C.U. through an "earth" return circuit.

Extra air valve

This valve is mounted above a water passage in the inlet manifold and registers the same temperature as the engine coolant. Its purpose is to provide the additional air required to maintain satisfactory engine idle speed until the engine reaches normal operating temperature. This air is taken from a point before the throttle butterfly (but after the air-flow meter, so that the air is registered by the E.C.U.) and returned to the plenum chamber after the throttle butterfly.

To allow air to pass through the valve, and thus by-pass the throttle butterfly, an opening in a rotatable metal disc is aligned with the inlet and outlet tubes on the valve. The position of this disc is controlled by a bi-metal strip which deflects according to the temperature it experiences. As the bi-metal strip heats up it rotates the metal until its opening no longer lines up with the air valve tubes and the extra air source is reduced and finally terminated as normal engine operating temperature is reached.

continued
The bi-metal strip is heated from two sources, the coolant temperature and a heater coil around the strip. The heater coil is energised from the ignition circuit and comes into operation whenever the coolant temperature sensor causes the E.C.U. to complete the heater coil circuit to 'earth'.

**Over-run valve**
This second air flow control device bleeds air into the engine inlet manifold, via the plenum chamber, when the manifold depression is high and thus maintains combustion during engine over-run. The valve operates independently of the electronic control system and is located on the side of the valve body connecting the constant depression region between the throttle and the air-flow meter measuring flap.

**Lambda sensors**
One sensor is fitted into each branch of the exhaust system near to the catalysts and, like the catalysts requires only UNLEADED fuel to be used to prevent damage to them. The sensors monitor the composition of exhaust gases leaving the engine. The internal working surfaces of the sensor are coated with a thin platinum layer which is permeable to gas. A special ceramic layer protects the electrodes against corrosion and this becomes conductive to oxygen atoms at about 600°C (1112°F). If the concentration of oxygen inside the sensor (from the exhaust gases) differs from that outside the sensors (atmosphere) a voltage is developed between the two surfaces that changes when the outer electrode has catalytic activity. This voltage is passed to the E.C.U. which compares it against a reference voltage for ideal combustion and adjusts the main injector 'open' time accordingly to permit more or less fuel to be used by the engine. More fuel will use the excess oxygen in the exhaust gas, less fuel will allow more oxygen, and so the ideal oxygen content is supplied to permit the catalyst to operate at its best efficiency.

By using lambda sensors to monitor the exhaust gases in this way a feed back 'closed loop' type of control system can be introduced for the fuel injection operation. Should for any reason the lambda sensors become inoperative or be disconnected the electronic control system will continue to function as an 'open loop' system without the fine tuning effect of the sensors.
SCHEMATIC WIRING DIAGRAM OF FUEL INJECTION SYSTEM COMPONENTS
(Alternative wiring colours are shown where applicable)
This diagnostic schedule is provided to assist in the identification of fuel injection problems. It is assumed that diagnostic equipment such as ignition system analysers, Lucas Epitest, fuel setting indicator, etc. are available, together with instructions applicable to these instruments.

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine does not crank, or cranks only at reduced speed</td>
<td>1 Low battery charge or poor connections</td>
<td>1a Check battery, recharge. Clean and secure terminals. 1b Check for electrical short-circuit or low output from alternator.</td>
</tr>
<tr>
<td>2 Starting system malfunction</td>
<td>2 Check starter circuit and connections.</td>
<td></td>
</tr>
<tr>
<td>3 Engine cylinder filled with fuel, oil or coolant</td>
<td>3 Remove spark plugs and crank engine. <strong>CAUTION: FIRE RISK</strong> if cylinder is filled with fuel. Disable ignition system before test. If cylinder is filled with oil or coolant, check for failed head gasket, valve oil seals, presence of water in air intake system. If cylinder is filled with fuel, use Lucas Epitest to check for stuck fuel injector or electrical malfunction.</td>
<td></td>
</tr>
<tr>
<td>4 Lack of fuel</td>
<td>4 Check that adequate fuel is present in fuel tank.</td>
<td></td>
</tr>
<tr>
<td>5 Inertia or ‘G’ switch tripped.</td>
<td>5 Check switch — reset if necessary.</td>
<td></td>
</tr>
<tr>
<td>6 Poor connections in ignition system</td>
<td>6 Ensure all ignition connections are securely made.</td>
<td></td>
</tr>
<tr>
<td>7 Poor connections in E.F.I. system</td>
<td>7 Ensure all E.F.I. system connections are securely made, including multi-way connections to E.F.I. relay and electronic control unit. Ensure all connector receptacles are undamaged and fully latched into housings. Check that E.F.I. earth connections are clean and tight. Carry out E.F.I. system check with Lucas Epitest.</td>
<td></td>
</tr>
<tr>
<td>Engine cranks at normal speed but will not start</td>
<td>8 Leaks in engine air intake system</td>
<td>8 Check for air leaks and correct connection of all hoses, joints and seals associated with the air flow meter, throttle, extra air valve, E.G.R. valve, plenum chamber, intake manifold, fuel injectors.</td>
</tr>
<tr>
<td>9 Ignition faults</td>
<td>9 Check for sparking at plug lead. If no spark or weak spark, check ignition system with suitable diagnostic equipment.</td>
<td></td>
</tr>
<tr>
<td>10 Wrong grade or contaminated fuel</td>
<td>10 If fuel contamination with dirt or water is suspected, drain and flush fuel tank, flush fuel system, replace fuel filter. Use Lucas Epitest to check operation of injectors, ensuring that they are not jammed closed or open by dirt or rust.</td>
<td></td>
</tr>
<tr>
<td>11 Fuel pump not running</td>
<td>11a Listen for fuel pump when engine is cranked, or remove air flow meter inlet hose and with ignition on open air meter flap to run pump. If pump does not run, check pump electrical circuit including E.F.I. relay. Check pump by substitution. 11b If it is suspected that pump has failed because of dirt ingress, refer to item 10 above.</td>
<td></td>
</tr>
<tr>
<td>12 Incorrect fuel pressure</td>
<td>12 Connect pressure gauge to engine fuel rail as described in Lucas Epitest Instruction Manual. Run fuel pump as described in 11a above. Fuel pressure should be approximately 36 lbf/in² or 2.5 bar. If not correct, check for leaks or blockages in fuel system. Check fuel pressure regulator by substitution.</td>
<td></td>
</tr>
<tr>
<td>13 Fuel injector or start injector stuck open</td>
<td>13 With pressure gauge fitted to fuel rail as in 12 above, pressurize fuel system with pump, then stop pump. The fuel system pressure should hold at or near normal running pressure. If pressure decays, there is a fuel leak which must be corrected.</td>
<td></td>
</tr>
</tbody>
</table>
### TR8 FUEL INJECTION DIAGNOSTIC SCHEDULE—continued

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine cranks at normal speed but will not start</td>
<td>Disconnect electrical connectors from injectors in turn to identify possible electrical fault holding injectors open. Ignition must be on. Check all fuel system pipes, hoses and joints for leakage. Remove start injector from plenum with fuel hose still connected and check for fuel leak from nozzle. Check for fuel leakage back to tank via the fuel pump or pressure regulator. Check by clamping off rubber hoses or substituting new components. <strong>NOTE:</strong> If fuel system joints are broken, exercise extreme care to prevent dirt ingress. Finally, remove fuel rail and fuel injectors from engine to check for a leaky fuel injector. Replace faulty components.</td>
<td>17 Incorrect fuelling</td>
</tr>
<tr>
<td>14 Ignition timing incorrect</td>
<td>Check and reset as necessary</td>
<td>19 Check items 1, 2</td>
</tr>
<tr>
<td>15 Cold start injector not working</td>
<td>With cold engine remove start injector from plenum but leave electrical and fuel hose connections made. Crank engine briefly. Start injector should spray fuel. <strong>CAUTION:</strong> FIRE RISK. Disable ignition system for this test. If start injector does not spray, check wiring of start injector and thermostat switch using Lucas Epitest. Check start injector and thermostat switch by substitution.</td>
<td>20 Check items 8, 6, 7, 9, 10, 12, 13, 14, 15, 16, 17, 18</td>
</tr>
<tr>
<td>16 Extra air valve malfunction</td>
<td>Crank engine with throttle held slightly open. If engine starts and runs, check valve by substitution. Note that when the extra air valve is cold the air metering orifice can be seen to be open through the hose stubs.</td>
<td>21 Check items 1, 2</td>
</tr>
<tr>
<td>17 Difficult cold start. Cranking speed low</td>
<td>22 Check items 8, 6, 7, 9, 10, 12</td>
<td>22 Check in order shown. If problem persists, continue to 23.</td>
</tr>
<tr>
<td>18 Difficult cold start. Cranking speed normal</td>
<td>23 Check item 13</td>
<td>23 It is essential for good hot starting that the fuel system holds pressure until the engine cools. Leaky pressure regulator or pump non-return valve can be a cause of poor hot starting as well as leaky injectors. Check the pressure regulator and pump by substitution. The pump non-return valve cannot be serviced separately.</td>
</tr>
<tr>
<td>19 Difficult hot start. Cranking speed low</td>
<td>24 Check items 14, 17, 18</td>
<td>24 Check in order shown.</td>
</tr>
<tr>
<td>20 Starts but does not run</td>
<td>25 Check items 8, 6</td>
<td>25 Check in order shown. If problem persists, continue to item 26.</td>
</tr>
</tbody>
</table>

**continued**
<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starts but does not run</td>
<td>26 Check item 7</td>
<td>26 In conducting the Epitest sequence pay particular attention to the signals to the E.C.U. from the ignition coil via the in-line resistor (whether a separate component in the harness near the ignition coil, or built into the ignition system ballast) and the signal from the starter circuit. Also check circuit via air-flow meter fuel pump contacts.</td>
</tr>
<tr>
<td></td>
<td>27 Check item 9</td>
<td>27 Pay particular attention to the working of the ballasted coil circuit during and after cranking.</td>
</tr>
<tr>
<td></td>
<td>28 Check items 4, 10, 12, 13, 16</td>
<td>28 Check in order shown. If problem persists, continue to item 29.</td>
</tr>
<tr>
<td></td>
<td>29 Air meter flap sticking</td>
<td>29 Remove hoses from air-flow meter and check flap is in the closed position. Gently open the flap against spring pressure until fully open, making sure that the air-flow meter does not stick or foul air-flow meter body at any point. Replace air-flow meter if necessary.</td>
</tr>
<tr>
<td>Engine cuts out</td>
<td>31 Lack of fuel</td>
<td>31 Check fuel level. Add fuel if required.</td>
</tr>
<tr>
<td></td>
<td>32 Check items 5, 8</td>
<td>32 Check in order shown. If problem persists, continue to item 33.</td>
</tr>
<tr>
<td></td>
<td>33 Check item 6</td>
<td>33 Examine all connections for signs of looseness or dirt. Remake as necessary. Flex all ignition L.T. cables to check for broken conductors, bad crimps or shorts to earth.</td>
</tr>
<tr>
<td></td>
<td>34 Check item 7</td>
<td>34 During testing, flex appropriate cables and connectors to check for intermittent contacts, broken conductors, bad crimps or short-circuits.</td>
</tr>
<tr>
<td></td>
<td>35 Check items 9, 10</td>
<td>35 Check in order shown. If problem persists, continue to item 36.</td>
</tr>
<tr>
<td></td>
<td>36 Check item 12</td>
<td>36 As noted in item 12, fuel pressure during cranking should be approximately 36 lbf/in² or 2.5 bar. This pressure should also be shown when the engine is running at full throttle.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine cuts out, continued</td>
<td>37 Check items 29, 17, 18</td>
<td>37 Check in order shown.</td>
</tr>
<tr>
<td>Poor or erratic idle, Hunting</td>
<td>38 Check items 8, 33, 34, 14</td>
<td>38 Check in order shown. If problem persists, continue with item 39.</td>
</tr>
<tr>
<td></td>
<td>39 Spark plug faults.</td>
<td>39 Check spark plugs for gap and condition. Check ceramic for cracks. Renew as necessary. Check that H.T. leads make good connections onto spark plugs.</td>
</tr>
<tr>
<td></td>
<td>40 Ignition system deterioration</td>
<td>40 Use suitable diagnostic equipment to ensure that adequate spark plug voltages are being generated. If not, diagnose faults and rectify.</td>
</tr>
<tr>
<td></td>
<td>41 Check items 4, 10, 36</td>
<td>41 Check in order shown. If problem persists, continue to item 42.</td>
</tr>
<tr>
<td></td>
<td>42 Incorrect idle speed</td>
<td>42 Adjust to specified speed using bypass screw on throttle body.</td>
</tr>
<tr>
<td></td>
<td>43 Engine oil filter cap loose or leaking</td>
<td>43 Check, and rectify if necessary.</td>
</tr>
<tr>
<td></td>
<td>44 Engine breather hoses leaking</td>
<td>44 Check, and rectify if necessary.</td>
</tr>
<tr>
<td></td>
<td>45 Engine breather restrictors missing or blocked</td>
<td>45 Check, and rectify if necessary.</td>
</tr>
<tr>
<td></td>
<td>46 E.G.R. valve open</td>
<td>46 Check that valve is not stuck open. Check that valve opens when a depression is applied to the vacuum control pipe. Check that control pipe is connected to correct throttle edge tapping.</td>
</tr>
<tr>
<td>SYMPTOM</td>
<td>POSSIBLE CAUSE</td>
<td>PROCEDURE</td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Poor or erratic idle. Hunting—continued</td>
<td>47 Charcoal canister or hoses restricted or blocked</td>
<td>47 Check, and rectify if necessary.</td>
</tr>
<tr>
<td></td>
<td>48 Charcoal canister filled with fuel</td>
<td>48 Purge or replace canister. Investigate why fuel drawn into canister.</td>
</tr>
<tr>
<td></td>
<td>49 Poor cylinder compression(s)</td>
<td>49 Check compression, and rectify as necessary.</td>
</tr>
<tr>
<td></td>
<td>50 Air leaks at exhaust manifold or down-pipes</td>
<td>50 Check for leaks, and rectify as necessary. <strong>NOTE:</strong> Air drawn into a leaky exhaust system will be sensed by the oxygen (lambda) sensors and seriously affect engine fueling.</td>
</tr>
<tr>
<td></td>
<td>51 Check items 29, 17, 18</td>
<td>51 Check in order shown. When fault is cured, continue to item 52.</td>
</tr>
<tr>
<td></td>
<td>52 Check and set engine fuelling</td>
<td>52 Check and set fueling to specification by means of exhaust manifold gas sampling or electronic fuel setting indicator.</td>
</tr>
<tr>
<td>Hesitation or flat spot</td>
<td>53 Check items 8, 6, 7, 14, 39, 40</td>
<td>53 Check in order shown. If problem persists, continue with item 54.</td>
</tr>
<tr>
<td></td>
<td>54 Free play in throttle linkage</td>
<td>54 Check and set throttle butterfly and linkage according to specification.</td>
</tr>
<tr>
<td></td>
<td>55 Throttle potentiometer loose or wrongly set</td>
<td>55 Check that throttle potentiometer is a good fit onto the throttle spindle with no free play. Reset the potentiometer using the Lucas Throttle Potentiometer Setting Unit only. Use of other instruments can cause damage to the potentiometer.</td>
</tr>
<tr>
<td></td>
<td>56 Faulty throttle potentiometer</td>
<td>56 Check potentiometer by substitution. Reset the new unit as in 55 above.</td>
</tr>
<tr>
<td></td>
<td>57 Distributor vacuum capsule operation faulty.</td>
<td>57 Check connection of vacuum pipe to capsule and correct throttle edge tapping. Check capsule operation. Rectify as necessary.</td>
</tr>
<tr>
<td></td>
<td>58 Distributor auto-advance mechanism faulty.</td>
<td>58 Check that mechanism is operating correctly. Lubricate or renew as necessary.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hesitation or flat spot—continued</td>
<td>59 Check items 4, 10 36</td>
<td>59 Check in order shown. If problem persists, continue to item 60.</td>
</tr>
<tr>
<td></td>
<td>60 Brakes and clutch</td>
<td>60 Check for binding brakes or slipping clutch.</td>
</tr>
<tr>
<td></td>
<td>61 Check items 43, 44, 45, 46, 47, 48, 49, 50, 29, 17, 18</td>
<td>61 Check in order shown. When fault is cured, set fueling as in item 52.</td>
</tr>
<tr>
<td>Excessive fuel consumption</td>
<td>62 Leaking fuel</td>
<td>62 Check fuel system for leaks. Rectify and renew parts as necessary. To pressurize fuel system run pump as in item 11a.</td>
</tr>
<tr>
<td></td>
<td>63 Check items 8, 6, 7, 14, 57, 58, 36, 60, 49, 50</td>
<td>63 Check in order shown. If problem persists, continue to item 64.</td>
</tr>
<tr>
<td></td>
<td>64 Engine running cold</td>
<td>64 Check that thermostat is not stuck open, and is operating at the specified temperature. Check that electric radiator fans are cutting-in at the specified temperatures.</td>
</tr>
<tr>
<td></td>
<td>65 Exhaust system restricted</td>
<td>65 Check, and renew as necessary.</td>
</tr>
<tr>
<td></td>
<td>66 Oxygen sensor cables short-circuit internally or short-circuit to earth</td>
<td>66 Connect electronic Fuel Setting Indicator to vehicle as described in engine fuel setting procedure. Disconnect both oxygen sensors from the screened cables at the connector in the engine compartment. With the ignition on, the Fuel Setting Indicator should show correctly set display. If the display shows an incorrect fuel setting, investigate for short-circuits within screened cables or to earth.</td>
</tr>
<tr>
<td></td>
<td>67 Faulty oxygen sensors</td>
<td>67 Faulty oxygen sensors</td>
</tr>
</tbody>
</table>

continued
<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive fuel consumption — continued</td>
<td>Drained and flush tank and fuel system. Change fuel filter. <strong>NOTE</strong>: Catalyst function may also be affected by lead.</td>
<td>Check items 29, 17, 18. When fault is cured, set engine fuelling as in item 52.</td>
</tr>
<tr>
<td>Lack of engine braking or high idle speed</td>
<td>Air leaks by-passing throttle</td>
<td>Any air leak by-passing the throttle and metered by the air-flow meter will cause high idle speed and reduce engine braking. Check leakage through extra air valve by clamping hose. Check electrical feed to extra air valve using Lucas Epitest. Replace valve if necessary. Check leakage through deceleration valve by clamping hose. Replace valve if necessary. Check that idle speed adjusting screw has not been disturbed.</td>
</tr>
<tr>
<td>Engine misfires or runs roughly</td>
<td></td>
<td>If it is suspected that the cable harness may be faulty or may have been tampered with, check that the right and left oxygen sensor signals are connected to the designated terminals in the E.C.U. multi-way connector. Reversal of the sensor signals will cause rich running on one bank of injectors and weak running on the other.</td>
</tr>
<tr>
<td>Fuel smells</td>
<td></td>
<td>If fuel smells are detected, check fuel feed pipe and filter for restriction. Check for low voltage supply to fuel pump.</td>
</tr>
</tbody>
</table>

**NOTE**: The table continues with similar entries for various symptoms and corresponding possible causes and procedures.
<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine runs on</td>
<td>85 E.F.I. relay not shutting down E.F.I. system</td>
<td>85 Check E.F.I. relay by substitution.</td>
</tr>
<tr>
<td></td>
<td>86 Check item 7.</td>
<td>86 Using appropriate settings on Lucas Epitest, investigate why power supply to E.F.I. system is maintained when ignition is switched off.</td>
</tr>
<tr>
<td></td>
<td>87 Check item 13</td>
<td></td>
</tr>
<tr>
<td>Engine knocking or pinking</td>
<td>88 Check items 10, 14, 57, 58, 76, 77, 65</td>
<td>88 Check in order shown.</td>
</tr>
<tr>
<td>Engine running rich</td>
<td>89 Check item 52</td>
<td>89 If engine cannot be set to specification, continue with item 90.</td>
</tr>
<tr>
<td></td>
<td>90 Check items 8, 6, 17, 14, 39, 40, 36, 13, 42, 43, 44, 45, 46, 47, 48, 49, 50, 66, 67, 29</td>
<td>90 Check in order shown. If fault persists, continue to item 91.</td>
</tr>
<tr>
<td></td>
<td>91 Faulty air-flow meter</td>
<td>91 Check air-flow meter by substitution.</td>
</tr>
<tr>
<td></td>
<td>92 Check items 17, 18</td>
<td>92 Check in order shown. When fault is cured, set engine fuelling as in item 52.</td>
</tr>
<tr>
<td>Engine running lean</td>
<td>93 Check item 51</td>
<td>93 If engine cannot be set to specification, continue with item 94.</td>
</tr>
<tr>
<td></td>
<td>94 Check items 8, 6, 17, 14, 39, 40, 13, 36, 42, 43, 44, 45, 46, 47, 48, 49, 50, 29, 90, 17, 18</td>
<td>94 Check in order shown. When fault is cured, set engine fuelling as in item 52.</td>
</tr>
<tr>
<td>Backfiring in exhaust</td>
<td>95 Check items 4, 10, 8, 6, 7, 14, 39, 40, 57, 58, 42</td>
<td>95 Check in order shown. If problem persists, continue to item 96</td>
</tr>
<tr>
<td></td>
<td>96 Deceleration valve faulty</td>
<td>96 Check valve by substitution.</td>
</tr>
<tr>
<td></td>
<td>97 Check items 76, 77, 13, 36, 43, 44, 45, 46, 47, 48, 49</td>
<td>97 Check in order shown. If problem persists, continue to item 98.</td>
</tr>
<tr>
<td></td>
<td>98 Exhaust system back pressure wrong.</td>
<td>98 Check that exhaust back pressure is neither too high because of blockage in exhaust system, or too low because of internal damage to silencer or catalyst.</td>
</tr>
<tr>
<td></td>
<td>99 Check items 29, 17, 18</td>
<td>99 Check in order shown.</td>
</tr>
</tbody>
</table>

| SYMPTOM                        | POSSIBLE CAUSE | PROCEDURE                                                                 |
| Excessive fuel pump noise      | 100 Fuel pump or pump hoses fouling vehicle body. | 100 Adjust mounting of pump or hose so that body contact is avoided. |
| Fuel temperature excessive     | 101 Faulty fuel pump | 102 Check pump by substitution. |
| Pump will generate more noise at high fuel temperatures. Add cool fuel or otherwise allow fuel to cool. |
1. Engine coolant temperature sensor
2. Thromotime switch
3. Air meter
4. Air temperature sensor
5. Throttle potentiometer
6. Ignition coil
7. Over-run valve
8. Pipe—over-run valve to constant depression region
9. Auxiliary air valve
10. Pipe—plenum to auxiliary air valve
11. Pipe—auxiliary air valve to constant depression region
**AIR CLEANER**

**Removing**
1. Remove three hoses from the air cleaner case.
2. Remove four nuts/bolts securing the air cleaner to its mounting.
3. Lift the air cleaner assembly clear of the car.

**Refitting**
4. Reverse instructions 1 to 3, ensuring that the air hose connections to the air cleaner case are sound.

**THROTTLE CABLE**

**Removing**
1. Disconnect the battery.
2. Disconnect the cable from the linkage at the engine end.
3. Release the cable from the accelerator pedal.
4. Release the outer cable from the clips in the engine compartment.
5. Feed the cable through the bulkhead grommet in to the engine compartment.

**Refitting**
6. Reverse instructions 1 to 5.
7. Check the throttle operation.

**EXTRA AIR VALVE**

**Removing**
CAUTION: This procedure should only be carried out on a cold or a cool engine.
1. Disconnect the electrical multi-pin plug from the valve.
2. Disconnect two air hoses from the valve.
3. Remove two mounting bolts securing the valve to the inlet manifold.
4. Lift off the valve.

**Refitting**
5. Reverse instructions 1 to 4.

**Test**
1. Remove the electrical connector from the valve.
2. Connect a voltmeter across the terminals of the connector.
3. Crank the engine over; battery voltage should be obtained. If there is no voltage there is a fault in the electrical system and the wires should be checked for leakage and deterioration. When it has been established that power is reaching the valve, the heating coils resistance should be checked.
4. Connect an ohmmeter between the terminals of the air valve. A resistance of 33 ohms should be obtained. If there is no resistance the valve should be replaced.
IDLE SPEED

Adjust 19.20.18

1. Run the engine until it has been working at normal operating temperature for at least two minutes.

NOTE: Before, and every three minutes during, the fuel setting procedure below the engine should be given a clear-out burst by running it at approximately 2000 rev/min on light load for a minimum of 30 seconds to maintain normal operating temperature.

2. Ensure that the engine ignition timing is correct (refer to Section 05, 'Engine Tuning Data') and that the throttle linkage is correctly set.

Idle speed

3. Using a separate proprietary tachometer, connected following the manufacturer’s instructions, or if necessary the vehicle fitted tachometer, check the engine idle speed; refer to Section 05, 'Engine Tuning Data'.

4. If adjustment is necessary, slacken the locknut and turn the idle adjustment bolt (clockwise to decrease speed, anti-clockwise to increase speed). Retighten the locknut.

Idle fuel setting

Two alternative methods may be used depending on the equipment available.

Approved type exhaust gas analyser

5. Insert analyser probe into exhaust system tapping point.

6. Check analyser CO reading which must not exceed that given in Section 05, 'Engine Tuning Data'.

7. If adjustment is necessary follow instructions 13 to 15 below.

8. Remove analyser probe and replace sealing nut.

Approved type fuel setting indicator

9. Connect the instrument to the fuel setting diagnostic connector, located behind the right-hand glovebox.

10. Check the instrument reading, which if correct will show lamp No. 2 in row A or B alight and lamp No. 2 or lamp No. 3 alight in either row A or B.

11. If adjustment is necessary follow instructions 13 to 15 below.

12. Disconnect the instrument.

Idle fuel setting adjustment

13. Remove the blanking plug from the airflow meter to expose the recessed adjustment screw.

14. Turn the adjustment screw until the required reading is obtained.

15. Reseal the adjustment screw as required by local territory legislation.

LAMBDA (OXYGEN) SENSOR

Remove and refit 19.22.16

Removing

1. Disconnect the electrical lead from the sensor.

2. Unscrew the sensor from the exhaust pipe taking care not to strain the exhaust system.

Refitting

3. Lubricate the threads of the sensor and fit it to the exhaust pipe.

4. Reconnect the electrical leads to the sensor.

5. Reset the service interval counter, using the special service tool key.
COOLANT TEMPERATURE SENSOR

Remove and refit 19.22.18

Removing
CAUTION: Before commencing this procedure ensure that the cooling system is depressurized. Remove the cooling system header tank filler cap taking care to avoid scalding; refer to Section 26, 'Cooling System'.

1 Locate the sensor, referring to the illustration and the vehicle wiring diagram.
2 Disconnect the electrical leads from the sensor.
3 Unscrew the sensor from the engine.

Refitting
4 Reverse instructions 2 and 3, ensuring that the sensor is sufficiently tightened to prevent water leaks without overstraining the threads.
5 Check/top-up the cooling system water level.

COOLANT TEMPERATURE SENSOR

Test 19.22.19

1 Disconnect battery.
2 Pull connector from temperature sensor.
3 Connect suitable ohmmeter between terminals; note resistance reading. The reading is subject to change according to temperature, and should closely approximate to the relevant resistance value given in the table.
4 Disconnect ohmmeter.
5 Check resistance between each terminal in turn and body sensor. A very high resistance reading (open-circuit) must be obtained.
6 Re-connect cable.
7 Re-connect battery.

<table>
<thead>
<tr>
<th>Coolant Temperature (°C)</th>
<th>Resistance (kilohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10</td>
<td>9.2</td>
</tr>
<tr>
<td>0</td>
<td>5.9</td>
</tr>
<tr>
<td>+20</td>
<td>2.5</td>
</tr>
<tr>
<td>+40</td>
<td>1.18</td>
</tr>
<tr>
<td>+60</td>
<td>0.60</td>
</tr>
<tr>
<td>+80</td>
<td>0.325</td>
</tr>
</tbody>
</table>

THERMOTIME SWITCH

Remove and refit 16.22.20

Removing
CAUTION: Before commencing this procedure ensure that the cooling system is depressurized. Remove the cooling system header tank filler cap taking care to avoid scalding; refer to Section 26, 'Cooling System'.

1 Locate the switch, referring to the illustration and the vehicle wiring diagram.
2 Disconnect the electrical leads from the switch.
3 Unscrew the switch from the engine.

Refitting
4 Reverse instructions 2 and 3, ensuring that the switch is sufficiently tightened to prevent water leaks without overstraining the threads.
5 Check/top-up the cooling system water level.

THERMOTIME SWITCH

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).

1 Disconnect battery earth lead.
2 Pull electrical connector from Thermotime switch.

'A' coolant temperature higher than switch rated value
3 Connect ohmmeter between terminal 'W' and earth. A very high resistance reading (open circuit) should be obtained.
4 Renew switch if a very low resistance reading (short-circuit) is obtained.

'B' coolant temperature lower than switch rated value
5 Connect ohmmeter between terminal 'W' and earth. A very low resistance reading (closed circuit) should be obtained.
6 Connect 12V supply via isolating switch to terminal 'G' of Thermotime switch.
7 Using stop-watch, check time delay between making isolating switch and indication on ohmmeter changing from low to high resistance. Delay period must closely approximate to time indicated in table, see table for specific coolant temperature (noted above).
8 Renew Thermotime switch if necessary.
9 Re-connect Thermotime switch.
10 Reconnect battery earth lead.

<table>
<thead>
<tr>
<th>Coolant Temperature (°C)</th>
<th>Delay (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20°C</td>
<td>8 sec.</td>
</tr>
<tr>
<td>0°C</td>
<td>4/5 sec.</td>
</tr>
<tr>
<td>+10°C</td>
<td>3/5 sec.</td>
</tr>
<tr>
<td>+35°C</td>
<td>0</td>
</tr>
</tbody>
</table>
AIR TEMPERATURE SENSOR
Remove and refit 19.22.22
The air temperature sensor is integral with the air-flow meter and as such cannot be replaced as a separate item.

AIR TEMPERATURE SENSOR
Test 19.22.23
1 Disconnect the battery.
2 Remove the multi-pin electrical connector from air-flow meter.
3 Connect a suitable ohmmeter between terminals 6 and 27 or the air-flow meter.

<table>
<thead>
<tr>
<th>Ambient Air Temperature (°C)</th>
<th>Resistance (kilohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10</td>
<td>9.2</td>
</tr>
<tr>
<td>0</td>
<td>5.9</td>
</tr>
<tr>
<td>+20</td>
<td>2.5</td>
</tr>
<tr>
<td>+40</td>
<td>1.18</td>
</tr>
<tr>
<td>+60</td>
<td>0.66</td>
</tr>
</tbody>
</table>

4 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.
5 Disconnect the ohmmeter.
6 Re-connect the multi-pin connector.
7 Re-connect the battery.

POWER AMPLIFIER
Remove and refit 19.22.23
Removing
1 Disconnect the electrical multi-pin plug from the unit.
2 Remove the bolts and lift off the unit.
Refitting
3 Reverse instructions 1 and 2.

ELECTRONIC CONTROL UNIT (E.C.U.)
Remove and refit 19.22.34
Removing
1 Locate the E.C.U. below the passenger glovebox inside the car and remove the cover (if fitted).
2 Peel back the passenger footwell carpet for access.
3 Disconnect the electrical multi-pin plug from the E.C.U.
4 Remove three bolts securing the E.C.U. and lower it into the footwell.
Refitting
5 Reverse instructions 1 to 4

THROTTLE SWITCH
c
Remove and refit 19.22.36
Removing
1 Disconnect the extra air valve pipes for access.
2 Disconnect the electrical multi-pin plug from the switch.
3 Remove two screws securing the switch to the plenum chamber.
4 Carefully remove the switch outwards off the throttle spindle.
Refitting
5 Reverse instructions 1 to 4, noting that the switch locates on a machined flat on the throttle spindle.

ELECTRONIC FUEL INJECTION RELAY
Remove and refit 19.22.38
Removing
1 Disconnect the battery.
2 Lower or remove the passenger glovebox, see 76.52.03.
3 Locate the relay mounted on the body behind the glovebox.
4 Remove the electrical connections from the relay.
5 Remove one bolt securing the relay to the body and manoeuvre the relay clear of the car.
Refitting
6 Reverse instructions 1 to 5.
PLENUM CHAMBER
Remove and refit 19.22.46

Removing
NOTE: If a water-heated plenum chamber is not fitted, instructions 1, 2 and 11 should be ignored.
1 Drain the cooling system, see 26.10.01.
2 Disconnect the cooling system water pipes from the plenum chamber.
3 Release the piping and cables from around the plenum chamber.
4 Disconnect the engine breather pipe from the plenum chamber.
5 Release the clip and withdraw the air meter air hose from the plenum chamber.
6 Disconnect the electrical multi-pin plugs to the throttle switch and the cold start injector.
7 By removing a single nut, disconnect the throttle lever from the linkage at the plenum chamber.
8 Remove eight bolts and lift off the plenum chamber.
9 Remove ancillary equipment fitted to the plenum chamber as required.

Refitting
10 Reverse instruction 2 to 9, ensuring that all mating surfaces are clean.
11 Refill the cooling system, see 26.10.01.

FUEL SYSTEM
WARNING: The fuel in the system is pressurized by the fuel pump to approximately 2.5 kgf/cm² (36 lb/in²) whilst the engine is running and experience has shown that this pressure has a very slow decay rate. Therefore it is essential to depressurize the fuel system, following the procedure under 19.50.02, before disconnecting any component in the system.

WARNING: During all operations connected with the fuel system make provision to minimize any risk of fire or explosion.

FUEL LINE FILTER(S)
Remove and refit 19.25.03
NOTE: A single filter or twin filters may be fitted and later vehicles have a protective shield over the filter(s).

Removing
1 Depressurize the fuel system, see 19.50.02.
2 Locate the filter(s) on the right-hand underside of the body, forward of the rear axle, just below the fuel pump.
3 Where fitted, remove four screws and lift off the filter cover.
4 Disconnect the input fuel pipe(s) and plug them to prevent fuel loss.
5 Disconnect the output fuel pipe(s) and plug them to prevent fuel loss.
6 Remove the filter retaining clamp bolt and nut and manoeuvre the filter(s) off the car.

Refitting
7 Reverse instructions 2 to 6.

FUEL PIPES
Petrol pipe main line — engine end section
Remove and refit 19.40.02
Petrol pipe main line — tank end section
Remove and refit 19.40.04
Petrol pipe — fuel return valve to petrol tank
Remove and refit 19.40.54

FUEL PUMP
Remove and refit 19.45.08

Removing
1 Depressurize the fuel system, see 19.50.02.
2 Locate the fuel pump on the right-hand underside of the body, forward of the rear axle.
3 Disconnect the electrical leads to the fuel pump.
4 Clamp the input fuel pipe to the pump to prevent the fuel tank draining when it is disconnected. Disconnect the pipe.
5 Disconnect the output fuel pipe from the pump and plug it to prevent fuel loss.
6 Remove the single bolt and nut securing the clamping bracket.
7 Manoeuvre the pump from the car.

Refitting
8 Reverse instructions 2 to 7.
FUEL PRESSURE REGULATOR

Removing
1. Depressurize fuel system, see 19.50.02.
2. Disconnect battery.
3. Remove one bolt and washers securing pressure regulator mounting bracket and carefully pull regulator and bracket upwards. Note orientation of regulator in bracket.
4. Clamp inlet and outlet pipes of regulator.
5. Release pipe clips and pull pipes from regulator unions.
6. Remove nut and washer and release regulator from bracket.

Refitting
7. Locate regulator in bracket orientated as noted in operation 3 and secure using nut and spring washer.
8. Push inlet and outlet pipes on to regulator and secure pipe clips ensuring that pipes are not kinked or twisted.
9. Remove pipe clamps.
10. Carefully press regulator and bracket into position and secure with one bolt and washers.
11. Re-connect battery.

Test
1. Depressurize fuel system, see 19.50.02.
2. Slacken pipe clip securing cold start injector supply pipe to fuel rail and pull pipe from rail.
3. Connect pressure gauge pipe to fuel rail and tighten pipe clip.
   CAUTION: Pressure gauge must be checked against an approved standard at regular intervals.
4. Pull —ve L.T. lead from 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 slowly drop through either the regulator valve seating or the pump non-return valve. A slow steady drop is permissible; a rapid fall MUST be investigated.
   If satisfactory results have been obtained, depressurize fuel system and continue with operations 5 to 9. If satisfactory results have not been obtained replace the regulator with a new unit.
5. Slacken pipe clip and remove pressure gauge from fuel rail.
6. Re-connect cold start injector supply pipe and secure pipe clip.
7. Re-connect the —ve L.T. lead to ignition coil.
8. Switch ignition on and check for leaks.
9. Switch ignition off.

Depressurize
1. The fuel system MUST always be depressurized before disconnecting any fuel system components.
2. Remove the fuel pump earth lead.
3. Switch on and crank engine for a few seconds.
4. Switch the ignition off and re-connect the pump to earth.

Pressure test see operation 19.45.12.

ALTERNATIVELY: The fuel cut-off inertia switch may be used to disconnect the fuel pump before cranking the engine.

CAUTION: The fuel system MUST always be depressurized before disconnecting any fuel system components.

FUEL SYSTEM

FUEL TANK

Remove and refit
19.50.02
Follow the instructions for carburetted fitted vehicles, operation 19.55.01, noting that the fuel return pipe from the pressure regulator must additionally be disconnected and reconnected to the fuel tank.
 Injector winding check

1 Use ohmmeter to measure resistance value of each injector winding which should be 2.4 ohms at 20°C (68°F).

2 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 Rails

Right hand bank
Remove and refit
19.60.04

Left hand bank
Remove and refit
19.60.05

Removing
1 Depressurize the fuel system, see 19.50.02.
2 Remove the plenum chamber, see 19.22.46.
3 Release the fuel input pipe — right hand rail, from main fuel line — left hand rail, feed pipe from right hand rail.
4 Disconnect the injectors from the fuel rail.
5 Lift the rail clear of the car.

Refitting
6 Reverse instructions 2 to 5.

Cold start injector
Remove and refit
19.60.06

Removing
1 Depressurize the fuel system, see 19.50.02.
2 Locate the injector at the rear of the plenum chamber.
3 Disconnect the electrical leads from the injector.
4 Unscrew the injector from the plenum chamber.

Refitting
5 Reverse instructions 2 to 4.

Left hand bank
Remove and refit
19.60.10

Right hand bank
Remove and refit
19.60.11

Removing
1 Remove the fuel rail, see 19.60.04/05.
2 Disconnect the electrical leads to the injector.
3 Unscrew the injector from the manifold.

Refitting
4 Reverse instructions 1 to 3, fitting a new injector seal.

Fuel feed pipe from fuel tank
3 Fuel rail
6 Manifold depression to pressure regulator pipe
7 Excess fuel return to tank from pressure regulator
8 Injectors
9 Cold start injector fuel feed pipe
10 Cold start injector
Carburettor engine cooling systems vary through the fitting of either an expansion tank (earlier models) or a header tank (later models) and the drain, fill and top-up procedures are affected.

Fuel injection engine cooling systems have a header tank only and may have fitted a water heating facility for the plenum chamber.

**Carburettter Engine Cooling Systems**

1. Top hose
2. Bottom hose
3. Radiator
4. Water pump
5. Heater return
6. Overflow bottle
7. Auto choke heaters
8. Steam bleed pipe
9. Thermostat
10. Thermostat by-pass
11. Engine driven fan
12. Heater input and return pipes

**Fuel Injection Engine Cooling Systems**

1. Top hose
2. Bottom hose
3. Radiator
4. Water pump
5. Heater return
6. Overflow bottle
7. Auto choke heaters
8. Steam bleed pipe
9. Thermostat
10. Thermostat by-pass
11. Air conditioning condenser
12. Cooling fans (electric)
13. Heater input and return pipes
1. Top hose
2. Bottom hose
3. Radiator
4. Water pump
5. Heater return
6. Overflow bottle
7. Steam bleed
8. Thermostat
9. Thermostat by-pass
10. Engine-driven cooling fan
11. Heater input
12. Hose—expansion tank to manifold

1. Top hose
2. Bottom hose
3. Radiator
4. Water pump
5. Heater return
6. Overflow bottle
7. Steam bleed
8. Thermostat
9. Thermostat by-pass
10. Air conditioning condenser
11. Cooling fans (electric)
12. Heater input
13. Hose—expansion tank to manifold
COOLING SYSTEM WITH EXPANSION TANK

COOLANT

Drain and refill 26.10.01

WARNING: This operation must only be carried out when the engine is cold.

Draining

1. Disconnect the battery.
2. Remove the expansion tank cap.
3. Move the heater control to the 'HOT' position.
4. Raise the car on axle stands to gain access to the cylinder block drain taps from underneath the car.
5. Place a suitable tray below the engine and radiator to catch the coolant.
6. Fit a length of tube to the L.H. and R.H. cylinder block drain taps to allow the coolant to drain freely.
7. Turn the cylinder block drain taps anti-clockwise.
8. Disconnect the bottom hose from the radiator.
9. Allow the coolant to drain completely and remove the tray.

Refilling

10. Close the cylinder block drain taps.
11. Connect the bottom hose to the radiator.
12. Remove the car from axle stands.
13. Remove filler plug from thermostat housing.
14. Fit the expansion tank cap.
15. Place suitable receptacles below the cylinder block drain taps and the radiator bottom hose.
16. Fit the filler plug.
17. Remove pressure cap but do not add coolant to tank.
18. Connect the battery.
19. Run the engine at fast idle, approximately 1,500 rev/min, until the radiator top hose is warm; this indicates that the thermostat is open.
20. Remove filler plug, top-up and refit plug.
21. Top-up expansion tank to half-full and fit pressure cap.

COOLING SYSTEM WITH HEADER TANK

COOLANT

Drain and refill 26.10.01

WARNING: This operation should only be carried out when the engine is cool.

Draining

1. Remove the header tank filler cap.
2. Remove the cooling system filler plug.
3. Place suitable receptacles below the cylinder block drain taps and the radiator bottom hose.
4. Open the cylinder block drain taps.
5. Release the bottom hose from the radiator.

Refilling

6. Close the cylinder block drain taps.
7. Connect the bottom hose to the radiator.
8. Fill the system through the header tank until the level is 35 mm (1.5 in) below the neck of the header tank.
9. Release the hose clip on the auto-choke body of the right-hand carburettor (carburettor cars only).
10. Start the engine.
11. Re-tighten the hose clip as soon as water issues from this connection.
12. Run the engine at approximately 1,500 rev/min until the temperature rises sufficiently to open the thermostat (approximately two minutes).
13. Stop the engine. Top-up the coolant level in the header tank to the base of the filler neck and refit the pressure cap.

CAUTION: When it is necessary to remove the pressure/filler cap from a hot engine, exercise great care by protecting the hands against escaping steam. Slowly turn the pressure cap anti-clockwise until resistance of the safety stop is felt. Leave the cap in this position until all pressure is released. Press the cap downwards against the spring to clear the safety stops, and continue turning until it can be lifted off.
**EXPANSION TANK**

Remove and refit 26.15.01

Removing
WARNING: This operation must only be carried out when the engine is cold.

1. Disconnect the expansion pipe from the thermostat housing.
2. Remove the expansion tank pressure cap and allow the coolant to drain into a suitable clean container.
3. Remove the expansion pipe from the expansion tank.
4. Slacken the expansion tank retaining clamp nut and bolt.
5. Withdraw the expansion tank.
6. Remove the overflow pipe from the tank.

Refitting
7. Fit the tank into the clamp and secure.
8. Refit the overflow pipe.
9. Fit the expansion pipe to the tank and thermostat housing.
10. Half fill the expansion tank with the correct mixture of anti-freeze and water.
11. Refit the pressure cap.

**HEADER TANK**

Remove and refit 26.15.01

Removing
WARNING: This operation must only be carried out when the engine is cold.

1. Disconnect the expansion pipe from the thermostat housing.
2. Remove the header tank pressure cap and allow the coolant to drain into a suitable container.
3. Remove the pipes from the header tank noting their position for refitting.
4. Remove the header tank retaining bolt and nut (noting the position of the pipe clip on carburettor models).
5. Remove the tank.

Refitting
6. Fit the tank into the clamp and secure.
7. Refit the pipes to the tank.
8. Refill the cooling system, see 26.10.01.

**FAN BELT**

Remove and refit 26.15.01

Removing

1. Slacken the two alternator pivot nuts and bolts.
2. Slacken the link pivot bolt.
3. Slacken the adjustment link clamp bolt.
4. Move the alternator towards the engine and slip the belt from the pulleys.

Refitting
5. Reverse instructions 1 to 4 ensuring that the belt is correctly tensioned, see 86.10.05.

**WATER PUMP PULLEY**

Remove and refit 26.25.03

Removing
1. Remove the alternator drive belt, see 86.10.03.
2. Slacken the three bolts securing the water pump pulley to the spindle.
3. Slacken the air pump pivot bolt.
4. Release the air pump drive belt tension.
5. Remove the water pump pulley retaining bolts.
6. Remove the pulley and air pump drive belt.

Refitting
7. Encircle the water pump pulley with the air pump drive belt.
8. Fit the pulley and secure with the three bolts.
9. Fit belt to air pump pulley and tension, see 17.25.13.
10. Fit the alternator drive belt, see 86.10.03.
FAN BLADES (Non air conditioning) 26.25.06

Removing
1. Disconnect the battery.
2. Raise the front of car and lower onto axle stands.
3. Slacken the four bolts retaining the radiator support cross-member.
4. Remove the four nuts and bolts securing the fan blades to the viscous coupling.
5. Move the radiator forward and withdraw the fan blades.

Refitting
6. Reverse instructions 1 to 5.

FAN BLADES (Air conditioning models) 26.25.06

Air conditioning models are fitted with two electrically driven fans mounted behind the radiator.

Removing
1. Remove the fan blades, see 26.25.06.
2. Remove the three socket-headed bolts retaining the fan shaft to the pulley.
3. Move the radiator assembly forward.
4. Remove the viscous coupling complete with fan shaft.
5. Remove the viscous coupling retaining bolt/nut.
6. Withdraw the coupling from the fan shaft.

Refitting
7. Reverse instructions 1 to 6.

FAN MOTOR MOUNTING FRAME ASSEMBLY 26.25.30

Removing
1. Drive the car onto a ramp and disconnect the battery.
2. Remove the ignition coil, see 86.35.32.
3. Remove the ballast resistor, see 86.35.33.
4. Remove the underbelly panel, see 76.10.38.
5. Remove the millboard mud shield on both sides of the radiator.
6. Remove the radiator, see 26.40.01.
7. Disconnect the electrical supply to the motors at the multi-pin connector.
8. Release wires from clip on fan frame.
9. Remove top bolt retaining framework, see 26.40.01, instruction 8.
10. Raise the ramp, and with assistance, lower and remove the fans and frame assembly.

Refitting
11. Fit grommets to the framework.
12. Fit seals to framework.
13. Working below the car, and with assistance, offer up the frame assembly and locate in position.
14. Fit the top bolt to hold framework, see instruction 9.
15. Fit the radiator.
16. Reverse instructions 7 and 8.
17. Reverse instructions 1 to 5.
RADIATOR TOP HOSES
Remove and refit 26.30.01

Removing
WARNING: This operation must only be carried out when the engine is cold or cool.
1 Disconnect the battery.
2 Partially drain the radiator.
3 Disconnect and remove the two top hoses.

Refitting
4 Fit the two hoses and tighten the clips.
5 Top-up the cooling system, see pages 10 and 11, with the correct mixture of antifreeze.
6 Reconnect the battery.
7 Check for leaks after the engine has been run and attained normal operating temperature.

RADIATOR BOTTOM HOSE
Remove and refit 26.30.07

Removing
WARNING: This operation must only be carried out when the engine is cold or cool.
1 Disconnect the battery.
2 Place a suitable container below the hose connection to the radiator, disconnect the hose from the radiator and allow the coolant to drain.
3 Disconnect and remove the hose from the water pump cover connection.

Refitting
4 Place the hose clips over the hose and fit the hose to the pump and radiator. Tighten the clips.
5 Connect the battery.
6 Refill the cooling system, see 26.10.01.

RADIATOR (Non air conditioning model)
Remove and refit 26.40.01

Removing
1 Drive the car onto a ramp and disconnect the battery.
2 Drain the cooling system, see 26.10.01.
3 Disconnect top hose from radiator.
4 Disconnect by-pass hose from radiator.
5 Remove the four bolts securing the radiator support bracket.
6 Remove the support bracket.
7 Withdraw the radiator and mounting rubbers from the car.

Refitting
8 Fit the mounting rubbers to the radiator.
9 Offer up radiator to car and align mounting rubbers to body locations.
10 Fit radiator support bracket, ensuring that the mounting rubbers locate properly.
11 Reverse instructions 1 to 4.

RADIATOR (Air conditioning model)
Remove and refit 26.40.01

Removing
1 Drive the car onto a ramp.
2 Disconnect battery.
3 Remove the millboard mud shield from both sides of the radiator.
4 Raise ramp, and using a long screwdriver, release the left- and right-hand top hose clips.
5 Drain the cooling system, see 26.10.01.
6 Lower the ramp and disconnect the top hoses from the radiator.
7 Disconnect the electrical plug from the fan switch on the left-hand side of the radiator.
8 Slacken the four nuts and bolts securing the fan frame assembly to the bonnet hinge panel and remove all but the extreme right-hand nut and bolt.
9 Raise the ramp and remove the underbelly panel, see 76.10.38.
10 Remove the two bolts securing the fan frame assembly to the radiator support cross-member.
11 Remove the four bolts (two each side) securing the air conditioning condenser to the chassis and ease the condenser forward away from the radiator.
12 Remove the four bolts (two each side) securing the radiator support cross-member to the chassis and remove the cross-member and two rubbers.
13 Withdraw the radiator downwards.

Refitting
14 Reverse instructions 1 to 13.


**THERMOSTAT**

Remove and refit 26.45.01

WARNING: This operation must only be carried out when the engine is cold.

Removing
1. Disconnect the battery.
2. Drain the radiator only by disconnecting the radiator bottom hose.
3. Disconnect the radiator top hose from the thermostat housing.
4. Remove the two bolts securing the thermostat housing cover to the induction manifold and move the cover aside.
5. Remove the thermostat.
6. Remove the joint.

Refitting
7. Clean the induction manifold and thermostat housing cover mating faces.
8. Fit the thermostat with the jiggle pin uppermost at 12 o'clock.
10. Fit the cover and retain with the two bolts, tightening evenly.
11. Connect the bottom hose and fill the radiator.

Test 26.45.09
1. Remove the thermostat, see 26.45.01.
2. Note the temperature stamped on the thermostat at which it should be fully open.
3. Place the thermostat and a Centigrade thermometer in a laboratory beaker half full of water.
4. Heat the water and observe the temperature at which the thermostat opens.
5. Refit, or renew the thermostat as necessary, see 26.45.01.

**WATER PUMP**

Remove and refit 26.50.01

Removing
1. Drive the car onto a ramp and disconnect the battery.
2. Drain the cooling system, see 26.10.01.
3. Lower the ramp and release the hose clip securing the hose to the water pump.
4. Raise the ramp, and using a long lever, prise off the hose from the water pump.
5. Disconnect the heater return hose from the water pump.
6. Disconnect the left-hand top hose from the thermostat housing.
7. Remove the four bolts common to the water pump and timing cover.
8. Remove the six water pump retaining bolts and move the air pump drive belt adjusting strap aside.
9. Remove the water pump.
10. Remove the gasket.

Refitting
11. Clean the water pump and timing cover mating faces.
12. Lightly grease a new gasket and place in position on timing cover.
13. Clean the threads of the four long bolts and smear with 3M EC 776 thread lubricant-sealant.
14. Check that the two dowels are free from burrs.
15. Locate the water pump in position on the two dowels.
16. Fit the retaining bolts in the positions illustrated.
17. Tighten the bolts evenly.
18. Reverse instructions 1 to 6.
EXHAUST SYSTEM
DESCRIPTION 30.00.00

Exhaust systems fitted to this model range may vary in detail according to model year, market and the type of fuel system fitted. The general views shown are for guidance only and whilst the operation instructions in this section are generally applicable, allowance should be made for these inter-model variations.

EXHAUST SYSTEM -- CARBURETTER ENGINES -- U.S.A. FEDERAL MARKETS

EXHAUST SYSTEM -- CARBURETTER ENGINES -- U.S.A. CALIFORNIA MARKET

EXHAUST SYSTEM -- FUEL INJECTION SYSTEM ENGINES
EXHAUST SYSTEM COMPLETE—LESS CATALYSTS

Remove and refit 30.10.01

Removing
1. Raise car on ramp.
2. Remove the grass shields, see 30.10.36.
3. Remove the tail pipes, see 30.10.22.
4. Remove bolts securing intermediate pipes to the support bracket attached to gearbox and fuel injection only, disconnect the lambda sensors.
5. Remove the flange nuts and bolts retaining the intermediate pipes to the catalysts.
6. Tap the flanges to break the seal and remove the olives.
7. Remove the intermediate pipes and silencer assembly, and heat shields.
8. Separate, if required, the intermediate pipes from the silencer assembly and the left-hand silencer from the right-hand one.

Refitting
9. Reverse instruction 8 if necessary.
10. Clean the sealing olives and mating faces.
11. With assistance, offer up the intermediate pipe and silencer assembly.
12. Fit olives and loosely fit the flange nuts and bolts.
13. Secure the intermediate pipes to the support bracket (attached to the gearbox) with the two bolts.
14. Tighten the flange nuts and bolts.
15. Position the intermediate pipe heat shields.
16. Fuel injection only: Reconnect the lambda sensors.
17. Fit the tail pipes, see 30.10.22.
18. Fit the grass shields, see 30.10.36.
INTERMEDIATE EXHAUST PIPE
—L.H. or R.H.

Remove and refit 30.10.11

Removing
1. Raise car on ramp and remove grass shield, see 30.10.36.
2. Remove the bolts, both sides, securing the pipe to the support bracket attached to the gearbox.
3. Remove the nuts and bolts, both sides, securing the tail-pipes to the support brackets.

NOTE: The following two instructions, 4 and 5, concern Californian specification cars only.
4. Remove the catalyst lower clamp bolt and nut.
5. Remove the clamp distance tube and slide the clamp upwards.
6. Slacken the nuts retaining the down-pipe flange to manifold.
7. Remove the three nuts and bolts connecting the catalyst to the intermediate pipe and top the flanges to break the seal.
8. Separate the catalyst from the intermediate pipe and remove the sealing olive.
9. Slacken clamp securing intermediate pipe to silencer assembly and slide clamp away.
10. Remove intermediate pipe heat shield.
11. Lever intermediate pipe away from silencer and remove pipe.
12. Remove the 'U' bolts nuts and clamps from pipe.

Refitting
13. Fit 'U' bolts and clamps to intermediate pipe.
14. Smear grease on pipe ends to assist assembly.
15. Fit clamp to silencer assembly and fit the intermediate pipe.
16. Fit heat shield.
17. Fit sealing olive.
18. Fit intermediate pipe to catalyst but leave nuts and bolts slack.
19. Tighten manifold flange nuts.
20. Tighten catalyst to intermediate pipe flange nuts and bolts and locknuts.
21. Slide catalyst bottom clamp into position and fit distance tube. Fit and tighten nut and bolt.
22. Tighten intermediate pipe to silencer clamp.
23. Fit and tighten the tail pipe support bracket nuts and bolts.
24. Fit and tighten the bolts securing intermediate pipe to support bracket.
25. Fit grass shield, see 30.10.36.

INTERMEDIATE TWIN SILENCER ASSEMBLY

Remove and refit 30.10.14

Removing
1. Drive car onto ramp.
2. Remove the mounting rubbers supporting both tail pipes.
3. Remove the tail pipe support bracket nuts and bolts.
4. Release both tail pipe to silencer clips.
5. Disconnect the tail pipes and move them well clear of the intermediate silencer assembly.
6. Release the clips securing the silencer assembly to the intermediate pipes.
7. Remove the intermediate silencer assembly from the intermediate pipes.
8. Release the clips holding the silencer assembly together.
9. Separate the two silencers.

Refitting
10. Assemble the two silencers with the clip.
11. Fit pipe clips to intermediate pipes and fit the silencer assembly and tighten the clips.
12. Fit clips to rear of silencer assembly and fit the tail pipes and tighten clips.
13. Fit and tighten tail pipe bracket support nuts and bolts.
14. Fit tail pipe rubber mounting rings.
15. Lower the ramp.

TAIL PIPE AND SILENCER—L.H. or R.H.

Remove and refit 30.10.22

Removing
1. Drive car onto ramp and raise.
2. Remove silencer clamp nuts and washers.
3. Remove the tail pipe support bracket nuts and bolts.
4. Slacken the clip retaining the tail pipe assembly to the intermediate silencer assembly.
5. Remove the tail pipe and silencer from the exhaust system.
6. Remove the retaining clip.

Refitting
7. Reverse instructions 1 to 6.
HEAT SHIELD–INTERMEDIATE PIPE–L.H. or R.H.

Remove and refit 30.10.32

Removing
1. Raise car on ramp.
2. Remove the grass shields from the appropriate side, see 30.10.36.
3. Remove, from both sides, the bolts securing the intermediate pipes to the support bracket (attached to the gearbox).
4. Remove, from both sides, the nuts and bolts securing the tail pipes to the support bracket.
5. Remove the catalyst lower clamp nut and bolt and distance tube.
6. Slide the clamp upwards.
7. Remove the nuts securing the down-pipe and catalyst assembly to the manifold flange.
8. Pull the assembly downwards until the flange is clear of studs.
9. Rotate the intermediate pipe heat shield clockwise and remove from system.

Refitting
11. Fit the manifold flange gasket to studs.
12. Fit down-pipe and catalyst assembly to manifold and secure with the nuts and washers.
13. Slide catalyst clamp to correct position, fit distance tube and tighten nut and bolt.
14. Fit and tighten tail pipe support bracket nuts and bolts.
15. Fit intermediate pipes to support bracket and tighten bolts.
16. Fit the grass shields, see 30.10.36.
17. Lower ramp.

EXHAUST GRASS SHIELDS–L.H. or R.H.

Remove and refit 30.10.36

Removing
1. Raise car on ramp.
2. Remove grass shield retaining nuts and bolts.
3. Remove catalyst grass shield side plates.
4. Remove grass shield from catalyst complete with grass shield clamps.
5. Remove grass shield from the intermediate flange.
6. Remove grass shield from intermediate pipe.
7. Remove the intermediate pipe heat shield clamps.

Refitting
8. Fit the intermediate pipe heat shield clamps using small pieces of Sealastrip or similar material to hold them in position.
9. Fit the intermediate pipe grass shield.
10. Fit the intermediate flange grass shield.
11. Fit the catalyst heat shield clamps.
12. Fit the catalyst grass shield side plates.
13. Secure the shields with the nuts, bolts and washers.
14. Lower ramp.
INDUCTION MANIFOLD GASKET — Carburettor Engines

Remove and refit 30.15.08

Removing
1. Drain the cooling system, see 26.10.01.
2. Remove the fresh-air duct.
3. Disconnect the top hose from the thermostat housing.
4. Disconnect the expansion hose from the thermostat housing.
5. Disconnect the hose from the diverter valve.
6. Disconnect brake servo hose from manifold nipple and release from clips.
7. Pull off the plug from the cooling fan switch.
8. Pull off the distributor vacuum pipe from the left-hand carburettor and remove the bolt retaining the clip.
9. Disconnect rubber hose from back of the distributor capsule.
10. Disconnect the vacuum hose from the right-hand carburettor to the E.G.R. valve.
11. Disconnect air cleaner inter-connection pipe from the left-hand box to enable the E.G.R. valve pipe to be removed.
12. Remove the asbestos-lagged E.G.R. valve pipe completely.
13. Disconnect the engine breather hose from the flame trap on the right-hand rocker cover.
14. Disconnect the float-chamber vent hose from the large canister and the left-hand carburettor.
15. Unclip the spark plug leads from the air cleaners.
16. Disconnect the air temperature control valve from both air cleaners.
17. Disconnect the throttle cable from the carburettor linkage and automatic transmission cars only, remove the kick-down cable bracket.
18. Disconnect the two heater hoses from the rear of the manifold.
19. Disconnect the heater hoses from the front of the manifold.
20. Disconnect the coolant temperature transmitter lead.
21. Disconnect the purge air filter line from left-hand rocker cover and remove filter from clip.
22. Disconnect main fuel line filter and release front clip.
23. Disconnect the carburettor countershaft link-rod from the left-hand carburettor by moving the sleeves outwards in direction of arrow.
24. Remove the twelve induction manifold retaining bolts.
25. Lift off manifold complete with carburettors and air cleaners.
26. Clean the outside of the manifold gasket, ensuring that any accumulation of coolant is removed.
27. Withdraw two bolts and remove the front and rear gasket clamps.
28. Lift off and discard the gasket.
29. Remove and discard the gasket seals.
30. Clean the threads of the manifold bolts.

Refitting
31. Smear both sides of new gasket seals with silicon grease.
32. Locate the seals in position with the ends engaged in the notches formed between the cylinder head and block.
33. Apply Hylomar PL 32M sealing compound to the four corners of a new gasket around the area of the water passage joints on the cylinder head side.
34. Fit the manifold gasket with the word 'FRONT' towards the front of the engine.
35. Fit the gasket clamps, but do not fully tighten the bolts at this stage.
36. Apply Hylomar PL 32M sealing compound to the four corners of the gasket as in instruction 33.
37. Locate the manifold in position on the engine.
38. Coat the threads of the manifold retaining bolts with thread lubricant-sealant 3M EC 776.
39. Fit the manifold bolts, tighten evenly from the centre outwards to the correct torque, see Section 06, 'TORQUE WRENCH SETTINGS'.
40. Tighten the gasket clamp bolts to
41. Reverse instructions 1 to 33.

INDUCTION MANIFOLD GASKET — Fuel Injection Engines

Remove and refit 30.15.08

Removing
1. Drain the cooling system, see 26.10.01.
2. Remove the fresh-air duct.
3. Disconnect the top hose from the thermostat housing.
4. Disconnect the expansion hose from the thermostat housing.
5. Remove the plenum chamber, see 19.22.46.
6. Remove the extra air valve, see 19.20.16.
7. Disconnect the pipes and filters from the manifold, placing them to one side.
8. Disconnect the temperature switches, sensors and Thermotime switch.
9. Remove the injectors, see 19.60.10/11.
10. Remove the twelve induction manifold retaining bolts.
11. Lift off manifold.
12. Clean the outside of the manifold gasket, ensuring that any accumulation of coolant is removed.
13. Withdraw two bolts and remove the front and rear gasket clamps.
14. Lift off and discard the gasket.
15. Remove and discard the gasket seals.
16. Clean the threads of the manifold bolts.

Refitting
17. Follow instructions 31 to 40 for Carburettor Engine operation.
18. Reverse instructions 1 to 9.
EXHAUST MANIFOLD — L.H.

Remove and refit 30.15.10

Removing
1. Drive car onto ramp.
2. Disconnect leads from spark plugs and retainer clips on left-hand bank.
3. Carburettor engines only: Remove the temperature control valve complete with hot air and cold air hoses.
4. Carburettor engines only: Remove the heat chamber from the manifold.
5. Bend down the manifold bolt lock-tabs except the tab locking the rear lower bolt, see instruction 7.
6. Raise ramp.
7. Bend down the tab locking the manifold lower rear bolt.
8. Remove the four nuts securing the catalyst or front pipe to the manifold.
9. Lower ramp and, Carburettor engines only, remove the E.G.R. valve, see 17.45.01.
10. Remove the eight bolts securing the manifold to the cylinder head.
11. Remove the manifold.
12. Remove and discard the flange gasket.
13. Remove the manifold gaskets.

Refitting
14. Clean the manifold and cylinder head mating faces.
15. Offer up the manifold to the cylinder head whilst positioning four new gaskets and locating them with the bolts and new lock-tabs.
16. Locate the flange gasket.
17. Tighten the manifold retaining bolts to 14 to 16 lb ft (19 to 21 Nm) and bend up the tabs except the lower rear tab, see instruction 22.
18. Carburettor engines only: Fit the heat chamber and E.G.R. valve.
19. Carburettor engines only: Fit the temperature control valve and hoses.
20. Connect lead to the spark plugs and retainer clips.
22. Bend up manifold lower rear lock-tab.
23. Fit and tighten the flange nuts and washers.
24. Lower ramp.

EXHAUST MANIFOLD — R.H.

Remove and refit 30.15.11

Removing
1. Drive car onto ramp, and Fuel injection engines only, remove the air-flow meter for access, see 19.22.25.
2. Disconnect leads from spark plugs and retainer clips on left-hand bank.
3. Carburettor engines only: Remove the R.H. temperature control valve assembly complete with hot and cold air hoses.
4. Carburettor engines only: Remove the heat chamber from the manifold.
5. Bend down the manifold bolt lock-tabs except the tab locking the rear lower bolt, see instruction 7.
6. Raise ramp.
7. Bend down the tab locking the manifold lower rear retaining bolt.
8. Remove the four nuts securing the catalyst or front pipe to the manifold.
9. Lower the ramp, and, Fuel injection engines only, remove the E.G.R. valve, see 17.45.01.
10. Remove the manifold retaining bolts.
11. Remove the manifold.
12. Remove and discard the gasket.
13. Remove and discard the flange gasket.

Refitting
14. Clean the manifold and cylinder head mating faces.
15. Offer up the manifold to the cylinder head whilst positioning four new gaskets and locating them with the bolts and new lock-tabs.
16. Locate the flange gasket.
17. Tighten the manifold retaining bolts to 14 to 16 lb ft (19 to 21 Nm) and bend up the tabs except the lower rear tab, see instruction 22.
18. Carburettor engines only: Fit the heat chamber.
19. Carburettor engines only: Fit the temperature control valve and hoses.
20. Connect leads to the spark plugs and retainer clips.
22. Bend up manifold lower rear lock-tab.
23. Fit and tighten the flange nuts and washers.
24. Lower ramp.
CLUTCH ASSEMBLY

Remove and refit 33.10.01

Removing
1 Remove the gearbox. 37.20.01
2 Evenly slacken and remove the six bolts and spring washers securing the clutch to the engine flywheel.
NOTE: If the clutch is to be refitted, scribe or mark clutch and flywheel to identify original relationship.
3 Remove the clutch assembly and drive plate.

Refitting
4 Using a substitute first motion shaft offer up the drive plate to the flywheel. Note that the longer boss of the drive plate must be adjacent to the gearbox.
5 Engage the clutch assembly on the flywheel dowels. Fit the six securing bolts and spring washers and tighten evenly to the correct torque – see 'TORQUE WRENCH SETTINGS'.
6 Remove the substitute first motion shaft.
7 Fit the gearbox. 37.20.01.

DRIVE PLATE
Remove and refit 33.10.02
As operation 33.10.01.

HYDRAULIC SYSTEM
Bleeding 33.15.01
1 Remove the heat shield.
2 Thoroughly clean the areas in the vicinity of the master cylinder reservoir filler cap and the slave cylinder bleed nipple.
3 Ensure that the master cylinder reservoir is topped up.
4 Attach one end of a bleed tube to the slave cylinder bleed nipple and immerse the other end in a transparent vessel containing brake fluid.
5 Open the bleed nipple approximately three-quarters of a turn. Depress and release the clutch pedal, pausing momentarily at each down stroke until fluid free of air issues from the slave cylinder. Close the bleed nipple with pedal depressed and release the pedal.
Care must be taken to ensure that the level of fluid in the master cylinder reservoir is never permitted to fall to less than half capacity.
6 Remove the bleed tube and top up the reservoir.
7 Refit the heat shield.

FLUID PIPES
Remove and refit 33.15.09

Removing
1 Drain the hydraulic system.
2 Remove the bolt securing the clip to the bell housing (lower pipe only).
3 Unscrew the pipe from the master cylinder.
4 Unscrew the pipe from the slave cylinder.
5 Remove the pipe from the car.

Refitting
6 Align the new pipe in the approximate position in the car.
7 Screw the pipe into the cylinder.
8 Screw the pipe onto the hose.
9 Top up the master cylinder with new brake fluid.
10 Bleed the system, see 33.15.01.
FLUID HOSE

Remove and refit 33.15.13

Removing
1 Drain the hydraulic system.
2 Unscrew the master cylinder pipe union from the hose and remove the locknut and washer.
3 Unscrew the slave cylinder pipe union from the hose and remove the locknut and washer.
4 Remove the hose from the car.

Refitting
5 Align the new hose with the threaded ends through the holes in the mounting brackets.
6 Fit and tighten the locknuts and washers.
7 Fit and tighten the slave cylinder pipe union.
8 Fit and tighten the master cylinder pipe union.
9 Top-up the master cylinder with new brake fluid.
10 Bleed the system, see 33.15.01.

MASTER CYLINDER

Remove and refit 33.20.01

Removing
1 Unscrew the pipe from the master cylinder.
CAUTION: Plug the master cylinder outlet and the end of the pipe to prevent spillage of fluid.
2 Remove the split pin, washer and clevis pin securing the push rod to the clutch pedal.
3 Remove the two nuts, spring washers and bolts securing the master cylinder to the body.
4 Withdraw the master cylinder.

Refitting
5 Reverse instructions 1 to 4.
6 Bleed the system. 33.15.01.

MASTER CYLINDER

Overhaul 33.20.07

1 Remove the master cylinder. 33.20.01.
2 Slide the rubber along the push-rod.
3 Remove the circlip from the end of the master cylinder and withdraw the push-rod and washer.
4 Withdraw the piston spring and seal assembly from the master cylinder.
Withdrawal may be facilitated by applying a compressed air line to the fluid outlet union.
5 Straighten the prong of the spring thimble and remove the thimble and spring from the piston.
6 Release the valve stem from the keyhole slot in the thimble.
7 Slide the valve seal spacer along the valve stem.
8 Remove the valve seal from the valve stem and fit a new seal.
9 Assemble the spacer, spring and thimble to the valve stem.
10 Remove the seal from the piston and fit a new seal (seal lip towards the spring).
11 Engage the spring thimble on the piston and carefully depress the thimble prong.
12 Lubricate the bore of the master cylinder with clean brake fluid and insert the seal assembly spring and piston.
13 Fit a new rubber to the push-rod.
14 Fit the push-rod and washer to the master cylinder and secure with the clip.
15 Slide the rubber into position on the master cylinder.
16 Refit the master cylinder. 33.20.01.
17 Bleed the system. 33.15.01.
RELEASE BEARING ASSEMBLY

Remove and refit 33.25.12

Service tools: ST 1136

Removing
1. Remove the gearbox. 37.20.01.
2. Using Tool ST 1136 unscrew the clutch release lever pivot bolt from the clutch housing.
3. Withdraw the release lever complete with pivot bolt and the release bearing.
4. Detach the release bearing from the release lever.

Refitting
5. Offer up the release bearing to the release lever ensuring that the rectangular slippers engage the bearing collar.
6. Slide the bearing complete with release lever and pivot bolt into position in the clutch housing.
7. Engage the pivot bolt in the clutch housing.
8. Using Tool ST 1136, tighten the pivot bolt.
9. Fit the gearbox to the car. 37.20.01.

RELEASE BEARING

Overhaul 33.25.17

Removing
1. Remove the release bearing assembly. 33.25.12.
2. Mount the assembly in a press and extract the sleeve from the bearing.

Refitting
3. Stand the sleeve on its collar end and evenly engage the new release bearing on the sleeve. (Release face of bearing uppermost.)
4. Press the bearing onto the sleeve until it abuts against the sleeve shoulder.
   CAUTION: The bearing must not be assembled to the sleeve by applying a load to the outer race.
5. Fit the release bearing assembly to the gearbox. 33.25.12.

CLUTCH AND BRAKE PEDAL ASSEMBLY

Overhaul 33.30.06

As operation 70.35.04.

CLUTCH PEDAL RETURN SPRING

Remove and refit 33.30.03

Removing
1. Release the spring ends from the clutch pedal and pedal bracket.

Refitting
2. The longer leg of the spring attaches to the clutch pedal. Engage the spring hook in the pedal bracket then clip the other hook through the drilling in the clutch pedal.

SLAVE CYLINDER

Remove and refit 33.35.01

Removing
1. Raise or jack up the car and support securely.
2. Remove the bolt securing the pipe clip to the bell housing.
3. Undip the heat shield.
4. Clean the slave cylinder removing all loose mud etc. in the vicinity of the fluid pipe and nipple.
5. Disconnect the fluid pipe and plug the cylinder and pipe union.
6. Remove the two bolts securing the slave cylinder to the engine.
7. Gently withdraw the slave cylinder.
   CAUTION: When the slave cylinder is removed do not attempt to move the operating push rod in a forward direction as this may cause the clutch release lever to be dislodged, necessitating the removal of the gearbox to permit refitting of the release lever.
8. Remove the gasket.

Refitting
9. Reverse instructions 2 to 8. The slave cylinder must be mounted with the bleed nipple above the fluid pipe.
10. Bleed the system. 33.15.01.
11. Lower the car.
SLAVE CYLINDER

Overhaul 33.35.07

Dismantling
1 Remove the slave cylinder. 33.35.01.
2 Remove the rubber boot.
3 Extract the circlip piston, cup and spring.

Inspection
4 Discard the rubber boot and cup and clean remaining components in clear brake fluid or methylated spirit.
5 Carefully examine the piston and cylinder bore. Renew either or both components if there is evidence of corrosion or scoring.

Assembling
6 Fit a new cup to the piston.
7 Lubricate the cylinder bore with clean brake fluid.
8 Fit the smaller diameter of the spring to the piston and fit the spring (larger diameter leading) piston and cup into the cylinder. Fit the circlip.
9 Smear the piston and bore with disc brake lubricant or rubber grease.
10 Fit the rubber boot.
11 Refit the slave cylinder. 33.35.01.
12 Bleed the system. 33.15.01.
**MANUAL GEARBOX**

**DRIVE FLANGE**
Remove and refit 37.10.01

Service tools: RG 421 or 18G 1205

Removing
1. Raise the car and support securely.
2. Slacken the bolt securing the propeller shaft strap and remove the remaining bolt. Swing the strap clear of the propeller shaft.
3. Scribe the relationship of the propeller shaft and gearbox flanges and remove the four securing nuts and bolts.
4. Release the propeller shaft from the gearbox flange.

Refitting
5. Using tool RG 421 or 18G 1205 to prevent rotation of the gearbox driving flange remove the securing nut and washer.
6. Withdraw the driving flange.

**CLUTCH/BELL HOUSING**
Remove and refit 37.12.07

Service tools: ST 1136

Removing
1. Remove the gearbox from the car, see 37.20.10/55.
2. Withdraw the clutch release lever and release bearing, see 33.25.12.
3. Remove the six bolts, plain and spring washers securing the clutch housing to the gearbox.
4. Remove the clutch housing.

Refitting
5. Reverse instructions 1 to 4.

**REAR COVER**
Remove and refit 37.12.42

Service tools: RG 421 or 18G 1205

Removing
1. Disconnect the battery.
2. Remove the gear lever.
3. Raise the car on a ramp or jack and support securely.
4. Remove one bolt from the propeller shaft safety strap, slacken the remaining bolt and swing the strap aside.
5. Disconnect the propeller shaft from the gearbox.
6. Tie the propeller shaft to the vehicle in a position where it allows access to the gearbox.
7. Release the rubber rings securing the exhaust system.
8. Detach the exhaust system from the manifold down-pipe.
9. Remove the gearbox drain plug and drain the oil.
10. Disconnect the speedometer cable and remove the speedometer drive pinion and housing, see 37.25.02.
11. Using tool RG 421 or 18G 1205 to prevent shaft rotation remove the nut and washer securing the gearbox drive flange.
12. Withdraw the drive flange.
13 Locate the jack under the engine flywheel and support the weight of engine and gearbox.

14 Remove the four bolts, spring washers and plate washers securing the gearbox rear crossmember to the body.

15 Carefully lower the jack slightly to facilitate access to the top of the gearbox.

16 Remove the nut, washer and pin securing the remote control linkage to the gearbox selector rod and detach the reverse switch lead.

17 Remove the two bolts and spring washers securing the flange of the fifth gear spool locating boss.

18 Withdraw the fifth gear spool locating boss.

19 Place a container under the gearbox centre plate/rear cover to catch residual oil when the rear cover is disturbed.

20 Remove the bolts and spring washers securing the rear cover to the gearbox.

21 Withdraw the rear cover and gasket ensuring that the centre plate is not disturbed.

22 Fit temporary slave bolts to retain the centre plate in position.

23 Remove the oil pump drive shaft.

24 Remove the rear oil seal, bearing, spacer, ring and speedometer driving gear from the rear cover.

25 Remove the slave bolts from the gearbox centre plate.

26 Ensure that the centre plate and rear cover mating faces are clean and fit a new gasket to the centre plate.

27 Engage the oil pump drive shaft in the layshaft.

28 Note the radial relationship of the square oil pump drive and align the oil pump gear centre.

29 Offer up the rear cover to the gearbox mainshaft and slide carefully into position. Ensure that the oil pump shaft engages the oil pump.

30 Fit and tighten the rear cover securing bolts.

31 Fit the speedometer driving gear ensuring that it properly engages the flats on the mainshaft and that the tapered head of the gears is to the rear.

32 Fit the circlip and the spacer, (machined recess in spacer towards the circlip).

33 Fit the rear bearing.

34 Fit a new oil seal. Lubricate the seal lip.

35 Lubricate the seal contact area on the driving flange and fit the flange, washer and nut.

36 Fit the 5th gear spool locating boss.

37 Fit the pin, washer and nut securing the remote control linkage to the gearbox selector rod. Connect the reverse switch lead.

38 Raise the jack supporting the engine and bolt the gearbox crossmember to the body.

39 Remove the engine jack.

40 Connect the propeller shaft to the gearbox.

41 Fit the propeller shaft safety strap.

42 Connect up the exhaust system.

43 Fit and tighten the gearbox drain plug.

44 Refill the gearbox with fresh oil.

45 Lower the car.

46 Fit the gear lever.

47 Connect the battery.

**OIL PUMP**

**Remove and refit 37.12.47**

**Removing**

1 Remove the rear cover, see 37.12.42.

2 Remove the four bolts and spring washers securing the oil pump cover to the gearbox rear cover.

3 Withdraw the oil pump cover and oil intake pipe.

4 Remove the internal and external toothed gears.

**Refitting**

5 Reverse instructions 1 to 4.
OIL PUMP

Test 37.12.50

1. Ensure that the gearbox oil level is correct.
2. Start the engine and allow to idle.
3. Remove the threaded plug in the rear cover, a steady flow of oil should be expelled.
4. Switch off the engine.
5. Prime the plug with 'Locquic Primer Grade T' then applying 'Loctite 270' immediately prior to assembly, refit the threaded plug.
6. Check and top up the gearbox level.

GEAR CHANGE LEVER

Remove and refit 37.16.04

Removing

1. Select neutral and unscrew and remove the gear lever knob.
2. Slacken the two screws securing the gear lever gaiter and top panel assembly to the rear of the console.
3. Remove the gear lever gaiter and panel assembly.
4. Remove the four screws retaining the gear lever draught excluder and flange assembly.
5. Withdraw the draught excluder and flange assembly.
6. Remove the dome cover securing the gear lever to the correct extension housing.
7. Remove the countersunk screw and bolt securing the bias spring rear bridge, and withdraw the bridge and liner.
8. Carefully prise the bias spring legs clear of the gear lever pins.
9. Gently lift out the gear lever taking care not to lose the nylon plunger and spring (anti-rattle) from the gear lever pivot ball.

Refitting

10. Reverse instructions 1 to 9.

GEAR CHANGE REMOTE CONTROL ASSEMBLY

Remove and refit 37.16.19

Removing

1. Disconnect the battery.
2. Remove the gear lever, see 37.16.04.
3. Raise the car on a ramp, or jack up the rear of the vehicle and support securely.
4. Remove one bolt from the propeller shaft safety strap and slacken the remaining bolt and swing the strap aside.
5. Disconnect the propeller shaft from the gearbox.
6. Tie the propeller shaft to the vehicle in a position where it allows access to the gearbox.
7. Release the rubber rings securing the exhaust system.
8. Detach the exhaust system from the manifold down pipe.
9. Locate a jack under the gearbox and support weight.
10. Disconnect the two reverse light switch leads.
11. Disconnect the speedometer cable at the gearbox.
12. Remove the four bolts securing the gearbox rear mounting bracket.
13. Carefully lower the jack and gearbox sufficient to obtain access to the remote control assembly.
14. Disconnect the nut, washer and pin securing the gearbox selector shaft to the remote control shaft.
15. Remove the four bolts, spring and plain washers securing the remote control assembly to the gearbox rear cover.
16. Withdraw the remote control assembly.

Refitting

17. Reverse instructions 1 to 16.
GEAR CHANGE REMOTE CONTROL ASSEMBLY

Overhaul 37.16.20

Dismantling
1. Remove the remote control assembly from the gearbox.
2. Remove the two bolts and two countersunk screws securing the bias spring bridge plates.
3. Remove the two bridge plates, bridge plate liners and the bias spring.
4. Remove the bias spring adjusting bolts and locknuts.
5. Remove the two bolts and washers securing the reverse baulk plate assembly and withdraw the reverse baulk plate, springs and spacers.
6. Remove the four bolts and washers securing the bottom cover plate.
7. Remove the bottom cover plate.
8. Remove the reverse light switch and locknut.
9. Remove the square-headed pinchbolt securing the selector shaft elbow.
10. Remove the selector shaft elbow.
11. Withdraw the selector shaft.
12. Press out the two selector shaft bushes in the remote control casing.
13. Remove the circlips securing the pivot ball and bushes in the selector shaft elbows and press out the bushes and pivot balls.

Assembling
14. Press in new selector shaft bushes in the remote control casing.
15. Fit new bushes, pivot balls and circlips to the selector shaft elbow.
16. Fit the selector shaft to the casing.
17. Fit the rear elbow and secure with the square-headed pinchbolt.
18. Fit the baulk plate assembly.
19. Fit the reverse switch and locknut.
20. Fit the bottom cover plate.
21. Fit the bias spring adjusting bolts and locknuts.
22. Fit the bias spring, bridge plate liners and bridge plates.
23. Fit the remote control assembly to the gearbox.
24. Operations to be carried out following the fitting of the remote control assembly to the gearbox.
28. Tighten the adjusting bolts equally until they just start to move the baulk plate out of contact with the backing plate.
29. Using a straight edge and feeler gauge move the adjusting bolts equally until a clearance of 0.050 to 0.060 in (1.27 to 1.42 mm) exists between (a) the lower face of the gear lever and the underside of the baulk plate. Tighten the locknuts. Note also that (b) a minimum clearance of 0.10 in (0.254 mm) must exist between the upper face of the baulk plate and the lower edge of the gear lever bush.
30. Engage 1st plate.
31. Check the clearance between the side of the gear lever and the edge of the baulk plate. This should be 0.004 to 0.012 in (0.10 to 0.30 mm). Adjust by adding or removing shims as necessary.
32. Check clearance between baulk plate edge and gear lever with 1st and 2nd gears engaged.
33. Fit bottom cover plate.

Adjustment of 1st/2nd gate stop
This operation must be carried out following the adjustment of the reverse baulk plate.
30. Engage 1st plate.
31. Check the clearance between the side of the gear lever and the edge of the baulk plate. This should be 0.004 to 0.012 in (0.10 to 0.30 mm). Adjust by adding or removing shims as necessary.
32. Check clearance between baulk plate edge and gear lever with 1st and 2nd gears engaged.
33. Fit bottom cover plate.

Adjustment of gear lever bias spring
34. Unit completely assembled, engage 3rd gear.
35. Adjust the screws to position both legs of spring 0.5 mm clear of lever crosspin.
36. Apply a light load to gear lever in LH direction taking up play. Adjust RH screw downward until RH spring leg just makes contact with crosspin.
37. Repeat instruction 36 on the other side. Play will still be present but at extremes of gear lever travel the crosspin should make contact with the spring legs.
38. Return lever to neutral and rock across gate several times. Lever should return to 3rd/4th gate.
39. Tighten the locknuts.
40. Adjust the reverse switch, see 86.65.20.
GEARBOX

Remove and refit 37.20.01

Removing
1. Drive the vehicle onto a ramp, open the bonnet.
2. Disconnect the battery.
3. Remove the gear lever, see 37.16.04.
4. Raise the ramp.
5. Remove the exhaust system, see 30.10.01, leaving the tail pipes loosely in position.
6. Disconnect the propeller shaft drive flange from the gearbox drive flange, and tie up the propeller shaft so that it does not obstruct the gearbox removal.

NOTE: In order to facilitate the use of a central engine support jack, it is necessary to raise the vehicle body using ramp side jacks.
7. Position the centre engine support jack under the engine sump. Interpose a piece of wood to prevent damaging the engine sump.
8. Raise the jack to support the engine.
9. Remove the two bolts securing the engine sump stiffening plate to the clutch housing.
10. Remove the bolt securing the clutch pipe to the rear engine plate.

11. Remove the clutch slave cylinder heat shield and the two bolts securing the clutch slave cylinder to the clutch housing, and position clear of the clutch housing.
12. Remove the nuts and washers securing the gearbox rear cross-member to the body.
13. Lower the ramp jack supporting the engine.
14. Release the speedometer cable clamp bolt and remove the cable from the gearbox.
15. Disconnect the electrical harness plug.
16. Remove the clutch housing bolts, except three.
17. Remove the four bolts retaining the flywheel cover-plate to the clutch housing.
18. Support the gearbox on a unit lift.
19. Remove the three remaining clutch housing bolts.
20. Carefully withdraw the gearbox assembly; lower the unit lift.

Refitting
21. Position the gearbox on the unit lift, engage 1st gear.
22. Raise the unit lift to align the gearbox with the engine.
23. Rotate the gearbox drive flange, carefully engage the splines of the gearbox input shaft with those of the clutch centre plate.
24. Locate the gearbox clutch housing with the engine plate dowels.
25. Fit and tighten the bolts securing the clutch housing to the engine.
26. Connect the harness plug.
27. Refit the speedometer cable to the gearbox and secure with the clamp bolt.
28. Raise the unit lift and locate the gearbox mounting to the body. Fit and tighten the securing nuts and washers.
29. Lower the unit lift, centre ramp jack and side ramp jacks.
30. Refit the bolts securing the engine sump stiffening plate to the clutch housing.
31. Refit the clutch slave cylinder, ensuring that the push-rod is correctly located.
32. Fit the clutch slave cylinder heat shield.
33. Position the clutch pipe bracket and secure to the engine plate.
34. Refit the four bolts securing the flywheel cover-plate to the clutch housing.
35. Refit the propeller shaft drive flange to the gearbox drive flange and secure with the four bolts and Nyloc nuts.
36. Refit the exhaust system.
37. Refit the gear lever, see 37.16.04.
38. Connect the battery.
**Gearbox Assembly**

**Overhaul 37.20.04**

Service tools: 47, 284, 18G 705-1, RG 421 or 18G 1205, RTR 47-23, LC 370-2, 18G 705 or S323, 18G 284 AAH, ST 1136

**Dismantling**

1. Place the gearbox on a bench or a gearbox stand ensuring that the oil is first drained.

2. Using tool ST 1136 unscrew the clutch release lever pivot bolt and withdraw the clutch release lever complete with pivot bolt and release bearing slippers.

3. Detach the release bearing and slippers.

4. Remove the six bolts, plain and spring washers securing the bell housing to the gearcase and remove the bell housing.

5. Remove the nut and connecting pin linking the selector shaft to the remote control shaft.

6. Remove the four bolts, spring and plain washers (2 top, 1 either side) securing the remote control housing to the gearcase rear cover.

7. Remove the nut and plain washer securing the drive flange to the mainshaft. Use tool RG 421 or 18G 1205 to prevent shaft rotation.

8. Withdraw the driving flange.

9. Remove the speedometer driven gear and housing.

10. Remove the two bolts and spring washers securing the locating boss for the selector rear spool and withdraw the locating boss.

11. Remove the ten bolts, spring and plain washers securing the rear cover to the gearcase and withdraw the rear cover and gasket.

12. Withdraw the oil pump drive shaft.

13. Remove the fifth gear selector fork and bracket (two bolts and spring washers).

14. Remove the circlip from the selector shaft.

15. Withdraw the fifth gear selector spool. Note that the longer cam of the spool is fitted towards the bottom of the gearbox.

16. Remove the circlip retaining the fifth gear synchro assembly to the mainshaft.

17. Withdraw the synchro assembly, fifth gear (driven) and spacer from the mainshaft.

18. Remove the circlip retaining the fifth gear (driving) from the layshaft.

19. Using tool 18G 705 and adaptors 18G 705-1 remove the fifth gear and spacer from the layshaft.

20. Remove the front cover and gasket (six bolts and spring washers).

21. Remove the input shaft selective washer, bearing track, layshaft selective washer and bearing track from the gearcase.

22. Remove the two bolts and spring washers securing the locating boss for the selector shaft front spool and withdraw the locating boss.

23. Remove the selector plug, spring and ball from centre plate.
24 Supporting the gearbox on the centre plate withdraw the gearcase.
25 Remove the input shaft and 1st gear synchro cone.
26 Withdraw the layshaft cluster.
27 Support the centre plate complete with gears in protected vice jaws.
28 Remove the reverse lever pivot pin circlip and pivot pin.
29 Remove the reverse lever and slipper pad.
30 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.
31 Withdraw the selector fork and spool. Note that the shorter cam of the spool is fitted towards the bottom of the gearbox.
32 Remove the nut and spring washers securing the reverse gear pivot shaft and remove the pivot shaft (only if renewal of the pivot shaft and/or the centre plate is intended).
33 Remove the centre plate from the vice and extract the two dowels (only if dowels and/or centre plate renewal is intended).
Input Shaft and Front Cover
34 Using tool RTR 47-23 remove the external bearing.
35 Using tools 18G 284 AAH and 284 withdraw the internal bearing track.
36 Remove the oil seal from the front cover.
37 Using tools LC 370-2 remove the layshaft bearings.
Mainshaft
38 Remove the pilot bearing and spacer.
39 Remove the 3rd and 4th speed synchroniser hub and sleeve.
40 Remove the 3rd speed gear.
41 Remove the circlip securing the mainshaft bearing.
42 Remove the bearing, 1st gear and bush, 1st and 2nd speed hub, sleeve and synchromesh cones, and 2nd gear.
Rear Cover
43 Remove the oil seal, bearing, speedo gear, circlip and sleeve and oil sleeve. Remove the oil pump drive, pump cover and gears.
44 Thoroughly clean and examine all components. Obtain new parts as necessary. continued
Layshaft
45 Fit the bearings to the layshaft.

Mainshaft
46 Synchro Assemblies. With the outer sleeve held, a push-through load applied to the outer face of the synchro hub should register 18 - 22 lb (18.2 - 10 kgm) to overcome spring detent in either direction.

47 Checking 1st speed bush end-float. Fit 2nd gear, 1st/2nd speed synchro hub and 1st gear bush to the mainshaft. Manufacture a spacer to the dimensions illustrated and slide the spacer on the mainshaft.

48 Remove the circlip, spacer, bush, synchro hub and 2nd gear from the mainshaft.

49 Checking 5th gear end-float. Fit the 5th gear assembly to the mainshaft, i.e. front spacer, 5th gear, synchro 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.

50 Remove the circlip spacer and 5th gear assembly.

51 Assembly It is important that 1st/2nd synchro is assembled correctly (short splines on inner member) towards 2nd gear. Fit 2nd gear, baulk ring, synchro hub and sleeve (selector fork annulus to rear of gearbox), baulk ring, 1st gear and selective bush, bearing and a new circlip. When fitting the circlip care must be taken to ensure that it is not stretched (opened) beyond the minimum necessary to obtain entry over the shaft. The internal diameter of an expanded circlip must not exceed 32.30 mm.

52 Fit 3rd gear, baulk ring, and synchro hub and sleeve (longer boss of synchro hub to front of gearbox) to the mainshaft.

53 Fit the spacer and bearing to front of mainshaft.

54 Fit the layshaft bearing track to the centre plate.

55 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 (opened) beyond the minimum necessary to obtain entry. The internal diameter of an expanded circlip must not exceed 22.5 mm.

56 Fit the mainshaft bearing track to the centre plate.

57 Locate the centre plate in protected vice jaws.

58 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 synchro sleeves on the mainshaft. Simultaneously engage the selector shaft and mainshaft assemblies in the centre plate.

59 Fit the spacer, 5th gear, baulk ring, synchro hub and sleeve end-plate, selective spacer (instruction 48), and a new circlip. When fitting the circlip care must be taken to ensure that it is not stretched (opened) beyond the minimum necessary to obtain entry. The internal diameter of an expanded circlip must not exceed 27.63 mm.

60 Fit the reverse gear (lip for slipper pad to front of box) front and rear spacers and the reverse shaft.

61 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.

62 Remove the centre plate and gear assembly from the vice and locate on a suitable stand with the front of the mainshaft vertically uppermost. Ensure that the reverse shaft does not slide out of position.

63 Fit the centre plate front gasket.

64 Fit the external bearing and internal bearing track to the input shaft.

65 Fit the input shaft to the gearcase.

Using an oil 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 which will give the required end-float.

66 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.
67 Fit the layshaft and input shaft bearing outer tracks.
68 Using seven slave bolts and plain washers to prevent damaging the rear face of the centre plate evenly draw the gearcase into position on the centre plate.

69 Place a layshaft spacer of nominal thickness (0.040 in, 1.02 mm) on the layshaft bearing track, and fit the front cover and gasket, securing with six bolts.
70 Using a dial gauge check layshaft end-float.
71 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).
72 Again fit the front cover and gasket, this time with the correct spacer arrived at in instruction 71.
73 Check layshaft end-float to ensure it is within the limits specified in instruction 71.
74 Place a ball bearing in the centre of the input shaft. This facilitates checking mainshaft end-float using a dial gauge.
75 Mount the dial gauge on the gearcase with the stylus resting on the ball. Zero the gauge.
76 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.
77 Having ascertained end-float select the spacer required as follows:
   End-float minus 0.035 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).
78 Remove the front cover and tape (if employed).
79 Fit the oil seal to the front cover and lubricate the seal lips.
80 Mask the splines and fit the front cover. Remove the spindles masking.
81 Place the gearbox on a bench or stand and remove the slave bolts and washers from the centre plate.
82 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.
83 Fit the 5th gear selector fork and bracket.
84 Renew the selector shaft 'O' ring in the rear cover and fit the oil ring bush.
85 Fit the rear gasket to the centre plate and engage the oil pump shaft in the layshaft.

86 Fit the oil pump gears and cover to the gearbox rear cover.
87 Fit the rear cover ensuring that the oil pump shaft engages the oil pump.
88 Fit the selector shaft ball, spring and plug to the centre plate.
89 Fit the spool locating bosses (2) to the 1st/2nd spool and 5th gear spool.
90 Fit the speedometer driving gear to the mainshaft ensuring that it properly engages the mainshaft flats.
91 Fit the circlip and sleeve and ball race to the mainshaft.
92 Fit the rear oil seal. Lubricate seal lip.
93 Fit the driving flange, washer and nut.
94 Fit the speedometer driven gear and housing.
95 Fit the bell housing.
96 Fit the clutch release bearing and withdrawal lever
97 Fit the remote, control housing.

**FIRST MOTION SHAFT OIL SEAL**

Remove and refit

37.23.04

Service tools: ST 1136

**Removing**

1 Remove the gearbox, see 37.20.01.

2 Using tool ST 1136 remove the clutch release fork and bearing.
3 Remove the bolts and washers securing the front cover to the gearbox.
4 Remove the front cover and gasket.

5 Remove the oil seal from the front cover. Ensure that the spacers for the first motion shaft and layshaft bearings are not intermixed.

**continued**
Refitting
6  Fit a new oil seal to the front cover (seal lip towards gearbox).
7  Lubricate the oil seal and fit the front cover and gasket.
8  Fit the clutch release fork and bearing.
9  Fit the gearbox to the car, see 37.20.01.

SPEEDOMETER DRIVE GEAR
Remove and refit 37.25.01
As Operation 37.12.42.

SPEEDOMETER DRIVE PINION
Remove and refit 37.25.05

Removing
1  Remove the bolt and washer securing the speedometer clamp plate.
2  Release the speedometer cable from the drive pinion.
3  Withdraw the pinion housing and pinion from the gearbox.
4  Remove the pinion from the housing.

Refitting
5  Reverse instructions 1 to 4. Renew the pinion housing 'O' ring if necessary.
Cutaway view of the BW 6S transmission unit showing the location of thrust bearings and washers
IMPORTANT

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

TYPE — Borg-Warner 65 Unit — P.R.N.D.2.1. System

UNIT IDENTIFICATION

A serial number prefix 6051 appears on a traffic yellow nameplate on the left-hand side of the transmission case.

AUTOMATIC TRANSMISSION

SHIFT SPEEDS

<table>
<thead>
<tr>
<th>Throttle Position</th>
<th>Zero Throttle</th>
<th>Light Throttle</th>
<th>Part Throttle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selector</td>
<td>1</td>
<td>2</td>
<td>D</td>
</tr>
<tr>
<td>Shift</td>
<td>2—1</td>
<td>1—2</td>
<td>2—3</td>
</tr>
<tr>
<td>Road Speed M.P.H.</td>
<td>26—37</td>
<td>9—13</td>
<td>13—17</td>
</tr>
<tr>
<td>Km/H</td>
<td>42—59</td>
<td>14—21</td>
<td>21—27</td>
</tr>
</tbody>
</table>

KICK-DOWN

<table>
<thead>
<tr>
<th>Selector</th>
<th>Throttle</th>
<th>Road Speed M.P.H.</th>
<th>Km/H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
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<tr>
<td>2—1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Capacity 5.3 litres (9½ pints) including cooler of 0.3 litres (½ pint)

TRANSMISSION DATA

<table>
<thead>
<tr>
<th>Gearbox ratios</th>
<th>TOP (3rd)</th>
<th>Intermediate (2nd)</th>
<th>Low (1st)</th>
<th>Reverse</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 : 1</td>
<td>Infinitely variable between operating in all gears</td>
<td>2.39 : 1</td>
<td>2.09 : 1</td>
<td></td>
</tr>
<tr>
<td>Converter reduction (2.08)</td>
<td>1 : 1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OVERALL RATIOS

| 3.08 | 4.47 | 7.36 | 6.44 |

217K Converter — dia. 280 mm (9½ in) — RATIO 2.08 : 1

EXAMINATION OF COMPONENTS

Transmission Case and Servo Covers
Check for cracks and obstructions in passages.

Front and Rear Pump
Check for scoring and excessive wear.

Shafts
Check bearing and thrust faces for scoring.

Clutch Plates
Check for warping, scoring, overheating and excessive wear.

Bands
Check for scoring, overheating and excessive wear.

Drums
Check for overheating and scoring.

Gears
Check teeth for chipping, scoring, wear and condition of thrust faces.

Uni-directional Clutch and Races
Check for scoring, overheating and wear.

Valve Block and Governor
Check for burns, crossed or stripped threads, and scored sealing faces.

Impeller Hub and Front Pump Drive Gear
Check for pitting and wear. Ensure good contact.

Thrust Washers
Check for burns, scoring and wear.

White Metal Bushes
Check for scoring and loss of white metal.

Lip Seals
Check for cuts, hardening of rubber, leakage past outer diameter.

Rubber ‘O’ Rings and Seals
Check for hardening, cracking, cuts or damage.

Cast Iron Sealing Rings
Check fit in groove and wear (evident by lip overhanging the groove).

Teflon Sealing Rings
Check for cracking, cuts or damage.

SERVICE REQUIREMENTS

1 For all operations high standards of cleanliness are essential.
2 Rags and cloths must be clean and free from lint; nylon cloths are preferable.
3 Prior to assembly all components must be cleaned thoroughly with petrol, paraffin or an industrial solvent.
4 All defective items must be renewed.
5 Components should be lubricated with transmission fluid before assembly.
6 New joint washers should be fitted where applicable.
7 Where jointing compound is required, the use of Hylomar SQ22M, Hermetite or Wellseal is approved.
8 All screws, bolts and nuts must be tightened to the recommended torque figure.
9 Thrust washers and bearings should be coated with petroleum jelly to facilitate retaining them in position during assembly operations. Grease should not be used as it may be insoluble in the transmission fluid and could subsequently cause blockage of fluid passages and contamination of brake band and clutch facings.

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

Remove and refit 44.10.01
Service tools: CBW 60, CBW 547A-50

Removing
1 Remove the transmission unit. 44.20.01.
2 Wash the exterior of the unit in clean petrol or paraffin, invert it and place on a bench cradle CBW 60. Remove the switch. 44.15.15.
3 Unscrew the bolts securing the torque converter housing.
4 Remove the torque converter housing.
5 Unscrew 12 bolts.
6 Remove the oil pan, joint washer and magnet.

Refitting
21 Squeeze together the ends of the front brake band and fit it in position together with the strut.
22 Refit the rear clutch and forward sun gear assembly.
23 Using petroleum jelly, stick the thrust washers to the rear clutch assembly (phosphor bronze towards the front clutch).
24 Refit the front clutch assembly.
25 Using petroleum jelly, stick the thrust washer to the pump assembly.
26 Refit the pump assembly and joint washer.
27 Fit and tighten the bolts.
28 Refit the oil tubes. (Note the ‘O’ ring on the pump suction tube.)
29 Refit the oil tube locating plate.
30 Fit and tighten the two bolts.
31 Carefully refit the valve block, ensuring that the oil tubes are not distorted.
32 Fit and tighten the three bolts (and washers).
33 Connect the downshift inner cable to the downshift cam.
34 Refit the five oil tubes.
35 Replace the magnet and refit the oil pan and joint washer.
36 Fit and tighten 12 bolts.
37 Locate the torque converter housing in place.
38 Fit and tighten four bolts securing the torque converter housing.
39 Refit the switch 44.15.15.
40 Refit the transmission unit.

15 Remove the pump and joint washer.
16 Remove the thrust washer.
17 Withdraw the front clutch.
18 Remove the thrust washers.
19 Withdraw the rear clutch and forward sun gear.
20 Squeeze together the ends of the front brake band and remove it together with the strut.

7 Pull out the five oil tubes.
8 Release the downshift inner cable from the downshift cam.
9 Take out three bolts (and washers).
10 Lift off the valve block.
11 Unscrew two bolts.
12 Remove the oil tube locating plate.
13 Pull out the oil tubes. (Note the ‘O’ ring on the pump suction tube.)
14 Take out five bolts.
REAR BRAKE BAND
Remove and refit 44.10.09
Service tools: CBW 60, CBW 547A-50

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

Refitting
24. Refit the rear brake band and strut.
25. Refit the centre support and planet gear assembly, ensuring that the oil holes in the centre support are aligned with those in the casing.
26. Fit and tighten the bolts.
27. Squeeze together the ends of the front brake band and fit it in position together with the strut.
28. Refit the rear clutch and forward sun gear assembly.
29. Using petroleum jelly, stick the thrust washers to the rear clutch assembly (phosphor bronze towards the front clutch).
30. Refit the front clutch assembly.
31. Using petroleum jelly, stick the thrust washer to the pump assembly.
32. Refit the pump assembly and joint washer.
33. Fit and tighten the bolts.
34. Refit the oil tubes. (Note the 'O' ring on the pump suction tube.)
35. Refit the oil tube locating plate.
36. Fit and tighten the two bolts.
37. Carefully refit the valve block, ensuring that the oil tubes are not distorted.
38. Fit and tighten the three bolts (and washers).
39. Connect the downshift inner cable to the downshift cam.
40. Refit the oil tubes.
41. Replace the magnet and refit the oil pan and joint washer.
42. Fit and tighten 12 bolts.
43. Locate the torque converter housing in place.
44. Fit and tighten four bolts securing the torque converter housing.
45. Refit the switch. 44.15.15.
46. Refit the transmission unit. 44.20.01.
FRONT CLUTCH

Remove and refit 44.12.04
Service tools: CBW 60, CBW 547A-50

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

Refitting
19. Using petroleum jelly, stick the thrust washers to the rear clutch assembly (phosphor bronze towards the front clutch).
20. Refit the front clutch assembly.
21. Using petroleum jelly, stick the thrust washer to the pump assembly.
22. Refit the front assembly and joint washer.
23. Fit and tighten the bolts.
24. Refit the oil tubes. (Note the ‘O’ ring on the pump suction tube.)
25. Refit the oil tube locating plate.
26. Fit and tighten the two bolts.
27. Carefully refit the valve block, ensuring that the oil tubes are not distorted.
28. Fit and tighten the three bolts (and washers).
29. Connect the downshift inner cable to the downshift cam.
30. Refit the oil tubes.
31. Replace the magnet and refit the oil pan and joint washer.
32. Fit and tighten the 12 bolts.
33. Locate the torque converter housing in place.
34. Fit and tighten four bolts securing the torque converter housing.
35. Refit the switch, 44.15.15.
36. Refit the transmission unit, 44.20.01.
REAR CLUTCH
Remove and refit 44.12.07
Service tools: CBW 60, CBW 547A-50

Removing
1 Remove the transmission unit. 44.20.01.
2 Wash the exterior of the unit in clean petrol or paraffin, invert it and place on a bench cradle CBW 60. Remove the switch. 44.15.15.
3 Unscrew the bolts securing the torque converter housing.
4 Remove the torque converter housing. Unscrew 12 bolts.
5 Remove the oil pan, joint washer and magnet.
6 Pull out the oil tubes.
7 Release the downshift inner cable from the downshift cam.
8 Lift off the valve block.
9 Take off three bolts (and washers).
10 Remove the oil tube locating plate.
11 Pull out the oil tubes. (Note the 'O' ring on the pump suction tube.)
12 Take off five bolts.
13 Remove the pump and joint washer.
14 Remove the thrust washer.
15 Withdraw the front clutch.
16 Remove the thrust washers.
17 Withdraw the rear clutch and forward sun gear.
18 Separate the forward sun gear assembly from the rear clutch.
19 Assemble the forward sun gear to the rear clutch.
20 Refit the rear clutch and forward sun gear assembly.
21 Using petroleum jelly, stick the thrust washers to the rear clutch assembly (phosphor bronze towards the front clutch).
22 Refit the front clutch assembly.
23 Using petroleum jelly, stick the thrust washer to the pump assembly.
24 Refit the pump assembly and joint washer.
25 Fit and tighten the bolts.
26 Refit the oil tubes. (Note the 'O' ring on the pump suction tube.)
27 Refit the oil tube locating plate.
28 Fit and tighten the two bolts.
29 Carefully refit the valve block, ensuring that the oil tubes are not distorted.
30 Fit and tighten the three bolts (and washers).
31 Connect the downshift inner cable to the downshift cam.
32 Refit the oil tubes.
33 Replace the magnet and refit the oil pan and joint washer.
34 Fit and tighten 12 bolts.
35 Locate the torque converter housing in place.
36 Fit and tighten four bolts securing the torque converter housing.
37 Refit the switch. 44.15.15.
38 Refit the transmission unit. 44.20.01.
FRONT CLUTCH

Overhaul

Service tool: BW 42

1. Remove the front clutch. 44.12.04.

Dismantling

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

Reassembling

14. Refit the 'O' ring to the drum.
15. Refit the seal to the piston.
16. Fit the piston into tool no. BW 42 and place the tool in the drum. Push the piston into the drum and remove the tool.
17. Locate the spring bearing in position.
18. Refit the spring.

REAR CLUTCH

Overhaul

Service tools: BW 37A, BW 41.

1. Remove the rear clutch. 44.12.07.

Dismantling

2. Remove the circlip.
3. Take out the pressure plate.
4. Remove the inner and outer friction plates.
5. Using tool BW 37A as shown, compress the spring and remove the spring seat circlip. Remove the tool.
6. Take out the spring seat.
7. Remove the spring.
8. Withdraw the piston.
9. Remove the rubber sealing ring from the piston.
10. Remove the rubber 'O' ring from the drum.
11. Fit the circlip.
12. Refit the spring.
13. Refit the spring seat.
14. Using tool BW 37A, compress the spring and fit the circlip. Remove the tool.
15. Refit the inner and outer clutch plates in alternate sequence.
16. Fit the pressure plate.
17. Refit the circlip.
18. Refit the rear clutch. 44.12.07.
UNI-DIRECTIONAL CLUTCH

Remove and refit

Service tools: CBW 60, CBW 547A-50

Removing

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

Refitting

20. Squeeze together the ends of the front brake band and remove it together with the strut.
21. Unscrew the bolts.
22. Withdraw the centre support/planet gear assembly.
23. Separate the centre support from the planet gear assembly.
24. Withdraw the uni-directional clutch.
25. Remove the circlip.
26. Remove the uni-directional clutch outer race.

27. Refit the uni-directional clutch outer race to the rear drum.
28. Refit the circlip.
29. Refit the uni-directional clutch.
30. Assemble the centre support and planet gear assembly.
31. Refit the assembly, ensuring that the oil and locating holes in the centre support align with those in the casing.
32. Fit and tighten three bolts.
33. Squeeze together the ends of the front brake band and fit it in position together with the strut.
34. Refit the rear clutch and forward sun gear assembly.
35. Using petroleum jelly, stick the thrust washer to the rear clutch assembly (phosphor bronze towards the front clutch).
Refit the front clutch assembly.

Using petroleum jelly, stick the thrust washer to the pump assembly.

Fit and tighten the bolts.

Refit the oil tubes. (Note the 'O' ring on the pump suction tube.)

Refit the oil tube locating plate.

Fit and tighten the two bolts.

Carefully refit the valve block, ensuring that the oil tubes are not distorted.

Fit and tighten three bolts (and washers).

Connect the downshift inner cable to the downshift cam.

Refit the oil tubes.

Replace the magnet and refit the oil pan and joint washer.

Fit and tighten 12 bolts.

Locate the torque converter housing in place.

Fit and tighten four bolts securing the torque converter housing.

Refit the switch.

Refit the transmission unit.

DOWNSHIFT CABLE

Remove and refit

Service tool: CBW 62

Removing

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

Refitting

8. Clip the downshift outer cable into the gearbox casing.
9. Connect the inner cable to the downshift cam.
10. Refit the sump pan and lower the ramp.

HAND SELECTOR LEVER

Remove and refit

Removing

1. Remove the push button cap.
2. Remove the push button securing screw and washer.
3. Remove the push button and spring.
4. Unscrew and remove the gear knob.
5. Remove the two screws securing the gear lever surround.

Refitting

11. Refit the clevis pin, washer and split pin.
12. Refit the locknut and adjust the cable.
13. Refit the unit with transmission fluid.

continued
6 Disconnect the quadrant illumination light from the surround.
7 Remove the gear lever surround.
8 Disconnect the gear indication light from the socket.
9 Remove the steel cover by operating the gear lever to each extreme.
10 Remove the two bolts securing the roller assembly.
11 Remove the roller assembly.
12 Remove the two bolts securing the gear lever to the turret shaft and remove the lever.

Refitting
13 Reverse 1–12
(To facilitate the refitting of the push button securing screw, pull out the inner lever and hold in position against the quadrant stop.)

Hand Selector Lever

**Overhaul** 44.15.05
1 Remove the hand selector lever. 44.15.04.
2 Pull out the inner lever.
3 Clean, inspect and regrease the inner lever.
4 Refit the inner lever.
5 Refit the hand selector lever.

Hand Lever Turret Assembly

**Overhaul** 44.15.06
1 Jack up front of the vehicle and place on two axle stands.
2 Disconnect the clip securing the selector rod to the turret lever.
3 Disconnect the selector rod from the turret lever.
4 Remove the hand selector lever assembly. 44.15.04.
5 Remove the two screws securing the hand brake lever surround.
6 Carefully remove the hand brake surround over the hand brake lever.
7 With the centre glove box open, remove the two screws securing the glove box catch to the centre console.
8 Remove the glove box catch.
9 Remove the four screws and rear plate securing the centre console.
10 Unclip the illumination light harness wires from the console.
11 Remove the centre console.
12 Remove the screws securing the turret assembly to the transmission tunnel.
13 Lift out the turret assembly.
14 Remove the two nuts and bolts securing the quadrant to the turret.

Selector Rod

**Remove and refit** 44.15.08

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

Refitting
5 Slacken the selector rod locknut.
6 Ensure that the gearbox selector lever and the hand lever are both in position 'P'.
7 Fit the selector rod to the gearbox selector lever.
8 Fit the clip onto the selector lever.
9 After the length of the rod by adjusting the turn-buckle until the end of the rod can be located in the hand lever.
10 Tighten the locknut.
11 Push the clip onto the lever and secure the rod.
12 Lower the ramp.
GEARBOX SELECTOR LEVER
Remove and refit 44.15.09

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

Refitting

STARTER INHIBITOR/REVERSE LAMP SWITCH
Remove and refit 44.15.15

Removing
1. Drive the vehicle onto a ramp, chock the wheels and raise the ramp.
2. Remove the three bolts securing the heat shield to the transmission sump.
3. Remove the heat shield and spacers.
4. Disconnect the switch from the block connector on the wiring harness.
5. Remove the nut and washer.
6. Remove the selector into the neutral position.

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

TORQUE CONVERTER HOUSING
Remove and refit 44.17.01

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

Refitting
4. Place the torque converter housing in position.
5. Fit and tighten the four bolts using Service tool CBW 547A-50.
6. Refit the gearbox, 44.20.01.

TORQUE CONVERTER
Remove and refit 44.17.07
Service tool: CBW 547A-50

Removing
1. Remove the transmission unit, 44.20.01.
2. Remove the torque converter from the transmission unit.

Refitting
3. Relocate the torque converter in the transmission unit.
4. Refit the gearbox, 44.20.01.
16 Remove the steady bar and disconnect the cable (if fitted).
17 Remove the four nuts securing the rear cross member.
18 Remove the cross member.
19 Remove the three bolts, heat shield and spacers.
20 Position the unit lift and support the gearbox.
21 Remove the four bolts securing the radiator lower mounting.
22 Detach the cooler pipes from the securing clips.
23 Detach the radiator from the upper mountings and withdraw forwards.
24 Remove the exhaust support bracket.

25 Lower the unit and remove all the bolts and nuts securing the bell housing and starter motor to the engine unit.
26 Remove the dipstick tube.
27 Remove the earth leads and all the harness securing clips.
28 Lower the gearbox rearwards on the unit lift.

Refitting
29 Raise the gearbox into position using the unit lift.
30 Fit and tighten the dowel bolt and nuts securing the bell housing to the engine.
31 Reposition the starter motor, earth leads, dipstick tube and harness clips to the converter housing.
32 Fit and tighten the remaining securing bolts.
33 Refit the exhaust bracket and tighten the fixing bolts.
34 Raise the engine and gearbox assembly into the mounting position.
35 Position the rear cross member and tighten the four securing bolts.
36 Remove the engine support jack and unit lift.
37 Position the rear mounting centre plate and steady bar (if fitted).
38 Tighten the rear mounting centre bolt.
39 Reconnect the steady cable (if fitted).
40 Fit and tighten the four bolts securing the torque converter to the engine drive plate.
41 Reconnect the propshaft and tighten the four bolts.
42 Fit the spacers, heat shield and securing bolts.
43 Reconnect and secure the speedo cable.
44 Reconnect the cooler pipes to the gearbox and tighten the union nuts.
45 Reposition the starter inhibitor/reverse light switch at the block connector on the wiring harness.
46 Reconnect the breather pipe.
47 Reconnect the selector lever.
48 Reconnect and tighten the dipstick tube to the transmission sump.
49 Reposition the radiator and tighten the four bolts securing the lower mounting.
50 Clip the cooler pipes to the radiator.
51 Refit the exhaust front pipe(s).
52 Lower the ramp.
53 Reconnect the downshift cable to the throttle linkage.
54 Fill the gearbox with fluid. 44.24.02

GEARBOX
Overhaul 44.20.06
1 Remove the transmission unit. 44.20.01.
2 Wash the exterior of the unit in clean petrol or paraffin, invert it and place on a bench cradle CBW 60.

Dismantling
3 Unscrew the bolts securing the torque converter housing.
4 Remove the torque converter housing.
5 Unscrew 12 bolts.
6 Remove the oil pan, joint washer and magnet.
7 Pull out the oil tubes.
8 Release the downshift inner cable from the downshift cam.
9 Take out three bolts and washers.
10 Lift off the valve block.
11 Unscrew two bolts.
12 Remove the oil tube locating plate.
13 Pull out the oil tubes. (Note the ‘O’ ring on the pump suction tube.)
14 Take out five bolts.
15 Remove the pump and joint washer.
16 Remove the thrust washer.
17 Withdraw the front clutch.
18 Remove the thrust washers.
19 Withdraw the rear clutch and forward sun gear.
20 Squeeze together the ends of the front brake band and remove it together with the strut.
21 Unscrew the three bolts.
22 Withdraw the centre support/planet gear assembly.
23 Squeeze together the ends of the rear brake band, tilt and withdraw it together with the strut.
24 Using tool no. RG 421 or S 337 to hold the flange, unscrew the nut.
25 Withdraw the flange.
26 Unscrew the bolts.
27 Remove the front extension and joint washer.
28 Remove the clamp tube.
29 Withdraw the speedometer drive gear.
30 Unscrew the counterweight.
31 Withdraw the governor assembly.
32 Withdraw the output shaft assembly and thrust washer.
33 Remove the oil tubes.
34 Unscrew the bolts.
35 Remove the rear servo assembly, joint washer and 'O' rings.
36 Unscrew the nut and remove the selector lever.
37 Unscrew the bolt and remove the switch.
38 Unscrew the bolts.
39 Remove the front servo and joint washer.
40 Remove the spring clip.
41 Withdraw the split-pin.
42 Withdraw the cross-shaft and remove the 'O' ring.
43 Remove the detent lever, collar, washers and 'O' ring.
44 Remove the oil seal.
45 Unscrew two screws and remove the cam plate.
46 Remove the parking brake rod assembly.
47 Withdraw the parking brake pawl pivot pin.
48 Remove the parking brake pawl.
49 Remove the spring.
50 Remove the relay lever pivot pin.
51 Remove the relay lever.
52 Remove the torsion spring.
53 Using tool no. CBW 62, remove the downshift cable assembly.
54 Using tool no. CBW 62, remove the breather adaptor.
55 Unscrew the unions and remove the bridge pipe.
56 Unscrew the adaptor.
57 Unscrew the return valve.
58 Withdraw the rear servo lever pivot pin.
59 Remove the rear servo lever.
60 Unscrew the locknuts.
61 Unscrew the adjusting screws.
62 Unscrew the pressure take-off plug.
Reassembling
63 Fit the pressure take-off plug.
64 Refit the adjusting screws.
65 Loosely refit the locknuts.
66 Replace the rear servo lever.
67 Refit the rear servo lever pivot pin.
68 Fit the oil return valve.
69 Fit the adapter.
70 Refit the bridge pipe and tighten the unions.
71 Refit the breather adapter.
72 Refit the downshift cable.
73 Replace the relay lever and torsion spring.
74 Refit the relay lever pivot pin.
75 Replace the parking brake pawl and spring.
76 Refit the parking brake pawl pivot pin.
77 Refit the parking brake rod.
78 Refit the cam plate, ensuring that the tag end locates in the groove in the rear servo lever pivot pin.
79 Fit and tighten the bolts.
80 Fit a new cross-shaft oil seal.
81 Locate the cross-shaft through the oil seal and fit the washers.
82 Fit the collar and detent lever and push the cross-shaft fully home.
83 Refit the split-pin.
84 Refit the clip.
85 Refit the 'O' ring.
86 Refit the front servo and joint washer.
87 Fit and tighten the bolts.
88 Refit the switch and secure with the bolt and washer.
89 Refit the selector lever and secure with the nut.
90 Refit the rear servo assembly, joint washer and 'O' rings, retaining them in position using petroleum jelly.
91 Fit and tighten the bolts.
92 Refit the oil tubes, ensuring that they are correctly located.
93 Locate the thrust washer on the end wall of the casing, using petroleum jelly.
94 Carefully refit the output shaft assembly.
95 Refit the governor assembly.
96 Fit and tighten the counterweight.
97 Refit the speedometer drive gear.
98 Refit the clamp tube.
99 Refit the rear extension housing and joint washer.
100 Fit and tighten the bolts.
101 Tap the drive flange into position.
102 Fit the washer and nut; using tool no. RG 421 or S 337 to hold the flange, tighten the nut to the correct torque.
103 Squeeze together the ends of the rear brake band, tilt and locate it in position.
104 Refit the rear brake band strut.
105 Using petroleum jelly, locate the thrust race on the rear drum spigot.
106 Refit the centre support/planet gear assembly, ensuring the oil and locating holes align with those in the casing.
107 Fit and tighten the three bolts.
108 Squeeze together the ends of the front brake band and fit it in position together with the strut.
109 Refit the rear clutch and forward sun gear assembly.
110 Using petroleum jelly, stick the thrust washers to the rear clutch assembly (phosphor bronze towards the front clutch).
111 Refit the front clutch assembly.
112 Using petroleum jelly, stick the thrust washer to the pump assembly.
113 Refit the pump assembly and joint washer.
114 Fit and tighten the bolts.
115 Using tool no. CBW 33, check the gear train end-float, and if necessary, adjust the selective use of the thrust washer fitted between the pump and the front clutch. Recommended end-float 0.25 mm to 0.75 mm (0.010 to 0.030 in).

116 Adjust the front band as follows:
   a. Slacken the adjusting screw and locknut.
   b. Tighten the adjusting screw to 0.7 kgf m (5 lbf ft) and back off three-quarters of a turn.
   c. Tighten the locknut to 4.84 kgf m (35 lbf ft).

117 Adjust the rear band as follows:
   a. Slacken the adjusting screw and locknut.
   b. Tighten the adjusting screw to 0.7 kgf m (5 lbf ft) and back off three-quarters of a turn.
   c. Tighten the locknut to 4.84 kgf m (35 lbf ft).

118 Refit the oil tubes. (Note the 'O' ring on the pump suction tube).

119 Refit the oil tube locating plate.

120 Fit and tighten the two bolts.

121 Carefully refit the valve block, ensuring that the oil tubes are not distorted.

122 Fit and tighten the three bolts and washers.

123 Connect the downshift inner cable to the downshift cam.

124 Refit the oil tubes.

125 Replace the magnet and refit the oil pan and joint washer.

126 Fit and tighten 12 bolts.

127 Locate the torque converter housing in place.

128 Fit and tighten four bolts securing the torque converter housing.

129 Refit the transmission unit.

REAR EXTENSION HOUSING

Remove and refit

Using Service tool RG 421 or 5337

Removing

1. Drive the vehicle onto a ramp, select 'N', chock the road wheels and raise the ramp.
2. By removing one of the bolts and slackening the other, swing the prop guard clear of the propshaft.
3. Remove the four nuts and bolts securing the propshaft to the drive flange and disconnect the propshaft.

4. Using Service tool RG 421 or 5337 remove the nut securing the drive flange.
5. Remove the drive flange.
6. Using a ramp jack and suitable wooden block, support the transmission unit under the sump pan.
7. Remove the centre gearbox mounting bolt and plate.
8. Remove the steady bar and disconnect the cable (if fitted).
9. Remove the four nuts securing the cross member.
10. By raising the LH captive bolts, release the cross member and remove.
11 Remove the clamp bolt and clamp and disconnect the speedo cable.
12 Remove the nut and bolt securing the exhaust pipe to the mounting bracket.
13 Remove the two nuts securing the bracket to the rear extension housing and remove the bracket and spacers.
14 Remove the eight bolts securing the rear extension to the transmission case.
15 Withdraw the rear extension housing.

Refitting
16 Reverse 1-15.

REAR OIL SEAL
Remove and renew 44.20.18

Removing
1 Drive vehicle onto a ramp, select 'P', chock the road wheels and raise the ramp.
2 Remove the four nuts and bolts securing the propshaft to the drive flange.
3 Disconnect the propshaft.
4 Remove the nut securing the drive flange.
5 Remove the drive flange.
6 Prise out the oil seal.
7 Clean the area surrounding the oil seal.

Renewing
8 Carefully fit the new oil seal into the rear extension.
9 Lubricate the lip of the oil seal.
10 Refit the drive flange and securing nut.
11 Reconnect the propshaft.
12 Refit and tighten the prop bolts and nuts.
13 Lower the ramp.

GOVERNOR
Remove and refit 44.22.01

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

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

GOVERNOR
Overhaul 44.22.04

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

Overhaul

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

Reassembling
6 Insert the valve.
7 Refit the spring onto the stem.
8 Refit the stem and spring.
9 Refit the weight.
10 Refit the retainer.
**DIPSTICK/FILLER TUBE**

**Removing**
1. Drive the vehicle onto a ramp, select 'P', apply the handbrake and open the bonnet.
2. Withdraw the dipstick.
3. Release the filler tube from the cylinder head.
4. Raise the ramp.
5. Unscrew the union nut from the sump pan, and release the filler pipe from the sump.
6. Drain the fluid from the transmission unit.

**Refitting**
7. Manoeuvre the filler tube into position and secure it to the sump pan with the union nut.
8. Lower the ramp.
9. Secure the filler tube to the cylinder head.
10. Refill the unit with fluid, see 44.24.02.

**TRANSMISSION FLUID**

**Drain and refill**

**Draining**
1. Drive the vehicle onto a ramp, select 'P' and apply the handbrake.
2. Raise the ramp.
3. Place a tray under the filler pipe union.
4. Unscrew the filler pipe union.
5. Drain the fluid into the tray.

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

**Filling**
If the sump has been drained, refill it with one of the recommended fluids via the dipstick/filler orifice until the level is no higher than the 'cold high' mark.

**Check fluid level 'cold'**

6. Park the vehicle on level ground, apply the handbrake, and with the footbrake firmly applied allow the engine to run for two minutes, passing the selector through the complete range of positions to ensure that the transmission is fully primed.
7. Select 'P' and allow the engine to idle.
8. Open the bonnet and withdraw the dipstick. Wipe the blade dry using lint-free cloth. Dip immediately and check the fluid level on the 'cold' side of the blade.
9. Top-up as required to the 'high cold' mark. Do not overfill.
10. Repeat instructions 6 to 9 as necessary.

**Check fluid level 'hot'**

The transmission should be at normal operating temperature: e.g., after 30 km (20 miles) running.

11. Park the vehicle on level ground, apply the handbrake, and with the footbrake firmly applied allow the engine to run at a maximum speed of 750 rev/min, for two to three minutes, passing the selector through the complete range of positions to ensure that the transmission is fully primed.
12. Select 'P' and allow the engine to idle.
13. Open the bonnet and withdraw the dipstick. Wipe the blade dry using lint-free cloth. Dip immediately and check the fluid level on the 'hot' side of the blade.
14. Top-up as required to the 'high hot' mark.
15. Repeat instructions 11 to 14 as necessary.

**DO NOT OVERFILL.**

**TRANSMISSION SUMP**

**Removing**
1. Unscrew the filler pipe union and drain the transmission unit.
2. Remove the bolts securing the heat shield.
3. Remove the heat shield spacers.
4. Remove the steady bar (if fitted).
5. Unscrew the bolts securing the sump.
6. Remove the sump and joint washer.

**Refitting**
7. Reverse instructions 1 to 6.
8. Fill the transmission unit with fluid, see 44.24.02.
**OIL/FLUID FILTER**

Remove and refit 44.24.07

**Removing**
1. Remove the transmission sump. 44.24.04.
2. Remove the four screws securing the filter in position.
3. Remove the filter.

**Refitting**
4. Reverse 1–3.

**OIL/FLUID COOLER**

Remove and refit 44.24.10

**Removing**
1. Drive the vehicle onto a ramp, select 'P'-Park', chock the road wheels and raise the ramp.
2. Detach the cooler pipes from the securing clip beneath the radiator.
3. Undo the cooler pipe union nuts.
4. Disconnect the cooler pipes.
5. Remove the two bolts securing the cooler to the body.
6. Remove the cooler.

**Refitting**
7. Reverse 1–6
8. Check/top up the transmission fluid.

**DOWNSHIFT CABLE**

**Initial setting** 44.30.01

**Adjust**

1. Check that the carburetter slow running and fast idle settings are satisfactory.
2. Slacken the locknut.
3. Adjust the outer cable in the bracket until the crimped stop is 0.25 to 0.50 mm (0.01 to 0.02 in) from the end of the outer cable ferrule.
4. Tighten the locknut.
5. Road test the vehicle and check the gear shift speeds.

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

**Pressure check**

Service tools: CBW 1A or B and CBW 1B-2

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

3. Raise the ramp.
4. Remove the plug.
5. Connect the pressure gauge to the transmission unit.
6. Lower the ramp, chock the wheels and apply the hand brake and foot brake.
7. Start the engine and select 'D'.
8. With the engine idling at 750 rev/min, note the pressure gauge reading which should be 3.5 to 4.6 kgf/cm² (50 to 65 lbf/in²).
9. Increase the engine speed to 1,000 rev/min and note the pressure increase which should be 1.4 to 1.8 kgf/cm² (20 to 25 lbf/in²).
10. Stop the engine.
11. If the pressure increase is less than 1.4 kgf/cm² (20 lbf/in²), increase the effective length of the outer cable. If the pressure increase is more than 1.2 kgf/cm² (25 lbf/in²), decrease the effective length of the outer cable.
12. Repeat operations 7 to 11 until the pressure increase is correct.
13. Raise the ramp.
14. Disconnect the pressure gauge.
15. Refit the plug.
16. Lower the ramp.
SELECTOR ROD
Adjust 44.30.04

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

REAR BRAKE BAND
Adjust 44.30.10
Service tools: 18G 307

1 Drive the vehicle onto a ramp, select P - 'Park', apply the handbrake and raise the ramp.
2 Slacken the locknut.
3 Tighten the adjusting screw to 0.7 kgf m (5.0 lbf ft) and back off three-quarters of a turn.
4 Tighten the locknut to 4.84 kgf m (35 lbf ft).
5 Lower the ramp.

STALL TEST
44.30.13
The function of a stall test is to determine that the torque converter and gearbox are operating satisfactorily.
1 Check the condition of the engine. An engine which is not developing full power will affect the stall test readings.
2 Allow the engine and transmission to reach correct working temperatures.
3 Check the wheels and apply the hand brake and foot brake.
4 Select '1' or 'R' and depress the throttle to the 'kick-down' position. Note the reading on the tachometer which should be 1800-2000 rev/min. If the reading is below 1,400 rev/min, suspect the converter for stator slip. If the reading is down to 1,600 rev/min, the engine is not developing full power. If the reading is in excess of 2,400 rev/min, suspect the gearbox for brake band or clutch slip.
5 Lower the ramp.

ROAD TEST 44.30.17
Throughout the road test procedure the term ‘full throttle’ is equivalent to approximately seven-eighths of the available pedal movement and ‘kick-down’ is equivalent to the full movement.

Procedure
1 Check that the starter motor will operate only with the selector lever in 'PARK' or 'N' and that the reverse lights operate only in 'R'.
2 Apply the hand brake and with the engine idling select 'N-D', 'N-2', 'N-R'. Engagement should be positive. A cushioned 'thump' under fast idling conditions is normal.
3 With the transmission at normal running temperatures, select 'D', release the brakes and accelerate with minimum throttle. Check the 1-2 and 2-3 shift speeds and the quality of change.
4 Stop the vehicle, select 'D' and re-start using 'kick-down'. Check the 1-2 and 2-3 shift speeds.
5 At 45 m.p.h. (72 km/h) apply ‘full throttle’. The vehicle should accelerate in third gear and should not downshift to second.
6 At a maximum speed of 56 m.p.h. (90 km/h) ‘kick-down’ fully. The transmission should downshift to second gear.

FRONT BRAKE BAND
Adjust 44.30.07
Service tools: 18G 307

1 Drive the vehicle onto a ramp, select P - 'Park', apply the hand brake and raise the ramp.
2 Slacken the locknut.
3 Tighten the adjusting screw to 0.7 kgf m (5.0 lbf ft) and back off three-quarters of a turn.
4 Tighten the locknut to 4.84 kgf m (35 lbf ft).
5 Lower the ramp.
11 With 1 still engaged, stop the vehicle and using 'kick-down' accelerate to over 40 m.p.h. (65 km/h). Check for 'slip', 'squawk', and the absence of upshifts.

12 Stop the vehicle and select 'R'. Reverse using 'full throttle' if possible. Check for 'slip' and 'squawk'.

13 Stop the vehicle on a gradient. Apply the hand brake and select 'P'-PARK. Release the hand brake and check the parking pawl hold. Check that the selector lever is held firmly in the gate in 'P'.

CONVERTER DIAGNOSIS

Inability to start on steep gradients, combined with poor acceleration from the rest and low stall speed (1,400 rev/min) indicates that the converter stator uni-directional clutch is slipping. This condition permits the stator to rotate in an opposite direction to the impeller and turbine, and torque multiplication cannot occur.

Poor acceleration in third gear above 30 m.p.h. (50 km/h) and reduced maximum speed, indicates that the stator uni-directional clutch has seized. The stator will not rotate with the turbine and impeller and the 'fluid flywheel' phase cannot occur. This condition will also be indicated by excessive overheating of the transmission although the stall speed will be correct.

ROAD TEST - FAULT DIAGNOSIS CHART

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Engagement of 1, 2, D or R</th>
<th>Take Off</th>
<th>Upshifts</th>
<th>Uplift Quality</th>
<th>Downshifts</th>
<th>Downshift Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid level insufficient</td>
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<td>Downshift cable incorrectly assembled or adjusted</td>
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<td>Manual linkage incorrectly assembled or adjusted</td>
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<tr>
<td>Incorrect engine idling speed</td>
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<td>7 7</td>
<td>8 8</td>
<td>8 9</td>
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<tr>
<td>Oil tubes incorrectly installed, missing or leaking</td>
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<td>10 10</td>
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<td>Sealing ring missing or broken</td>
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<td>6 6</td>
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<td>Valve block across missing or loose</td>
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<td>Throttle valve sticking</td>
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<td>Governor valve sticking, leaking or incorrectly assembled</td>
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<td>Convertor 'out' check valve sticking or missing</td>
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<td>Rear clutch seized or plates distorted</td>
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<td>Uni-directional clutch slipping or incorrectly installed</td>
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<td>Uni-directional clutch seized</td>
<td>18</td>
<td>18</td>
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<tr>
<td>Input shaft broken</td>
<td>19</td>
<td>19</td>
<td>19</td>
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<tr>
<td>Front pump drive tangs on converter hub broken</td>
<td>20</td>
<td>20</td>
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<tr>
<td>Front pump worn</td>
<td>21</td>
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<tr>
<td>Converter Sliding and/or uni-directional clutch failed</td>
<td>22</td>
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<td>22</td>
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NOTE: The numbers indicate the recommended sequence of investigation.
PUMP
Remove and refit 44.32.01
Service tools: CBW 60, CBW 547A-50

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

Refitting
17 Using petroleum jelly, stick the thrust washer to the pump assembly.
18 Refit the pump assembly and joint washer.
19 Fit and tighten the bolts.
20 Refit the oil tubes. (Note the 'O' ring on the pump suction tube.)
21 Refit the oil tube locating plate.
22 Fit and tighten the two bolts.
23 Carefully refit the valve block, ensuring that the oil tubes are not distorted.
24 Fit and tighten the three bolts and washers.
25 Connect the downshift inner cable to the downshift cam.
26 Refit the oil tubes.
27 Replace the magnet and refit the oil pan and joint washer.
28 Fit and tighten 12 bolts.
29 Locate the torque converter housing in place.
30 Fit and tighten four bolts.
31 Refit the switch. 44.15.15.
32 Refit the transmission unit. 44.20.01.

PUMP
Overhaul 44.32.04
Service tool: CBW 547A-50

Dismantling
2 Unscrew the bolts.
3 Take out the locating screw.
4 Separate the stator support from the pump body assembly.
5 Mark the outside faces of the gears to facilitate correct assembly.
6 Remove the gears.
7 Remove the 'O' ring.
8 Extract the seal.

Reassembling
9 Renew the seal.
10 Refit the 'O' ring.
11 Fit the gears into the pump body.
12 Lightly lubricate the gears and the 'O' ring.
13 Refit the stator support.
14 Fit and tighten the locating screw and lock washer.
15 Fit and tighten the bolts and lock washers.
16 Refit the pump. 44.32.01.
FRONT SERVO
Remove and refit 44.34.07
Service tool: CBW 547A-50

Removing
1 Drive the vehicle onto a ramp, select 'N' and apply the hand brake.
2 Disconnect the gearbox selector lever.
3 Take out the four bolts.
4 Withdraw the front servo assembly, spring and joint washer.

Refitting
5 Locate the joint washer onto the servo body flange.
6 Refit the servo and spring.
7 Fit the tighten the bolts using CBW 547A-50.

FRONT SERVO
Overhaul 44.34.10

Dismantling
2 Remove the spring.
3 Withdraw the piston using air pressure.
4 Remove the 'O' rings from the body.
5 Remove the 'O' rings from the piston.

Reassembling
6 Fit the 'O' rings to the piston.
7 Fit the 'O' rings to the body.
8 Refit the piston.
9 Fit the spring.
10 Refit the front servo assembly. 44.34.07.

REAR SERVO
Remove and refit 44.34.13
Service tool: CBW 547A-50

Removing
1 Remove the exhaust front pipe. 44.34.07.

Dismantling
2 Remove the push-rod.
3 Remove the spring.
4 Withdraw the piston using air pressure.
5 Remove the 'O' rings.

Reassembling
6 Fit the 'O' rings to the piston.
7 Refit the piston.
8 Refit the spring.
9 Refit the push-rod.
10 Refit the rear servo. 44.34.13.

REAR SERVO
Overhaul 44.34.16

1 Remove the rear servo. 44.34.13.

Removing
2 Unscrew the six bolts.
3 Withdraw the servo and joint washer together with 'O' rings, spring and push-rod.

Refitting
4 Locate the 'O' rings and joint washer onto the gearbox casing.
5 Fit the servo assembly, spring and push-rod.
6 Fit and tighten the six bolts using CBW 547A-50.
7 Refit the exhaust front pipe. 30.10.09.
OUTPUT SHAFT

Remove and refit

Service tools: CBW 60, RG 421 or S 337, CBW 547A-50

Removing

1. Remove the transmission unit.
2. Wash the exterior of the unit in clean petrol or paraffin, invert it and place on a bench cradle CBW 60. Remove the switch. 44.15.15.
3. Unscrew the bolts securing the torque converter housing.
4. Remove the torque converter housing.
5. Unscrew 12 bolts.
6. Remove the oil pan, joint washer and magnet.
7. Pull out the oil tubes.
8. Release the downshift inner cable from the downshift cam.
9. Take out three bolts and washers.
10. Lift off the valve block.
11. Unscrew two bolts.
12. Remove the oil tube locating plate.
13. Pull out the oil tubes. (Note the 'O' ring on the pump suction tube.)
14. Take out five bolts.
15. Remove the pump and joint washer.
16. Remove the thrust washer.
17. Withdraw the front clutch.
18. Remove the thrust washers.
19. Withdraw the rear clutch and forward sun gear.
20. Squeeze together the ends of the front brake band and remove it together with the strut.
21. Unscrew the three bolts.
22. Withdraw the centre support/planet gear assembly and needle thrust assembly.
23. Squeeze together the ends of the rear brake band, tilt and withdraw together with the strut.
24. Using tool no. RG 421 or S 337 to retain the flange, unscrew the nut.
25. Withdraw the flange.
26. Unscrew the bolts.
27. Withdraw the rear extension and joint washer.
28. Remove the clamp tube.
29. Withdraw the speedometer drive gear.
30. Unscrew the counterweight and remove the governor.
31. Withdraw the output shaft assembly.
32. Remove the thrust washer.
33. Remove the circlip.
34. Detach the outer annulus from the output shaft.
Refitting
35 Assemble the outer annulus and the output shaft.
36 Fit the circlip.
37 Using petroleum jelly, stick the thrust washer to the casing.
38 Refit the output shaft assembly.
39 Refit the governor and secure it with the counterweight.
40 Refit the speedometer drive gear.
41 Refit the clamp tube.
42 Refit the rear extension, using a new joint washer if necessary.

43 Fit and tighten the bolts.
44 Refit the flange.
45 Holding the flange with tool no. RG 421 or S 337, fit and tighten the nut.
46 Using petroleum jelly, stick the needle thrust bearing onto the planet gear case (rear drum).
47 Refit the rear brake band and strut.
48 Refit the centre support/planet gear assembly, ensuring that the oil and locating holes align with those in the casing.

49 Fit and tighten the bolts.
50 Squeeze together the ends of the front brake band and fit it in position together with the strut.
51 Refit the rear clutch and forward sun gear assembly.
52 Using petroleum jelly, stick the thrust washers to the rear clutch assembly (phosphor bronze towards the front clutch).
53 Refit the front clutch assembly.
54 Using petroleum jelly, stick the thrust washer to the pump assembly.
55 Refit the pump assembly and joint washer.
56 Fit and tighten the bolts.
57 Refit the oil tubes. (Note the 'O' ring on the pump suction tube.)
58 Refit the oil tube locating plate.
59 Fit and tighten the two bolts.
60 Carefully refit the valve block, ensuring that the oil tubes are not distorted.
61 Fit and tighten the three bolts and washers.
62 Connect the downshift inner cable to the downshift cam.
63 Refit the oil tubes.
64 Replace the magnet and refit the oil pan and joint washer.
65 Fit and tighten 12 bolts.
66 Locate the torque converter housing in place.
67 Fit and tighten four bolts securing the torque converter housing.
68 Refit the switch, 44.15.15.
69 Refit the transmission unit, see 44.20.01.
PLANET GEARS AND REAR DRUM ASSEMBLY
Remove and refit 44.36.04
Service tools: CBW 60, CBW 547A-50

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

Refitting
27. Fit the uni-directional clutch outer race to the rear drum assembly.
28. Fit the circlip.
29. Refit the uni-directional clutch.
30. Assemble the centre support and planet gear assembly.
31. Refit the centre support/planet gear assembly, ensuring that the oil and locating holes align with those in the casing.
32. Fit and tighten the bolts.
33. Squeeze together the ends of the front brake band and fit it in position together with the strut.
34. Refit the rear clutch and forward sun gear assembly.
35. Using petroleum jelly, stick the thrust washers to the rear clutch assembly (phosphor bronze towards the front clutch).

continued
36 Refit the front clutch assembly.
37 Using petroleum jelly, stick the thrust washer to the pump assembly.
38 Refit the pump assembly and joint washer.
39 Fit and tighten the bolts.
40 Refit the oil tubes. (Note the 'O' ring on the pump suction tube.)
41 Refit the oil tube locating plate.
42 Fit and tighten the two bolts.
43 Carefully refit the valve block, ensuring that the oil tubes are not distorted.
44 Fit and tighten the three bolts and washers.
45 Connect the downshift inner cable to the downshift cam.
46 Refit the oil tubes.
47 Replace the magnet and refit the oil pan and joint washer.
48 Fit and tighten 12 bolts.
49 Locate the torque converter housing in place.
50 Fit and tighten four bolts securing the torque converter housing.
51 Refit the switch. 44.15.15.
52 Refit the transmission unit. 44.20.01.

SPEEDOMETER DRIVE PINION
Remove and refit 44.38.04

Removing
1 Drive the vehicle onto a ramp, apply the hand brake and raise the ramp.
2 Disconnect the speedometer cable from the gearbox.
3 Carefully prise the speedometer pinion housing out of the extension.
4 Withdraw the pinion from the housing.
5 Remove the 'O' ring.
6 Extract the seal.

Refitting
7 Press a new seal into the housing.
8 Fit a new 'O' ring to the housing.
9 Fit the drive pinion into the housing.
10 Press the housing into the rear extension.
11 Refit the speedometer cable.
12 Lower the ramp.

SPEEDOMETER DRIVE GEAR
Remove and refit 44.38.07

Removing
1 Remove the rear extension housing. 44.20.15.
2 Remove the clamp tube.
3 Withdraw the speedometer drive gear.

Refitting
4 Fit the speedometer drive gear.
5 Refit the clamp tube.
6 Refit the rear extension housing. 44.20.15.

VALVE BLOCK
Remove and refit 44.40.01

Removing
1 Remove the sump pan. 44.24.04, and remove the switch. 44.15.15.
2 Remove the magnet.
3 Pull out the oil connector pipes.
4 Disconnect the downshift cable from the cam.
5 Take out three bolts.
6 Release the valve block.

Refitting
7 Ensure that the pipes are correctly located.
8 Fit the valve block to the unit.
9 Secure with three bolts.
10 Attach the downshift cable to the cam, ensuring that the cam is correctly located on the manual valve.
11 Refit the oil connector pipes.
12 Attach the magnet to one end of the bolt heads.
13 Refit the switch. 44.15.15.
14 Replace the sump pan. 44.24.04.
VALVE BLOCK
Overhaul 44.40.04
Service tool: CBW 548

1. Remove the valve block. 44.40.01.

Disassembling
2. Take out two screws.
3. Remove the downshift cam assembly.
4. Take out four screws.
5. Remove the oil strainer and gasket.
6. Take out eight screws.
7. Remove the governor line plate.
8. Remove the separating plate.
9. Remove the check valve.
10. Remove the check valve ball and spring.
11. Remove the servo orifice control valve spring and stop.
12. Remove the throttle valve stop and return spring.
13. Remove the throttle valve plate.
14. Withdraw the manual control valve.
15. Withdraw the downshift valve.
16. Remove the throttle valve spring.
17. Tap out the dowel pin, applying light pressure to the plug.
18. Withdraw the modulator plug.
19. Withdraw the modulator valve.
20. Withdraw the modulator valve spacer.
21. Withdraw the modulator valve spring.
22. Withdraw the servo orifice control valve.
23. Slacken progressively the three screws.
24. Carefully remove the end plate.
25. Remove the spring.
26. Withdraw the sleeve.
27. Take out the primary regulator valve.
28. Remove the spring.
29. Withdraw the secondary regulator valve.
30. Remove the screws from the upper valve body.

Reassembling
31. Insert the 1-2 shift valve.
32. Insert the 2-3 shift valve.
33. Replace the rear end plate.
34. Fit and tighten the three screws.
35. Insert the 1-2 shift valve plunger.
36. Insert the 2-3 shift valve spring.
37. Insert the 1-2 shift valve spring.
38. Insert the 2-3 shift valve plunger.
39. Locate the front end plate in position.
40. Fit and tighten three screws.
41. Insert the secondary regulator valve into the lower valve body.
42. Refit the spring.
43. Insert the primary regulator valve.
44. Insert the sleeve.
45. Insert the spring.
46. Hold the end plate in position.
47. Fit and tighten the three screws.
48. Insert the servo orifice control valve.
49. Insert the spring.
50. Depress the spring and fit the stop.
51. Insert the modulator control valve spring.
52. Insert the spacer.
53. Insert the modulator control valve.
54. Insert the plug.
55. Fit the dowel pin.
56. Insert the throttle valve.
57. Insert the spring.
58. Insert the downshift valve.
59. Insert the manual control valve.
60. Insert the throttle valve return spring and stop.
61. Refit the throttle valve plate.
62. Refit the check valve ball and spring.
63. Refit the check valve.
64. Place the separating plate in position.
65. Hold the governor line plate in position.
66. Fit and loosely tighten the four screws.
67. Replace the oil tube collector.
68. Fit and loosely tighten eight screws.
69. Replace the upper valve body.
70. Fit and tighten the eight screws.
71. Refit the oil strainer and gasket.
72. Fit and tighten four screws.
73. Refit the detent spring and spacer.
74. Fit and tighten the screw.
75. Tension the downshift cam and refit the assembly.
76. Fit and tighten two screws.
77. Refit the valve block. 44.40.01.
PROPELLER SHAFT

Remove and refit 47.15.01

Removing
1 Scribe the gearbox flange, rear axle flange, and propeller shaft flanges to enable reassembly in original locations.
2 Remove the four bolts and nyloc nuts securing the propeller shaft and rear axle pinion flanges.
3 Remove the four bolts and nyloc nuts securing the propeller shaft and gearbox flanges.
4 Remove the propeller shaft.

Refitting
5 Reverse instructions 1 to 4.
HALF SHAFT BEARING AND OUTER OIL SEAL

Remove and refit 51.10.02
Service tools: 18G 284 AR and 284

Removing
1. Jack up the rear of the car and support securely.
2. Remove the half shaft. 51.10.12
3. Using a drill, bore the retaining collar to weaken it.
   CAUTION: Do not allow the drill to penetrate the collar as damage will be caused to the half shaft.

Using a hammer and chisel carefully burst the retaining collar and remove it from the half shaft.
5. Using a press remove the bearing, oil seal and retaining plate.
6. Using tools 18G 284 AR and 284 remove the half shaft bearing outer track from the axle casing.

Refitting
7. Fit the half shaft outer bearing track to the axle casing.
8. Fit the retaining plate to the half shaft (welded member adjacent to the shaft flange).
9. Lubricate the lip of the oil seal.
10. Slide the seal into position on the shaft.
11. Fit the bearing (tapered face of bearing towards the half shaft splines).
12. Wipe the shaft in front of the bearing clean of grease.
13. Smear the shaft in front of the bearing with Loctite 602 compound and also the bore of the new retaining collar.
14. Fit the new retaining collar and press the collar home until it butts against the bearing.
   CAUTION: A force of not less than three tons should be required to slide the retaining collar into position over the last 0.125 in (3.175 mm) of its travel. If it is found that the interference fit of the collar is such that it can be fitted using a force of less than three tons the collar must be removed and another fitted.
15. Smear the bearing oil seal and the rear axle tube with a lithium base grease.
   See NOTE Operation No. 7 - 51.10.12.
16. Fit the half shaft. 51.10.12.
17. Lower the car.

HALF SHAFT ASSEMBLY

Remove and refit 51.10.12
Service tools: 18G 284-1 and 284 (4235 or 3072 with S4235A-1 may be used in lieu of 284)

Removing
1. Jack up the rear of the car and support securely.
2. Remove the rear road wheel.
3. Release the handbrake and remove the brake drum.
4. Remove the four bolts and nuts securing the half shaft assembly and the back plate to the axle tube flange.
5. Using tools 18G 284-1 and 284 withdraw the half shaft.

Refitting
6. Smear the interior of the axle tube/half shaft bearing area with a lithium base grease.
7. Similarly grease the half shaft bearing and oil seal.

continued
NOTE: On initial build, when lubricating the half shaft bearing using a grease-gun, the shaft should be rotated during the operation to ensure that the bearing is properly 'primed'.

On initial assembly, a total of 40 gms of grease must be used.

8 Enter the half shaft in the axle tube and engage the differential splines.
9 Carefully slide the half shaft into position. Ensure that the bearing and the oil seal enter the axle tube squarely.
10 Fit the four securing bolts and nuts. Tighten them evenly.
11 Carefully wipe off surplus grease to prevent contamination of the brake linings.
12 Fit the brake drum.
13 Fit the road wheel.
14 Lower the car.

HALF SHAFT INNER OIL SEAL

Remove and refit 51.10.14
Service tool: 18G 1271

Removing
1 Jack up the rear of the car and support securely.
2 Remove the half shaft assembly. 51.20.12.

Refitting
3 Remove the half shaft inner oil seal using tool 18G 1271

DUFFERENTIAL ASSEMBLY

Overhaul 51.15.07

1 Remove the rear axle assembly from the car. 51.25.01.
2 Remove the brake pipes.
3 Support the axle on stands.

Crown wheel differential unit
8 Check or mark the carrier bearing caps to establish original locations. Bearing caps must not be interchanged.
9 Remove the four bolts securing the bearing caps.
10 Remove the bearing caps.
11 Carefully lever the crown wheel and differential unit clear of the axle casing. If difficulty is experienced a spreader, tool S101 and S101-1 should be employed.
12 Lift out the crown wheel and differential unit complete with carrier bearings and shims.

Dismantling
4 Remove the differential rear cover and drain the oil.
5 Remove the half shafts and brake backplates 51.10.12.
6 Remove the nyloc nut securing the drive flange and remove the flange.
7 Remove the four bolts securing the pinion oil seal housing to the axle case.
13 Using press 47 and adaptors S4221A-16 withdraw the carrier bearings.
14 Remove the eight bolts securing the crown wheel to the carrier flange and withdraw the crown wheel.
15 Withdraw the ball locating the differential pinion pin.
16 Remove the differential pinion pin.
17 Rotate the differential sun wheels to bring the two planet wheels and their respective thrust washers clear of the casing.
18 Remove the planet wheels and thrust washers.
19 Remove the two sun wheels and thrust washers.

Pinion and Bearings
20 Using tools 18G 1272 and S98A remove the pinion shaft nut.
21 Using a hardwood block carefully tap out the pinion complete with selective spacer, pinion head bearing and collapsible spacer.
22 Remove the pinion outer bearing from the axle casing.
23 Evenly drift out the pinion inner and outer bearing tracks from the axle casing. Care must be taken not to damage the axle casing.

Assembling
24 Remove the collapsible spacer from the pinion shaft.
25 Using tool 47 and adaptor 18G 47AJ remove the pinion head bearing and spacer.

Crown Wheel and Differential Unit
26 Fit the carrier bearings to the differential unit.
27 Lightly lubricate the carrier bearings, fit the bearing outer tracks and place the differential unit in the axle casing.
28 Slide the differential unit to one side of the axle casing and rotate the unit to allow the bearings to centralise.
29 Using a dial gauge check the crown wheel mounting flange for 'run-out'. 'Run-out' should not exceed 0.003 in (0.08 mm). Ensure that the bearing tracks are properly seated. When satisfied that 'run-out' is correct proceed as follows:
30 With the differential unit and bearings pressed to one side of axle casing note the reading on the dial gauge.
31 Slide the differential unit and bearings to the other side of the casing. Note this lateral travel registered on the dial gauge. Record this lateral travel (dimension 'A') as it is subsequently used to determine the shim pack required for the carrier bearings. CAUTION: The lateral travel in some cases may be found to be restricted due to a foul condition between the case and the bearing on the short side of the differential unit. In the event of this, a nominal shim should be used between the case and the bearing on the short side of the differential unit. The value of this shim should be added to the gauge reading to give the lateral travel.
32 Remove the differential complete with bearings.
33 LIGHTLY lubricate the sun wheel thrust washers and install the sun wheel and thrust washers in the differential unit.
34 Mesh the planet wheels with the sun wheels ensuring that the planet wheels are diametrically opposite. Rotate the sun wheels to bring the planet wheels into position in the differential unit casing.

Pinion and Bearings
35 Fit the differential pinion pin.
36 Check and assess planet wheel end float.
37 Remove the pinion pin and rotate both sun wheels to bring the planet wheels clear of the differential unit casing.
38 Lubricate the planet wheel thrust washers selected and slide the planet wheels and thrust washers into position. Fit the pinion pin ensuring that the groove aligns with the location for the retaining ball and again check the planet gears for backlash and end float. Zero backlash is required. Choose thrust washers as necessary from the selection available.
39 Fit the crown wheel and the ball retaining the pinion pin.
40 Smear the threads of the crown wheel securing bolts with 'Loctite 601' compound. Fit the bolts and evenly tighten. (See 'TORQUE WRENCH SETTINGS'.)

Pinion and Bearings
41 Fit the pinion shaft inner and outer bearing tracks to the axle casing.
42 Fit the pinion inner bearing to the dummy pinion 18G 191-1. NOTE: The dimension of the dummy pinion incorporates a built-in allowance for the maximum pinion head bearing spacer available, 0.0492 in (1.25 mm).
43 LIGHTLY lubricate the bearings and fit the dummy pinion, bearings, spacer, washer and nut.
44 Tighten the dummy pinion nut until a bearing pre-load of 15 to 18 lbf in (0.17 to 0.21 kgf m) is obtained. This can be checked using a lbf in (kgf m) scale torque wrench and a socket.
45 Mount a dial gauge (tool 18G 191) on the dummy pinion and zero the gauge using the dummy pinion head as a base.
46 Move the gauge stylus over the centre of one carrier bearing bore. Note the indicated measurement. Repeat for the opposite carrier bearing bore.
47 Add the two measurements and divide by two.
48 Remove the gauge and dummy pinion.
49 Calculate the spacer required for the pinion head bearing. Example:
- Sum of carrier bearing bore readings = 0.002 in (0.051 mm) + 0.002 in (0.051 mm) = 0.004 in (0.102 mm)
- Divide by two = 0.004 in (0.102 mm) = 0.002 in (0.051 mm)
- Add dummy pinion spacer allowance, 0.049 in (1.25 mm) (lublited in dummy pinion dimensions) = 0.002 in (0.051 mm) + 0.049 in (1.25 mm) = 0.051 in (1.301 mm)
- Examine the markings on the pinion head. Three markings will be found. These are:
  X Identification for matched crown wheel/pinion set.

continued
Variation in pinion head thickness from nominal.

This is a 'boxed' figure which indicates the variation from nominal setting to obtain the best running position. This dimension must be used when calculating the thickness of the pinion head spacer. If the 'boxed' figure Z is plus, subtract this value (+0.003 in) from the previous calculation. In the example 0.051 in (1.301 mm) - 0.003 in (0.076 mm) = 0.048 in (1.225 mm) pinion head spacer required. If the 'boxed' figure Z is minus, add this value to the previous calculation. In the example 0.051 in (1.301 mm) + 0.003 in (0.076 mm) = 0.054 in (1.337 mm) = pinion head spacer required.

61 Shim thickness required for carrier bearing on plain side of the crown wheel = Dimension 'B' (Instruction 58) minus crown wheel backlash plus carrier bearing preload

Example: Using the mean values of 0.005 in for crown wheel backlash, 0.003 in for carrier bearing preload and an assumed value of 0.115 in for dimension 'B' the calculation is:

\[ 0.115 - 0.005 + 0.003 = 0.1135 \text{ in (2.8321 mm)} = \text{thickness of shim required.} \]

In the example quoted the required shim thickness falls outside the shim sizes available. The nearest shim thickness is 0.112 in (2.85 mm). It is thus thicker than the calculated requirement. Since the calculation was made using the mean values for backlash and bearing preload and the increased thickness of the shim available falls within the tolerance specified (Instruction 60) the 0.112 in (2.85 mm) shim is acceptable.

62 Allocate the selected shims to their respective carrier bearings. Ensure the shims are not interchanged.

63 Fit the spreading tool S101 and S101-1 to the axle casing.

64 Carefully expand the spreading tool to allow the crown wheel/differential unit to be placed in position complete with carrier bearing shims. Do not expand more than is necessary or irreparable damage will be caused to the axle casing. Do not exceed a stretch exceeding three or four flats of a finger tight turnbuckle. Do not lever against the spreader.

65 Remove the spreading tool.

66 Fit the carrier bearing caps to their original marked position and the four securing bolts. Evenly tighten the bolts—see ‘TORQUE WRENCH SETTINGS’.
Check crown wheel/pinion backlash.
Fit the rear cover and gasket to the axle casing.
Fit the halfshafts and backplate assemblies, 51.10.12.

Pinion oil seal housing
Remove the old oil seal from the pinion seal housing and fit a new seal (tool 6312, seal lip facing away from the front face of the seal housing).
Using a strip of masking tape place it over the machined step on the pinion shaft as illustrated. This protects the seal when the housing is eased into position. Apply the tape marginally to facilitate tape removal.
Lubricate the seal lip and masking tape.
Enter the seal housing in the axle casing and tap gently into position. Remove the masking tape.
Fit the brake pipes.
Fill the axle to the level of the filler plug with fresh oil.
Fit the axle to the car. 51.25.01
Bleed the brakes.
Lower the car.

DIFFERENTIAL PINION OIL SEAL
Remove and refit 51.20.01 *
Service tools: 6321 and 18G 1273 18G 1205

Removing
1. Jack up the rear of the vehicle and support the body securely on two stands.
2. Remove the four bolts securing the rear propshaft coupling.
3. Remove the nut securing the drive flange and remove the flange.
4. Remove the four bolts and spring washers securing the pinion oil seal housing to the axle case.
5. Remove the pinion oil seal (Tool 6312).

Refitting
6. Fit a new oil seal to the housing ensuring that the lip of the seal faces away from the front face of the housing (Tool 18G 1273).
7. Wrap a narrow strip of masking tape over the machined step on the pinion shaft. This prevents damage to the seal when fitting. Apply the tape marginally to facilitate tape removal.
8. Lubricate the seal lip and the masking tape.
9. Fit the seal and housing, evenly entering the housing in the axle casing. Gently and evenly tap into position.
10. Fit and tighten the four bolts and spring washers securing the pinion oil seal housing to the axle case.
11. Refit the flange and nyloc nut and washer.
12. Tighten the flange nut.
13. Refit and tighten the rear propshaft coupling bolts.
14. Lower the vehicle.
15. Check the oil level.

REAR AXLE ASSEMBLY
Remove and refit 51.25.01

Removing
1. Jack up the rear of the vehicle and support the body securely on two stands.
2. Remove the rear wheels and release the handbrake.
3. Co-relate the drive flanges and remove the four rear propshaft securing nuts and bolts.
4. Fit a brake pipe clamp to the flexible brake hose.
5. Undo the fixed brake pipe and union nut and displace the flexible hose from the axle.
6. Remove the split pins and clevis pin from the handbrake cable clevis forks.
7. Slacken the compensator pinch bolt.
8. Remove the compensator trunion.
9. Feed the handbrake cables through the rear bracket on the axle.
10. Support the axle on a jack.
11. Disconnect the rear dampers from their lower fixing brackets.
12. Lower the axle on the jack.
13. Remove the rear road springs.
14. Remove the nuts and bolts securing the radius arms to the axle.
15. Displace the handbrake cables and bracket to one side.
16. Remove the nuts and bolts securing the trailing arms to the axle.
17. Manoeuvre the axle over the anti-roll bar and clear of the vehicle.

Refitting
18. Position the jack and manoeuvre the axle into position over the anti-roll bar.

continued
19 Grease all bushes with rubber grease.
20 Refit and tighten the trailing arm securing bolts and nuts.
21 Reposition the handbrake cable bracket and refit and tighten the radius arm securing bolts and nuts.
22 Refit the rear road springs.
23 Jack up the axle and locate the dampers in their lower fixing brackets.
24 Fit the damper rubbers and washers and tighten the securing nuts and lock nuts.
25 Lower the jack.

26 Feed the handbrake cables through the rear bracket and refit the compensator trunion.
27 Tighten the pinch bolt.
28 Connect the handbrake cable clevis forks, pins and split pins.
29 Refit the flexible brake hose to the axle and connect the fixed brake pipe.
30 Remove the brake pipe clamp.
31 Refit the propshaft and tighten the four nuts and bolts.
32 Bleed the brakes.
33 Refit the rear wheels.
34 Remove the stands and lower the rear of the vehicle.
35 Check the axle oil level.

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Torque (Nm)</th>
<th>Torque (lbf ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear cover to axle case</td>
<td>22-28</td>
<td>16-21</td>
</tr>
<tr>
<td>Pinion oil seal housing to axle case</td>
<td>40-50</td>
<td>30-37</td>
</tr>
<tr>
<td>Differential unit bearing caps to axle case</td>
<td>80-100</td>
<td>60-75</td>
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<tr>
<td>Crown wheel to differential unit (with Loctite)</td>
<td>108-122</td>
<td>80-90</td>
</tr>
<tr>
<td>Pinion flange to pinion</td>
<td>120-160</td>
<td>90-120</td>
</tr>
<tr>
<td>Axle shafts/backplates to axle casing</td>
<td>40-60</td>
<td>35-40</td>
</tr>
<tr>
<td>Oil capacity</td>
<td>1.60 pts</td>
<td>0.91 litres</td>
</tr>
</tbody>
</table>

Loctite specification — axle shaft collars and crown wheel bolts.
The power steering system provides hydraulic assistance to reduce driver effort to a minimum. Since the energy needed to marginally deflect the front road wheels at speed is considerably less than is necessary to apply full lock to a stationary car, the degree of assistance must be variable and related to the frictional resistance between tyre and road surface. In addition, it is necessary to ensure that the effort of turning the steering-wheel is not reduced to such negligible limits that the 'feel' of the car is lost, i.e. the effort required to steer the car must not be entirely removed. The power steering system therefore provides variable, sensitive assistance to deflect the front road wheels as required.

The power steering system comprises a rack-type steering mechanism which incorporates a double-acting hydraulic ram, a control/valve pinion assembly, a combined hydraulic pump and fluid reservoir, and connecting supply and return hoses.

The vane-type hydraulic pump which is belt-driven from the engine crankshaft pulley delivers a continuous supply of oil to the steering rack control valve. The control valve is the intermediate link between the steering-wheel and the rack pinion. As its name suggests, the control valve is the instrument through which the circulating oil is directed to change either side of the steering race ram chamber or to permit free return to the reservoir.

Power assistance is provided only when the engine and therefore the hydraulic pump is running. When the engine is stationary, or if for any reason the hydraulic system is inoperative, steering is performed by direct mechanical means.
POWER STEERING HYDRAULIC PUMP

Description
A combined hydraulic pump and fluid reservoir unit is secured to the engine by two brackets and is belt-driven from the engine crankshaft pulley. Two flexible hoses—one delivery, one return—connect it to a control valve on the steering rack. A rotor with 10 floating vanes is fitted to the pump shaft and is enclosed by an elliptical ring which provides two diametrically opposed pumping chambers. Fitted front and rear of the rotor are, respectively, a thrust plate and a pressure plate. These plates employ dowel pins to align them with the elliptical ring and pump body. A tapered compression spring assisted by a pumping output pressure maintains controlled loading of the pressure plate. An end plate located by a circlip and sealed by an 'O' ring provides a division between pump and reservoir. Below the rotor, from which it is supplied, is a combined flow valve/relief valve, and the pump delivery union. Oil, returned from the rack control valve is fed directly to the reservoir.

Operation
Oil, from the reservoir, is admitted via a drilling in the pump body to the underside of the pump rotor, from whence, through portings between the rotor and thrust plate and also the rotor and pressure plate, it is admitted to the pumping chambers. From the pumping chambers the oil is expelled to the discharge chamber, and, via a drilling in the pump body, to the pump outlet union. Pressurized oil in the discharge chamber is also admitted to the vane roots, thus ensuring that the vane tips follow the contours of the elliptical ring. At the pump outlet union the oil passes via a slot on the piston crown of the flow/relief valve and is delivered to the rack control valve.

The flow/relief valve serves a dual function, namely to provide escape for pressurized oil when steering demands require limitation (for example, when the road wheels are on full lock and excessive pressure would overload the rack seals), and also to ensure that oil flow is adequate to pressurize the rack chamber as required. The flow/relief valve comprises a piston, the crown of which is exposed to pump pressure, the other end bears against a compression spring. Within the piston is a spring-loaded ball type relief valve. The need for high rack chamber pressure is greatest when manoeuvring or parking and usually coincides with reduced pump speeds and high frictional resistance between tyre and road due to zero or low rolling speed. The flow/relief valve therefore has to cater for a range of flow and pressure variations ranging from high volume flow and no steering demands (vehicle travelling in straight line at high speed), and low volume flow and maximum steering demands (vehicle stationary, engine idling, full lock).

Pump discharge pressure, acting on the piston of the flow valve, tends to displace the piston against the action of its compression spring, thereby increasing oil flow through the outlet union, to the rack control valve, or, when the piston is displaced sufficiently, to uncover the escape port, allowing oil to return to the reservoir. This latter position is the normal working position of the piston, as discharge from the pump is always in excess of power steering requirements and oil is constantly being circulated externally. However, oil admitted to the outlet union also has access, via an orifice and transfer passage, to the spring chamber of the flow piston where it is further assisted by the spring.

Since piston area, front and rear, are equal, given hydraulic balance, the spring will oppose pump pressure and resist piston displacement, but since movement of the piston towards the outlet union must create restriction in oil flow and consequent pressure increase, the piston adjusts bleed-off or escape to the reservoir to match the pressure and flow requirements of the rack control valve.

Piston displacement is also influenced by the orifice in the transfer passage to the spring chamber, as its presence introduces a delay factor in pressure balance between spring chamber and piston crown.
THE VALVE HOUSING

Description

The cut-away illustration shows the construction and component parts. The spool shaft (12), spool sleeve (11) and the pinion shaft (7) are connected by dogs (inset). The dogs (inset) positively locate the spool sleeve to the pinion shaft but provide sufficient tolerance or backlash to permit slight (approximately 1°) rotation of the spool shaft in relation to the spool sleeve before they transmit direct mechanical torque to the pinion shaft. The spool shaft and pinion shaft are also connected by a torsion bar (14) which is pinned at its ends to each shaft. Thus, while movement imparted to the steering-wheel results in rotation of the spool shaft, spool sleeve and pinion shaft, the spool shaft, due to the backlash provided in the dogs and to the action of the torsion bar, always leads in relation to the other two components. The significance of this pre-movement becomes apparent on examination of the spool sleeve and spool shaft.

The spool sleeve (11) has three external annular grooves and four sealing rings; internally there are two adjacent vertical channels. A drilling in the upper annular groove connects the upper extremity of one vertical channel. The lower annular groove is drilled to connect the other vertical channel at its lower extremity. A drilling in the external annular groove penetrates the spool at a point opposite the two vertical channels.

The spool shaft has three machined flutes of equal length. The two outer flutes are connected by a machined groove. The central flute is drilled to connect through the hollow shaft with six equally spaced radial drillings above the vertical flutes.

OIL FLOW

A Steering straight
B Steering right
C Steering left
D Oil inlet from pump
E Connections to rack ram
F Oil return to reservoir

1 Flutes—spool shaft
2 Fluid outlet to pump reservoir
3 Fluid inlet—from pump
4 Outlet/inlet ports—to and from rack
5 ‘O’ ring
6 Ball race
7 Pinion
8 Pin—torsion bar
9 ‘O’ ring
10 Circlip
11 Sealing rings—spool sleeve
12 Spool shaft
13 Pin—torsion bar
14 Torsion bar
<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>CAUSE</th>
<th>CURE</th>
</tr>
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<tbody>
<tr>
<td>Oil leaks</td>
<td>Damaged or worn seals</td>
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<tr>
<td></td>
<td>Loose unions</td>
<td>- Replace sealing washers</td>
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<td></td>
<td>Damaged union sealing</td>
<td>- Replace seals</td>
</tr>
<tr>
<td></td>
<td>washers</td>
<td>- Tighten unions</td>
</tr>
<tr>
<td></td>
<td>- Replace sealing washers</td>
<td>- Tighten unions</td>
</tr>
<tr>
<td>Leak at pump shaft</td>
<td>Damaged shaft seal</td>
<td>Replace shaft seal</td>
</tr>
<tr>
<td>Leak at high pressure</td>
<td>Loose or damaged union</td>
<td>Tighten union</td>
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<tr>
<td>outlet union</td>
<td>Damaged pipe end</td>
<td>Replace pipe</td>
</tr>
<tr>
<td>Leak at low pressure</td>
<td>Loose or damaged hose</td>
<td>Remove and refit or renew hose</td>
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<tr>
<td>inlet connection</td>
<td>connection and clip</td>
<td>and clip</td>
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<tr>
<td>Overflow from reservoir</td>
<td>Reservoir overfull</td>
<td>Reduce level in reservoir</td>
</tr>
<tr>
<td>cap</td>
<td>Flow control valve stuck closed</td>
<td>Remove valve, renew and refit</td>
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<tr>
<td></td>
<td>- Replace 'O' ring</td>
<td>- Replace 'O' ring</td>
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<tr>
<td></td>
<td>Noises</td>
<td>- Bleed system, see 57.15.02</td>
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<td>Noise from hydraulic</td>
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<tr>
<td></td>
<td>system</td>
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<tr>
<td></td>
<td>Pump noisy – squeal</td>
<td>- Adjust drive belt tension</td>
</tr>
<tr>
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<td>- mechanical</td>
<td>- Overhaul pump, see 57.20.20</td>
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<td></td>
<td>- Slack drive belt</td>
<td>- Adjust drive belt tension</td>
</tr>
<tr>
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<td>- Internal wear and damage</td>
<td>- Overhaul pump, see 57.20.20</td>
</tr>
<tr>
<td></td>
<td>- Worn rack and pinion gears</td>
<td>- Adjust rack damper, see 57.20.13</td>
</tr>
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<td></td>
<td>- Worn inner ball joints</td>
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<tr>
<td></td>
<td>- Loose universal joint</td>
<td>- Tighten clamping bolts</td>
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<tr>
<td></td>
<td>Steering veering to</td>
<td>- Inflatable to correct pressure</td>
</tr>
<tr>
<td></td>
<td>left or right</td>
<td>- Replace parts as necessary</td>
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<td></td>
<td></td>
<td>- Replace parts as necessary</td>
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<td>- Replace parts as necessary</td>
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<td></td>
<td></td>
<td>- Replace parts as necessary</td>
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<tr>
<td>Heavy steering – when</td>
<td>Low tyre pressure</td>
<td>- Inflate to correct pressure</td>
</tr>
<tr>
<td>parking</td>
<td>- Tightness in steering-</td>
<td>- Replace parts as necessary</td>
</tr>
<tr>
<td></td>
<td>column</td>
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</tr>
<tr>
<td></td>
<td>- Tightness in steering-</td>
<td>- Replace parts as necessary</td>
</tr>
<tr>
<td></td>
<td>joints</td>
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<td></td>
<td>- Slack drive belt</td>
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<tr>
<td></td>
<td>- Restricted hose</td>
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<tr>
<td></td>
<td>- Control valve stuck open</td>
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</tr>
<tr>
<td></td>
<td>- Internal leaks in steering</td>
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</tr>
<tr>
<td></td>
<td>unit</td>
<td>- Replace parts as necessary</td>
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<td>- Replace parts as necessary</td>
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<td>- Replace parts as necessary</td>
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</tbody>
</table>

**POWER STEERING**

**CAUTIONARY NOTE:** It is important that whenever any part of the system including the flexible piping, is removed or disconnected, the utmost cleanliness is observed. All ports and hose connections should be suitably sealed off to prevent the ingress of dust and dirt. If metallic sediment is found in any part of the system, the complete system must be checked, the cause rectified, and the whole system thoroughly cleaned.

Never start the engine until the reservoir has been filled. Failure to observe this rule will result in serious damage to the pump.

Heavy steering and pull to one side may be caused by such mechanical faults as incorrect wheel alignment, damaged tyre treads, incorrect tyre pressures, worn or badly adjusted wheel bearings, incorrect steering geometry, or excessive wear or stiffness in any other suspension or steering components. These faults must be checked for first before attributing any blame to the power steering equipment.

If lack of power assistance is evident it is imperative that the pressure of the hydraulic pump, which is fitted to the front of the engine, is checked and if necessary corrected or a replacement unit fitted before any action is taken to replace any other component in the power steering system.
**POWER STEERING RACK**

*Remove and refit 57.10.01*

**Service tools:** 18G 1063, MS 53 A

**NOTE:** Modify MS 53 A as shown, making

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A—4.375 in (111.125 mm)
Hole diameter—0.6875 in (17.5 mm)

**Removing**

1. Drive the vehicle onto a ramp.
2. Remove the fresh air duct, see 80.15.31.
3. Set the steering in the straight-ahead position.
4. Modify service tool MS 53 A, engine support bracket, as shown, and position across the engine bay, locating the legs in the front wing gutters.

5. Locate the service tool hooks in the rear engine lifting brackets at the back of the left-hand and right-hand cylinder heads.
6. Support the weight of the engine by tightening the lifting hooks adjusting nuts.
7. Disconnect the cold air intake hoses from the temperature valves.
8. Remove the nuts and bolts securing the engine mountings to the sub-frame.
9. Raise the ramp.
10. Using ramp jacks, raise the vehicle so that the front wheels are clear of the ramp.
11. Disconnect the steering rack tie-rod outer ball joints from the steering arms, using service tool 18G 1063.
12. Turn the right-hand wheel outwards.
13. Remove the pinch-bolt securing the steering coupling to the rack pinion.
14. Remove the power steering pipe bracket clamp bolt and remove the bracket.
15. Disconnect the feed and return pipes from the pinion valve housing, and drain fluid into a suitable receptacle.

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**Refitting**

16. Seal the pipes and housing ports to prevent the ingress of dust and dirt.
17. Remove the bolts, nuts and washers securing the steering rack to the sub-frame.
18. Position a ramp jack under the sub-frame to support the weight of the sub-frame.
19. Remove the nuts, lower sub-frame mounting washers and rubber bushes, securing the sub-frame to the body.
20. Carefully lower the sub-frame until the rear mounting bolts just clear the sub-frame.
21. Release the steering rack pinion from the lower steering coupling.
22. Turn the pinion to obtain full right-hand lock.
23. Manœuvre the steering rack through the right-hand side of the sub-frame until the left-hand tie-rod clears the engine mounting bracket.
24. Twist the rack and withdraw from the front of the vehicle.

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25. Turn the rack pinion to full right-hand lock.
26. Manœuvre the rack into position on the sub-frame.
27. Centralize the steering rack; remove the plug in the rack damper assembly and, using a suitable tool, locate the dimple in the rack shaft. Refit and tighten the plug.
28. Fit the sub-frame upper mounting washers and rubber bushes to the mounting bolts.
29. Refit the sub-frame.

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30. Ensure that the metal distance tubes are fitted to the mounting bolts, shorter ones at the front; fit the sub-frame lower mounting rubber bushes and washers.
31. Fit and tighten the sub-frame mounting nuts and bolts.
32. Set the steering-wheel in the straight-ahead position and fit the steering coupling to the rack pinion.
33. Secure the steering rack to the sub-frame.
34. Fit and tighten the steering coupling pinch-bolt.
35. Unplug the fluid pipes and housing ports.
36. Refit the feed and return pipes to the valve housing.
37. Fit the bracket to the pipes and secure with the clamp bolt.
38. Fit and secure the steering rack tie-rod outer ball joints to the steering arms.
39. Lower the car onto the ramp.
40. Lower the ramp.
41. Lower the engine, fit the engine mounting bolts, washers and Nyloc nuts. Remove the service tool MS 53 A.
42. Refit the cold air intake hoses to the temperature control valves.
43. Refit the fresh air duct, see 80.15.31.
44. Fill the fluid reservoir and bleed the system, see 57.15.02.
45. Check/adjust front wheel alignment.
POWER STEERING RACK

**Overhaul** 57.10.07

Service tools: 18G 1321, 18G 1322, 18G 1323, 18G 1327

**Dismantling**
1. Remove the power steering rack, see 57.10.01.
2. Thoroughly clean the outside of the unit.
3. Eject the oil from the unit by moving the rack through its full stroke in each direction.
4. Note the position of the valve housing porting face relative to the pinion housing, also the position of the two valve to cylinder pipes.
5. Hold the unit at the pinion end of the cylinder in a soft-jawed vice.
6. Break the wire ties and slide the gaiters along the tie-rods to expose the inner ball joints.
7. Extend the rack and hold the unit across the rack teeth in a soft-jawed vice.
8. Remove the tie-rod assemblies by unscrewing the inner ball joints.
9. Break the wire ties and slide the gaiters along the tie-rods to expose the inner ball joints.
10. Remove the air transfer pipe.
11. Remove the valve to cylinder pipes.
12. Remove the valve assembly and rack assembly. Do not allow the housing to separate the pinion from the valve housing at this stage.
13. Hold the unit at the pinion end of the cylinder in a soft-jawed vice.
14. Hold the unit at the pinion end of the cylinder in a soft-jawed vice.
15. Remove the three locknuts and unscrew the inner ball joints.
16. Unscrew the retaining nut and remove the end housing.
17. Withdraw the rack and pinion assembly.
18. Remove the porting adaptor and slide the porting ring along the cylinder to expose the feed hole.
19. Using a scriber or similar pointed tool, press the point into the seal expander ring (visible through the feed hole) and lever the seal towards the open end of the cylinder until it is turned sideways across the cylinder bore, taking care to avoid damaging the feed hole seating. Withdraw the seal from the cylinder using a length of wire across the cylinder bore, and lever the seal towards the open end of the cylinder until it is turned sideways across the cylinder bore, taking care to avoid damaging the feed hole seating. Withdraw the seal from the cylinder using a length of wire across the cylinder bore, and lever the seal towards the open end of the cylinder until it is turned sideways across the cylinder bore, taking care to avoid damaging the feed hole seating. Withdraw the seal from the cylinder using a length of wire across the cylinder bore, and lever the seal towards the open end of the cylinder until it is turned sideways across the cylinder bore, taking care to avoid damaging the feed hole seating. Withdraw the seal from the cylinder using a length of wire across the cylinder bore, and lever the seal towards the open end of the cylinder until it is turned sideways across the cylinder bore, taking care to avoid damaging the feed hole seating. Withdraw the seal from the cylinder using a length of wire across the cylinder bore, and lever the seal towards the open end of the cylinder until it is turned sideways across the cylinder bore, taking care to avoid damaging the feed hole seating. Withdraw the seal from the cylinder using a length of wire across the cylinder bore, and lever the seal towards the open end of the cylinder.
20. Remove the locknut, threaded plug, spring and plunger from the pinion housing.
21. Thoroughly wash and dry the cylinder.
22. Remove the 'O' ring and abutment washer from the end housing.
23. Remove the seal from the end housing by gripping the seal expander ring with thin-nosed pliers.
24. Wash and dry the end housing.
25. Prior to reassembly inspect the undermentioned components as follows:
   a. Pipes – renew if pipe or end fittings are damaged. Note with cracked or heavily flared seatings can cause damage on assembly.
   b. Rack – check external surface for longitudinal scratch lines. Scratches that can be felt by a ‘fingernail test’ should be removed with super fine emery-cloth used across the scratch lines. Wash the rack thoroughly after such work.
   c. Rack and cylinder ends – check for burrs or sharp edges and remove with an oil-stone.
   d. Rack teeth – check for damage and excessive wear.
   e. Ball joints (inner and outer) – check for free play.
   f. Gaiters – remove all grease and oil and renew if damaged.
   g. Control valve – renew seals and gasket if oil leakage from the control valve is apparent. See operation 57.10.22.

26. Lightly oil the rubber part of the end housing rack seal. Select the narrower expander ring from the kit and fit it into the seal body.
27. Position the anti-extrusion ring in the end housing and fit the seal ensuring that it is pressed fully against the abutment face (load applied to the expander ring). Ensure that the anti-extrusion ring engages correctly with the seal body.
28. Lubricate the ‘O’ ring and fit it into the housing groove.
29. Fit a new centre feed porting adaptor into the porting ring. Position the ring to allow the conical seating on the adaptor to engage with the seating on the cylinder. Tighten to 22 to 25 lbf ft (30 to 34 Nm).
30. Lightly oil the rubber part of the rack seal. Select the wider expander ring from the kit and fit it into the seal body.
31. Assemble the rack seal on service tool 18G 1323 and pass the tool over the toothed section of the rack to bring the seal up to the piston. Lightly oil the anti-extrusion ring and engage it with the recess in the back of the seal.
32. Hold the pinion end of the cylinder in a soft-jawed vice.
33 Oil the bore of the cylinder at the open end and grease the rack directly behind the teeth (plunger contact area). Fit service tool 18G 1322 onto the cylinder and carefully enter the rack and piston assembly into the cylinder, using a firm steady pressure to push the seal down the cylinder until it contacts the abutment face. As the piston ring enters the bore, ensure that the ring collapses and is carefully guided into the cylinder.

34 Fit a new gasket to the valve mounting face of the pinion housing.

35 Liberally grease the pinion small journal, pinion teeth and ball race and fit the control valve on the pinion housing ensuring correct valve port positioning. Fit the three locknuts and tighten progressively to 10 to 14 lbf ft (14 to 19 Nm).

36 Smear the end housing, bush and seal bores with grease.

37 Smear the inner face of the abutment washer with grease and locate it in the housing.

38 Fit service tool 18G 1321 onto the end of the rack and carefully align and fit the end housing.

39 Screw the locking ring into the end housing sufficiently to hold the mounting feet in parallel alignment.

40 Hold the end housing in a soft-jawed vice with the cylinder vertical.

41 Using service tool 18G 1327, tighten the locking ring to 80 to 90 lbf ft (110 to 122 Nm), re-check alignment of the mounting feet and re-set if necessary.

42 Hold the unit in a soft-jawed vice at the pinion end of the cylinder so as not to obstruct pipe runs.

43 Fit the plunger spring, threaded plug and locknut. Tighten the threaded plug whilst moving the rack through its full stroke in each direction until hard mesh is achieved, then back off the threaded plug just sufficiently to achieve a smooth traverse (normally one-eighth of a turn). Tighten the locknut without allowing the adjusting screw to move. Re-check action of the unit.

NOTE: Excessive plunger lift resulting in the unit 'knocking' in service will occur if the threaded plug is backed off excessively.

44 Fit the air transfer pipe (housing end first).

45 Fit the valve to cylinder pipes and tighten to 10 to 14 lbf ft (14 to 19 Nm).

46 Fit a lock washer over the inner ball joints and run up the ball joints onto the rack ends ensuring correct engagement of the lock washer tabs in the slots across the rack ends.

47 Extend the rack at the toothed end sufficiently to grip the rack teeth in a soft-jawed vice. Tighten the inner ball joints to 66 to 81 lbf ft (90 to 110 Nm).

NOTE: Do not tighten the ball joints using the pinion to prevent rotation.

48 Remove the unit from the vice and support the inner ball joint housing on a firm base. Using a drift, tap over the lock washer skirt onto each of the six flats on the ball housing. Repeat for the other inner ball joint. Move the rack through its full stroke in each direction to ensure that the crimped lock washer clears the recess in each housing.

49 Hold the unit at the pinion end of the cylinder in a soft-jawed vice and extend the rack at the end housing end. Smear this section of the rack with grease.

50 Place approximately 1 to 2 oz (28 to 56 grammes) of grease in each gaiter and secure the gaiters with a wire tie to each housing.

51 Remove the plug and fit a grease nipple to the tapped hole in the threaded plug. Charge the unit with approximately five strokes of a hand grease gun. Do not overgrease.

52 Remove the grease nipple and replace the plug.

NOTE: To facilitate front wheel alignment it is advisable to slacken the locknuts on the tie-rod outer ball joints and the clips on the bellows prior to refitting the power steering rack.

53 Refit the power steering rack, see 57.10.01.

CONTROL VALVE AND PINION

Removing

1 Remove the power steering rack, see 57.10.01.

NOTE: The position of the valve housing porting face relative to the pinion housing, also the position of the two valve cylinder pipes.

2 Remove the pinion cover.

3 Hold the unit at the pinion end of the cylinder in a soft-jawed vice.

4 Remove the two valve to cylinder pipes.

5 Slacken the locknut and unscrew the threaded plug to release the plunger spring load.

6 Remove the three locknuts and withdraw the valve assembly, gently tapping the housing if necessary. Discard the gasket.

Refitting

7 Reverse instructions 1 to 6, using a new valve housing gasket and pinion cover.
OVERHAUL

CONTROL VALVE AND PINION

Service tools: 18G 275 N, 18G 1259, 18G 1320

Overhaul

1. Remove the power steering rack, see 57.10.01.
2. Note the position of the valve housing porting face relative to the pinion housing, also the positions of the two valve to cylinder pipes.
3. Remove the control valve and pinion, see 57.10.19.
4. Hold the valve housing and tap the end of the splined input shaft on a firm base to separate the housing and the valve/pinion assembly.
5. Carefully lever off the top cover from the valve housing and wipe the grease from the top of the seal.
6. Using service tool 18G 275 N, remove the circlips, lift out the back-up ring and carefully lever out the top valve seal. Discard the back-up ring and top valve seal.
7. Using an 'Easi-Out' extractor, withdraw the inserts from the valve housing.
8. Check the condition of the four tapped holes in the valve porting face for damage and rectify as necessary. (¼ in. U.N.F. return, ½ in. U.N.F. feed and ¼ in. U.N.F. cylinder.)
9. Wash and dry the housing.
10. Using service tool 18G 275 N, remove the circlip, lift out the back-up ring and carefully lever out the top valve seal. Discard the back-up ring and top valve seal.
11. Using an 'Easi-Out' extractor, withdraw the inserts from the valve housing.
12. Check the rotor spline and pinion teeth for damage and excessive wear.
13. Wash the valve/pinion assembly in a clean solvent and either blow dry or leave to dry.

NOTE: Do not wipe dry with a cloth as this may leave fibres likely to cause valve malfunction.
14. Oil or grease a new Nu-lip seal and fit it on the pinion.
15. Fit new inserts in the feed and return ports. Tap the inserts into position with a drift.
16. Grease the outside of a new top valve seal and fit the seal in the housing using service tool 18G 1320.
17. Fit a new back-up ring and refit the circlips.
18. Remove the Nu-lip seal from the pinion.
19. Check the rotor spline and pinion teeth for damage and excessive wear.
20. Grease the cavity in the top of the housing and refit the housing top cover.
21. Refit the control valve and pinion, see 57.10.01.
22. Refit the power steering rack, see 57.10.01.

POWER STEERING SYSTEM

Test

Service tools:

JD 10: Three-way adaptor hose and pressure gauge for testing the power steering.
JD 10-2: Adaptor pipe and tap for use with JD 10.

1. The hydraulic pressure test gauge is used in conjunction with the special adaptor for testing the power steering system. This gauge is calibrated to read up to 140 kgf/cm² (2,000 lbf/in²) and the normal pressure which may be expected in the power steering system is 60 kgf/cm² (850 lbf/in²).
2. Under certain fault conditions of the hydraulic pump it is possible to obtain pressure up to 100 kgf/cm² (1,500 lbf/in²); therefore it is important to note that the pressure upon the gauge is directly proportional to the pressure being exerted upon the steering-wheel. When testing apply pressure to the steering-wheel very gradually while carefully observing the pressure gauge.
3. Check the hydraulic fluid level and top-up as required.
4. Examine the power steering units and connections for leaks. All leaks must be rectified before attempting to test the system.
5. Release the rubber bellows from the rack-ends and examine for fluid leakage.
6. Check the hydraulic pump drive belt for condition and tension, rectify as necessary.
7. Fit test gauge JD 10 and the adaptor JD 10-2 to the hydraulic pump outlet line.
8. Open the tap in the adaptor JD 10-2.
9. Bleed the system, see 57.15.02, exercising great care not to overload the pressure gauge.
10. Check the hydraulic fluid level and top-up as required.
11. Examine the power steering units and connections for leaks. All leaks must be rectified before attempting to test the system.
12. Release the rubber bellows from the rack-ends and examine for fluid leakage.
13. Check the hydraulic pump drive belt for condition and tension, rectify as necessary.
14. Fit test gauge JD 10 and the adaptor JD 10-2 to the hydraulic pump outlet line.
15. Open the tap in the adaptor JD 10-2.
16. Bleed the system, see 57.15.02, exercising great care not to overload the pressure gauge.
With the system in good condition, the pressures should be as follows:

a) Steering-wheel held hard on full lock and engine running at 1,000 rev/min, the pressure should be 67 to 70 kgf/cm² (950 to 1,000 lbf/in²).

b) Engine idling and the steering-wheel held hard on full lock, the pressure should be 32 kgf/cm² (450 lbf/in²) minimum.

These checks should be carried out first on one lock then on the other.

CAUTION: Under no circumstances must the steering-wheel be held in full lock for more than 30 seconds in any one minute, otherwise there will be a tendency for the oil to overheat and possibly damage may be caused to the seals.

c) Release the steering-wheel and allow the engine to idle, pressure should be 4 kgf/cm² (55 lbf/in²) maximum.

10 If the pressures recorded during the foregoing test are outside the specified range or pressure imbalance is recorded, a fault exists in the system. To determine if the fault is in the steering rack or the pump close the adaptor tap for a period not exceeding five seconds. If the gauge fails to register the specified pressure, the pump is inefficient and the pump relief valve should be examined and renewed as necessary.

11 Repeat the foregoing test after renewing the relief valve and bleeding the system. If the pump delivery is satisfactory and low pressure or a marked imbalance exists, the fault is in the steering rack and control valve housing.

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POWER STEERING SYSTEM

The hydraulic steering system is self-bleeding but care must be taken to ensure that at no time is the fluid reservoir allowed to empty or become dangerously low.

This is especially important where both the pump and the rack have been newly installed. When the hydraulic system has been disturbed, proceed as follows:

1. Ensure that all the hydraulic pipe connections are tight.
2. Fill the hydraulic fluid reservoir to the correct level, indicated on dipstick, with one of the recommended fluids.
3. Place the road wheels in the straight-ahead position.
4. With the drive belt slackened or removed, rotate the pulley by hand to prime the system.
5. Fit and adjust the drive belt, see 57.20.02.
6. Check, and top up the fluid reservoir as necessary.
7. Start the engine and allow it to idle.
8. Turn the steering-wheel to full lock and return to the straight-ahead position.
9. Check and top up the hydraulic fluid reservoir.
10. Turn the steering-wheel to the opposite lock and return to the straight-ahead position.
11. Check and top up the hydraulic fluid reservoir.
12. Turn the road wheels from lock to lock several times to permit air to be fully exhausted from the system.
13. Return the road wheels to the straight-ahead position and check the fluid level in the hydraulic reservoir.

NOTE: Repeated turning of the steering-wheel when the car is stationary will not harm the steering mechanism and hydraulic units, but will affect the mechanical components of the steering and tyre threads. When testing or bleeding the power steering, to minimize tyre scrub the road wheels should be rotated slowly or the front wheels positioned on steering geometry turntables.

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POWER STEERING PUMP

DRIVE BELT

Remove and refit

1. Remove the alternator drive belt, see 86.10.03.
2. Remove the air pump drive belt, see 17.25.15.
3. Remove the water pump pulley from the water pump, see 26.25.03.
4. Remove the air conditioning compressor drive belt—where fitted, see 82.10.01.
5. Remove the jockey pulley belt.
6. Remove the air intake hose from the left-hand temperature sensor.
7. Slacken the two bolts securing the timing pointer to the front timing cover and move it aside.
8. Slacken the two pivot nuts and bolts securing the pump to the engine bracket.

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NOTE: All belts must be fitted by hand and must not be levered over the pulley flanges. Ensure that each belt is tensioned correctly, refer to \"GENERAL SPECIFICATION DATA.\"
POWER STEERING PUMP
(Non-air conditioning models)

Remove and refit 57.20.14

Removing
1 Remove the left-hand air intake hose from the temperature control valve.
2 Remove the fluid inlet and outlet pipes from the pump; drain the fluid into a suitable receptacle.

Refitting
7 Reverse instructions 1 to 6. Fit all belts by hand; do not lever over the pulley flanges. Ensure that the belt is correctly tensioned, refer to 'GENERAL SPECIFICATION DATA'.

STEERING PUMP

Overhaul 57.20.20

Service tool: 18G 1326, Power steering pump pulley remover/replacer

Dismantling
1 Remove the pump, see 57.20.14.
2 Drain the oil from the pump and reservoir.
3 Withdraw the pulley from the shaft, using Churchill Service tool 18G 1326.
4 Remove the bracket from the pump. NOTE: Thoroughly clean the exterior of the pump and reservoir.
5 Remove the high pressure outlet union, and the two mounting studs from the back of the reservoir.
6 Detach the reservoir from the pump body. Remove the 'O' ring.

Inspection
20 Thoroughly clean all the components in a non-toxic solvent.
21 Renew the shaft seal and all the 'O' rings; lubricate with power steering fluid.

22 Check the pressure plate, thrust plate and rotor. Light scoring can be removed by lapping.
23 Check the pump ring for extreme wear. Scuff marks and uniform wear are not detrimental. Renew the pump ring and rotor vanes if chatter marks and grooves are present.
24 Check the shaft and bush.
25 Check the flow control valve for free movement in the bore. Remove burrs of foreign matter if sticking. Renew if faulty.
26 Check the internal diameter of the pulley and the external diameter of the pump shaft. These parts MUST NOT BE reassembled with an interference fit of less than 0.001 in (0.025 mm) or more than 0.0026 in (0.066 mm).

Reassembling
27 Lubricate the shaft seal with petroleum jelly and fit the pump housing.
28 Fit the pressure plate 'O' ring (in the third groove from the rear of the housing).
29 Insert the dowel pins in the pump housing.
30 Fit the thrust plate to the pump shaft.
31 Fit the rotor on the splines with the countersunk face towards the thrust plate, and secure with a new snap-ring.
32 Insert the shaft in the housing; ensure that the thrust plate locates on the dowel pins.
33 Fit the pump ring on the dowel pins, with the arrow towards the rear of the housing.
34 Fit the 10 vanes in the rotor slots with the rounded edge of the vanes outermost. Ensure that all the vanes slide freely.
35 Fit the pressure plate, engaging the dowels.
36 Fit the end plate 'O' ring.
37 Fit the end plate spring in the groove provided in the pressure plate.
38 Fit the end plate. Using a press, apply sufficient pressure until the retaining ring can be sprung into the groove.
39 Fit the end plate retaining ring and release the press.
40 Fit the flow control valve spring and valve, gauze end first.
41 Fit new stud and union seals in the recessed holes, in the housing. Lubricate with Power Steering Fluid.
42 Fit a new reservoir 'O' ring to the housing.

43 Lubricate the inside edge of the reservoir with Power Steering Fluid and fit to the housing, carefully aligning all the holes.
44 Fit the two stud bolts.
45 Fit a new 'O' ring to the high pressure outlet union and insert in the flow control valve hole. Tighten to 25 to 40 lbf ft (2.77 to 5.53 kgf m).
46 Using Churchill Service Tool 1RG 1326, refit the pulley to the pump shaft.
47 Fit the bracket to the pump.
48 Fit the pump to the car.
49 Fill the system with the recommended fluid and bleed, see 57.15.02.

STEERING RACK GAITERS
Remove and refit 57.25.02
Removing
1 Slacken the locknut securing both tie-rod outer ball joints.
2 Remove the nut and washer securing the tie-rod outer ball joint to the steering-arm.
3 Release the ball joint from the steering-arm.
4 Unscrew the ball joint from the tie-rod and remove the retaining locknut.
5 Remove the wire tie and clip retaining the gaiter to the rack and tie-rod respectively.
6 Withdraw the gaiter.
7 Repeat instructions 2 to 6 on the opposite tie-rod.

Refitting
8 Lubricate the new gaiter with 1 oz to 2 oz (28 to 56 grammes) of fresh grease.
9 Slide the new gaiter along the tie-rod into position on the rack.
10 With the rack centralized, fit the wire tie to the gaiter and rack housing.
11 Position the outer end of the gaiter on the tie-rod so that it is capable of accommodating movement of the tie-rod from lock to lock.
12 Secure the outer end of the gaiter to the tie-rod end with the clip.
13 Fit the locknut to the tie-rod, locating it as near as possible to its original location.
14 Fit the outer ball joint to the tie-rod.
15 Connect the tie-rod outer ball joint to the steering-arm and secure it with the plain washer and nut.
16 Repeat instructions 8 to 15 on the opposite tie-rod.
17 Check, and re-set the front wheel track as necessary.
18 Tighten the locknut securing the tie-rod outer ball joint.
STEERING-COLUMN ASSEMBLY

Remove and refit 57.40.01

Removing
1. Open the luggage compartment and disconnect the battery.
2. Remove the pinch bolt securing the upper universal coupling to the steering mast.
3. Remove the cleat securing the electrical harness to the steering-column.
4. Disconnect the plug-in connectors for the ignition/starter, horn/trafficator/lights and windscreen wiper/washer switches.
5. Remove the two screws securing the nacelle to the steering-column.
6. Remove the nacelle.
7. Using a centre-punch, mark the centre of the two shear-head bolts securing the column housing to the body.
8. Using a small chisel, unscrew the shear-head bolts;
   or
   a. If instruction 7 proves to be unsuccessful, drill into the shear-head bolts where previously marked by the centre punch and unscrew using an Easiout extractor.
9. With the road wheels in the straight-ahead position, withdraw the steering-column assembly, noting the positions of the flat and wavy washers.

Refitting
9. Enter the steering-column in the lower bush. Ensure that the flat and wavy washers are in position.
10. With the road wheels in the straight-ahead position and the steering-wheel centralized, engage the steering-column splines in the upper universal coupling.
11. Fit and tighten the pinch bolt.
12. Locate the steering-column on the body and align the mounting holes.
13. Fit two new shear-head bolts and tighten evenly until both heads shear.
14. Re-connect the plug-in connectors and secure the electrical harness to the steering-column housing with the plastic cleat.
15. Fit the nacelle and secure with the two screws.
16. Connect the battery.
STEERING COLUMN ASSEMBLY
Overhaul 57.40.10

Dismantling
1 Remove the steering-column assembly from the car, see 57.40.01.
2 Remove the steering-wheel centre cover.
3 Slacken and remove the nut and washer securing the steering-wheel hub to the steering-column.
4 Using a suitable extractor, remove the steering-wheel.
5 Slacken the clamping screw and withdraw the steering-column multi-purpose switch assembly from the column.
6 Using a centre-punch, mark the centre of the two shear-head bolts securing the steering lock to the column housing.
7 Using a small chisel, unscrew the shear-head bolts:
   a If instruction 7 proves to be unsuccessful, drill into the shear-head bolts where previously marked by the centre-punch and unscrew using an Easiout extractor.
8 Withdraw the column housing off the steering mast.

Reassembling
9 Remove the nut and bolt securing the clamp to the steering mast. Remove the clamp.
10 Using a suitable drift, remove the top and bottom bushes from the steering-column housing.
11 Align the slots in the bushes with the lugs in the column housing. Press in the bushes.
12 Fit the clamp to the steering mast. Fit and tighten the pinch bolt.
13 Fit the steering mast into the housing.
14 Fit the steering lock to the column housing and secure with two new shear-head bolts. Evenly tighten the bolts until the heads shear off.
15 Fit the multi-purpose switch assembly to the column housing and secure by tightening the clamp screw.
16 Align the arrow on the trafficator cancelling collar with the centre of the trafficator stalk.
17 Align the lugs of the steering-wheel with the cut-outs in the cancelling cam. Fit the steering-wheel.
18 Fit and tighten the plain washer and nut securing the steering-wheel hub to the steering-column.
19 Fit the steering-wheel centre cover.
20 Fit the steering-column assembly to the car, see 57.40.01.

INTERMEDIATE SHAFT
Remove and refit 57.40.22

Removing
1 Remove the pinch bolt securing the intermediate shaft to the upper universal coupling.
2 Remove the pinch bolt securing the intermediate shaft universal joint to the rack pinion.
3 Set the road wheels to the straight-ahead position.
4 Slide the intermediate shaft upwards to disengage the universal joint from the pinion shaft.
5 Withdraw the intermediate shaft downwards and disengage from the upper universal coupling.

Refitting
6 Engage the splines of the intermediate shaft in the upper universal coupling.
7 Ensure that the steering-wheel is in the straight-ahead position and engage the intermediate shaft universal joint in the splines of the rack pinion.
8 Fit and tighten the two pinch bolts.

STEERING-COLUMN UPPER UNIVERSAL COUPLING
Remove and refit 57.40.26

Removing
1 Slacken the pinch bolt securing the upper universal coupling to the steering mast.
2 Remove the pinch bolt securing the upper universal coupling to the intermediate shaft.
3 Turn the steering-wheel to facilitate the removal of the top pinch bolt.
4 Set the road wheels to the straight-ahead position.
5 Slide the upper universal coupling down the intermediate shaft and remove the two washers from the steering mast (noting position for reassembly).
6 Remove the upper universal coupling from the intermediate shaft.

Refitting
7 Engage the upper universal coupling in the splines of the intermediate shaft.
8 Fit the two washers to the steering mast.
9 Ensuring that the steering-wheel and the road wheels are in the straight-ahead position, engage the coupling in the splines of the steering mast.
10 Fit and tighten the two pinch bolts.
STEERING-COLUMN NACELLE

Remove and refit 57.40.29

Removing
1. Withdraw the key from the steering lock/ignition switch.
2. Remove the two screws clamping the nacelle halves.
3. Remove the nacelle halves.

Refitting
4. Reverse instructions 1 to 3.

STEERING LOCK/IGNITION SWITCH

Remove and refit 57.40.31

Removing
1. Remove the nacelle, see 57.40.29.
2. Using a centre-punch, mark the centre of the two shear-head bolts securing the steering lock to the column.
3. Using a small chisel, unscrew the shear-head bolts;
   or
   a. If instruction 3 proves to be unsuccessful, drill into the shear-head bolts where previously marked by the centre-punch, and unscrew using an Easiout extractor.
4. Disconnect the plug-in connector to the ignition switch.
5. Remove the steering lock.

Refitting
6. Locate the steering lock on the column and align the mounting holes.
7. Fit two new shear-head bolts. Evenly tighten until both heads shear.
8. Connect the plug-in connector for the ignition switch.
9. Fit the nacelle, see 57.40.29.

TIE-ROD BALL JOINT – OUTER

Remove and refit 57.55.02

Removing
1. Slacken the locknut securing the tie-rod to the outer ball joint.
2. Remove the nut and washer securing the ball joint to the steering-arm.
3. Release the ball joint from the steering-arm.
4. Unscrew the ball joint from the tie-rod.

Refitting
5. Screw the ball joint onto the tie-rod. (The distance between tie-rod ball joint centres [inner to outer] is 13 ½ in (338 mm.)
6. Connect the ball joint to the steering-arm and secure with the washer and nut.
7. Check and adjust the front wheel track as necessary.
8. Tighten the tie-rod locknut.
STEERING-WHEEL

Remove and refit  57.60.01

Removing
1 Remove the steering-wheel centre cover.
2 Locate the road wheels in the straight-ahead position.
3 Slacken and remove the nut and washer securing the steering-wheel hub to the steering-column.
4 To ensure that the steering-wheel (hub) will be replaced in its original spline location, scribe both the hub centre and the top of the steering mast.
5 Using a suitable extractor, withdraw the steering-wheel. DO NOT attempt to drive or tap the steering-wheel from the mast.

Refitting
6 Ensure that the arrow on the trafficator cancelling collar aligns with the centre of the trafficator stalk. Reverse instructions 1, 2, 3 and 5. If the steering-wheel was withdrawn without the spline location being marked, set the road wheels to the straight-ahead position and centralize the steering-wheel.

STEERING GEOMETRY

Check  57.65.00

See ‘GENERAL SPECIFICATION DATA’.

FRONT WHEEL ALIGNMENT

Check and adjust  57.65.01

Checking
1 Locate the car on level ground and position the front wheels in the straight-ahead position.
2 Using wheel alignment equipment, check the front wheels for toe-in. Four requirements should be met:
   a Centralized steering-wheel.
   b Centralized steering-rack.
   c Front wheels parallel to \( \frac{1}{8} \) in (1.59 mm) toe-in.
   d Ball centres of both tie-rods equal.

Adjusting
3 Slacken the outer clips on the rack gaiters.
4 Slacken the locknut at the tie-rod outer ball joints.
5 Shorten or extend both tie-rods by an equal amount to obtain the required setting (0 to \( \frac{1}{8} \) in, 0 to 1.59 mm toe-in).
6 Tighten the locknuts at the tie-rod outer ball joints.
7 Tighten the gaiter clips.
ANTI-ROLL BAR

Remove and refit 60.10.01
Bottom link rubbers — remove and refit 60.10.06

Removing
1 Raise the car and support securely.
2 Remove the four nuts, bolts, plain washers and the two spacers securing the anti-roll bar brackets to the sub-frame.
3 Remove the spring pin, nyloc nut, flat washer, dished washer and outer rubber bush, securing each end of the anti-roll bar to the bottom link.
4 Withdraw the anti-roll bar, adjusting the jacks as necessary to facilitate removal.
5 Remove the inner bush and dished washer from each end of the anti-roll bar.

Refitting
6 Fit the inner dished washer (dish towards the bush) and the inner rubber bush to each end of the anti-roll bar.
7 Offer up the anti-roll bar and align the ends with the mounting holes in each of the bottom links.
8 Fit the outer rubber bush, dish washer, flat washer and nyloc nut to each end of the anti-roll bar.
9 Tighten to stop and fit the spring pin.
10 Position the mounting brackets and spacers and secure the anti-roll bar to the sub-frame with the bolts and nyloc nuts.
11 Lower the car.

ANTI-ROLL BAR MOUNTING RUBBERS

Remove and refit 60.10.05

Removing
1 Raise the car and support securely.
2 Remove the anti-roll bar. 60.10.01.
3 Cut the old mounting bushes and remove them from the anti-roll bar.

Refitting
4 Ensure that the anti-roll bar is clean throughout its length.
5 Smear the anti-roll bar with the approved rubber grease.
6 Slide the new mounting bushes into position along the anti-roll bar.
7 Fit the anti-roll bar to the car. 60.10.01.
8 Lower the car.

BALL JOINT

Remove and refit 60.15.03

Removing
1 Remove the bottom link. 60.40.02.
2 Remove the plastic boot from the ball joint.
3 Remove the circlip.
4 Press out the ball joint housing.

Refitting
5 Using a short length of suitable bore steel tubing, press a new ball joint and housing squarely into the bottom link. Do not apply pressure to the centre of the housing end cap.
6 Fit the circlip and plastic boot.
7 Fit the bottom link. 60.40.02.
FRONT ROAD SPRING

Remove and refit 60.20.01
Bump stop — remove and refit 60.30.10
Service tools: P.5045, RTR 360

Removing
1. Jack up the car and support the body on stands.
2. Remove the road wheel.
3. Detach the steering arm from the stub axle assembly (two bolts).
4. Slacken the locknut securing the brake hose to the bracket on the damper tube.
5. Remove the remaining bolt securing the brake caliper to the stub axle assembly, and support the brake caliper.
6. Remove the split pin, slotted nut and flat washer and release the ball joint from the stub axle assembly.
7. Remove the three nyloc nuts securing the damper and spring to the wing valance.
8. Pull the strut clear of the car.
9. Fit the two clamps P.5045 to the spring and compress coils evenly.
10. Remove the nut from the damper piston rod.
11. Lift off the spring pan complete with the top mounting and swivel assembly.
12.Withdraw the road spring from the damper strut.
13. Progressively slacken the spring clamps.

Refitting
14. Using the clamps, P.5045 compress the road spring.
15. Ensure that the bump stop rubber is in position.
16. Extend fully the damper piston rod and fit the lower insulating ring, rubber gaiter, road spring, upper insulating ring and spring pan.
17. Fit the seal to the thrust collar and position on the upper spring pan.
18. Fit the large plain washer. (Ground surface facing spring pan.)
19. Fit the rubber mounting to the damper piston rod and secure with the dished washer and nut using the special tool RTR 360. Tighten to the correct torque.
20. Slacken progressively the spring clamps, ensuring correct seating of the spring.
21. Ensure that the rubber gaiter is correctly fitted.
22. Thoroughly clean the spring turret and apply plasti-seal to the damper upper mounting flange.
23. Offer up the damper to the spring turret with the cut out facing outboard.
24. Engage the three studs, fit the plain washers, nyloc nuts and tighten.
25. Fit the ball joint into the stub axle assembly and secure with the flat washer, slotted nut and split pin.
26. Position the brake caliper onto the stub axle assembly and insert the upper bolt — do not tighten at this stage.
27. Position the brake pipe to the bracket on the damper tube.
28. Fit the steering arm to the stub axle assembly (the rear bolt also secures the brake caliper) and tighten to the correct torque.
29. Tighten the brake hose locknut to the fixing bracket.
30. Fit the road wheel and lower the car.
FRONT HUB

Remove and refit 60.25.01

Removing
1. Jack up the car and support the body on stands.
2. Remove the caliper. 70.55.02.
3. Prise off the hub cap and wipe grease from the end of the stub axle.
4. Remove the split pin, nut retaining cap, nut and washer from the stub axle.
5. Withdraw the hub complete with disc, bearings and oil seal.

Refitting
6. Partially pack the hub with fresh grease.
7. Locate the oil seal in the hub and enter the hub and bearings on the stub axle.
8. Fit the washer and slotted nut to the stub axle.
9. Tighten the slotted nut to a torque of 7.5 lb ft (0.691 kgf m) back off one flat, fit the nut retaining cap and secure with a split pin.
10. Position the brake pipe to the fixing bracket on the damper tube.
11. Fit the caliper. 70.55.02.

FRONT HUB BEARING END-FLOAT

Check and adjust 60.25.13
1. Remove the road wheel.
2. Check the hub for end-float.
3. If adjustment is required remove hub cap and split pin.
4. Tighten the slotted nut as required to eliminate end-float. A torque of 5 lb ft (0.691 kgf m) must not be exceeded or damage may be caused to the bearings and bearing tracks. Back off one flat and fit the nut retaining cap.
5. Insert and lock the split pin.
6. Clean the hub cap and refit.
7. Fit the road wheels.

FRONT HUB BEARINGS

Remove and refit 60.25.14

Removing
1. Remove the front hub. 60.25.01.
2. Remove the outer bearing, inner oil seal and inner bearing.
3. Thoroughly clean the hub.
4. Drift the outer and inner bearing tracks from the hub.

Refitting
5. Clean the bearing track recesses in the hub.
6. Install the new tracks in the hub, ensuring that they abut against the machined lip.
7. Fit a new oil seal. 60.25.15.
8. Fit the hub assembly to the car. 60.25.01.
FRONT HUB OIL SEAL

Remove and refit 60.25.15

Removing
1 Remove the front hub. 60.25.01.
2 Extract the oil seal from the hub.

Refitting
3 Insert the new oil seal (lip towards bearing) into hub and press or drift evenly into position.
4 Lubricate the seal lip.
5 Ensure that the seal deflector ring, incorporated in the disc shield is not damaged and does not foul the hub.
6 Fit the hub to the car. 60.25.01.

STUB AXLE ASSEMBLY

Remove and refit 60.25.22

Removing
1 Remove the road spring. 60.20.01.
2 Remove the front damper cartridge. 60.30.02.
3 Remove the front hub. 60.25.01, instructions 7 to 9.
4 Remove the three bolts securing the disc shield.

Refitting
5 Secure the disc shield with the three bolts and spring washers.
6 Refit the front hub. 60.25.01, instructions 10 to 15.
7 Fit the front damper cartridge. 60.30.02.
8 Fit the road spring to the car. 60.20.01.

WHEEL STUD

Remove and refit 60.25.29

Removing
1 Remove the front hub. 60.25.01.
2 Remove the four bolts retaining the hub to the brake disc and remove the hub from the disc.
3 Extract the stud from the hub.

Refitting
4 Ensure that the mating countersunk faces of the stud and the flange are clean.
5 Enter the stud from the rear of the hub flange, align the splines and press into position.
6 Fit the front hub to the disc and evenly tighten the four bolts 25-32 lbf ft (3.46-4.42 kgf m).
7 Fit the front hub to the stub axle. 60.25.01.

FRONT DAMPER

Remove and refit 60.30.02

Service tool: RTR 359

Removing
1 Remove the front road spring. 60.20.01.
2 Using the special tool undo the closure nut.
3 Remove the damper cartridge.

Refitting
4 Fit the damper cartridge.
5 Fit the closure nut, and tighten to the correct torque.
6 Fit the road spring. 60.20.01.

FRONT STRUT UPPER SWIVEL ASSEMBLY

Remove and refit 60.30.04

As operation 60.20.01.
BOTTOM LINK

Remove and refit 60.40.02

Removing
1. Jack up the car and support the body on stands.
2. Remove the road wheel.
3. Remove the spring pin, nyloc nut, flat washer and outer rubber bush from the end of the anti-roll bar.
4. Remove the two bolts securing the steering arm to the stub axle assembly and push clear.
5. Remove the split pin, slotted nut and plain washer and release the ball joint from the stub axle assembly.
6. Remove the bolt and nyloc nut securing the bottom link to the sub frame. Withdraw the bottom link.

Refitting
7. Locate the anti-roll bar into the mounting hole in the bottom link.
8. Position the bottom link and secure to the sub frame with the bolt and nyloc nut. DO NOT tighten fully until the car is resting on its wheels.
9. Fit the ball joint into the stub axle assembly and secure with the flat washer, slotted nut and split pin.
10. Place the jack under the bottom link and carefully raise the link to locate the outer rubber bush, dished washer, flat washer and nyloc nut onto the end of the anti-roll bar.
11. Tighten the nyloc nut to the stop and fit the spring pin.
12. Lower the jack.
13. Fit the steering arm and tighten the two bolts.
14. Fit the road wheel and lower the car.

BOTTOM LINK

Overhaul 60.40.06

1. Remove the bottom link. 60.40.02.
2. Remove the plastic gaiter and rubber ring from the ball joint.
3. Remove the circlip retaining the ball joint housing to the bottom link.
4. Press or drive out the ball joint and housing.
5. Enter the new ball joint and housing from the underside of the bottom link ensuring that the housing is squarely located.
6. Press the housing into the bottom link taking care not to damage the bottom of the housing. (A short length of suitable diameter tube is recommended.)
7. Fit the circlip, new plastic gaiter and gaiter retaining ring.
8. Press out the rubber bush and sleeve from the fulcrum end of the bottom link.
9. Press the new bush and sleeve into position.
ROAD SPRING

Remove and refit 64.20.01
Insulating rings 64.20.17

Removing
1. Jack up the car and support the body on stands.
2. Remove the road wheel.
3. Transfer the jack to support the suspension arm and partially compress the road spring, taking care not to relieve the weight on the stands.
4. Remove the two nuts and bolts securing one side of the anti-roll bar to the suspension arm.
5. Remove the nut and bolt securing the rear end of the suspension arm to the axle bracket.
6. Carefully lower the jack.
7. Remove the spring and its upper and lower insulating rubbers.

Refitting
8. Ensure that the spring insulating rubbers are correctly positioned and fit the spring.
9. Position the jack under the suspension arm.
10. Carefully raise the jack and engage the rear end of the suspension arm in the axle bracket.
11. Fit the bolt and nut.
12. Connect the anti-roll bar to the suspension arm.
13. Fit the road wheel.
14. Remove the stands and lower the car.
15. Tighten the nut and bolt securing the rear end of the suspension arm to the axle bracket.

REAR DAMPER LEFT HAND

Remove and refit 64.30.02

Removing
1. Jack up the car and support the body on stands.
2. Remove the rear wheel.
3. Remove the three screws securing the damper access plate to the body in the boot. Remove the plate.
4. Remove the locknut, nut, plain washer and rubber bush securing the upper end of the damper to the body.
5. Remove the locknut, nut, plain washer and rubber bush securing the lower end of the damper to the axle bracket.
6. Withdraw the damper.
7. Remove the rubber and plain washer from each end of the damper.

Refitting
8. Fit the plain washer and rubber bush to the upper end of the damper.
9. Position the damper on the car. Fit the rubber, plain washer, nut and locknut securing the upper end of the damper to the body.
10. Apply a plasti-seal to the damper cover plate. Fit the plate and secure with the three screws.
11. Fit the plain washer and rubber to the lower end of the dampers. Position the damper in the axle bracket and secure with the rubber, bush, plain washer, nut and locknut.
12. Refit the road wheel.
13. Remove the stands and lower the car.
REAR DAMPER RIGHT HAND

Remove and refit 64.30.03

Removing
1. Jack up the car and support the body on stands.
2. Remove the rear road wheel.
3. Remove the fuel filler cap and filler assembly, 19.55.08.
4. Remove the locknut, nut, plain washer and rubber bush securing the upper end of the damper to the body.
5. Remove the locknut, nut, plain washer and rubber bush securing the lower end of the damper to the axle bracket.
6. Withdraw the damper.
7. Remove the rubber bush and plain washer from each end of the damper.

Refitting
8. Fit the plain washer and rubber bush to the upper end of the damper.
9. Position the damper on the car. Fit the rubber bush, plain washer, nut and locknut, securing the upper end of the damper to the body.
10. Fit the fuel filler cap and filler assembly, 19.55.08.
11. Fit the plain washer and rubber bush to the lower end of the damper. Position the damper in the axle bracket and secure with the rubber bush, plain washer, nut and locknut.
12. Refit the road wheel.
13. Remove the stands and lower the car.

BUMP STOP

Remove and refit 64.30.15

Removing
1. Remove the bump stop from its mounting.

Refitting
2. Press new bump stop into position.

SUSPENSION ARM

Remove and refit 64.35.02

Removing
1. Jack up the car and support the body on stands.
2. Remove the road wheel.
3. Transfer the jack to support the suspension arm and partially compress the road spring, taking care not to relieve the weight on the stands.
4. Remove two nuts and bolts securing the anti-roll bar to the suspension arm.
5. Remove the nut and bolt securing the rear end of the suspension arm to the axle bracket.
6. Carefully lower the jack.
7. Remove the spring.
8. Remove the nut and bolt securing the forward end of the suspension arm to the body bracket.
9. Detach the suspension arm from the bracket.

Refitting
10. Engaging the forward end of the suspension arm in the body bracket, fit the bolt and nut. Do not tighten at this stage.
11. Place the jack under the suspension arm.
12. Ensure that the spring insulating rubbers are correctly positioned and fit the spring.
13. Raise the jack and engaging the rear end of the suspension arm in the axle bracket, fit the bolt and nut. Do not tighten at this stage.
14. Connect the anti-roll bar to the suspension arm.
15. Fit the road wheel.
16. Remove the stands and lower the car.
17. Tighten the front and rear suspension arm, nuts and bolts.
**SUSPENSION ARM BUSHES**

**Remove and refit 64.35.05**

**Removing**

1. Remove the suspension arm, see 64.35.02.
2. Press out the old bushes.

**Refitting**

3. Press in the new bushes, ensuring that they are centralized in the suspension arm. Note that the front bush must be installed in the position illustrated.
4. Fit the suspension arm, see 64.35.02.

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**ANTI-ROLL BAR**

**Remove and refit 64.35.08**

**Removing**

1. Raise the car and support it safely.
2. Remove the four bolts and nuts (two either side) securing the anti-roll bar to the rear suspension arms.
3. Withdraw the anti-roll bar and shim(s), if fitted.

**Refitting**

4. Locate the anti-roll bar (and shim(s), if removed) in position on the rear suspension arm.
5. Align the mounting holes and fit and tighten the four securing bolts and nuts.
6. Lower the car.

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**RADIUS ROD**

**Remove and refit 64.35.28**

**Removing**

1. Jack up the car and support the body on stands.
2. Remove the nut and bolt securing the rear end of the radius rod to the rear axle bracket.
3. Remove the nut and bolt securing the forward end of the radius rod to the body bracket.
4. Withdraw the radius rod.

**Refitting**

5. Refit the radius rod.
6. Engage the forward end of the radius rod in the body bracket and fit the bolt and nut.
7. Engage the rear end of the radius rod in the axle tube bracket. Fit the bolt and nut.
8. Tighten both nuts.
9. Remove the stands and lower the car.

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**RADIUS ROD BUSHES**

**Remove and refit 64.35.29**

**Removing**

1. Remove the radius rod from the car, see 64.35.28.
2. Press out the bush from the radius rod.

**Refitting**

3. Fit a new bush to the radius rod.
4. Install the radius rod in the car, see 64.35.28.
PRESSURE REDUCING VALVE

Description 70.00.00

The pressure reducing valve is installed in the brake circuit between the master cylinder and the front and rear brakes. Its function is to limit the pressure applied to the rear brakes relative to the pressure applied to the front brakes, thus minimizing the possibility of rear wheel locking. In the event of a failure in the front brake circuit the cut-off pressure is increased and the pressure reduction ratio changes.

Operation

Fluid from the primary chamber of the master cylinder is fed into the pressure reducing valve at port A and out to the front brakes via ports C and D. The master cylinder secondary chamber feeds into port B, through the internal passages in the valve plunger, past the metering valve and out to the rear brakes via port E. The large spring S is pre-loaded to bias the valve plunger to the left. Hydraulic pressure therefore acts on the annular area (a1 - a2) forcing the plunger to the left while the force acting on area a1 and annular area (a4 - a3) tends to move the plunger to the right where it is opposed by spring S. When the net force acting to the right overcomes the pre-load provided by spring S the plunger assembly shifts to the right thereby closing the metering valve F. Pressure at the rear outlet port E therefore falls relatively to the input pressure. As pressure is increased at ports A and B the plunger is forced to the left, opening the metering valve F and permitting a small quantity of fluid to be fed to the rear brakes. The resultant increase in pressure acting on area a1 causes the plunger to again shift to the right closing the metering valve. This procedure continues until there is no further increase in pressure from the master cylinder.

The pressure at outlet E is reduced after cut-off in proportion to the areas a2 and the difference between the two annular areas (a1 - a2) and (a4 - a3). The cut-off pressure is equal to the pre-load in the spring S divided by the combined areas a2 and (a4 - a3). Should the front brake circuit fail there will be no pressure acting on annular area (a4 - a3) so that the net force tending to move the plunger to the right will be equivalent to the product of the input pressure and area a2. Thus, as the value of the pre-load spring S is unchanged, the cut-off pressure will increase considerably (approximately threefold). As the annular area (a4 - a3) is now redundant, the reduction ratio after cut-off changes to a value which is proportional to the areas a1 and (a1 - a2). Should the rear brake circuit fail the pressure reducing valve is completely inoperative and pressure is fed to the front brakes in the normal manner.

REAR BRAKE-DRUM

Remove and refit 70.10.03

Removing

1. Jack up the car and support the body on stands.
2. Remove the road wheel.
3. Release the hand brake.
4. Remove the countersunk screw(s) securing the brake-drum to the hub and withdraw the brake-drum.

Refitting

5. Align the countersunk hole(s) in the drum with the tapped hole(s) in the hub.
6. Engage the wheel studs in the drum.
7. Slide the drum into position. If the brake-shoes were disturbed, they may require to be centralized on the backplate to allow drum entry.
8. Fit and tighten the countersunk screw(s).
9. Fit the road wheel and lower the jack.
10. Apply the foot brake several times to adjust the rear brakes.

FRONT BRAKE DISC

Remove and refit 70.10.10

Removing

1. Remove the front hub, see 60.25.01.
2. Remove the four bolts securing the disc to the hub.
3. Withdraw the disc.

Refitting

4. Offer up the disc to the hub.
5. Fit and evenly tighten to 25 to 32 lbf ft (3.5 to 4.4 kgf m) the four bolts securing the disc to the hub.
6. Fit the front hub to the stub axle and adjust, see 60.25.01.
DISC SHIELD
Remove and refit 70.10.18

Removing
1 Remove the front hub, see 60.25.01.
2 Remove the three bolts and spring washers securing the disc shield to the vertical link assembly.
3 Remove the disc shield.

Refitting
4 Position the disc shield over the stub axle and secure to the vertical link with the three bolts and spring washers.
5 Fit the front hub to the stub axle and adjust, see 60.25.01.

REAR BRAKE BACKPLATE
Remove and refit 70.10.26

Removing
1 Jack up the car and support the body on stands.
2 Remove the rear road wheel and release the hand brake.
3 Remove the rear hub, see 51.10.18.
4 Remove the clevis pin securing the hand brake cable fork to the back plate lever.
5 Disconnect the fluid feed pipe union at the wheel cylinder (left-hand side only);
6 Disconnect the fluid feed and transfer pipe unions at the wheel cylinder (right-hand side only).
7 Remove four nuts, spring washers, and bolts securing the backplate to the axle casing flange.
8 Withdraw the deflector plate and the backplate.

Refitting
9 Reverse instructions 1 to 7.
10 Bleed the brakes.

BRAKE HOSE - FRONT
Remove and refit - Left-hand 70.15.02 - Right-hand 70.15.03

Removing
1 Disconnect the brake pipe and union from the inboard end of the flexible hose.
2 Disconnect the brake pipe and union from the outboard end of the flexible hose.
3 Using two spanners, remove the locknuts and washers securing the hose to the support brackets, one on the wheel arch the other on the damper tube, and remove the hose.

Refitting
4 Reverse instructions 1 to 3. Ensure that the hose is neither kinked nor twisted when installed.
5 Bleed the brakes.

BRAKE HOSE - REAR
Remove and refit 70.15.17

Removing
1 Disconnect the brake pipe and union at the front end of the brake hose.
2 Disconnect the brake pipe and union at the rear end of the brake hose.
3 Using two spanners, remove the locknuts and washers securing the hose to the brackets, one on the body, the other on the axle tube. Remove the brake hose.

Refitting
4 Reverse instructions 1 to 3. Ensure that the hose is neither kinked nor twisted when installed.
5 Bleed the brakes.
HYDRAULIC PIPES

To aid identification of individual pipes, operation numbers are included in the illustration showing the general arrangement of the brake system. Left-hand-drive vehicles are set out symmetrically opposite at the front end to that shown.

- Pipe - master cylinder to pressure reducing valve - front brakes
- Pipe - master cylinder to pressure reducing valve - rear brakes
- Pipe - pressure reducing valve to L.H. front hose
- Pipe - pressure reducing valve to R.H. front hose
- Pipe - L.H. front hose to caliper
- Pipe - R.H. front hose to caliper
- Pipe - pressure reducing valve to rear hose
- Pipe - R.H. rear wheel cylinder to L.H. rear wheel cylinder
- Pipe - rear hose to R.H. rear wheel cylinder

BRAKES

Bleed

Do not allow the fuel level in the reservoir to fall below half capacity. When topping-up during the bleeding process, DO NOT USE aerated fluid exhausted from the system. DO NOT bleed the system with the servo in operation (engine running).

1. Disconnect the wires to the pressure failure switch and remove the pressure failure switch from the underside of the master cylinder.
2. Release the hand brake.
3. Attach the bleed tube to the bleed nipple of the front caliper farthest from the master cylinder, allowing the free end of the bleed tube to hang submerged in brake fluid in a transparent container.
4. Open the bleed nipple (90 to 180 degrees).
5. Fully depress the brake pedal and follow with three rapid successive strokes. Allow the pedal to return. Repeat this procedure until fluid free from air bubbles issues from the wheel cylinder.
6. Depress the brake pedal, close the nipple and release the pedal.
7. Remove the bleed tube.
8. Attach the bleed tube to the opposite front caliper and repeat instructions 4 to 7.
9. Attach the bleed tube to the single nipple on the rear backplate (R.H. Stg. - left-hand backplate; L.H. Stg. - right-hand backplate) and repeat instructions 4 to 7.
10. Fit the pressure failure switch to the master cylinder and connect the wires. The P.D.W.A. shuttle fitted to this vehicle is self-centring.

Adjust

Self-adjusting brakes are fitted to the front and rear. Front adjustment is hydraulically self-compensating to provide for brake pad wear. In the rear brakes a self-adjusting mechanism incorporated in the brake-shoe hand brake linkage maintains a fixed brake liner/drum running clearance; self-adjustment occurs on the application of the footbrake.
PRESSURE REDUCING VALVE

Remove and refit 70.25.21

Removing
1. Slacken the brake pipe unions at the master cylinder.
2. Remove the two inlet pipes from the top of the pressure reducing valve.
3. Remove the rear brake outlet pipe from the end plug of the pressure reducing valve.
4. Remove the two front brake outlet pipes from the underside of the pressure reducing valve. To facilitate removal of the L.H. front brake pipe, first remove the R.H. front brake pipe from the pressure reducing valve and detach the pipe from the clip on the inner wheel arch.
5. Remove the nut, plain washer, spring washer and bolt, and remove the pressure reducing valve with the bracket from the suspension turret.

Refitting
6. Align the lugs on the bracket with the holes in the suspension turret.
7. Fit the pressure reducing valve and secure to the suspension turret with the bolt, plain washer, spring washer and nut.
8. Fit the brake pipes, tighten the pressure reducing valve unions, and attach the R.H. front brake pipe to the clip on the inner wheel arch.
9. Tighten the brake pipe unions at the master cylinder.
10. Bleed the brakes.

MASTER CYLINDER – TANDEM

Remove and refit 70.30.08

Removing
1. Depress and release the brake pedal at least ten times to ensure that no vacuum exists to operate the servo.
2. Noting their positions, disconnect the brake pipes at the master cylinder.
3. Plug the master cylinder ports to prevent fluid discharge from the reservoir. Seal the brake pipes to prevent ingress of foreign matter.
4. Disconnect the wires to the pressure failure switch.
5. Remove the two nuts and spring washers securing the master cylinder to the serve and withdraw the master cylinder.

Refitting
5. Reverse instructions 2 to 4.
6. Bleed the brakes.

Dismantling
1. Remove the tandem master cylinder from the car, see 70.30.08.
2. Drain the fluid from the reservoir.
3. Remove the two screws securing the fluid reservoir to the master cylinder and remove the reservoir.
4. Noting their original positions, remove the two rubber seals from the cylinder body recesses.
5. Remove the circlip and rubber boot from the end of the master cylinder.
6. Remove the primary piston and return spring.
7. Insert a soft metal rod into the cylinder and depress the secondary piston. This will release the stop pin which is seated adjacent to the secondary piston fluid feed port.
8. Remove the pin and withdraw the secondary piston, the spring retainer and the return spring.
9. Carefully note the sizes and positions of the rubber seals, the piston washers and the spring retainers. Remove the seals using only the fingers.
10. Unscrew the pressure failure switch from the cylinder body.
11. Remove the end plug and copper washer, withdraw the distance piece, and the piston and spring sub assembly.
12. Carefully remove the two rubber seals.

Inspection
13. Clean all the components thoroughly in a recommended brake fluid and dry using a lint-free cloth.
14. Carefully inspect the metal components for faults and wear. A replacement assembly must be fitted if the cylinder bores show the slightest signs of corrosion, ridging or scoring.
15. Ensure that all the ports and drillings in the cylinder body, piston heads and the vent hole in the filler cap are clear of any obstructions.

continued
Reassembly

16. Fit new seals and washers to the primary and secondary pistons, using only the fingers.
17. Fit the secondary return spring, spring retainer and piston into the cylinder bore, taking care not to bend back the lip of the seal.
18. With a soft metal rod, depress the secondary piston. When the head of the piston passes the secondary fluid feed port, fit the piston stop pin.
19. Fit the primary return spring, spring retainer and piston into the cylinder bore, ensuring that the lip of the seal is not bent back.
20. Fit the circlip at the mouth of the cylinder bore and check that it is correctly seated in the groove.
21. Fit the two rubber seals into the cylinder body recesses.
22. Ensure that the reservoir is clean and fit to the master cylinder body with the two screws. Tighten to a torque of 5 lbf ft (0.69 kgf m). DO NOT overtighten.
23. Insert the piston and spring sub-assembly into its respective bore, taking care not to damage the 'O' rings.
24. Fit the metal distance piece.
25. Fit a new copper washer to the end plug and screw into the bore. Tighten to a torque of 33 lbf ft (4.56 kgf m).
26. Fit the master cylinder to the car, see 70.30.08.
27. Bleed the brakes.

PEDAL BOX

Remove and refit 70.35.03

Removing
1. Disconnect the two spade terminals from the brake stop light switch.
2. Remove the speedo cable from its retaining clip.
3. Remove the clevis pin securing the brake pedal to the brake master cylinder rod.
4. Remove the clevis pin securing the clutch pedal to the clutch master cylinder rod.
5. Remove the four nuts and spring washers securing the servo to the pedal box.
6. Remove the two nuts, bolts and spring washers securing the clutch master cylinder to the pedal box.
7. Remove the cleat securing the harness to the stabilizer bar.
8. Remove the nut and bolt securing the stabilizer bar to the fascia rail.
9. Remove the three bolts and spring washers securing the top of the pedal box to the body.
10. Withdraw the pedal box assembly.

Refitting
11. Reverse instructions 1 to 10.

PEDAL BOX

Overhaul 70.35.04

1. Remove the pedal box from the car, see 70.35.03.
2. Remove the brake stop light switch.
3. Remove the circlip from one end of the pedal pivot rod.
4. Push the rod through the bracket.
5. Remove the brake and clutch pedals and the two anti-rattle springs.
6. Remove and renew the two Teflon coated bushes in each pedal.
7. Remove and renew the pedal pad rubbers.
8. Locate both the clutch and brake pedals in the pedal box, ensuring that the anti-rattle springs are fitted.
9. Push through the pivot rod and secure using the circlip.
10. Fit the brake stop light switch.
11. Fit the pedal box to the car, see 70.35.03.
HAND BRAKE LEVER ASSEMBLY
Remove and refit 70.35.08

Removing
1. Drive the vehicle onto a ramp. Release the hand brake.
2. Raise the ramp.
3. Using a screw jack, raise the body to allow access to the underside of the transmission tunnel.
4. Pull back the rubber gaiter and release the hand brake cable locknut; note original position.
5. Unscrew the hand brake cable from the operating rod.
6. Lower the ramp.
7. Remove the centre console, see 76.25.01.
8. Remove the Lucar connector from the handbrake warning light switch.
9. Remove the four bolts and spring washers securing the hand brake lever assembly to the transmission tunnel.
10. Withdraw the hand brake lever assembly, the lower plate and the rubber gaiter.

Refitting
11. Reverse instructions 1 to 10.
12. Check the adjustment of the hand brake and rectify as necessary, see 70.35.10.

HAND BRAKE CABLES
Adjust 70.35.10

Removing
1. Jack up the rear of the vehicle and support the axle on stands.
2. Release the hand brake.
3. Disconnect the hand brake cables from the rear brake backplate levers.
4. Applying light finger pressure, push the brake operating levers inboard to ensure that the operating levers are in contact with the brake-shoe webs.
5. With the compensator 12 mm (½ in) to the left-hand side of its vertical position adjust the cable forks to permit clevis pin entry.
6. Fit the clevis pins. Ensure that the brakes do not drag.
7. With 25 lbf effort applied to the hand brake, the travel of the lever should be between four and seven notches.

Refitting
11. Reverse instructions 1 to 10.
12. Adjust the hand brake cable, see 70.35.10.
FRONT BRAKE PADS
Remove and refit 70.40.02
Removing
1. Jack up the car and remove the front road wheel.
2. Depress the pad-retaining spring and withdraw the split pins.
3. Taking note of their positions, lift the pads and shims out of the caliper recesses. The shims need not be renewed provided they are undamaged and are not corroded.
Refitting
4. Ease the caliper pistons into the bores to provide the extra clearance to accommodate the new unworn brake pads. During this operation brake fluid will be displaced and to prevent the reservoir overflowing, open the caliper bleed screw as pressure is applied to the piston. Close the bleed screw when the piston has moved the required amount. Repeat on the opposite piston in the caliper.
5. Remove dust and clean the brake pad locations in the caliper.
6. Insert the new pads and shims (smaller cut-out uppermost) into the caliper recesses.
7. Fit the new pad-retaining spring and split pins.
8. Firmly depress the foot brake pedal several times to correctly locate the friction pads.
9. Fit the road wheel and lower the car.
10. Check the fluid level in the reservoir and top up as necessary.

REAR BRAKE-SHOES
Remove and refit 70.40.03
Removing
1. Jack up the car and support the body on stands.
2. Remove the road wheel.
3. Release the hand brake.
4. Remove the two countersunk screws securing the brake-drum and withdraw the brake-drum. When brake-drum removal is found to be difficult due to wear or ridging, remove the rubber plug on the inboard side of the backplate. Insert a small screwdriver, and engage it in the slotted hole in the small adjusting lever. Press down to release the mechanism.
5. Carefully note the position of the shoes and springs.
6. Remove the shoe steady pin cups and springs and extract the shoe steady pin from the rear of the backplate.
7. Ease the toe of the leading shoe followed by the heel of the trailing shoe out of the slotted piston heads.
8. Unlock the pull-off springs, and the cross lever tension spring and remove the brake-shoes. To avoid possible ejection of the wheel cylinder pistons restrain them in position with a twist of wire or a suitable clamp. Take care not to damage the rubber boots.
9. Insert the cross lever tension spring hook in the cross lever, engage the other end in the leading shoe web in the previously noted hole position. This spring is not interchangeable with the spring on the opposite brake.
10. Ease the brake-shoe and the cross lever towards the backplate, engage the toe of the shoe into the slot in the piston and the heel of the shoe into the abutment.
11. Hold the cross lever and shoe against the backplate, fit the steady pin, spring and cup.
12. Hook the pull-off springs into the holes in the shoe webs. The spring nearest the abutment is fitted on the backplate side of the shoes.
13. Pull the trailing shoe against the resistance of the springs. Position the heel into the slot in the piston and the toe into the abutment. Ensure that the cut-out in the cross lever engages with the slot in the adjuster plate.
14. Fit the remaining steady pin, spring and cup.
15. The functioning of the adjuster can be checked by gently operating the foot brake with the drum removed. Following expansion of the brake-shoes the ratchet will be seen to operate. Brake-shoes expansion can be cancelled by raising the ratchet plate to separate the ratchet teeth and allowing the pull-off springs to retract the shoes.
16. Replace the brake-drum and road wheel. Lower the car.
17. Apply the foot brake heavily several times to centralize and adjust the brake-shoes.
18. Road-test the car. If the operation of the brakes, including the hand brake, is poor, make four brake applications applying moderately high pedal efforts to decelerate the vehicle from 20 m.p.h. to rest. This will ensure correct adjustment of the rear brakes.
SERVO
Remove and refit 70.50.01
Removing
1 Remove the master cylinder from the servo, see 70.30.08.
2 Disconnect the vacuum hose from the non-return valve.
3 Remove the clevis pin securing the servo push-rod to the brake pedal.
4 Remove the four nuts and spring washers securing the servo to the pedal bracket.
5 Withdraw the servo.
Refitting
6 Reverse instructions 1 to 5.
7 Bleed the brakes.

VACUUM HOSE
Remove and refit 70.50.14
Removing
1 Release the vacuum hose clips at the manifold and the servo non-return valve.
2 Remove the hose from the manifold and the non-return valve.
Refitting
3 Reverse instructions 1 and 2.

NON-RETURN VALVE
Remove and refit 70.50.15
Removing
1 With the engine stopped, depress the brake pedal to destroy the vacuum in the servo.
2 Release the hose clip securing the vacuum hose to the non-return valve and disconnect the hose.
3 Withdraw the non-return valve from the servo.
Refitting
4 Renew the sealing rubber as necessary, and press the non-return valve into position in the servo.
5 Connect the vacuum hose to the non-return valve and secure with the hose clip.
SERVO FILTER
Remove and refit 70.50.25

Removing
1 Remove the brake stop light switch.
2 Remove the split pin, plain washer and clevis pin securing the servo rod to the brake pedal.
3 Remove the rubber boot from the push-rod.
4 Withdraw the filter.

Refitting
5 Reverse instructions 1 to 4.

BRAKE CALIPER – FRONT
Remove and refit 70.55.02

Removing
1 Jack up the car and remove the front wheel.
2 Disconnect the brake union at the caliper and seal the fluid connections to prevent entry of grit.
3 Remove the two bolts and spring washers retaining the steering-arm and the caliper lower mounting lug to the stub axle assembly.
4 Push the steering-arm clear.

5 Remove the bolt and spring washer securing the caliper upper mounting lug to the stub axle assembly.
6 Withdraw the caliper.

Refitting
7 Engage the caliper on the disc and align the locating lugs.
8 Position the upper bolt and spring washer; do not tighten.
9 Fit the steering-arm to the stub axle assembly.
10 Tighten the three bolts.
11 Bleed the brakes.
12 Fit the road wheel and remove the jack.
FRONT CALIPER
Renew seals 70.55.13

Dismantling
1 Remove the caliper from the car, see 70.55.02.
2 Remove the brake pads and shims, see 70.40.02.
3 Extract the caliper pistons. Piston removal may be affected by using a low pressure air line. DO NOT interchange the pistons. If either piston is seized, the whole caliper assembly must be renewed.
4 Using a blunt screwdriver carefully prise out the wiper seal retainers, taking care not to damage the seal grooves in the caliper bores.
5 Extract the wiper dust seal and the fluid seal from each caliper bore.
6 Thoroughly clean the caliper pistons and caliper bores with new clean brake fluid or methylated spirit.
7 Carefully inspect the caliper bores and pistons. If they show any signs of corrosion, fault or wear, the parts affected must be renewed.

Reassembling
8 Fit the new fluid seals, using only the fingers, into the grooves in the caliper bores, ensuring that they are properly located. The fluid seal grooves and the seals are not the same in section, therefore even when located correctly the seal feels proud at the edge farthest away from the mouth of the caliper bore.
9 Lubricate the bores with new, clean brake fluid.
10 Squarely insert the pistons into the caliper bores. Leave approx. 6 in (7.94 mm) of each piston projecting from the mouth of each bore.
11 Fit a new wiper seal into each of the seal retainers and slide the assemblies, seal first, carefully into the mouth of each bore using the pistons as a guide.
12 Carefully press home the seals, taking care not to distort the retainers.
13 Push home the pistons.

REAR WHEEL CYLINDER
Remove and refit 70.60.18

Removing
1 Jack up the car and support the body on stands.
2 Remove the rear wheel.
3 Remove the brake-drum, see 70.10.03.
4 Remove the brake-shoes, see 70.40.03.
5 Disconnect the hand brake cable at rear of the backplate.
6 Disconnect the fluid feed pipe union at the wheel cylinder and remove the bleed screw (left-hand side only); or Disconnect the fluid feed and transfer pipe unions at the wheel cylinder (right-hand side only).
7 Remove the spring clip securing the wheel cylinder to the rear of the backplate.
8 Remove the wheel cylinder and gasket.

Refitting
9 Reverse instructions 1 to 8, fitting a new gasket and circlip.
10 Apply the foot brake several times to adjust the rear brakes.
11 Bleed the brakes.
12 Road-test the car. If the operation of the brakes, including the hand brake, is poor, make four brake applications applying moderately high pedal efforts to decelerate the vehicle from 20 m.p.h. to rest. This will ensure correct adjustment of the rear brakes.
REAR WHEEL CYLINDER

Overhaul 70.60.26

1. Remove the wheel cylinder from the backplate, see 70.60.18.
2. Remove the rubber boots from the cylinder body and remove the pistons.
3. Withdraw the pistons from the bore and retrieve the spring located between the two pistons.
4. Carefully inspect all components for faults and wear. A replacement wheel cylinder assembly must be fitted if, after cleaning, the bore of the old unit shows the slightest signs of corrosion or scoring.
5. Smear the cylinder bore with clean brake fluid.
6. Renew the seal on each piston, carefully fit the seal into the larger groove on each piston, with the lip of the seal facing away from the slotted head.
7. Locate the rubber boots into the smaller groove on each of the pistons.
8. Insert the pistons into the cylinder bore ensuring that the spring locates between them in the counter-bored ends.
9. Refit the wheel cylinder, see 70.60.18.
BODY UNIT

Alignment check 76.10.01

1 A preliminary check of the alignment should be carried out by dropping a plumb-bob from the centre of the points A, B, C, D on each side of the car.

2 Establish a centre line by means of a large pair of compasses at points B and D.

3 Check measurements against those given in DATA.

4 Construct diagonals. Incorrect alignment will be evident by the failure of the diagonals to intersect on the centre line or by considerable deviation from the dimensions given.

DATA

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
</tr>
<tr>
<td>A</td>
<td>552</td>
<td>594</td>
<td>964</td>
<td>1042</td>
</tr>
<tr>
<td></td>
<td>(21.73 in)</td>
<td>(23.38 in)</td>
<td>(37.95 in)</td>
<td>(41.02 in)</td>
</tr>
</tbody>
</table>
Vertical alignment

The dimensions given below are for cars in showroom condition, unladen and without fuel. It should be noted that the important point is the relative positions of the vertical datum points to each other and not their actual height from the wheel hub centres.

<table>
<thead>
<tr>
<th>Code</th>
<th>Dimension</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>347 mm (13.66 in)</td>
<td>Anti-roll bar front mounting to suspension pod cap</td>
</tr>
<tr>
<td>B</td>
<td>141.5 mm (5.57 in)</td>
<td>Rear suspension arm mounting to radius rod mounting</td>
</tr>
<tr>
<td>a</td>
<td>33 mm (1.29 in)</td>
<td>Anti-roll bar clamp front fixing bolt to lower link</td>
</tr>
<tr>
<td>b</td>
<td>345 mm (13.59 in)</td>
<td>Top of front wheel arch to wheel hub centre - Manual transmission</td>
</tr>
<tr>
<td></td>
<td>354 mm (13.97 in)</td>
<td>Top of front wheel arch to wheel hub centre - Manual transmission with air conditioning</td>
</tr>
<tr>
<td></td>
<td>347 mm (13.69 in)</td>
<td>Top of front wheel arch to wheel hub centre - Automatic transmission</td>
</tr>
<tr>
<td></td>
<td>356 mm (14.05 in)</td>
<td>Top of front wheel arch to wheel hub centre - Automatic transmission with air conditioning</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Dimension</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>c</td>
<td>583 mm (22.95 in)</td>
<td>Lower link to front suspension pod cap</td>
</tr>
<tr>
<td>d</td>
<td>476.5 mm (18.75 in)</td>
<td>Front suspension pod cap to datum line</td>
</tr>
<tr>
<td>e</td>
<td>338 mm (13.3 in)</td>
<td>Top of wheel arch to datum line</td>
</tr>
<tr>
<td>f</td>
<td>136 mm (5.35 in)</td>
<td>Rear suspension arm mounting to radius rod mounting</td>
</tr>
<tr>
<td>g</td>
<td>95 mm (3.74 in)</td>
<td>Rear suspension arm mounting to datum line</td>
</tr>
<tr>
<td>h</td>
<td>319 mm (12.56 in)</td>
<td>Top of rear wheel arch to datum line</td>
</tr>
<tr>
<td>j</td>
<td>353 mm (13.92 in)</td>
<td>Top of rear wheel arch to wheel hub centre - Manual transmission</td>
</tr>
<tr>
<td></td>
<td>354 mm (13.95 in)</td>
<td>Top of rear wheel arch to wheel hub centre - Automatic transmission</td>
</tr>
</tbody>
</table>

DATUM LINE
BODY UNIT

Alignment check 76.10.01
(Using Churchill 700 or 707 system)

Whilst severe underframe damage is readily detected, less serious damage may cause distortion that is not visually apparent.

If steering or suspension checks indicate a fault which cannot be attributed to anything other than underframe distortion, initial checking should be carried out to determine the area and extent of distortion.

Initial check
1. Clip the location tape to the right-hand side of the jig and make a chalk mark on the floor at each required location for initial checking.
2. Remove the tape to avoid damage.
3. Position the car centrally over the jig with the front wheel centres approximately 76 cm (30 in) from the front of the jig.

6. Lower the car to locate the bracket pegs in the front tooling holes in the floor side-member.
7. Raise the rear of the car by jacking under the differential.
8. Fit transverse member number 2.
9. Fit brackets S700-29/1 (LH) and S700-29/2 (RH) to the transverse member, locating the inner bracket bolts in holes 'L'.
   NOTE: These holes are not marked on Churchill 700 systems. Distance across bolt centres should be 819 mm (32.25 in).

10. Lower the car and fit the two bushes S700-29/4 over the trailing arm hanger bolt heads.
11. Fit transverse member number 4 with the rear mounting holes at tape position 18.

12. Fit bracket S700-401/1 (LH) and S700-401/2 (RH) locating the inner bracket bolts in holes 'G'.

13. Fit risers S700-2B and transverse member number 1 with the rear mounting holes at tape position 4/28.

Repair Stage

It may not be necessary to fit the full set of repair brackets. If damage is confined to the front end of the car, repair brackets can be fitted at the front and the initial check brackets retained at the rear or vice-versa in the case of rear end damage. Where it is necessary to remove sub-assemblies before fitting repair brackets, reference should be made to the appropriate workshop manual section.

For front end repairs, the transverse members and brackets used for initial checking are used again in their original positions with the following additions:-

continued
Fit transverse member number 1 with the rear mounting holes at tape position 15.

Fit risers S700-17/1 (LH) and S700-17/2 (RH).

Fit brackets S700-18/1 (LH) and S700-18/2 (RH) to the risers, using the eight screws supplied.

Secure the brackets to the spring turrets, using the damper attachment nuts.

For rear end repairs:

Remove the two bushes S700-29/4 and the two bolts and nuts from the trailing arm hangers. Refit the bushes and fit the two pins S700-29/5.

Fit adaptors S700-401/3 into brackets S700-401/1 (LH) and S700-401/2 (RH).

Install the two original bolts through the sub-frame front mounting holes in the longitudinal members and screw them into the adaptors.
Transverse member locations for initial check
Transverse member locations for repair
SUB FRAME

Alignment check

Diagram Number

AA Datum line

BB Datum face

CL Centre Line

<table>
<thead>
<tr>
<th>Diagram Number</th>
<th>Millimetres</th>
<th>Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>310 ± 0.50</td>
<td>12.20 ± 0.020</td>
</tr>
<tr>
<td>2</td>
<td>74 ± 0.25</td>
<td>2.91 ± 0.010</td>
</tr>
<tr>
<td>3</td>
<td>171 ± 1</td>
<td>6.73 ± 0.040</td>
</tr>
<tr>
<td>4</td>
<td>88 ± 0.25</td>
<td>3.46 ± 0.010</td>
</tr>
<tr>
<td>5</td>
<td>26</td>
<td>1.02</td>
</tr>
<tr>
<td>6</td>
<td>78 ± 1</td>
<td>3.07 ± 0.040</td>
</tr>
<tr>
<td>7</td>
<td>75 ± 1</td>
<td>2.95 ± 0.040</td>
</tr>
<tr>
<td>8</td>
<td>36 ± 1</td>
<td>1.41 ± 0.040</td>
</tr>
<tr>
<td>9</td>
<td>730 ± 0.50</td>
<td>28.74 ± 0.020</td>
</tr>
<tr>
<td>10</td>
<td>812 ± 0.50</td>
<td>31.96 ± 0.020</td>
</tr>
<tr>
<td>11</td>
<td>138 ± 1</td>
<td>5.43 ± 0.040</td>
</tr>
<tr>
<td>12</td>
<td>222 ± 1</td>
<td>8.74 ± 0.040</td>
</tr>
</tbody>
</table>

12.20 ± 0.020

12.20 ± 0.020

12.20 ± 0.020

12.20 ± 0.020

12.20 ± 0.020

12.20 ± 0.020

12.20 ± 0.020

12.20 ± 0.020

12.20 ± 0.020

12.20 ± 0.020

12.20 ± 0.020

12.20 ± 0.020

12.20 ± 0.020

12.20 ± 0.020

12.20 ± 0.020

12.20 ± 0.020

12.20 ± 0.020

SUB-FRAME

Remove and refit

76.10.29

Removing

1 Jack up the front of the vehicle sufficiently to take the weight of the body off the front suspension.

2 Support the sub-frame by placing a jack beneath it.

3 Remove the power steering rack, 57.10.01.

4 Remove the four nuts, bolts, plain washers and the two spacers securing the anti-roll bar to the sub-frame.

5 Remove the two nuts and bolts securing the lower links to the sub-frame. Adjust the jacks if necessary to ensure that the bolts are not under load. Withdraw the two bolts and release the lower links from the sub-frame.

6 Lower the sub-frame and remove it from the vehicle.

Refitting

7 Reverse instructions 1 to 6.
UNDERBELLY PANEL
(Vehicles with air conditioning)
Remove and refit 76.10.50

Removing
1 Remove the two screws securing the underbelly panel to the brackets on the radiator cross-member.
2 Remove the four screws securing the underbelly panel to the lower front panel.

Refitting
3 Reverse instructions 1 and 2.

REAR COMPARTMENT TRIM PAD
Remove and refit 76.13.20

Removing
1 Move both seats and seat squabs to the fully forward position.
2 Open the rear console lid and remove the two screws and cup washers securing the trim pad to the body.
3 Remove the two screws and cup washers securing the trim pad to the body.
4 Remove the four bolts securing the hinges to the adjuster plates and lift off the bonnet.

Refitting
5 Reverse instructions 1 to 4, using Dunlop SP758 adhesive on the mating surfaces of trim pad edging and body flange.

REAR QUARTER TRIM PAD
Remove and refit 76.13.12

Removing
1 Pull the weatherstrip away from the door aperture in the area of the trim pad.
2 Carefully pull the trim pad edging away from the body flange.
3 Remove the cap, screw and retainer.
4 Prise off the trim pad—5 clips.

Refitting
5 Reverse instructions 1 to 4, using Dunlop SP758 adhesive on the mating surfaces of trim pad edging and body flange.

BONNET
Remove and refit 76.16.01

Removing
1 Pull the tubing from the screenwasher pump; attach a suitable length of string to the end of the tubing to facilitate refitting, and pull the tubing through the holes in the inner wheel arch.
2 Mark the hinge positions on the body.
3 Support the bonnet and remove the two screws and spring washers securing the stay to the bonnet.
4 Remove the four bolts securing the hinges to the adjuster plates and lift off the bonnet.

Refitting
3 Reverse instructions 1 and 2.

BONNET CATCH
Adjust 76.16.20

To ensure positive locking and eliminate free movement at the closing face, adjust the bonnet catch as follows:
1 Pull back the spring and slacken the locknut at the base of the shaft.
2 Using a screwdriver, screw the shaft in or out as required.
3 Retighten the locknut.
4 Check the bonnet closing action and repeat instructions 1 to 3 if necessary.

BONNET STAY
Remove and refit 76.16.14

Removing
1 Support the bonnet and remove the two screws and spring washers securing the stay to the bonnet.
2 Remove the bolt and spring washer securing the lower end of the stay to the body.

Refitting
5 Reverse instructions 1 to 4, adjusting if necessary to ensure correct alignment before fully tightening bolts 4.
BONNET LOCK
Remove and refit  76.16.21
Removing
1 Remove the trunnion from the cable.
2 Slacken the pinch bolt and detach the cable from the lock.
3 Remove the four bolts, spring washers and plain washers securing the lock to
   the body.

Refitting
4 Reverse instructions 1 to 3.

BONNET RELEASE CABLE
Remove and refit  76.16.29
Removing
1 Remove the trunnion from the cable.
2 Slacken the pinch bolt and detach the cable from the lock.
3 Unscrew the nut securing the outer cable to the bracket beneath the facia.
4 Withdraw the cable through the grommet on the bulkhead and collect
   the nut and shakeproof washer.
CAUTION: Do not close the bonnet with the cable removed or loose.

Refitting
2 Refit in reverse order and adjust if necessary, see 76.16.20.

BONNET CATCH
Remove and refit  76.16.34
Removing
1 Remove the two bolts, spring washers and plain washers. Remove the catch
   from the bonnet.

LUGGAGE COMPARTMENT LID
Remove and refit  76.19.01
Removing
1 Mark the hinge positions on the lid.
2 Disconnect the two rear number plate lamp leads from the connector at the
   R.H. side of the luggage compartment.
3 Earlier models only: Support the lid and remove the two bolts securing the stay to
   the lid.
4 Remove the four bolts, spring washers and plain washers securing the lid to the hinges
   and lift off the lid.

Refitting
5 Reverse instructions 1 to 4, ensuring that the lock release lever is not
   pre-loaded by the cable.

LUGGAGE COMPARTMENT LID HINGES
Remove and refit  76.19.07
Removing
1 a Remove the luggage compartment lid, see 76.19.01.
   b Later models only: Remove one bolt, nut and washers to release the gas
      strut from each hinge.
2 Remove (two each side) the four bolts, spring washers and plain washers securing
   the hinges to the body and lift off the hinges.

Refitting
4 Reverse instructions 1 to 3.

LUGGAGE COMPARTMENT LOCK
Remove and refit  76.19.11
Removing
1 Remove the three bolts, spring washers and plain washers and lift off the latch.
2 Pull the spring clip to one side to disengage it from the lock.
3 Carefully withdraw the lock and gasket.

Refitting
3 Reverse instructions 1 and 2 ensuring correct alignment in the vertical plane
   before fully tightening bolts 2.
LUGGAGE COMPARTMENT LOCK STRIKER

Remove and refit 76.19.12

Removing
1 Pull the weatherstrip away from the body panel in the area of the striker.
2 Mark the position of the striker bolts on the body panel.
3 Remove the three bolts, spring washers and plain washers.
4 Withdraw the striker from the body panel aperture.

Refitting
4 Reverse instructions 1 to 3.

BUMPER—REAR

Remove and refit 76.22.15

Removing
1 Remove the four nuts, spring washers and plain washers securing the side support brackets to the bumpers.
2 Remove the three nuts, spring washers and plain washers and lift off the handling brackets—U.S.A. models.
3 Support the bumper and remove the remaining two nuts, spring washers and plain washers. Lift off the bumper.

Refitting
5 Reverse instructions 1 to 3.

CONSOLE ASSEMBLY

Remove and refit 76.25.01

Removing
1 Raise the handgrip lever and pull off the grip.
2 Un螺丝 the gear lever knob.
3 Remove the two screws and lift off the handbrake lever surround trim panel.
4 Prise off the gear lever gaiter—4 fasteners.
5 Remove the two screws and plain washers securing the front console to the transmission tunnel.

Refitting
9 Reverse instructions 1 to 8.

BUMPER—FRONT

Remove and refit 76.22.08

Removing
1 Disconnect the six snap connectors from the parking and flasher lamp leads.
2 Remove the outer four nuts, spring washers and plain washers.
3 Support the bumper and remove the remaining two nuts, spring washers and plain washers. Lift off the bumper.

Refitting
4 Reverse instructions 1 to 3.
**CONTROL COWL**

**Remove and refit 76.25.03**

**Removing**

1. Remove the console assembly, see 76.25.01.
2. Pull the four knobs from the heating and ventilation control levers.
3. Remove the two screws securing the cowl to the control levers.
4. Remove the two screws securing the control illumination panel to the cowl.
5. Remove the screw securing the cowl to the bracket on the transmission tunnel.
6. Remove the two screws securing the cowl to the body.
7. Engage top gear and pull the cowl clear of the heater.
8. Disconnect the bulbholder and two leads from the cigar lighter.
9. Disconnect the two lucar connectors from the rheostat.
10. Remove the cowl from the vehicle.

**Refitting**

12. Reverse instructions 1 to 11.

**DOOR GLASS REGULATOR**

**Remove and refit 76.31.45**

**Removing**

1. Remove the door trim pad, see 76.31.45.
2. Remove the door lock remote control, see 76.37.31.
3. Remove the door glass regulator, see 76.31.45.
4. Remove the bolt, spring washer and plain washer securing the rear glass channel to the door.
5. Pull the two bolts and plain washers securing the front glass channel to the door.
6. Carefully ease the quarter light and weatherstrip rearwards and upwards and remove them from the door.

**Refitting**

7. Reverse instructions 1 to 6, ensuring that the weatherstrips are correctly positioned.

---

**DOOR GLASS**

**Remove and refit 76.31.01**

**Removing**

1. Remove the door trim pad, see 76.31.45.
2. Remove the door lock remote control, see 76.37.31.
3. Remove the bolt, spring washer and plain washer securing the rear glass channel to the door.
4. Pull the two bolts and plain washers securing the front glass channel to the door.
5. Pull the top of the glass channel away from the quarter light weatherstrip.
6. Carefully ease the quarter light and weatherstrip rearwards and upwards and remove them from the door.

**Refitting**

1. Reverse instructions 1 to 3, check the door closing action and alignment and adjust if necessary before fully tightening nuts 3.
2. Support the glass.
3. Remove the four bolts, spring washers and plain washers securing the regulator to the door.
4. Carefully push the regulator handle shaft inside the door aperture and slide the regulator assembly towards the rear of the door, lowering the glass by hand sufficiently to enable the rollers to be disengaged from the glass channels and the channel on the door interior.
4 Lift off the outer striker plate and the
Manoeuvre the regulator out of the
doors through the lower aperture,
taking care to avoid scratching the
glass.

Refitting
8 Reverse instructions 1 to 7.

**DOOR TRIM PAD**
Remove and refit
76.34.01

Removing
1 Unscrew and remove the plunger
knob.

**DOOR ARM-REST**
Remove and refit
76.34.23
The door arm-rest is secured to the door
shell by two screws.

**DOOR LOCK**
Remove and refit
76.37.12

Removing
1 Remove the door trim pad, see
76.34.01.
2 Remove the bolt, spring washer and
plain washer securing the rear glass
channel to the door. Detach the insert
from the channel and carefully
withdraw the channel and weather
curtain.
3 Remove the four screws securing the
lock assembly to the door and lift off
the disc latch.

4 Remove the retaining clip and detach
the remote control rod from the lock.
5 Remove the two nuts and spring
washers securing the clamp bracket to
the outside handle.
6 Manoeuvre the outside handle and
seal, together with the door lock,
through the handle aperture and out
of the door.
CAUTION: Care must be taken to
avoid straining locks or linkages.
7 Remove the retaining clips from the
door handle and private lock control
rods and separate the outside handle
and door lock.

Refitting
8 Reverse instructions 1 to 7 ensuring
that the plunger rod is correctly
located before securing the lock to the
doors.

**DOOR LOCK STRIKER**
Remove and refit
76.37.23

Removing
1 Remove the rear quarter trim pad, see
76.13.12.
2 Remove the two screws securing the
striker assembly to the ‘B’ post.

**DOOR LOCK STRIKER**
Adjust
76.37.27
1 Slacken the two screws.
2 Adjust the striker position as
necessary to ensure correct door
locking action and alignment.
3 Re-tighten the screws.
5 Withdraw the control assembly from the door.

Refitting
6 Reverse instructions 1 to 5.

DOOR PRIVATE LOCK
Remove and refit 76.37.39
Removing
1 Remove the door outside handle, see 76.58.01.
2 Remove the circlip.

Refitting
6 Reverse instructions 1 to 5.

WINDSCREEN FINISHER—LOWER
Remove and refit 76.43.41
Removing
1 Remove the drivers wiper arm, see 84.15.02
2 Remove the passengers wiper arm, see 84.15.03.
3 Remove the nut, distance piece and rubber washer from the passenger's side wheelbox spindle.
4 Pull off the two bulkhead weatherstrips.
5 Remove the two screws and plain washers and detach the finisher from the body taking care to avoid scratching the body and windscreen.

Refitting
6 Reverse instructions 1 to 5.

FASCIA
Remove and refit 76.46.01
Removing
1 Isolate the battery.
2 Remove the instrument cowl, see 76.46.17.
3 Remove the fascia switch panel, see 86.65.66, noting the positions of the three harness plugs and two switch identification bulb holders for refitting.
4 Remove the two 'A' post trim pads—two screws—together with the fascia corner finishers.
5 Remove the four screws securing the demister vents to the fascia.
6 Remove the two screws securing the fascia to the brackets on the bulkhead.
7 Remove the two bolts and plain washers securing the tongues on the fascia to the bulkhead.

continued
8 Remove the steering nacelles—two screws.
9 Remove the two shear-head bolts securing the steering column housing to the body. Operation 57.40.01, instructions 6 and 7.
10 Remove the five screws (two each side of the steering column—one below bonnet release) securing the fascia to the support rail beneath the instrument panel.
11 Remove the two screws securing the fascia to the support rail beneath the glovebox.
12 Remove the two screws securing the control illumination panel to the cowl.
13 Remove the screw securing the fascia to the bracket on the control cowl.
14 Remove the lid from the component mounting panel inside the glovebox—two screws.
15 Remove the three screws and two brackets securing the component mounting panel to the fascia.
16 Remove the two screws securing the wiring harness clips to the top of the fascia.
17 Disconnect the cable from the speedometer by depressing the lever to release the catch from the annular groove in the boss.
18 Unscrew the knurled nut and release the speedometer trip reset from the bracket slot.
19 Unscrew the knurled nut and release the clock reset from the bracket slot.
20 Disconnect the two multi-contact harness plugs.
21 Ease the fascia rearwards and pull the air hoses from the outer swivelling vents.
22 Carefully manoeuvre the fascia out of the car, simultaneously feeding the three harness plugs and two switch identification bulb holders through the four apertures above the switch panel aperture.

**Refitting**

23 Ensure that the demister vents are correctly positioned.
24 Reverse instructions 1 to 22.

---

**FASCIA INSTRUMENT COWL**

Remove and refit 76.46.17

**Removing**

1 Remove the fascia centre grille, see 76.55.14.
2 Remove the two screws securing the cowl to the fascia above the switch panel.
3 Remove the two screws securing the cowl to the fascia above the instrument panel.
4 Remove the screw securing the underside of the cowl to the bracket above the switch panel.
5 Remove the two screws securing the outer tongues of the cowl to the fascia.
6 Swing the cowl rearwards to disengage the side tongues from the fascia.
7 Remove the cowl.

**Refitting**

8 Reverse instructions 1 to 7.
**FASCIA GLOVEBOX COWL**

Remove and refit 76.46.18

Removing
1. Remove the fascia, see 76.46.01.
2. Remove the two bolts securing the cowl to the inside of the fascia.
3. Remove the three screws securing the glovebox lid latch.
4. Remove the three screws from inside the glovebox.
5. Lift off the cowl.

Refitting
6. Reverse instructions 1 to 5.

**CARPET—REAR FLOOR**

Remove and refit 76.49.03

Removing
1. Remove the seat, see 76.70.04/05.
2. Lift out the carpet.

Refitting
3. Reverse instructions 1 and 2.

**CARPET—TRANSMISSION TUNNEL**

Remove and refit 76.49.06

Removing
1. Remove the console assembly, see 76.25.01.
2. Lift out the carpet.

Refitting
3. Reverse instructions 1 and 2.

**GLOVEBOX LID ASSEMBLY**

Remove and refit 76.52.02

Removing
1. Press out the centres of the rokut rivets and detach the support straps from the lid and the fascia.
2. Remove the four screws securing the hinges to the fascia and lift off the lid.

Refitting
3. Position the lid and refit the four hinge screws.
4. Fit new support straps using a suitable tool to install the rokut rivets.
GLOVEBOX LOCK
Remove and refit 76.52.08

Removing
1 Pull off the knob.
2 Remove the two bolts securing the lock to the lid interior and withdraw the lock.
3 Remove the latch if necessary by removing the two screws securing it to the fascia.

Refitting
4 Reverse instructions 1 to 3.

FRONT GRILLE
Remove and refit 76.55.03

Removing
1 Remove the blanking plate—two screws.
2 Press out the centres of the three rokut rivets securing the grille to the body.
3 Remove the grille.

Refitting
4 Reverse instructions 1 to 3.

FASCIA CENTRE GRILLE
Remove and refit 76.55.14

Removing
1 The grille is retained by five forward projections which locate into slots in the fascia and by four plastic spigots which locate into 'snap backs' secured to the fascia.
2 Using a wide bladed screwdriver, carefully prise up the grille adjacent to the spigots.
3 Move the grille rearwards to disengage the forward projections.

Refitting
4 Locate the forward projections into the fascia slots.
5 Locate the spigots into the 'snap backs' and press down into position.

AIR VENT GRILLE
Remove and refit 76.55.17

Removing
1 Remove the rear quarter trim pad, see 76.13.12.
2 Remove the four nuts, spring washers, plain washers and two spacers.
3 Lift off the moulding together with the four 'T' shaped bolts.

Refitting
4 Reverse instructions 1 to 3.

DOOR OUTSIDE HANDLE
Remove and refit 76.58.01

Removing
1 Remove the door trim pad, see 76.34.01.
2 Remove the bolt, spring washer and plain washer securing the rear glass channel to the door.
3 Remove the two nuts and spring washers securing the clamp bracket to the outside handle.
4 Manoeuvre the outside handle and seal, together with the door lock, through the handle aperture and out of the door.
5 Reverse instructions 1 to 7 ensuring that the plunger rod is correctly located before securing the lock to the door.
Removing
1. Release the front of the hood by turning the levers.
2. Disconnect the eight fasteners securing the sides of the hood to the body.
3. Remove the eight screws securing the rear trimboard to the body and pull the trimboard forwards.
4. Remove the seven nuts securing the hood retaining strip to the rear deck.
5. Remove the two hood linkage covers — three screws each.
6. Lower the hood into the rearmost position ensuring that the hood material does not become damaged.
7. With the aid of an assistant, remove the four bolts, spring washers and plain washers and lift off the hood.

Refitting
8. Install the hood and loosely fit bolts 7. Ensure that the hood moves freely, and fully tighten the bolts.
**HEADLINING**

Remove and refit (Cars without sliding roof) 76.64.01

**Removing**
1. Isolate the battery.
2. Remove the roof lamp, see 86.45.02.
3. Remove the heated backlight, see 76.81.11.
4. Remove the sun visors and retainers.
5. Remove the interior mirror — two screws.
6. Pull off the windscreen header rail finisher.
7. Remove the two 'A' post trim pads—two screws each.
8. Pull off the door weatherstrips.
9. Remove the rear quarter trim pads, see 76.13.12.
10. Pull the lining edges away from the body flanges.
11. Detach the listing rails and remove the headlining.

**Refitting**
12. Apply a 50 mm (2 in) border Dunlop SP 758 adhesive to the headlining, around the roof light aperture, and on the body flanges. Allow ten minutes for the adhesive to become tacky.
13. Reverse instructions 1 to 11, cutting off any excess material, to leave approximately 13 mm (5/8 in) overlap on all flanges and apertures.

---

**HEADLINING**

Remove and refit (Cars with sliding roof) 76.64.01

**Removing**
1. Isolate the battery.
2. Remove the sliding roof, see 76.82.01.
3. Remove the roof lamp, see 86.45.02.
4. Remove the heated backlight, see 76.81.11.
5. Remove the sun visors and retainers.
6. Remove the interior mirror — two screws.
7. Pull off the windscreen header rail finisher.
8. Remove the two 'A' post trim pads — two screws each.
9. Pull off the door weatherstrips.
10. Remove the rear quarter trim pads, see 76.13.12.
11. Pull the lining edges away from the body and remove the headlining from the vehicle.

**Refitting**
12. Apply a 50 mm (2 in) border of Dunlop SP 758 adhesive to the headlining edges and around the roof light and sliding roof apertures. Allow ten minutes for the adhesive to become tacky.
13. Reverse instructions 1 to 11, cutting off any excess material to leave approximately 13 mm (5/8 in) overlap on all flanges and apertures.
PARCEL TRAY—REAR
Remove and refit 76.67.06
Removing
1 Move both seats and seat squabs to the fully forward position.
2 Remove the two bolts and spring washers securing the seat belt swivel brackets to the seats.
3 Feed the seat belts through the apertures in the parcel tray.
4 Remove the four screws and cup washers securing the parcel tray and rear compartment trim pad to the body.
5 Remove the four screws and cup washers securing the rear of the parcel tray to the body.
6 Carefully manoeuvre the parcel tray upwards and forwards and remove it from the car.

Refitting
7 Install the parcel tray in the car, feeding both seat belts through the apertures before finally positioning it.
8 Reverse instructions 1, 2, and 4 to 6.

ASHTRAY
Remove and refit 76.67.13
Removing
1 Depress the stubber to release the top edge of the bowl and carefully disengage the retainers on the bottom edge from the surround.
2 Using a small screwdriver carefully prise up the retainers on the surround sufficiently to enable it to be pulled clear of the trim pad.

Refitting
3 Press the surround into the trim pad sufficiently to engage the retainers.
4 Refit the bowl.

SEATS
Remove and refit
Driver’s seat 76.70.04
Passenger’s seat 76.70.05
Removing
1 Move the seat fully rearwards.
2 Remove the two capscrews (long), and rectangular washers securing the runners to the floor.
3 Move the seat fully forwards.
4 Remove the two capscrews (short), one rectangular washer and one stop plate securing the seat to the floor.
5 Remove the bolt and spring washer securing the seat belt bracket to the seat.
6 Disconnect the seat belt buckle unit harness plug (if fitted).
7 Disconnect the two seat belt warning light switch harness plugs (if fitted).
8 Lift out the seat complete with runners.

Refitting
9 Ensure that the packing washers are correctly positioned.
10 Reverse instructions 1 to 8.

SEAT RUNNERS
Remove and refit 76.70.21
Removing
1 Remove the seat, see 76.70.04/76.70.05.
2 Remove the six capscrews and spring washers securing the runners to the seat, moving the slides as necessary to obtain access.

Refitting
3 Reverse instructions 1 and 2.
SEAT BELTS

Removing 76.73.10

Removing
1 Remove the bolt and spring washer securing the swivel bracket to the seat.
2 Earlier models: Feed the seat belt through the aperture in the parcel shelf.
3 Earlier models: Working inside the luggage compartment remove the trim panel above the wheel arch—two fasteners.
4 Remove the bolt and spring washer securing the reel unit mounting bracket to the wheel arch.

NOTE: On later models a cover over the reel must be prised up and lifted off to gain access to the reel securing bolt.

Refitting
5 Reverse instructions 1 to 7.

WINDSCREEN

Introduction 76.81.00

The Thermo Electric Windscreen Sealer is an uncured 'Neoprene' based material supplied in round strip form, which has a thin insulated resistance wire running through its centre core. The compound surrounding the wire also has a heat activated accelerator incorporated in it and has sufficient initial tackiness to adhere it to the painted metal aperture.

The service kit contains a preformed Solbit sealing strip of sufficient length to lap completely around the windscreen aperture flange. Also included are a bottle of primer, wire for cutting out laminated windscreens and two rubber spacers for supporting the new windscreen. The internal resistance wire is exposed at each end of the strip and connected to a low voltage electrical supply. This is obtained by connecting two fully charged 12 volt batteries in series (+ to -) or alternatively using a variable output transformer capable of giving 11 amps at 24 volts. A lower current would be insufficient to effect a satisfactory cure of the Solbit strip. The resistance wire becomes warm and softens the strip, enabling the windscreen and finishers to be bedded into position. Further heat helps to cure the sealer and after 1½ to 2 hours the adhesion is strong enough for the car to be used.

NOTE: A The aid of an assistant is required for this operation.
B Glass lifters should be used for handling the screen.
C Cleanliness is essential.

WINDSCREEN

Removing and refit 76.81.01

Removing
1 Cover the fascia and interior trim to protect them from broken glass.
2 Remove the windscreen wiper arms, see 84.15.02/03.
3 Remove the lower windscreen finisher, see 76.43.41.
4 Remove the 'A' post trim pads—two screws, together with the fascia corner finishers.
5 Pull off the header rail finisher.
6 Push the finisher moulding cover to one side to expose the Solbit.
From both outside and inside, cut or pierce a hole through the existing Solbit and thread one end of the wire through the hole to an assistant inside the car. As each end of the wire is twist on a small piece of wood to act as a handle or form a handle by threading the wire through a small hole drilled in the end of an old screwdriver. By pulling the wire in a saw like motion, cut through the Solbit. Use long steady pulls rather than short quick ones otherwise the wire will overheat and break. Narrow the angle of the cut by keeping the wire ends as close as possible to the glass. Ensure that the wire outside the car is pulled along the moulding rather than the painted body otherwise the latter will be damaged.

With a sharp knife, cut through the old Solbit remaining on the flange and remove it by a combination of cutting and pulling.

Cut away any sharp edges or remaining lumps of old Solbit to ensure an even surface.

Cut away and remove Solbit from the finisher mouldings. Avoid distorting the mouldings during the cleaning operation. It may be necessary to obtain replacements. Remove any dirt or loose material from the flange using a clean lint-free cloth moistened with methylated spirit.

Remove approximately 25 mm (1 in) of the exposed excess Solbit from the surface. This will begin to soften the Solbit after compression.

Apply a thin coat of primer to the remaining Solbit or painted flange using a clean lint-free cloth. Allow to dry for approximately one minute.

Connect two fully charged 12 volt batteries in series (+ to -). NOTE: Alternatively a variable output transformer set to give 11 amps at 24 volts may be used.

Exposure the bared ends of the wire in the Solbit strip whilst in the container pack and connect to the batteries or transformer until the Solbit is just sufficiently tacky to adhere to the flange. This time can vary between 15 and 90 seconds depending on the temperature and age of the Solbit. Disconnect the current.

NOTE: Do not overheat the Solbit as this will make it both difficult to remove from the pack and to handle. Do not press the glass too far into the Solbit at this stage because, if somewhat proud, the depth can be rectified when the chrome finishers are embedded into the Solbit.

Using glass lifters install the windscreen in the aperture resting the bottom edge on the spacers and taking care to position it exactly where previously marked with the masking tape. Avoid fingering the primed areas. Remove approximately 25 mm (1 in) of the exposed excess Solbit from the wire.

Connect the two bared wire ends of the Solbit strip to the 24 volt supply. This will begin to soften the Solbit and after 1 to 2 minutes, press the glass into the Solbit, starting with pressure in the centre of the glass and out to the pillars. Do not press the glass too far into the Solbit at this stage because, if somewhat proud, the depth can be rectified when the chrome finishers are embedded into the Solbit.

continued
21 Inspect the bond line (which should be no less than 7 mm (¼ in) wide) through the glass during early stages of the heating cycle. Potential leak sources can easily be seen and rectified by a little extra pressure in the area while the heat is on or by pressing some of the previously removed excess Solbit into the particular leak source.

22 After 10 minutes position and embed the chrome finishers into the Solbit; very little pressure is required. If at this stage mouldings and windscreen are proud, additional pressure can be applied. Disconnect electrical current after 1½ to 2 hours.

23 Allow the glass to cool down.

24 Test for water leaks.

25 Trim off exposed ends of Solbit and rubber spacers with snips or press out of sight into the rebate.

26 Refit the header rail.

27 Refit the 'A' post trim pads—2 screws, together with the fascia corner finishers.

28 Refit the lower windscreens finisher, see 76.43.41.

29 Refit the windscreens wiper arms, see 84.15.02/03.

HEATED BACKLIGHT

Remove and refit 76.81.11

Removing
1. Break the seal, using a suitably blunt tool.
2. Carefully pull the rear edges of the rear quarter trim pads away from the body to expose the Lucar connectors. Disconnect the two Lucar connectors from the backlight.
3. Push the glass outwards. CAUTION: Take care to avoid scratching the glass, which must be steadied by an assistant.
4. Remove the weatherstrip from the glass.

Refitting
5. Reverse instruction 4 using a new weatherstrip if necessary, and apply Seelastik to the glass channel before fitting.
6. Insert a strong cord into the weatherstrip inner channel, allowing the ends to protrude from the lower edge.
7. Have an assistant position the glass centrally in the aperture, allowing a steady pressure whilst the cord ends are pulled to locate the weatherstrip on the body flange.
8. Seal the outer channel of the weatherstrip to the body using Seelastik.
9. Reconnect the two Lucar connectors and ensure that the rear quarter trim pads are correctly positioned.

SLIDING ROOF

Remove and refit 76.82.01

Removing
1. Prise out the four chrome caps.
2. Remove the four screws, spring washers and plain washers.
3. Open the roof and carefully pull it rearwards on one side at a time until the four slides are disengaged from the runners. Lift off the roof.
4. Remove the five screws securing one of the side runners to the roof. Remove the runner taking care to avoid breaking the spring when disengaging it. Remove the opposite side runner in the same manner.
5. Remove the five screws securing the rear frame to the roof. Remove the frame.
6. Drill out the four rivets on the vertical face of the front frame.
7. Carefully pull the two hinge brackets outwards to disengage them.
8. Drill out the eight rivets on the top face of the frame. Remove the frame.

Refitting
9. Ensure that the headlining is correctly positioned with an overlap of approximately 13 mm (½ in).
10. Apply Kelseal to the forward top face of the roof aperture.
11. Reverse instructions 3 to 8.
12. Close the roof and adjust if necessary to obtain correct tension before fully tightening screws 2.
13. Replace the four chrome caps.
BODY PANELS REPAIR

PREPARATIONS AND TECHNIQUES 77.00.01

Description

A body repair can be effected by many methods dependent upon the extent of the damage. These methods range from straightening procedures to the replacement of individual parts or panel assemblies.

The Repairer will select the best and most economic repair, subject to available equipment and labour, but will ensure, at all times, that safety requirements are observed.

This section is intended to advise skilled body repairers on methods by which a damaged vehicle can be restored to an acceptable structural condition.

To reduce the cost of a repair, certain individual panels are available which may be used either in their entirety or cut at a convenient point to reduce the volume of work involved.

Damage may make it impossible, or unnecessary, to remove some of the mechanical and electrical components before carrying out a body repair; but when components are removed and, subsequently, refitted, refer to the appropriate section for detailed instructions.

Equipment

The equipment shown should be used when carrying out repairs described in this section:

- A Pneumatic saw
- B Hand punching tool (5mm dia.)
- C Drilling machine
- D Grinding machine
- E Spot welding gun
- F Metal Inert Gas welding equipment

Joints

There are four types of joint to be considered when effecting body repairs which are as follows:

(a) butt joints
(b) lap joints
(c) double lap joints
(d) flanged joints

Welds

1. Fusion welds are suitable for butt and lap joints and should also be used for reinforcing corners and notches in flanges. If it is necessary to fusion weld a flange joint ensure that the designed strength of the joint is preserved. A fusion weld along the toe of a flange is not, generally, acceptable unless the flange is cut back.

2. Spot welds (i.e. resistance spot welds unless otherwise stated) are suitable for lap, double lap and flanged joints. This method can be used either in single or double, staggered rows. For single row spot welding, space the spot welds 13 to 25mm apart. In the case of double row spot welding, space the welds 22 to 31mm apart.

External examination gives little indication of the quality of a spot weld. It is therefore necessary to make a test joint using similar material and then split the test pieces apart. If the metal tears or the weld pulls a hole in one piece the joint is satisfactory. Repeat the test each time the electrodes are re-dressed or changed and each time a change of metal gauge is encountered.

3. Plug welds are employed where the area to be welded is only accessible from one side. To make a plug weld, drill a 5 to 8mm hole through the accessible panel and weld the components together through the hole. The components may be clamped together by using drive screws at intervals. After plug welding, the drive screws are removed and the resulting holes plug welded.

Separation of spot welded components

Centre-punch each spot weld. Adjust a spot welder so that it cuts through the thickness of the material to be removed. Holding the cutter square to the material, cut through each spot weld. Always use a pneumatic tool provided with a throttle. If the new joint is made with spot welds, cut the old spot welds from the component which is to be discarded. If the new joint is to be made with plug welds, cut the old spot welds from the component which is to be retained and use the holes for plug welding.
Welding preparation
Remove all traces of sealer from the area of the joint likely to be affected by heat. Clean both sides of the welding areas, to bare metal, on both existing and new panels. Grind existing welds smooth and dress the panels or flanges to ensure that the welding faces fit closely. Mask the welding areas and paint any areas which will be inaccessible after panels are fitted. Remove all masking before welding.

Prior to spot welding apply zinc rich welding primer to both mating surfaces and spot weld while the primer is still moist.

Finishing
Grind all plug welds and butt welds smooth and fill the surface where necessary. Clean the repair for sealing and painting.

Sealing
After fitting panels seal all joints and apply underseal where required.

Legal requirements
'E' Mark Approval Label
This label is attached to the R.H. front suspension turret. If the label is detached or damaged or if the valance is renewed, a new label should be ordered giving the vehicle, chassis, commission, body shell and engine numbers. Attach the new label to the R.H. front suspension turret.

Symbols
The following symbols are used on the illustrations in this section to indicate cutting areas and recommended types of weld.

Cutting Symbols

Weld/Braze Symbols

HORIZONTAL ALIGNMENT CHECK

A preliminary check of the alignment should be carried out by dropping a plumb-bob from the centre of the points A, B, C, D on each side of the vehicle.

Establish a centre line by means of a large pair of compasses at points B and D.

Check measurements against those given in DATA.

Construct diagonals.

Incorrect alignment will be evident by the failure of the diagonals to intersect on the centre line by considerable deviation from the dimensions given.
**VERTICAL ALIGNMENT CHECK**

77.01.02

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**Vertical alignment**

The dimensions given below are for cars in showroom condition, unladen and without fuel. It should be noted that the important point is the relative positions of the vertical datum points to each other and not their actual height from the wheel hub centres.

<table>
<thead>
<tr>
<th>Code</th>
<th>Dimension</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>346 mm (13.62 in)</td>
<td>Anti-roll bar front mounting to suspension pod cap</td>
</tr>
<tr>
<td>B a</td>
<td>33 mm (1.29 in)</td>
<td>Rear suspension arm mounting to radius rod mounting</td>
</tr>
<tr>
<td>b</td>
<td>361 mm (14.20 in)</td>
<td>Anti-roll bar clamp front fixing bolt to lower link</td>
</tr>
<tr>
<td>d</td>
<td>476.5 mm (18.75 in)</td>
<td>Top of front wheel arch to wheel hub centre - Europe - 4 speed gearbox</td>
</tr>
<tr>
<td>e</td>
<td>338 mm (13.3 in)</td>
<td>Top of front wheel arch to wheel hub centre - Europe - Automatic transmission</td>
</tr>
<tr>
<td>f</td>
<td>361 mm (14.20 in)</td>
<td>Top of front wheel arch to wheel hub centre - USA - 4 speed gearbox</td>
</tr>
<tr>
<td>g</td>
<td>95 mm (3.74 in)</td>
<td>Top of front wheel arch to wheel hub centre - USA - 5 speed gearbox</td>
</tr>
<tr>
<td>h</td>
<td>319 mm (12.56 in)</td>
<td>Top of front wheel arch to wheel hub centre - USA - Automatic transmission</td>
</tr>
<tr>
<td>i</td>
<td>348 mm (13.71 in)</td>
<td>Top of front wheel arch to wheel hub centre - USA - air conditioning</td>
</tr>
<tr>
<td>j</td>
<td>356 mm (13.88 in)</td>
<td>Lower link to front suspension pod cap</td>
</tr>
<tr>
<td>k</td>
<td>349 mm (13.75 in)</td>
<td>Front suspension pod cap to datum line</td>
</tr>
<tr>
<td>l</td>
<td>350 mm (13.80 in)</td>
<td>Top of wheel arch to datum line</td>
</tr>
<tr>
<td>m</td>
<td>346 mm (13.63 in)</td>
<td>Rear suspension arm mounting to radius rod mounting</td>
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<tr>
<td>n</td>
<td>348 mm (13.72 in)</td>
<td>Top of rear wheel arch to datum line</td>
</tr>
<tr>
<td>o</td>
<td>343 mm (13.52 in)</td>
<td>Top of rear wheel arch to wheel hub centre - Europe - 4 speed gearbox</td>
</tr>
<tr>
<td>p</td>
<td>345 mm (13.60 in)</td>
<td>Top of rear wheel arch to wheel hub centre - Europe - 5 speed gearbox</td>
</tr>
<tr>
<td>q</td>
<td>346 mm (13.63 in)</td>
<td>Top of rear wheel arch to wheel hub centre - USA - 4 speed gearbox</td>
</tr>
<tr>
<td>r</td>
<td>348 mm (13.72 in)</td>
<td>Top of rear wheel arch to wheel hub centre - USA - 5 speed gearbox</td>
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<tr>
<td>s</td>
<td>343 mm (13.52 in)</td>
<td>Top of rear wheel arch to wheel hub centre - USA - Automatic transmission</td>
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<tr>
<td>t</td>
<td>346 mm (13.63 in)</td>
<td>Datum line</td>
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## Method of Attachment

<table>
<thead>
<tr>
<th></th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18 spot welds</td>
<td>20 plug welds</td>
</tr>
<tr>
<td>2</td>
<td>26 spot welds</td>
<td>(a) Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) Single row spot welds (ARO 100846 or equivalent)</td>
</tr>
<tr>
<td>3</td>
<td>2 spot welds</td>
<td>2 spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>4</td>
<td>14 spot welds</td>
<td>(a) Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) 4 plug welds</td>
</tr>
<tr>
<td>5</td>
<td>20 spot welds</td>
<td>Single row spot welds each side (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>6</td>
<td>20 spot welds</td>
<td>Single row spot welds each side (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>7</td>
<td>22 spot welds</td>
<td>Single row spot welds each side (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>8</td>
<td>4 x 15mm CO₂/MIG welds each side</td>
<td>4 x 15mm MIG welds each side</td>
</tr>
<tr>
<td>9</td>
<td>3 spot welds</td>
<td>3 spot welds (ARO 107477 or equivalent)</td>
</tr>
</tbody>
</table>
Removing
10 Disconnect battery.
11 Remove fuel tank.
12 Remove components as necessary to gain access to the rear luggage compartment.
13 Cut spot welds as described in 1, 2 and 3.
14 Remove spare wheel panel.
15 Cut spot welds as described in 4, 5, 6 and 7.
16 Grind off welds at 8.
17 Remove clip described in 9 from spare wheel panel for re-use.
18 Remove blanking disc, laid in with sealant under anti-drum pad, and retain for further use.

Refitting
19 Prepare all mating surfaces (see 'PREPARATION AND TECHNIQUES').

FRONT PANEL

<table>
<thead>
<tr>
<th>Method of Attachment</th>
<th>Factory Joint</th>
<th>Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 To wings</td>
<td>8 bolts (10mm)</td>
<td>8 bolts (10mm)</td>
</tr>
<tr>
<td>2 To bonnet abutment</td>
<td>16 spot welds</td>
<td>(a) Single row spot welds (ARO 242A or equivalent)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) 6 spot welds (ARO 100483 or equivalent)</td>
</tr>
<tr>
<td>3 Lower attachments</td>
<td>10 spot welds</td>
<td>Single row spot welds (ARO 242A or equivalent)</td>
</tr>
<tr>
<td>4 To panel filler</td>
<td>10 x 15mm CO₂/MIG welds</td>
<td>10 x 15mm MIG welds</td>
</tr>
</tbody>
</table>

77.28.25

880006

BRO007

Refitting
11 Prepare new panel (see 'PREPARATION AND TECHNIQUES').
12 Replace four bolts each side.
13 Place front panel in position and tighten bolts.
14 Replace bonnet tapping plates.
15 Bolt bonnet in position to check alignment.
16 Remove bonnet.
17 Make spot welds in 2a and 3.
18 Spot weld as described in 2b.
19 MIG weld as described in 4.
20 Finish (see 'PREPARATION AND TECHNIQUES') and paint.
21 Refit the components removed in 6 and connect the battery.
Removing
4 Disconnect the battery.
5 Remove components as necessary.
6 Cut the spot welds as described in 1, 2 and 3.

Refitting
7 Prepare new panel (see 'PREPARATION AND TECHNIQUES').
8 Make spot welds in 1, 2 and 3.
9 Finish (see 'PREPARATION AND TECHNIQUES') and paint.
10 Reverse instructions 4 and 5.

Method of Attachment | A Factory Joint | B Service Joint
--- | --- | ---
1 To front wings | 6 spot welds | 6 spot welds (ARO 242A or equivalent)
2 To filler panels | 4 spot welds | 4 spot welds (ARO 242A or equivalent)
3 To centre strut | 4 spot welds | 6 spot welds (ARO 242A or equivalent)
### Method of Attachment

<table>
<thead>
<tr>
<th>Method of Attachment</th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 To front panel</td>
<td>4 bolts (10mm)</td>
<td>4 bolts (10mm)</td>
</tr>
<tr>
<td>2 To 'A' post</td>
<td>3 bolts (10mm)</td>
<td>3 bolts (10mm)</td>
</tr>
<tr>
<td>3 To valance top flange</td>
<td>17 spot welds</td>
<td>(a) Single row spot welds (ARO 103402 or equivalent)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) 4 MIG plug welds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(c) 2 spot welds (ARO 100843 or equivalent)</td>
</tr>
<tr>
<td>4 To sill flange</td>
<td>8 spot welds</td>
<td>Single row spot welds (ARO 105492 or equivalent)</td>
</tr>
<tr>
<td>5 To front panel</td>
<td>2 spot welds</td>
<td>2 spot welds (ARO 105492 or equivalent)</td>
</tr>
<tr>
<td>6 To lower front panel</td>
<td>3 spot welds</td>
<td>3 spot welds (ARO 242A or equivalent)</td>
</tr>
<tr>
<td>7 To wheel arch</td>
<td>24 spot welds</td>
<td>Single row spot welds (ARO 105010 or equivalent)</td>
</tr>
<tr>
<td>8 To valance</td>
<td>4 x 10mm MIG</td>
<td>MIG</td>
</tr>
</tbody>
</table>

---

### Factory Joint
- **4 bolts (10mm)**
- **3 bolts (10mm)**
- **17 spot welds**
- **8 spot welds**
- **2 spot welds**
- **3 spot welds**
- **24 spot welds**
- **4 x 10mm MIG**

### Service Joint
- **4 bolts (10mm)**
- **3 bolts (10mm)**
- **Single row spot welds (ARO 103402 or equivalent)**
- **4 MIG plug welds**
- **2 spot welds (ARO 100843 or equivalent)**
- **Single row spot welds (ARO 105492 or equivalent)**
- **2 spot welds (ARO 105492 or equivalent)**
- **3 spot welds (ARO 242A or equivalent)**
- **Single row spot welds (ARO 105010 or equivalent)**
- **MIG**
Removing
9 Disconnect battery.
10 Remove components as necessary to obtain access to the wing and wing joints.
11 Remove sill trim strip.
12 Remove four bolts to front panel. Access through headlamp aperture.
13 Remove three bolts to 'A' post.
14 Cut wing away as illustrated.
15 Cut the spot welds described in 3, 4, 5, 6 and 7.
16 Remove remnants of wing panel.
17 Cut the weld at 8.

Refitting
18 Slot bolt holes in new front wing to facilitate assembly.
19 Prepare the panels (see 'PREPARATION AND TECHNIQUES').
20 Fit the three bolts and washers to the 'A' post.
21 Fit the new wing, align it with the door and bonnet and clamp in position.
22 Fit re-inforcing strip and bolt wing to front panel.
23 Attach clamps to wheel arch and tack weld in position.
24 Replace bonnet to check alignment of wing.
25 Remove the bonnet.
26 Make the spot welds described in 3, 4, 5, 6 and 7.
27 MIG weld at 8.
28 Finish (see 'PREPARATION AND TECHNIQUES') and paint.
29 Refit sill trim strip.
30 Replace all components removed in 10 and connect the battery.

Method of Attachment

<table>
<thead>
<tr>
<th></th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To front longitudinal - top</td>
<td>4 spot welds</td>
</tr>
<tr>
<td>2</td>
<td>To front longitudinal - bottom</td>
<td>4 spot welds</td>
</tr>
<tr>
<td>3</td>
<td>To front longitudinal - vertical flange</td>
<td>8 spot welds</td>
</tr>
</tbody>
</table>

FRONT CROSS-MEMBER

20 Fit the three bolts and washers to the 'A' post.
21 Fit the new wing, align it with the door and bonnet and clamp in position.
22 Fit re-inforcing strip and bolt wing to front panel.
23 Attach clamps to wheel arch and tack weld in position.
24 Replace bonnet to check alignment of wing.
25 Remove the bonnet.
26 Make the spot welds described in 3, 4, 5, 6 and 7.
27 MIG weld at 8.
28 Finish (see 'PREPARATION AND TECHNIQUES') and paint.
29 Refit sill trim strip.
30 Replace all components removed in 10 and connect the battery.

Refitting
7 Prepare the replacement cross-member (see 'PREPARATION AND TECHNIQUES').
8 Clamp cross-member in position and align.
9 Make the welds described in 1 to 3.
10 Finish and paint (see 'PREPARATION AND TECHNIQUES').
11 Reverse the procedure in 4 and 5.
<table>
<thead>
<tr>
<th>Method of Attachment</th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Upper flange to bulkhead</td>
<td>2 x 15mm CO₂/MIG welds</td>
<td>2 x 15mm MIG welds</td>
</tr>
<tr>
<td>2 To underframe</td>
<td>2 x 15mm CO₂/MIG welds</td>
<td>2 x 15mm MIG welds</td>
</tr>
<tr>
<td>3 Toe-board vertical flange</td>
<td>1 spot weld</td>
<td>1 x 15mm MIG weld</td>
</tr>
<tr>
<td>4 Longitudinal rear end lug</td>
<td>2 spot welds</td>
<td>1 x 25mm MIG weld</td>
</tr>
<tr>
<td>5 Longitudinal rear end flanges</td>
<td>2 x 25mm CO₂/MIG welds</td>
<td>2 x 25mm MIG welds</td>
</tr>
<tr>
<td>6 Longitudinal inboard flange at rear</td>
<td>1 x 35mm CO₂/MIG weld</td>
<td>1 x 35mm MIG weld</td>
</tr>
<tr>
<td>7 Gearbox reinforcement plate</td>
<td>6 x 10mm CO₂/MIG welds</td>
<td>6 x 10mm MIG welds</td>
</tr>
<tr>
<td>8 Longitudinal rear end to toe-board and floor</td>
<td>36 spot welds</td>
<td>40 plug welds</td>
</tr>
<tr>
<td>9 Anchor bracket attachment to longitudinal</td>
<td>6 x 20mm CO₂/MIG welds</td>
<td>6 x 20mm MIG welds</td>
</tr>
</tbody>
</table>

Removing
10 Disconnect the battery.
11 Remove components as necessary to gain access to the longitudinal and its joints.

12. Grind off welds described in 1, 2, 5 and 6.
13. Grind away weld at 7 and retain gearbox reinforcing plate for refitting.
15 Grind off welds at 9 and retain anchor bracket for refitting.

**Refitting**

16 Prepare the replacement front longitudinal (see "PREPARATION AND TECHNIQUES").
17 Weld anchor bracket in position on bench as described in 9.
18 Position longitudinal on jig and clamp in position.
19 Tack plug through floor panel to hold alignment.
20 MIG plug through floor panel and toe-board as described in 8.
21 Position gearbox reinforcing plate and MIG weld as described in 7.
22 Make the MIG welds described in 1, 2, 3, 4, 5 and 6.
23 Finish (see "PREPARATION AND TECHNIQUES") and paint.
24 Reverse instructions 10 and 11.

**FRONT LONGITUDINAL CLOSING PANEL** 77.31.57

### Removing
5 Disconnect the battery.
6 Remove components as necessary to gain access.
7 Cut spot welds described in 1, 2 and 3.
8 Grind off welds described in 4.

### Refitting
9 Prepare the replacement panel (see "PREPARATION AND TECHNIQUES") and all mating surfaces.
10 Clamp closing panel in position and align.
11 Make the spot welds described in 1, 2 and 3.
12 Make MIG welds as described in 4.
13 Finish (see "PREPARATION AND TECHNIQUES") and paint.
14 Reverse the procedure in 5 and 6.

<table>
<thead>
<tr>
<th>Method of Attachment</th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 To headlamp closing panel</td>
<td>6 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>2 To front longitudinal — top flange</td>
<td>8 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>3 To front longitudinal — bottom flange</td>
<td>8 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>4 To front longitudinal — vertical flange</td>
<td>3 x 10mm CO2/MIG welds</td>
<td>3 x 10mm MIG welds</td>
</tr>
</tbody>
</table>
Removing
6 Disconnect the battery.
7 Remove components as necessary to gain access.
8 Cut spot welds as described in 1, 2, 3, 4 and 5.

Refitting
9 Prepare the replacement panel (see 'PREPARATION AND TECHNIQUES').
10 Clamp the new outer wheel arch in position and tack weld.
11 Make spot welds described in 1, 2, 3, 4 and 5.
12 Finish (see 'PREPARATION AND TECHNIQUES') and paint.
13 Reverse instructions 6 and 7.

FENDER VALANCE R.H.

<table>
<thead>
<tr>
<th>Method of Attachment</th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 To fender valance – front</td>
<td>11 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>2 To fender valance – top</td>
<td>16 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>3 To fender valance – rear</td>
<td>6 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>4 To sill</td>
<td>8 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>5 Inner flange to fender valance</td>
<td>12 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method of Attachment</th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 To 'A' post</td>
<td>7 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>2 To front longitudinal – top flange</td>
<td>15 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>3 To bulkhead</td>
<td>14 spot welds</td>
<td>Single row spot welds (ARO 100486 or equivalent)</td>
</tr>
<tr>
<td>4 To front longitudinal – lower flange</td>
<td>20 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>5 To bonnet retention bracket</td>
<td>5 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
</tbody>
</table>
### Method of Attachment

<table>
<thead>
<tr>
<th></th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Filler panel to top flange of longitudinal welds</td>
<td>3 x 20mm CO₂/MIG welds</td>
<td>3 x 20mm MIG welds</td>
</tr>
<tr>
<td>7 To 'A' post</td>
<td>1 x 25mm CO₂/MIG weld</td>
<td>1 x 25mm MIG weld</td>
</tr>
<tr>
<td>8 To bulkhead</td>
<td></td>
<td>4 x 15mm MIG weld</td>
</tr>
</tbody>
</table>

### Removing

9 Disconnect the battery.
10 Remove components as necessary to gain access to the fender valance.
11 Cut spot welds as described in 1, 2, 3, 4 and 5.
12 Grind away welds at 6 and 7.

### Refitting

13 Prepare mating surfaces (see 'PREPARATION AND TECHNIQUES').
14 Clamp panel in position.
15 Make spot welds described in 1, 2, 3, 4 and 5.
16 MIG weld at 6, 7 and 8.
17 Finish (see 'PREPARATION AND TECHNIQUES') and paint.
18 Reverse instructions 9 and 10.
<table>
<thead>
<tr>
<th>Method of Attachment</th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 To bonnet retention bracket</td>
<td>5 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>2 Longitudinal front section - vertical face</td>
<td>17 spot welds</td>
<td>17 MIG plug welds</td>
</tr>
<tr>
<td>3 Longitudinal front section - bottom face</td>
<td>10 spot welds</td>
<td>10 MIG plug welds</td>
</tr>
<tr>
<td>4 To sill outer</td>
<td>8 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>5 Inner flange to fender valance</td>
<td>12 spot welds</td>
<td>(a) 5 spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>6 Fender valance to bulkhead</td>
<td>10 spot welds</td>
<td>(b) 4 MIG plug welds</td>
</tr>
<tr>
<td>7 To longitudinal</td>
<td>4 spot welds</td>
<td>Single row spot welds (ARO 100486 or equivalent)</td>
</tr>
<tr>
<td>8 To longitudinal top flange</td>
<td></td>
<td>(a) Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>9 To longitudinal lower flange</td>
<td></td>
<td>(b) 11 MIG plug welds</td>
</tr>
<tr>
<td>10 Fender valance to ‘A’ post</td>
<td></td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>11 Outer wheel arch rear flange</td>
<td></td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
</tbody>
</table>
Removing
21 Disconnect battery.
22 Remove components as necessary to gain access to the panel and its joints.
23 Cut spot welds as described in 1 to 7.
24 Cut through longitudinal and fender valance as shown.
25 Cut through support bracket below battery tray.
26 Cut through forward battery tray strut.
27 Grind off welds on top flange of battery tray.
28 Withdraw fender valance and front section of longitudinal.
29 Remove remnants of panel and forward section of longitudinal.
30 Grind off lower portion of battery tray support bracket.
31 Grind off upper portion of battery tray support bracket and MIG weld to lower portion to incorporate in service repair.
32 Grind off front battery tray support in attachment angle for re-use.
33 Prepare all mating surfaces (see "PREPARATION AND TECHNIQUES").
34 Offer up front section of longitudinal, place on front jig point and clamp in position.
35 Mark position of anchorage bracket and weld in position on bench.
36 Reposition front section of longitudinal, align front cross-member and clamp in position.
37 Spot weld front cross-member to longitudinal.
38 Plug weld front section of longitudinal to rear section as described in 2 and 3.
39 Offer up fender valance assembly and support in jig at turret.
40 Clamp fender valance in position and make spot welds described in 1, 6, 7, 8, 9 and 10.
41 Offer up outer wheel arch and clamp in position.
42 Spot weld as described in 11, 12, 13, 4 and 5a.
43 MIG plug as described in 5b.
44 MIG weld at 14 and 15.
45 Offer up battery tray rear support and spot weld in position as described in 16.
46 MIG weld as described in 17 and 18.
47 Spot weld at 19.
48 MIG weld as described in 20.
49 Finish (see "PREPARATION AND TECHNIQUES") and paint.
50 Reverse instructions 21 and 22.

HEADLAMP CLOSING PANEL

<table>
<thead>
<tr>
<th>Method of Attachment</th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 To front longitudinal closing panel</td>
<td>6 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>2 To fender valance closing plate</td>
<td>4 spot welds</td>
<td>4 spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>3 To fender valance</td>
<td>5 spot welds</td>
<td>5 spot welds (ARO 264A or equivalent)</td>
</tr>
</tbody>
</table>
Removing
4 Disconnect battery.
5 Remove components as necessary to gain access.
6 Cut spot welds described in 1, 2 and 3.

Refitting
7 Prepare the replacement panel, (see 'PREPARATION AND TECHNIQUES').
8 Clamp closing plate in position and align.
9 Make the spot welds described in 1, 2 and 3.
10 Finish (see 'PREPARATION AND TECHNIQUES') and paint.
11 Reverse the procedure in 4 and 5.

<table>
<thead>
<tr>
<th>Method of Attachment</th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Tonneau side panel to</td>
<td>3 bolts (10mm)</td>
<td>3 bolts (10mm)</td>
</tr>
<tr>
<td>closing panel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Tonneau side panel to</td>
<td>12 spot welds</td>
<td>Single row spot welds (ARO 264A or equivalent)</td>
</tr>
<tr>
<td>'B' post</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Tonneau side panel to</td>
<td>16 spot welds</td>
<td>Single row spot welds (ARO 105010 or equivalent)</td>
</tr>
<tr>
<td>wheel arch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Tonneau side panel to</td>
<td>5 spot welds</td>
<td></td>
</tr>
<tr>
<td>rear upper panel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Tonneau side panel to</td>
<td>6 spot welds</td>
<td>4 MIG plug welds</td>
</tr>
<tr>
<td>sill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Tonneau side panel to</td>
<td>4 spot welds</td>
<td>4 MIG plug welds</td>
</tr>
<tr>
<td>'B' post closing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Tonneau side panel to</td>
<td>10 spot welds</td>
<td>10 MIG plug welds</td>
</tr>
<tr>
<td>rear quarter panel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Rear deck to tonneau</td>
<td>1 Pop rivet</td>
<td></td>
</tr>
<tr>
<td>side panel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Tonneau side panel to</td>
<td>MIG</td>
<td>MIG</td>
</tr>
<tr>
<td>'B' post closing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10a Rear deck to tonneau</td>
<td>MIG</td>
<td>2 x 15mm MIG welds</td>
</tr>
<tr>
<td>side panel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>gutter to rear deck</td>
<td>6 spot welds</td>
<td>4 MIG plug welds</td>
</tr>
<tr>
<td>10b Tonneau side panel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>rear quarter panel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Method of Attachment

<table>
<thead>
<tr>
<th>Method of Attachment</th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>11a Tonneau lower panel rear flange</td>
<td>6 spot welds</td>
<td>Single row spot welds (ARO 105010 or equivalent)</td>
</tr>
<tr>
<td>11b Tonneau lower panel front flange</td>
<td>7 spot welds</td>
<td>Single row spot welds (ARO 105010 or equivalent)</td>
</tr>
<tr>
<td>11c Tonneau lower panel bottom flange</td>
<td>5 spot welds</td>
<td>Single row spot welds (ARO 105010 or equivalent)</td>
</tr>
<tr>
<td>12 Tonneau side panel to luggage compartment floor</td>
<td>4 spot welds</td>
<td>4 MIG plug welds</td>
</tr>
<tr>
<td>13 Tonneau side panel to floor</td>
<td>–</td>
<td>MIG</td>
</tr>
<tr>
<td>14 Tonneau side panel to tonneau lower panel</td>
<td>6 spot welds</td>
<td>Single row spot welds (ARO 102653 or equivalent)</td>
</tr>
<tr>
<td>15 Tonneau side panel gutter to rear upper panel gusset</td>
<td>5 spot welds</td>
<td>Single row spot welds (ARO 103402 or equivalent)</td>
</tr>
<tr>
<td>16 Boot lid stay bracket (L.H. side only)</td>
<td>2 spot welds</td>
<td>4 spot welds (ARO 102653 or equivalent)</td>
</tr>
</tbody>
</table>

### Removing

17 Disconnect the battery.
18 Remove components as necessary to obtain access to the tonneau side panel and its joints.
19 Remove boot lid.
20 Remove three bolts securing tonneau side panel to valance.
21 Cut spot welds described in 2, 3, 4, 5, 6 and 7.
22 Cut tonneau side panel as shown.
23 Cut spot welds at 10b, 12 and 15.
24 Cut welds at 9, 10a and 13.
25 Remove remnants of tonneau side panel.
26 Cut spot welds described in 11a, 11b, 11c and 14.
27 Remove tonneau lower panel.
28 Prepare tonneau side panel and tonneau lower panel (see 'PREPARATION AND TECHNIQUES').
29 Offer up the tonneau lower panel and clamp in position.
30 Make spot welds described in 11a, 11b and 11c.
31 Clamp tonneau side panel in position.
32 Locate tonneau side panel on bolts. To facilitate this, slot holes in panel.
33 Check door and boot lid alignment.

### Refitting

28 Prepare tonneau side panel and tonneau lower panel (see 'PREPARATION AND TECHNIQUES').
29 Offer up the tonneau lower panel and clamp in position.
34 Make spot welds described in 2, 3, 4 and 14.
35 MIG plug weld at 5, 6, 7, 10b and 12.
36 MIG plug weld holes at 13.
37 Make spot welds at 15.
38 Spot weld bonnet lid stay bracket in position (L.H. side only).
39 Finish (see ‘PREPARATION AND TECHNIQUES’) and paint.
40 Refit components removed in 18 and connect battery.

**TONNEAU SIDE PANEL — L.H.**

<table>
<thead>
<tr>
<th>Method of Attachment</th>
<th>A</th>
<th>Factory Joint</th>
<th>B</th>
<th>Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Support stay bracket (L.H. side only)</td>
<td>2 spot welds</td>
<td>4 spot welds (ARO 102653 or equivalent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Tonneau side panel to gutter</td>
<td>10 spot welds</td>
<td>Single row spot welds (ARO 103402 or equivalent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Tonneau side panel to rear upper panel</td>
<td>5 spot welds</td>
<td>Single row spot welds (ARO 103402 or equivalent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Tonneau side panel to wheel arch</td>
<td>5 spot welds</td>
<td>Single row spot welds (ARO 105010 or equivalent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Tonneau side panel to lower panel</td>
<td>9 spot welds</td>
<td>(a) 5 spot welds (ARO 102653 or equivalent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 New part panel to existing panel</td>
<td>-</td>
<td>(b) 4 MIG plug welds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Fill in holes in boot floor</td>
<td>-</td>
<td>Continuous MIG</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Removing**
8 Disconnect the battery.
9 Remove the fuel tank.
10 Remove components as necessary to obtain access to the tonneau side panel and its joints.
11 Cut spot welds as described in 1, 2, 3 and 4.
12 Cut through tonneau side panel as shown.
13 Cut through welds at 5 and 7.
14 Remove remnants of panel.
Refitting

15 Cut new panel to approximately the shape required.
16 Prepare all surfaces (see 'PREPARATION AND TECHNIQUES').
17 Clamp new panel section in position and check alignment.
18 Cut panels to butt.
19 Prepare panel mating surfaces (see 'PREPARATION AND TECHNIQUES').
20 MIG tack weld part panel in position.
21 Continuous MIG weld as described in 6.
22 Align boot lid, rear upper panel and tonneau side panel.
23 Make spot welds in 1, 2, 3, 4 and 5a.
24 Make MIG plug welds in 5b.
25 Finish (see 'PREPARATION AND TECHNIQUES') and paint.
26 Refit components and connect battery.
REAR UPPER PANEL

Method of Attachment

<table>
<thead>
<tr>
<th>Method of Attachment</th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Rear upper panel to side panels and rear luggage compartment floor</td>
<td>27 spot welds</td>
<td>Single row spot welds (ARO 103402 or equivalent)</td>
</tr>
<tr>
<td>2 Rear upper panel to tonneau side panels</td>
<td>10 spot welds</td>
<td>Single row spot welds (ARO 103402 or equivalent)</td>
</tr>
<tr>
<td>3 Rear upper panel gusset to gutter</td>
<td>10 spot welds</td>
<td>Single row spot welds (ARO 103402 or equivalent)</td>
</tr>
<tr>
<td>4 Fill holes in luggage compartment floor</td>
<td>CO₂/MIG</td>
<td>MIG</td>
</tr>
</tbody>
</table>

Removing

5 Disconnect the battery.
6 Remove any components which prevent access to the rear upper panel and its joints.
7 Remove all flammable material from the vicinity of the rear upper panel.
8 Cut the spot welds described in 1.
9 Cut the rear upper panel either side as shown and remove having cut welds at 4.
10 Cut spot welds described in 2 and 3.

Refitting

11 Prepare the panel and all mating joints (see 'PREPARATION AND TECHNIQUES').
12 Fit the rear upper panel and align with drain channels and tonneau side panels.
13 Make spot welds described in 1.
14 Fit boot lid and check alignment.
15 Remove boot lid and make spot welds described in 2 and 3.
16 MIG weld fill holes at intersection of rear upper panel, tonneau side panels and side panels of luggage compartment.
17 Finish (see 'PREPARATION AND TECHNIQUES') and paint.
18 Reverse the procedure in 5 and 7.
## Method of Attachment

<table>
<thead>
<tr>
<th></th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To spring turret</td>
<td>3 spot welds</td>
</tr>
<tr>
<td>2</td>
<td>To petrol filler duct</td>
<td>3 spot welds</td>
</tr>
<tr>
<td>3</td>
<td>To side-member flanges</td>
<td>2 spot welds</td>
</tr>
<tr>
<td>4</td>
<td>To heelboard</td>
<td>25 spot welds</td>
</tr>
<tr>
<td>5</td>
<td>Side-member forward flange – outboard</td>
<td>2 spot welds</td>
</tr>
<tr>
<td>6</td>
<td>Side-member forward flange – inboard</td>
<td>3 spot welds</td>
</tr>
<tr>
<td>7</td>
<td>To edge of side-member flange – outboard</td>
<td>–</td>
</tr>
<tr>
<td>8</td>
<td>Skid bracket attachment to underframe</td>
<td>4 spot welds</td>
</tr>
</tbody>
</table>

### Removing

8 Disconnect battery.
9 Remove fuel tank.
10 Remove components as required to gain access to the side-member.
11 Cut spot welds as described in 1, 2, 3 and 4.
12 Cut through rear side-member at front flanges and remove side-member.
13 Cut spot welds at 5 and 6.
14 Grind off flanges at 7 and remove remnants of panel.
15 Cut spot welds at 8.
Refitting
16 Prepare all mating flanges (see ‘PREPARATION AND TECHNIQUES’).
17 Offer up replacement side-member, clamp in position and support in jig.
18 Plug weld as described in 1, 2, 3, 4, 5 and 6.
19 MIG weld at 7.
20 Spot weld as described in 8.
21 Finish (see ‘PREPARATION AND TECHNIQUES’) and paint.
22 Reverse instructions 8, 9 and 10.

‘A’ POST

Method of Attachment

<table>
<thead>
<tr>
<th></th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20 spot welds</td>
<td>(a) Single row spot welds (ARO 100486 or equivalent)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) 5 MIG plug welds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(c) 4 MIG plug welds</td>
</tr>
<tr>
<td>2</td>
<td>6 spot welds</td>
<td>Single row spot welds (ARO 100486 or equivalent)</td>
</tr>
<tr>
<td>3</td>
<td>14 spot welds</td>
<td>14 MIG plug welds</td>
</tr>
<tr>
<td>4</td>
<td>6 spot welds</td>
<td>(a) 4 spot welds (ARO 242A or equivalent)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) 2 MIG plug welds</td>
</tr>
<tr>
<td>5</td>
<td>6 spot welds</td>
<td>6 MIG plug welds</td>
</tr>
<tr>
<td>6</td>
<td>CO₂/MIG weld</td>
<td>(a) 4 spot welds (ARO 100486 or equivalent)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) 3 x 15mm MIG welds</td>
</tr>
<tr>
<td>7</td>
<td>CO₂/MIG weld</td>
<td>Continuous MIG weld</td>
</tr>
<tr>
<td>8</td>
<td>CO₂/MIG weld</td>
<td>Continuous MIG weld</td>
</tr>
</tbody>
</table>

Removing
9 Disconnect the battery.
10 Remove components as necessary to gain access.
11 Cut spot welds as described in 1, 2, 3, 4 and 5.
12 Grind off the welds described in 6, 7 and 8.

Refitting
13 Prepare the replacement panel (see ‘PREPARATION AND TECHNIQUES’).
14 Clamp the new ‘A’ post in position.
15 Fit the wing to check alignment.
16 Fit door to check alignment.
17 Remove door and front wing.
18 Tack weld ‘A’ post in position.
19 Make spot welds described in 1a, 2, 4a and 5a.
20 Make the plug welds described in 1b, 4b, 5b and 5c.
21 Make the MIG welds described in 1a, 2a, 4a and 5a.
22 Finish (see ‘PREPARATION AND TECHNIQUES’) and paint.
23 Refit the components described in 10 and connect the battery.
DOOR PANEL

Method of Attachment | A Factory Joint | B Service Joint
---|---|---
1 | To door frame | 1 x 15mm CO₂/MIG 1 x 35mm CO₂/MIG 2 spot welds | 1 x 15mm MIG 1 x 35mm MIG 2 spot welds (ARO 100737 or equivalent) 9 tack welds (ARO 242A with electrode 5632) Metal-to-metal adhesive

Removing
2 Remove the door glass and inner components.
3 Remove the door frame.
4 Grind off the edges of the door panel.
5 Cut the spot welds and separate.
6 Cut around the arc welds, break the adhesive joint and remove the panel.
7 Remove remnants of door panel.

Refitting
8 Prepare the panel (see 'PREPARATION AND TECHNIQUES').
9 Apply metal-to-metal adhesive to door flange.
10 Place panel in position on door frame and clamp in position.
11 Tack spot weld around flange of door frame.
12 Dress face welds and paint with zinc based primer around flange.
13 Bend flanges on door panel over edges of door frame.
14 Make spot welds as above.
15 MIG weld around door frame.
16 Finish (see 'PREPARATION AND TECHNIQUES') and paint.
17 Reverse the procedure in 2 and 3.
### Method of Attachment

<table>
<thead>
<tr>
<th>Method of Attachment</th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Rear flange of rear quarter panel</td>
<td>4 spot welds</td>
<td>4 plug welds</td>
</tr>
<tr>
<td>2 Forward flange of rear quarter panel</td>
<td>2 spot welds</td>
<td>4 spot welds</td>
</tr>
<tr>
<td></td>
<td>(ARO 242A or equivalent)</td>
<td>(ARO 264A or equivalent)</td>
</tr>
<tr>
<td>3 Rear quarter panel to 'B' post closing panel</td>
<td>5 spot welds</td>
<td>2 x single row spot welds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ARO 242A or equivalent)</td>
</tr>
<tr>
<td>4 'B' post closing panel to inner sill</td>
<td>6 spot welds</td>
<td>Single row spot welds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ARO 264A or equivalent)</td>
</tr>
<tr>
<td>5 'B' post closing panel to wheel arch angle</td>
<td>8 spot welds</td>
<td>Single row spot welds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ARO 264A or equivalent)</td>
</tr>
<tr>
<td>6 Wheel arch angle to closing panel</td>
<td>9 spot welds</td>
<td>Single row spot welds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ARO 264A or equivalent)</td>
</tr>
<tr>
<td>7 Closing panel to rear deck</td>
<td>3 bolts (10mm)</td>
<td>3 bolts (10mm)</td>
</tr>
<tr>
<td>8 Closing panel to 'B' post closing panel</td>
<td>4 spot welds</td>
<td>4 MIG plug welds</td>
</tr>
<tr>
<td>9 Seat belt bracket to 'B' post closing panel</td>
<td>6 spot welds</td>
<td>6 spot welds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ARO 100486 or equivalent)</td>
</tr>
</tbody>
</table>

### Method of Attachment

<table>
<thead>
<tr>
<th>Method of Attachment</th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Rear deck to closing panel</td>
<td>1 x 25mm CO2/MIG weld</td>
<td>1 x 25mm MIG weld</td>
</tr>
<tr>
<td>11 'B' post closing panel to rear quarter panel</td>
<td>2 spot welds</td>
<td>(a) 1 plug weld</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) 1 x 25mm MIG weld</td>
</tr>
<tr>
<td>12 'B' post closing panel to header rail</td>
<td>5 spot welds</td>
<td>5 plug welds</td>
</tr>
<tr>
<td>13 'B' post to 'B' post closing panel</td>
<td>24 spot welds</td>
<td>Single row spot welds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ARO 242A or equivalent)</td>
</tr>
<tr>
<td>14 'B' post closing to front luggage compartment</td>
<td>--</td>
<td>2 MIG plug welds</td>
</tr>
<tr>
<td>15 Top of 'B' post to door aperture</td>
<td>--</td>
<td>Braze</td>
</tr>
<tr>
<td>16 Seat belt anchorage in wheel arch outer</td>
<td>4 spot welds</td>
<td>4 spot welds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ARO 264A or equivalent)</td>
</tr>
<tr>
<td>17 Outer wheel arch to inner wheel arch</td>
<td>19 spot welds</td>
<td>Single row spot welds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ARO 264A or equivalent)</td>
</tr>
<tr>
<td>18 Outer wheel arch to inner wheel arch and</td>
<td>8 spot welds</td>
<td>Double row spot welds</td>
</tr>
<tr>
<td>tonneau lower filler panel</td>
<td></td>
<td>(ARO 264A or equivalent)</td>
</tr>
<tr>
<td>19 Outer wheel arch flange to inner wheel arch flange</td>
<td>Roller weld</td>
<td>4 x 25mm MIG welds</td>
</tr>
<tr>
<td></td>
<td>(continuous seam weld 1320mm)</td>
<td></td>
</tr>
<tr>
<td>20 Wheel arch angle to outer wheel arch</td>
<td>--</td>
<td>Single row spot welds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ARO 264A or equivalent)</td>
</tr>
<tr>
<td>21 Seat belt bracket to wheel arch</td>
<td>--</td>
<td>7 MIG plug welds</td>
</tr>
<tr>
<td>22 Inner wheel arch to heelboard</td>
<td>17 spot welds</td>
<td>(a) Single row spot welds (ARO 242A or equivalent)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) 3 MIG plug welds</td>
</tr>
<tr>
<td>23 Inner wheel arch to underframe</td>
<td>8 spot welds</td>
<td>Single row spot welds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ARO 242A or equivalent)</td>
</tr>
<tr>
<td>24 Inner wheel arch vertical webs</td>
<td>14 spot welds</td>
<td>12 MIG plug welds</td>
</tr>
</tbody>
</table>
### Method of Attachment

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
<th>Factory Joint</th>
<th>A Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>Inner wheel arch lower flange rear</td>
<td>5 spot welds</td>
<td>(a) 3 spot welds (ARO 242A or equivalent)</td>
</tr>
<tr>
<td>26</td>
<td>Inner wheel arch to side panel</td>
<td>2 spot welds</td>
<td>(b) 1 MIG plug weld</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 spot welds (ARO 264A or equivalent)</td>
</tr>
</tbody>
</table>

### Removing

- Disconnect the battery.
- Remove the fuel tank.
- Remove components as necessary to gain access to the wheel arch and associated panels.
- Remove all flammable material from the vicinity of the wheel arch.

- Cut through the rear quarter panel and 'B' post where shown.
- Cut the spot welds at 1, 2 and 3.
- Remove the lower portion of rear quarter panel.
- Cut spot welds at 4, 5, 6 and 8.
- Grind off weld at 10.
- Unbolt at 7 and remove filler panel.

- Cut spot welds at 9.
- Cut spot welds at 11, 12 and 13 and remove 'B' post closing panel.
- Cut through the outer wheel arch as shown.
- Cut spot welds at 16 and salvage seat belt anchorage plate to use in repair.
- Cut spot welds at 17 and 18.
- Grind away seam weld at 19.
- Remove flange by grinding.

### Refitting

- Prepare the replacement panels (see 'PREPARATION AND TECHNIQUES').
- Offer up inner wheel arch and clamp in position.
- Make the spot welds as described in 22a, 23 and 25a.
- Plug weld as described in 22b, 24 and 25b.
- Fit the wheel arch angle, described in 20, to the outer wheel arch on the bench.

- Bench fit the seat belt anchorage plate to the outer wheel arch.
- Offer up the outer wheel arch and clamp in position.
- Offer up tonneau side panel to check alignment.

---

continued
53 Make spot welds as described in 17 and 18.
54 MIG weld as described in 19.
55 Offer up the 'B' post filler panel and clamp in position.
56 Spot weld as described in 4 and 5.
57 Plug weld as described in 11a, 12 and 14.
58 Position seat belt bracket on outer wheel arch and spot weld as described in 9.
59 Plug weld foot of seat bracket to outer wheel arch as described in 21.
60 Cut replacement 'B' post to butt and spot weld as described in 13.
61 Cut replacement rear quarter panel to butt and MIG weld joint together with 'B' post.
62 Braze top of 'B' post to door aperture.
63 Locate filler panel on bolts at 7.
64 Spot weld as described in 6.
65 Plug weld as described in 6.
66 MIG weld rear deck to filler panel as described in 10.
67 Finish (see 'PREPARATION AND TECHNIQUES') and paint.
68 Refit the components described in 28 and 29.
69 Reconnect the battery.
### OUTER SILL COMPLETE

#### 77.70.70

**Method of Attachment**

<table>
<thead>
<tr>
<th></th>
<th><strong>Factory Joint</strong></th>
<th><strong>Service Joint</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sill top flange</td>
<td>Single row spot welds (ARO 107477 or equivalent)</td>
</tr>
<tr>
<td>2</td>
<td>'B' post to sill</td>
<td>10 MIG plug welds</td>
</tr>
<tr>
<td>3</td>
<td>'A' post to sill</td>
<td>14 MIG plug welds</td>
</tr>
<tr>
<td>4</td>
<td>Sill to 'A' post</td>
<td>4 MIG plug welds</td>
</tr>
<tr>
<td>5</td>
<td>Sill to wheel arch rear</td>
<td>Single row spot welds (ARO 105010 or equivalent)</td>
</tr>
<tr>
<td>6</td>
<td>Sill bottom flange</td>
<td>Single row spot welds (ARO 107477 or equivalent)</td>
</tr>
<tr>
<td>7</td>
<td>Sill to wheel arch front</td>
<td>4 MIG plug welds</td>
</tr>
<tr>
<td>8</td>
<td>Sill inner flange to tonneau side panel</td>
<td>4 MIG plug welds</td>
</tr>
<tr>
<td>9</td>
<td>Tonneau side panel to sill</td>
<td>4 MIG plug welds</td>
</tr>
<tr>
<td>10</td>
<td>Sill to wheel arch abutment</td>
<td>CO₂/MIG weld</td>
</tr>
<tr>
<td>11</td>
<td>Tonneau side panel abutment to sill</td>
<td>MIG weld</td>
</tr>
<tr>
<td>12</td>
<td>'A' post to inner sill</td>
<td>Braze</td>
</tr>
</tbody>
</table>

**Notes:**

- Single row spot welds
- 3 x 15mm MIG welds
- MIG weld
- CO₂/MIG weld
- Braze
- ARO 107477 or equivalent
- ARO 105010 or equivalent
- ARO 242A or equivalent
Removing
13 Remove front wing as described in 77.28.29.
14 Remove door and all flammable material from area of sill.
15 Cut spot welds as described in 1, 2, 3, 4 and 5.
16 Cut sill as shown.
17 Cut spot welds in 6.
18 Cut sill reinforcing member.
19 Remove remnants of lower flange.
20 Cut spot welds at 7.
21 Cut sill flange at rear of ‘A’ post.
22 Cut spot welds described in 8 and 9.
23 Remove remnants of panel.
24 Cut and separate top portion of sill reinforcement.
25 Cut the weld described in 10.

Refitting
26 Prepare the panel and mating surfaces (see ‘PREPARATION AND TECHNIQUES’).
27 Clamp the replacement outer sill in position.
28 Plug tack outer sill with door in position to check alignment.
29 Make spot welds described in 1, 5, 6 and 7.
30 Make MIG plug welds described in 2, 3, 4, 8 and 9.
31 MIG weld at 10 and 12.
32 Braze at 11.
33 Finish (see ‘PREPARATION AND TECHNIQUES’) and paint.

Method of Attachment

<table>
<thead>
<tr>
<th>Method of Attachment</th>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Sill top flange</td>
<td>13 spot welds</td>
<td>Single row spot welds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ARO 107477 or equivalent)</td>
</tr>
<tr>
<td>2 Sill to ‘B’ post</td>
<td>10 spot welds</td>
<td>10 MIG plug welds</td>
</tr>
<tr>
<td>3 Sill bottom flange</td>
<td>17 spot welds</td>
<td>Single row spot welds (ARO 107477 or equivalent)</td>
</tr>
<tr>
<td>4 Sill to tonneau side panel</td>
<td>Braze</td>
<td>Braze</td>
</tr>
<tr>
<td>5 Sill to wheel arch</td>
<td>4 spot welds</td>
<td>4 spot welds (ARO 105010 or equivalent)</td>
</tr>
<tr>
<td>6 Sill top flange to valance</td>
<td>6 spot welds</td>
<td>4 MIG plug welds</td>
</tr>
<tr>
<td>7 Sill to wheel arch rear</td>
<td>MIG</td>
<td>MIG</td>
</tr>
<tr>
<td>8 Tonneau side panel to sill</td>
<td>6 spot welds</td>
<td>4 MIG plugs</td>
</tr>
<tr>
<td>9 New sill to existing sill</td>
<td>–</td>
<td>MIG weld butt joint</td>
</tr>
</tbody>
</table>

OUTER SILL
(Cut rear of ‘A’ post)
Removing
10 Disconnect the battery.
11 Disconnect petrol pipe (R.H. side only).
12 Cut through outer sill panel:
   a along the rear edge of the 'A' post to the bottom flange,
   b around the front, outer and rear of the tonneau side panel and 'B' post.
13 Cut the spot welds described in 1 and 6.
14 Cut weld described in 7.
15 Cut the spot welds described in 8 and remove remnants of sill.

Refitting
16 Cut the new outer sill to make butt joints described in 9.

INNER SILL

Method of Attachment

<table>
<thead>
<tr>
<th>A Factory Joint</th>
<th>B Service Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 To 'B' post closing panel</td>
<td>6 spot welds</td>
</tr>
<tr>
<td>2 Lower flange</td>
<td>24 spot welds</td>
</tr>
<tr>
<td>3 Forward flange</td>
<td>5 spot welds</td>
</tr>
<tr>
<td>4 Sill to front floor stiffener</td>
<td>3 spot welds</td>
</tr>
<tr>
<td>5 Sill to central floor stiffener</td>
<td>4 spot welds</td>
</tr>
<tr>
<td>6 Sill to intermediate floor stiffener</td>
<td>4 spot welds</td>
</tr>
<tr>
<td>7 Sill to rear floor stiffener</td>
<td>5 spot welds</td>
</tr>
<tr>
<td>8 Rear flange to heel-board</td>
<td>7 spot welds</td>
</tr>
<tr>
<td>9 Wheel arch to lower panel</td>
<td>5 spot welds (ARO 264A or equivalent)</td>
</tr>
</tbody>
</table>
16 Remove remnants of panel.
17 Cut spot welds in wheel arch lower panel at 9.

Refitting
18 Prepare the replacement panel (see 'PREPARATION AND TECHNIQUES').
19 Clamp panel in position and align.
20 Spot weld at 2 and 3.
21 Complete the welds at 1, 4, 5, 6, 7 and 9.
22 MIG weld at 8.
23 Finish (see 'PREPARATION AND TECHNIQUES') and paint.
24 Reverse the procedure in 10 and 11.
DEMISTER DUCTS
Remove and refit — L.H. 80.15.03
— R.H. 80.15.08

Removing
1 Remove the fascia, see 76.46.01.
2 Detach the duct from the heater unit.

Refitting
3 Fit new spring nuts to the ducts.
4 Reverse instructions 1 and 2.

AIR HOSES
Remove and refit — R.H. 80.15.11
— L.H. 80.15.12

Removing
1 Remove the fascia, see 76.46.01.
2 Pull the hose ends from the heater.

Refitting
3 Reverse instructions 1 and 2.

SWIVELLING VENTS — OUTER
Remove and refit — R.H. 80.15.23
— L.H. 80.15.22

Removing
1 Remove the fascia, see 76.46.01.
2 Push the vent assembly outwards to release the four tongues securing the vent to the fascia.
3 Depress the sides of the vent sufficiently to release the four tongues securing it to the duct.
4 Remove the vent.

Refitting
5 Reverse instructions 1 to 4.
**SWIVELLING VENT – CENTRE**

*Remove and refit 80.15.24*

**Removing**
1. Depress one side of the vent frame to detach the retaining boss from the surround.
2. Lift out the vent.

**Refitting**
3. Reverse instructions 1 and 2.

---

**FRESH AIR DUCT**

*Remove and refit 80.15.31*

**Removing**
1. Release the two clips.
2. Disengage the bonnet lock cable from the duct and carefully manoeuvre the duct clear of the engine compartment.

**Refitting**
3. Reverse instructions 1 and 2 ensuring that the duct is located in the retaining clips on the bulkhead.

---

**HEATER UNIT**

*Remove and refit 80.20.01*

**Removing**
1. Isolate the battery.
2. Drain the coolant.
3. Remove the fresh air duct, 80.15.31.
4. Slacken the two clips and disconnect both water hoses from the heater.
5. Remove the fascia, 76.46.01.
6. Remove the two air hoses from the heater.
7. Remove the console assembly, 76.25.01.
8. Remove the control cowl, 76.25.03.
9. Remove the two demister ducts from the heater unit.
10. Remove the one bolt securing the heater air intake to the bulkhead.
11. Remove the control cowl support bracket – two bolts, spring washers and plain washers.
12. Slacken the two bolts securing the heater to the front of the heater support bracket on the transmission tunnel.
13. Remove the two heater support brackets – two bolts, spring washers, and plain washers.
14. Remove the two nuts, bolts, spring washers and plain washers securing the fascia support rails to the support bracket on the transmission tunnel.
15. Disconnect the two leads from the fan motor, (1 Black 1 Green).
16. Remove the nut, spring washer and plain washer securing the water pipe bracket to the bulkhead.
17. Remove the nut, spring washer and plain washer securing the rear of the heater to the bulkhead.
18. Remove the heater from the vehicle taking care to avoid spillage of coolant remaining in the matrix.

**Refitting**
19. Reverse instructions 1 to 18.
HEATER MATRIX
Remove and refit 80.20.29

Removing
1 Isolate the battery.
2 Remove the battery, see 80.20.01.
3 Remove the fan motor, see 80.20.15.
4 Remove the seal from the pipe flange plate.
5 Drill out the rivet securing the pipe flange plate to the heater.
6 Remove the two screws securing the pipe mounting bracket to the heater.
7 Lift off the bracket and packing piece.
8 Slacken the three trunnions and disconnect the flap operating rods from the levers.

9 Lift off the face level flap.
10 Lift off the heater inlet flap.
11 Drill out the four rivets securing the control level mounting plate to the heater.
12 Remove the two screws securing the lower flange of the control lever mounting plate to the heater. Lift off the mounting plate.
13 Remove the spire nut securing the lower side flap operating rod to the lever and disconnect the rod from the lever.
14 Remove the spire nut securing the lower flap spindle to the matrix housing.
15 Carefully pull the operating lever and spring clip off the lower flap spindle.
16 Detach the lower flap from the matrix housing and collect the spacer.

Refitting
10 Reverse instructions 9 to 4.
11 With the cam set in the position shown, set the air inlet flap against the aperture with the control lever in the 'OFF' position and tighten the trunnion screw.
12 Operate the control lever to check engagement of detents and full movement of the flap, then return the lever to the 'OFF' position and check sealing of the flap.
13 Reverse instructions 1 and 2.

FAN MOTOR
Remove and refit 80.20.15

Removing
1 Isolate the battery.
2 Remove the fan motor, see 80.20.01.
3 Slacken the trunion and disconnect the air intake control rod.
4 Remove the six screws and detach the air intake from the heater.
5 Drill out the four rivets.
6 Release the clip and detach the resistor from the heater.
7 Disconnect the two Lucas connectors from the fan motor.
8 Detach the fourteen clips and lift off the upper half of the casing.
9 Lift out the fan motor.

Refitting
10 Reverse instructions 9 to 4.
11 With the cam set in the position shown, set the air inlet flap against the aperture with the control lever in the 'OFF' position and tighten the trunnion screw.
12 Operate the control lever to check engagement of detents and full movement of the flap, then return the lever to the 'OFF' position and check sealing of the flap.
13 Reverse instructions 1 and 2.
17 Drill out the two rivets securing the lower side flap assembly to the heater box.
18 Remove the lower side flap assembly.
19 Drill out the seven rivets securing the matrix housing to the heater box.
20 Remove the matrix complete with housing from the heater box.
21 Remove the matrix from the housing.

Refitting
22 Fit two new pipe seals into the matrix and replace the foam packing piece.
23 Reverse instructions 8 to 21.
24 Lubricate the pipes and seals with an anti-freeze solution.
25 Reverse instructions 7 to 3.
26 With the face level ventilation flap closed against the aperture as shown and the control lever in the 'OFF' position, tighten the trunnion screw.

31 Operate the control lever to check engagement of detents and full movement of the flap, then return the lever to the 'OFF' position and check sealing of the flap.
32 With the heater inlet flap set as shown and the outlet flap closed as shown, tighten the trunnion screw.
33 Set the control level in the 'COLD' position and tighten the trunnion screw.
34 Operate the control lever to check engagement of detents and full movement of both flaps, then return the lever to the 'COLD' position and check sealing of the outlet flap.
35 Reverse instructions 1 and 2.

WATER HOSES

Remove and refit
Hose - feed - engine to heater
Hose - return - heater to engine return pipe

Removing
1 Drain the cooling system. 26.10.01.
2 Remove the fresh air duct. 80.15.31.
3 Slacken the clips and remove the hoses.

Refitting
4 Reverse instructions 1 to 3.
INTRODUCTION

The air conditioning system is designed to provide a two level output. The upper level provides cool air at face level for increased comfort in hot climates. The lower level provides either cool or warm air at foot level and an air supply available to the screen.

The principal component of the system is the air conditioner unit. It governs all airflows and contains one blower motor and two matrixes. A cold matrix is cooled by the cold refrigeration circuit and a hot matrix heated by the hot water circuit.

All incoming air is accelerated by the blower motor running at one of three speeds. When the blower motor is selected 'OFF' a flap prevents outside air entering the system. With the manual cut-out switch selected 'ON' all incoming air is first cooled, dehumidified and cleaned by passing through the cold matrix. The air is then passed to the distribution and hot matrix area.

Cold air is delivered from the central fascia vent and the two end fascia vents at a temperature controlled by the cold temperature control system.

Cold air or hot air is delivered from the footwell outlets and screen outlets at a temperature controlled by a combination of both the cold temperature control system and the hot temperature control system.

Air extraction is from two air-vent grilles in the vehicle body rear quarter panels.

The refrigeration circuit consists of a compressor at the front of the engine driven from two drive belts and an electromagnetic clutch, a condenser with two fans in the nose of the vehicle, a receiver drier cylinder at the front of the engine bay and the cold matrix in the air conditioner unit. Hoses join the components.

The system is filled with refrigerant which must be subject to special precautions. It exists in the circuit both as a liquid and a vapour.

Service personnel who are not familiar with air-conditioned vehicles must study Servicing 82.30.00. A full understanding of this section must be obtained before breaking into the system. Failure to observe this instruction may result in severe personal injury.
COLD REFRIGERATION CIRCUIT

Introduction
The function of the refrigeration circuit is to cool the cold matrix. The circuit comprises the following main components:

- Compressor
- Condenser
- Receiver drier
- Expansion valve and cold matrix

Hoses are employed to transport the refrigerant between components.

Compressor
The compressor draws vaporized refrigerant from the cold matrix. It is compressed, and thus heated, and passed on to the condenser as a hot, high pressure vapour.

Condenser
The condenser is mounted at the front of the car. Its function is to remove heat from the refrigerant and disperse it into the atmosphere. It is delivered with hot, high pressure vapour. Air flow across the tubes, induced by vehicle movement and assisted by two electric fans, cools the vapour, causing it to condense into a high pressure liquid. As this change of state occurs a large amount of latent heat is released.

Receiver drier
This unit filters, removes moisture, and acts as a reservoir for the liquid. To prevent icing inside the system, extreme precautions are taken during servicing to exclude moisture. The receiver drier should be considered as a second stage insurance to prevent the serious consequences of ice obstructing the flow. A sight glass provided in the unit top enables a visual check to be made of the high pressure liquid flow.

Expansion valve and cold matrix
High pressure liquid refrigerant is delivered to the expansion valve. A severe pressure drop occurs across the valve and as the refrigerant enters the cold matrix space at a temperature of approximately -6°C it boils and vaporizes. As this change of state occurs, a large amount of latent heat is absorbed. The cold matrix is therefore cooled and as a result heat is extracted from the air flowing across the matrix.

Second cycle
Vaporized refrigerant is then drawn from the cold matrix by the compressor and a second cycle commences.
### COMPRESSOR DATA

**Manufacturer** .................................................. Delco Air, Dayton, Ohio, U.S.A.
**Type** .............................................................. Radial 4
**Delco Air model No.** ........................................... 1131063
**Triumph Part No.** ................................................ ERC 3010

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>British Imperial</th>
<th>U.S.</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bore</td>
<td>1.788 in</td>
<td>45.42 mm</td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>1.000 in</td>
<td>25.40 mm</td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>10 in³/rev</td>
<td>164 cm³/rev</td>
<td></td>
</tr>
<tr>
<td>Inlet valves</td>
<td>Reed valves</td>
<td>Mounted on piston tops</td>
<td></td>
</tr>
<tr>
<td>Discharge valves</td>
<td>Reed valves</td>
<td>Mounted on cylinder top plates</td>
<td></td>
</tr>
<tr>
<td>Main bearings</td>
<td>Needle roller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eccentric bearing</td>
<td>Needle roller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubrication – oil</td>
<td>See 82.10.14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– initial oil charge</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Mounting – holes              | 0.380 in diameter |       |
|                               | – 20 U.N.F. 1.125 in deep |       |

| Maximum speed – continuous    | 7,000 rev/min    |       |
| – intermittent               | 8,500 rev/min    |       |

| Rotation                      | Clockwise or anti-clockwise |       |
| High pressure relief valve – blow off pressure | 440 lb/in² |       |
| Low refrigerant charge protection | Superheat switch |       |
| Clutch current                | 3.2 amp          |       |
| Length                        | 6.92 in          | 175.8 mm |       |
| Width                         | 6.98 in          | 177.3 mm |       |
| Height                        | 6.98 in          | 177.3 mm |       |
| Weight                        | 17.3 lb          | 7.85 kg |       |
COMPRESSOR DRIVE BELT

Adjust 82.10.01

1 Pull off the cold air inlet hose.
2 Slacken three bolts and the exhaust manifold nut associated with the support strut.
3 Slacken the main mounting bolt.
4 Slacken the link to engine bolt.
5 Slacken the adjustment bolt.

NOTE: Do not tension the compressor drive belt before ensuring that the jockey pulley drive belt tension is correct. See 82.10.04.

6 Pull the compressor up to tension the belt. Tighten the adjustment bolt.
7 Check the belt tension. Total movement should be 0.1 to 0.2 in (2.5 to 5.0 mm) at the mid point of the run.
8 Tighten the link to engine bolt.
9 Tighten the main mounting bolt.
10 Tighten three bolts and the exhaust manifold nut associated with the support strut.
11 Push on the cold air inlet hose.
COMPRESSOR DRIVE BELT
Remove and refit 82.10.02

Removing
1 Perform 82.10.01, instructions 1 to 5.
2 Push the compressor down to release the belt tension.
3 Remove the belt.

Refitting
4 Fit the belt.
5 Perform 82.10.01, instructions 6 to 11.

JOCKEY PULLEY DRIVE BELT
Remove and refit 82.10.03

Removing
1 Remove the alternator drive belt, see 86.10.03.
2 Remove the water pump pulley, see 26.25.03.
3 Perform 82.10.01, instructions 1 to 5.
4 Push the compressor down to release the compressor drive belt tension.
5 Remove the compressor drive belt.
6 Slacken the clamp bolt.
7 Push the jockey pulley inwards to release the belt tension.
8 Remove the belt.

Refitting
9 Fit the belt.
10 Perform 82.10.04, instructions 4 to 5.
11 Fit the compressor drive belt.
12 Perform 82.10.01, instructions 6 to 11.
13 Fit the water pump pulley, see 26.25.03.
14 Fit the alternator drive belt, see 86.10.03.
**JOCKEY PULLEY DRIVE BELT**

1. Perform 82.10.01, instructions 1 to 5.
2. Push the compressor down to release the compressor drive belt tension.
3. Slacken the clamp bolt.
4. Pull the jockey pulley outwards to tension the belt. Tighten the clamp bolt.
5. Check the belt tension. Total movement should be 0.1 to 0.2 in (2.5 to 5.0 mm) at the mid point of the run.
6. Perform 82.10.01, instructions 6 to 11.

**COMPRESSOR CLUTCH**

Remove and refit 82.10.08

Triumph spares supply the compressor and clutch assembly complete to be used as a replacement unit.

Clutch remove and refit is therefore not detailed in this Manual.

The four components of the clutch —

- hub drive plate
- rotor and bearing
- pulley
- coil

— may be removed using special tools available from —

Robinair
Montpelier
Ohio
U.S.A.
Use only refrigerant compressor oil of approved trade names –
- BP Energol LPT 100
- Texaco Capella E
- Shell Clavus 33.

To prevent icing or corrosion inside the refrigeration system extreme precautions must be observed during servicing to exclude moisture. Ensure that the oil contains no moisture. The specification states that the oil moisture content should not exceed 10 parts per million by weight.

No access to the lubricant is possible while the system is charged. When the system is discharged oil may be added or drained through the compressor suction side pipe connection as shown.

During system operation some oil from the compressor crankcase circulates throughout the circuit. When the system is stopped the oil remains in the components and hoses. If a component is changed some oil will therefore be lost.

The Delco Air Radial 4 compressor has no dip stick. To ensure that the correct quantity of lubricant is maintained the instructions given in the 'Lubrication chart' must be followed during system servicing.

Study of the Lubrication Chart will show that the method to establish an oil quantity datum is to drain the compressor. After a 10 minute drain approximately 22 to 26 cc of oil will remain in the compressor. This has been allowed for in all oil quantities stated on the chart.

LUBRICATION CHART

<table>
<thead>
<tr>
<th>New system</th>
<th>Clean system</th>
<th>Lubrication check</th>
<th>Ruptured system</th>
<th>Contaminated system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full initial oil change in compressor, Condensor, receiver drier, cold matrix and hoses dry.</td>
<td>To replace oil lost when renewing one or more components on a clean system</td>
<td>To check correct quantity of oil is in system</td>
<td>Fast discharge with loss of unknown quantity of oil</td>
<td>Due to component failure depositing swarf or other foreign matter into the system</td>
</tr>
<tr>
<td>The new compressor will be supplied from Delco Air with a full initial oil charge of 177 cc</td>
<td>If the system can be operated perform the following to distribute the lubricant: Run the engine at 1000 to 1500 rev/min for 5 minutes with the control levers set as follows: Lever A to MAX Lever B to COLD Lever C to 3 Lever D to CAR</td>
<td>Discharge, see 82.30.05</td>
<td>Ensure that the system is fully discharged, see 82.30.05</td>
<td>Discharge, see 82.30.05</td>
</tr>
<tr>
<td>To check oil charge before fitting compressor to vehicle remove plate and observe oil through suction side pipe connection</td>
<td></td>
<td>Remove receiver drier</td>
<td>Remove receiver drier</td>
<td>Remove receiver drier</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remove compressor</td>
<td>Remove compressor</td>
<td>Remove compressor</td>
</tr>
</tbody>
</table>

NOTE: Warm air from above the engine will enter the fresh air duct to be presented to the cold matrix. This condition will cause the system to operate hard and prevent frequent cutting in and out of the compressor clutch.
<table>
<thead>
<tr>
<th>If doubt exists on quantity perform the following —</th>
<th>Drain oil from compressor into a clean jug.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain oil from compressor into a clean jug.</td>
<td>Remove defective component.</td>
</tr>
<tr>
<td>Add 153 cc of oil to compressor.</td>
<td></td>
</tr>
<tr>
<td>Fit compressor.</td>
<td></td>
</tr>
<tr>
<td>Evacuate, see 82.30.06.</td>
<td></td>
</tr>
<tr>
<td>Charge, see 82.30.08.</td>
<td></td>
</tr>
<tr>
<td>Functional check, see 82.30.16.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compressor</th>
<th>Condenser</th>
<th>Receiver drier</th>
<th>Cold matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add 153 cc of oil to compressor into a clean measuring jug.</td>
<td>Add 60 cc of oil directly into new condenser.</td>
<td>Add 40 cc of oil directly into new receiver drier.</td>
<td>Add 70 cc of oil directly into cold matrix inlet hose.</td>
</tr>
<tr>
<td>Note the quantity of old oil.</td>
<td>Note the oil condition. If contaminated refer to appropriate column of this chart.</td>
<td>Fit new components as required. Do not fit compressor or receiver drier yet.</td>
<td>Fit new components as required. Do not fit compressor or receiver drier yet.</td>
</tr>
<tr>
<td>Drain oil from new compressor into a clean jug.</td>
<td>Drain oil from compressor into a clean jug.</td>
<td>Drain oil from compressor into a clean jug.</td>
<td>Drain oil from compressor into a clean jug.</td>
</tr>
<tr>
<td>Add a specific quantity of new oil to new compressor. The quantity is to be equal to that drained from old compressor and noted above.</td>
<td>Add 148 cc of oil to compressor.</td>
<td>Add 148 cc of oil to compressor.</td>
<td>Add 148 cc of oil to compressor.</td>
</tr>
<tr>
<td>Fit new component.</td>
<td>Fit compressor.</td>
<td>Fit compressor.</td>
<td>Fit compressor.</td>
</tr>
<tr>
<td>Evacuate, see 82.30.06.</td>
<td>Charge, see 82.30.08.</td>
<td>Charge, see 82.30.08.</td>
<td>Charge, see 82.30.08.</td>
</tr>
<tr>
<td>Functional check, see 82.30.16.</td>
<td>Functional check, see 82.30.16.</td>
<td>Functional check, see 82.30.16.</td>
<td>Functional check, see 82.30.16.</td>
</tr>
</tbody>
</table>
COMPRESSOR

Removing
1. Pull off the cold air inlet hose.
2. Connect gauge set, see 82.30.01.
3. Discharge, see 82.30.20.
4. Pull electrical socket from superheat switch.
5. Pull electrical harness plug from clutch.
6. Protect the eyes with safety goggles and wear gloves during operation 7.
7. Remove bolt, spring washer and plate. Separate pipes from compressor. Blank exposed connections immediately.
8. Remove strut.
9. Slacken three bolts.
10. Remove drive belt.
11. Remove adjustment bolt.
12. Remove main bolt and lift compressor from vehicle.

NOTE: Do not allow the oil in the compressor to flow out of the pipe connections.
13. If the compressor is to be renewed carefully drain the oil from the old compressor into a clean measuring jug and note the quantity.
14. If necessary remove mounting brackets.

Refitting
15. If necessary fit mounting brackets.
16. Ensure that the system is returned to service containing the correct quantity of lubricant. Refer to 82.10.14.
17. Position compressor. Fit main bolt finger tight.
18. Fit adjustment bolt finger tight.
19. Fit drive belt.
20. Tension drive belt and tighten three bolts.
21. Fit strut. Ensure correct alignment to bracket by slackening and tightening two bolts.
22. Position pipes to compressor. Use new rubber 'O' rings if available. Use refrigerant compressor oil on rubber 'O' rings to assist leakage prevention. Secure with bolt, spring washer and plate.
23. Connect electrical harness plug to clutch.
24. Connect electrical socket to superheat switch.
25. Evacuate, see 82.30.06.
26. Charge, see 82.30.08.
27. Perform a leak test on all disturbed joints, see 82.30.09.
28. Functional check, see 82.30.16.
29. Disconnect gauge set, see 82.30.01.
30. Push on the cold air inlet hose.
Triumph spares supply the compressor and clutch assembly complete to be used as a replacement unit.

Compressor overhaul is therefore not detailed in this Manual.

The compressor may be dismantled to fit Delco Air service parts or service sub-assemblies using special tools available from –

Robinair
Montpelier
Ohio
U.S.A.
FAN MOTOR AND BLADE

DATA
Manufacturer ........................................... I.B. Mechanics, Melco Spa, Asti, Italy
I.B. Mechanics part No. ................................. MP 092 22
Triumph part No. ........................................... RKC 3107

Threads and hexagons ........................................ Metric
Armature size - diameter ................................... 92 mm (3.622 in)
- width ....................................................... 22 mm (0.866 in)
Normal running with blade - speed ...................... 2,600 rev/min minimum
- current .................................................... 13 amp maximum
- torque ..................................................... Not stated
Load running with brake - speed ......................... 2,500 ± 100 rev/min
- current .................................................... 14.5 amp
- torque ..................................................... Not stated
Locked - speed ............................................. Nil
- current ..................................................... 50 amp
- torque ..................................................... 1.5 Nm (1.1 lbf ft)
Brush length - new ......................................... 17 mm (0.67 in)
Brush spring pressure ..................................... 280 ± 10% g (9.9 ± 10% oz)
Balance - motor and blade assembly to ............... 1.5 g cm (5.5 lb)
Weight ....................................................... 2.5 kg

FAN MOTOR AND BLADE
Remove and refit 82.15.01

Removing
1 Remove the radiator, see 26.40.01.
2 Disconnect the fan motor harness plug.
3 Remove the harness from the mounting bracket clips.
4 Remove three nuts, spring washers and washers.
5 Remove the fan motor and blade forwards and downwards from the vehicle.

Refitting
6 Reverse 1 to 5.
FAN MOTOR AND BLADE

Dismantling
1. Support the blade hub in a large soft-jawed vice. Remove the nut and anti-vibration washer.
2. Pull the blade hub from the shaft.
3. Remove the end cover from the motor and harness.
4. Lift the brush assembly from the two pillars. Handle with care to ensure that the brushes are not damaged.
5. Remove four nuts and anti-vibration washers. Remove the rear bearing bracket from the bolts.
6. Support the body by hand. Use a soft headed mallet. Carefully tap the shaft end to drive the armature from the front bearing.
   CAUTION: Do not apply heavy hammer blows to the shaft end. Such action may burr over and damage the thread.
7. Pull the armature from the body against the action of the permanent magnet.

Reassembling
8. Position the armature to the body.
9. Support the body by hand. Use a soft headed mallet. Carefully tap the shaft end to position the armature to the front bearing.
   CAUTION: The armature shaft only mates with half the bearing width. Do not attempt to tap in further.
10. Position the rear bearing bracket to the bolts with the bracket lug aligned to the body slot. Secure with four nuts and anti-vibration washers.
11. Align the brush assembly so that the hole slot is aligned to the pillar projection. Push the four brushes back to clear the commutator. Manoeuvre the brush assembly into position.
12. Thread the harness through the end cover slot. Position the end cover. Secure with two screws.
13. Fit the blade hub to the shaft with the shaft pin aligned to the hub slot.
14. Fit the nut and anti-vibration washer.
CONDENSER
Remove and refit 82.15.07

CAUTION: If a component is renewed some oil will be lost. Ensure that the system is returned to service containing the correct quantity of lubricant. Refer to 82.10.14.

Removing
1 Drive the vehicle onto a ramp.
2 Connect gauge set, see 82.30.01.
3 Discharge, see 82.30.05.
4 Select the master light switch to raise the headlamps.
5 Isolate the battery to extinguish the headlamps.
6 Raise the ramp.
7 Remove the underbelly panel, see 76.10.50.
8 Protect the eyes with safety goggles and wear gloves during operation 9.
9 Carefully disconnect two hose connections. Use two spanners at each joint to protect the delicate condenser pipe joints. Blank exposed connections immediately.
10 Slacken four longitudinal bolt assemblies.

NOTE: The right-hand bracket is provided with slots as shown to facilitate withdrawal and positioning of the assembly and to ensure that the brackets are drawn up firmly against the body longitudinal members. Note that the left-hand bracket has no slots.

11 Remove two left-hand bolts, spring washers and washers. Collect up the nut plate.
12 Remove two right-hand bolts, spring washers and washers.
13 Carefully withdraw the condenser downwards from the vehicle. Handle with care as the fins are easily damaged.
14 If necessary remove four bolts, two inhibitor plates, four washers, four spring washers and four nuts. Remove two mounting brackets.

Refitting
15 If necessary position two mounting brackets. Secure with four bolts with heads on rear face, two inhibitor plates with flanges against upper bolt heads, four washers, four spring washers and four nuts. Tighten finger tight only.
16 Ensure that two rubber bushes and distance tubes are in position on the left-hand mounting bracket.
17 Position the condenser.
18 Fit two right-hand bolts, spring washers and washers finger tight.
19 Position the nut plate. Fit two left-hand bolts, spring washers and washers finger tight.
20 Tighten two right-hand bolts.
21 Tighten two left-hand bolts.
22 Tighten four longitudinal bolt assemblies.
23 Connect two hose connections. Use new rubber ‘O’ rings if available. Use refrigerant compressor oil on rubber ‘O’ rings to assist leakage prevention.

Torque load as follows:

<table>
<thead>
<tr>
<th>Thread size</th>
<th>Ibf ft</th>
<th>Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet connection</td>
<td>¾ in – 16 U.N.F.</td>
<td>20.0</td>
</tr>
<tr>
<td>Outlet connection</td>
<td>¼ in – 18 U.N.F.</td>
<td>13.0</td>
</tr>
</tbody>
</table>

24 Lower the ramp.
25 Connect the battery.
26 Select the master light switch to lower the headlamps.
27 Evacuate, see 82.30.06.
28 Charge, see 82.30.08.
29 Perform a leak test on all disturbed joints, see 82.30.09.
30 Functional check, see 82.30.16.
31 Disconnect gauge set, see 82.30.01.
32 Raise the ramp.
33 Fit the underbelly panel, see 76.10.50.
**RECEIVER DRIER**

Remove and refit 82.17.01

CAUTION: Immediate blanking of the receiver drier is important. Exposed life of the unit is only 15 minutes.

CAUTION: If a component is renewed some oil will be lost. Ensure that the system is returned to service containing the correct quantity of lubricant. Refer to 82.10.14.

**Removing**
1. Connect gauge set, see 82.30.01.
2. Discharge, see 82.30.05.
3. Protect the eyes with safety goggles and wear gloves during operations 4 and 5.
4. Carefully disconnect the capillary tube from the receiver drier. Blank exposed connections immediately.
5. Carefully disconnect two hose connections. Use a second spanner to support the squared hose adaptor. Blank exposed connections immediately.
6. Remove the clamp screw, washer, washer and nut.
7. Withdraw the receiver drier from the mounting bracket.

**Refitting**
8. Insert the receiver drier into the mounting bracket with the inlet and outlet connections correct to the refrigerant circuit flow as shown.
9. Connect two hose connections finger tight. Use refrigerant compressor oil on all mating surfaces to assist leakage prevention.
10. Fit the clamp screw, washer, washer and nut.
11. Tighten two hose connections. Use a second spanner to support the squared hose adaptor.
12. Carefully connect the capillary tube to the receiver drier. Use refrigerant compressor oil on all mating surfaces to assist leakage prevention.
13. Evacuate, see 82.30.06.
14. Charge, see 82.30.08.
15. Perform a leak test on all disturbed joints, see 82.30.09.
16. Functional check, see 82.30.16.
17. Disconnect gauge set, see 82.30.01.
CONTROL LEVERS

**Description**

Lever 'A' controls the flow of cold air delivered from the central fascia vent. Moving lever 'A' up to the 'OFF' position will terminate the airflow. Moving lever 'A' down to the 'MAX' position will provide the maximum airflow. Any intermediate position may be used. This control operates through the direct linkage 'A' to position flap 'A'.

Lever 'B' directs the temperature required. Moving lever 'B' up to the 'COLD' position will provide maximum cooling. Moving lever 'B' down to the 'HOT' position will provide maximum heating. Any intermediate position may be used. This control operates through the non-direct linkage 'B' to provide an input to both the cold thermostat and the hot thermostat. Lever 'B' therefore influences the airflow from both the cold outlets and the hot outlets. After setting the position of lever 'B' the cold temperature control system will maintain an approximately constant interior temperature.

Lever 'C' is the master control to bring into action the cold refrigerant circuit and the blower motor. It also selects the input air — either fresh air at ambient temperature through the underbonnet fresh air duct or recirculated air from the vehicle interior.

Moving lever 'C' up to the 'OFF' position will electrically switch off the compressor electromagnetic clutch and the blower motor. Flap 'C' will be in the recirculate position so vehicle movement will not induce an airflow through the system.

Moving lever 'C' slightly down to position 'MAX' will electrically switch on the cold refrigerant circuit and the blower motor at its fastest speed. Flap 'C' will remain in the recirculate position. This selection of lever 'C' will provide the maximum cooling or the maximum heating condition.

Moving lever 'C' further down to position '3' will maintain the cold refrigerant circuit electrically on and the blower motor at its fastest speed. Flap 'C' will be traversed by the non-direct 'quick changeover' linkage 'C' to the fresh position. Any intermediate position between 'MAX' and '3' may be used.

Moving lever 'C' slightly further down to position '2' will maintain the cold refrigerant circuit electrically on and flap 'C' at the fresh position. The blower motor will drop to its middle speed.

Moving lever 'C' slightly further down to position '1' will maintain the cold refrigerant circuit electrically on and flap 'C' at the fresh position. The blower motor will drop to its slowest speed.

Lever 'D' controls the flow of cold air or hot air delivered from the screen vents and footwell. Moving lever 'D' up to the 'SCREEN' position will provide the maximum airflow to the screen vents. Moving lever 'D' down to the 'CAR' position will provide the maximum airflow to the footwell. Any intermediate position may be used. This control operates through the direct linkage 'D' to position flap 'D'.
**ELECTRICAL CIRCUIT**

**Description**

The function of the circuit is to control the on-off switching of the compressor electromagnetic clutch and to control the off-low-high switching of the two condenser and radiator fan motors.

The clutch circuit and the fan circuit are separate. Each may be considered in two sections. A control circuit and a power circuit.

**Clutch control circuit**

Supply to the relay winding is from a fuse. The earth path may be interrupted by the manual cut out switch, the cold thermostat and the driver's selection of lever 'C'.

With lever 'C' up to the 'OFF' position the circuit is broken. With lever 'C' selected to any other position, 'MAX', '3', '2' or '1' an earth path exists across the blower motor switch. The relay control circuit current is small so the introduction of a blower motor speed control resistor in the circuit at positions 'MAX', '3' and '1' will have no consequence.

**Clutch power circuit**

Actuation of the relay connects supply to the compressor clutch. The circuit may be interrupted by the thermal fuse.

The thermal fuse and superheat switch together provide a compressor protection system. If the superheat switch contacts close the thermal fuse heater warms. After a short time period the thermal fuse will melt to disconnect the compressor clutch and also the thermal fuse heater.

**Fan control circuit**

The supply to the low speed relay winding is controlled by the radiator temperature switch which is responsible for the majority of fan runs.

The supply to the two high speed relay windings is controlled by two switches wired in parallel. The two relays thus operate together in the event of either switch actuating. The switches are the engine temperature switch and the high pressure cut in.

The earth path for all three relay windings is through the starter motor. This line goes positive when the starter motor is selected. If the ignition is switched on when the engine is hot the fans may run. This 'earth path' design ensures that the fans stop when the starter motor is operated. Battery power is thus reserved, when required, for the starter motor and not reduced by the fans.

Both the high speed relays have a secondary function. The high speed—supply line relay breaks the low speed series line. The high speed—earth line relay breaks the heated backlight circuit to ensure that two 'heavy current' circuits are not selected together. The battery and/or alternator is thus protected from an excess demand.

**Fan power circuit**

Fan motor 1 is permanently connected to a fused supply. Fan motor 2 is permanently connected to earth.

One relay controls the low speed function. Actuation of the low speed relay connects the two fan motors in series. Both fan motors run at low speed on half system voltage. A high speed relay is included in the line but it plays no part in the off-low switching.

Two relays, which operate together, control the high speed function. Actuation of the two high speed relays connects fan motor 1 to earth and fan motor 2 to a fused supply. Both fan motors run at high speed on full system voltage.

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**AIR CONDITIONING**

**System wiring diagram on following page.**
Clutch control circuit
1. Fuse
2. Relay
3. Manual cut out switch
4. Cold thermostat
5. Lever 'C'

Clutch power circuit
6. Thermal fuse and heater
7. Compressor clutch
8. Superheat switch

Other components
9. Blower motor
10. Blower motor resistors
11. Blower motor switch

Fan control circuit
12. Radiator temperature switch
13. Low speed relay
14. Engine temperature switch
15. High pressure cut in
16. High speed relay — earth line
17. High speed relay — supply line
18. Earth path through starter motor
19. Diode — circuit refinement only

Fan power circuit
20. Fuses
21. Fan motor 1
22. Fan motor 2

Also
23. From heated backlight circuit
COLD THERMOSTAT

Description

The principal unit of the cold temperature control system is the cold thermostat mounted on the left-hand side of the air conditioner unit.

The thermostat receives two inputs. A capillary tube inserted into the air space of the cold matrix senses the cold matrix temperature. The driver's direction of the temperature required is transmitted by lever 'B' and linkage 'B' to position the thermostat lever.

The output of the thermostat is an electric switch in the air conditioning electrical circuit. This controls indirectly the on-off switching of the compressor electromagnetic clutch.

HOT THERMOSTAT

Description

The principal unit of the hot temperature control system is the hot thermostat mounted on the left-hand side of the air conditioner unit.

The thermostat receives two inputs. A capillary tube mounted against the downstream face of the hot matrix senses the hot matrix temperature. The driver's selection of the temperature required is transmitted by lever 'B' and linkage 'B' to position the thermostat lever.

The output of the thermostat is a water valve in the hot water circuit. This controls the flow of hot water from the engine into the hot matrix.
HIGH PRESSURE CUT IN

Description

The unit increases the efficiency of the refrigeration circuit. A capillary tube senses the refrigerant pressure at the receiver drier. This pressure governs an electrical switch within the unit. In conditions of normal air conditioning system use it may be subject to some cycling.

The switch is included in the fan circuit. As the refrigerant pressure rises the expansion valve moves towards the closed position and the cooling system efficiency drops. When the refrigerant reaches the 'cut in' pressure both fans run at high speed. Increased air flow across the condenser lowers the refrigerant pressure. The expansion valve thus opens to improve the cooling system performance.

MANUAL CUT OUT SWITCH

Description

This switch enables the driver to cut out the refrigeration circuit. The switch is included in the clutch circuit.

With the switch 'ON', moving lever 'C' away from the 'OFF' position will bring into action the refrigeration circuit and the blower motor.

With the switch 'OFF', moving lever 'C' away from the 'OFF' position will bring into action only the blower motor. The system will then operate as a 'heater equipped vehicle' without the air cooling, air dehumidifying and air cleaning functions.

The switch may be selected 'ON' or 'OFF' at any time. The following uses are suggested:

Road performance

Select 'OFF' to remove the compressor drive load from the engine to obtain maximum road performance.

Fuel consumption

Select 'OFF' to remove the compressor drive load from the engine to obtain improved fuel consumption.

Ambient temperature below 20°C (68°F)

Air conditioning system operation not normally required. Select 'OFF' to prevent infrequent cycling of the system under the action of the cold thermostat. In certain extreme conditions of high humidity or dust select 'ON' to obtain air dehumidifying and/or air cleaning.

Ambient temperature above 20°C (68°F)

Select 'ON' to obtain normal air conditioning system operation.

Winter season

Do not leave the switch selected 'OFF' for long periods during the winter season. Select 'ON' for a few minutes each week to exercise the total system and keep the compressor and interior of the system well lubricated.

Data

Manufacturer: Ranco
Triumph part No.: TKC 3842
Cut in pressure: 230 ± 5 lbf/in²
Cut out pressure: 195 ± 2 lbf/in²
Mounting hole threads: No. 10-32 U.N.F.
Pressure pipe coupling: ¼ in S.A.E. flare nut
RADIATOR TEMPERATURE SWITCH

DATA
Manufacturer.............................. Otter
Type ........................................ V51
Triumph part No........................... URP 1126
Cut-in temperature – maximum ........... 93°C (199°F)
Cut-out temperature – minimum .......... 82°C (180°F)
Minimum differential .................... 4.0°C (7.2°F)

Description
The unit monitors the engine coolant temperature in the top left-hand corner of the radiator. It is the 'first stage' protection against high coolant temperature. In normal vehicle operating conditions it may be subject to some cycling.

The switch is included in the fan circuit. When the coolant reaches the 'cut-in' temperature both fans run at low speed. Increased air-flow across the radiator lowers the coolant temperature. When the 'cut-out' temperature is reached the fans will stop.

ENGINE TEMPERATURE SWITCH

DATA
Manufacturer.............................. Otter
Type ........................................ V52
Triumph part No........................... ERC 2864
Cut-in temperature ....................... 102 to 108°C
Cut-out temperature ...................... 216 to 226°F
Rating on 12 volt d.c ...................... 3 amp

Description
The unit monitors the engine coolant temperature in the inlet manifold forward of the carburetters. This position provides a quick response time to check any rapid rise in temperature. It is the 'second stage' protection against high coolant temperature. In hot vehicle operating conditions it may be subject to some cycling.

The switch is included in the fan circuit. When the coolant reaches the 'cut-in' temperature both fans run at high speed. Increased airflow across the radiator lowers the coolant temperature. When the 'cut-out' temperature is reached the fans may revert to a low speed run.
HIGH PRESSURE RELIEF VALVE

Description

The unit is a safety feature to protect the refrigeration circuit from excessive pressure. It will only 'blow off' under emergency conditions.

The high pressure relief valve is mounted in the rear of the compressor to communicate with the discharge side gas accumulator space.

If the gas reaches the 'blow off' pressure it will unseat the valve and pass through to be jettisoned into the engine bay.
SUPERHEAT SWITCH AND THERMAL FUSE

Description

These two components are included in the clutch circuit and together provide a compressor protection system. This guards against low refrigerant charge providing inadequate compressor lubrication and resulting compressor damage.

The superheat switch is mounted in the rear of the compressor to communicate with the suction side gas. With low refrigerant charge the suction side gas pressure drops and the temperature rises. This excessive superheat condition closes the switch contacts.

The thermal fuse is a fully-sealed unit containing a heater and meltable fuse. With the superheat switch contacts closed the heater warms. After a short time period the thermal fuse will melt to disconnect the compressor clutch and also the thermal fuse heater.

Further rotation of the compressor will not occur and damage from inadequate lubrication will be avoided.

CAUTION: After a thermal fuse melt establish the cause. Refer to the 'thermal fuse melt chart' below.
# THERMAL FUSE MELT CHART

<table>
<thead>
<tr>
<th>Fault</th>
<th>Check</th>
<th>Test</th>
<th>Satisfactory result</th>
<th>Unsatisfactory result</th>
<th>Rectification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total failure of cold refrigeration circuit</td>
<td>1, 2</td>
<td>1 Controls selected on a Control lever C</td>
<td>Selected to any position except OFF</td>
<td>Selected to OFF</td>
<td>Move control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b Manual cut out switch</td>
<td>Selected ON</td>
<td>Selected OFF</td>
<td>Move control</td>
</tr>
<tr>
<td>Total failure of cold refrigeration circuit — with thermal fuse melt</td>
<td>3, 4, 5, 6, 7</td>
<td>2 Thermal fuse Remove thermal fuse, see 82.20.50. Check continuity across fuse — terminals B to C</td>
<td>Closed circuit</td>
<td>Open circuit</td>
<td>Establish cause of thermal fuse melt. Consider tests 3 to 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Electrical short on thermal fuse heater earth path Check black wire between fuse harness plug and superheat switch. Check socket is correctly fitted to superheat switch</td>
<td>Secure circuit</td>
<td>Earth path found</td>
<td>Repair circuit. Renew fuse</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 Superheat switch Disconnect harness socket. Employ ohmmeter to check resistance between switch pin and compressor body</td>
<td>Open circuit. This condition is not conclusive. Switch may become defective in operating conditions</td>
<td>Closed circuit</td>
<td>Discharge Renew superheat switch Renew fuse Evacuate Charge Functional check</td>
</tr>
</tbody>
</table>

continued
<table>
<thead>
<tr>
<th>Fault</th>
<th>Check</th>
<th>Test</th>
<th>Satisfactory result</th>
<th>Unsatisfactory result</th>
<th>Rectification</th>
</tr>
</thead>
</table>
| 5 Low refrigerant charge | Due to system leak. Leak test system, see 82.30.09. It may be necessary to add some refrigerant to system to find leak | No leak found | Leak found | Discharge  
Stop leak  
Renew fuse  
Evacuate  
Charge  
Functional check |
|  | Due to full 2½ lb of refrigerant not being put into system at last air conditioning system service | | | Discharge  
Renew fuse  
Evacuate  
Charge  
Functional check |
| 6 Moisture in system | System blockage by icing especially at expansion valve | | | Discharge  
Evacuate  
Fit new receiver drier  
Renew fuse  
Evacuate  
Charge  
Functional check |
| 7 Mechanical blockage | External – inspect components and pipes for damage. Inspect hoses for kinks | No damage or kink found | Damage or kink found | Discharge  
Renew defective component  
Renew fuse  
Evacuate  
Charge  
Functional check |
|  | Internal – due to component failure depositing swarf or other foreign matter into the system | | | Refer to 'Lubrication Chart – contaminated system', see 82.10.14  
Also renew fuse. |
## CONTROL SUMMARY

<table>
<thead>
<tr>
<th>Cold temperature control system</th>
<th>Hot temperature control system</th>
<th>Fan control system</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Controls</strong></td>
<td><strong>Controls</strong></td>
<td><strong>Sequence summary</strong></td>
</tr>
<tr>
<td>Manual</td>
<td>Manual</td>
<td>Automatic Low speed High speed</td>
</tr>
<tr>
<td>Automatic</td>
<td>Automatic</td>
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<tr>
<td><strong>Sequence Summary</strong></td>
<td><strong>Sequence Summary</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Cold temperature control system
- Control lever C
- Manual cut out switch
- Control lever B
- Cold matrix temperature
- Superheat switch
- Superheat switch
- Cold matrix temperature
- Cold matrix temperature
- Clutch relay
- Clutch relay
- Low speed relay
- Refrigerant switch
- Refrigerant pressure
- High pressure cut in
- Two high speed relays
- High speed fans
- Refrigerant pressure
- Refrigerant pressure
- Engine coolant temperature
- Engine coolant temperature
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RADIATOR TEMPERATURE SWITCH

Remove and refit 82.20.09

NOTE: The condenser is mounted close to the forward face of the radiator. This restricts access to the front spring clip. Side access to the switch is also limited by the body panel. First attempt to perform the operation as detailed below.

If the front spring clip becomes detached from the radiator flange it may be necessary to remove four condenser mounting bolts and tilt the condenser forward to obtain the required access.

If difficulty is experienced with the switch or rubber seal it may be necessary to remove the radiator.

Refitting
10 Fit the rubber seal. Use a new rubber seal if available.
11 Insert the switch. Position the plug pedestal forward as shown to facilitate instruction 12.
12 Carefully swing the bracket rearward to align correctly to the switch. Engage the rear spring clip to the radiator flange.
13 Dismiss the second operator.
14 Connect the harness plug. The plug may be fitted either way round.
15 Recharge the coolant, see 26.10.01.

MANUAL CUT OUT SWITCH

Remove and refit 82.20.12

Removing
1 Isolate the battery.
2 Remove the radio.
3 Locate the hole in the underside of the knob. Insert a suitable probe into the hole and, while depressing, pull the knob from the shaft.
4 Use a suitable tool to slacken the bezel. Unscrew the bezel.
5 Withdraw the switch downwards from the centre console panel.
6 Disconnect two Lucar connectors.

Refitting
7 Position nut to obtain correct switch projection.
8 Connect two Lucar connectors. The connectors may be fitted either way round. Do not fit both connectors to the common two blade switch terminal.
9 Reverse 1 to 5.

Removing
1 Drive the vehicle onto a ramp.
2 Locate the radiator temperature switch on the top left-hand corner of the radiator.
3 Raise the ramp.
4 Drain part of the coolant, see 26.10.01.
5 Disconnect the harness plug.
6 Employ a second operator with his arm inserted through the front air intake as shown to hold the front spring clip in position during instructions 7 to 12.

NOTE: If the front spring clip becomes detached from the radiator flange additional work may be necessary as detailed in the Note above.

7 Release the rear spring clip from the radiator flange. Carefully swing the bracket forward.
8 Use a wide-bladed screwdriver to carefully prise the switch from the rubber seal.
9 Remove the rubber seal.
COLD THERMOSTAT

Removing
1. Isolate the battery.
2. Remove the fascia, see 76.46.01.
3. Disconnect two Lucar connectors.
4. Hold the cold thermostat trunnion hexagon and slacken the screw.
5. Detach the control rod.
6. Free the capillary tube from the sealer below the refrigerant outlet pipe.
7. Centre punch and drill out two rivets.
8. Use a ~ in drill.
9. Carefully withdraw the capillary tube from the air space of the cold matrix.
10. Collect up the split rubber grommet.
11. Remove the cold thermostat from the vehicle.

Refitting
10. Bend the capillary tube of the new cold thermostat to the correct shape.
11. Use the old unit as a guide and bend the end as shown.
12. Thread the capillary tube between the refrigerant outlet pipe and the case.
13. Insert the capillary tube end into the air space of the cold matrix to achieve the position shown.
14. Fit the split rubber grommet AAP 0165.
15. Coil the surplus length of the capillary tube as shown. Ensure that the coil does not extend outboard of the cold thermostat.
16. Position the cold thermostat against the mounting bracket, Secure with two screws YZ 3404.
17. If necessary, restore the sealer below the refrigerant outlet pipe.
18. Attach the control rod. Adjust linkage B, see 82.25.08.
19. Connect two Lucar connectors. The connectors may be fitted either way round.
20. Fit the fascia, see 76.46.01.
21. Connect the battery.
22. Functional check, see 82.30.16.

If the operation of the cold thermostat is suspect an adjustment may be made by amending the position of the capillary tube in the air space of the cold matrix.

Access to achieve this operation may be obtained by removing the fascia centre grille, see 76.55.14.
HIGH PRESSURE CUT IN

Remove and refit 82.20.20

CAUTION: Immediate blanking of the receiver drier is important. Exposed life of the unit is only 15 minutes.

Removing
1. Pull off the cold air inlet hose.
2. Connect gauge set, see 82.30.01.
3. Discharge, see 82.30.05.
4. Release two claws and disconnect the harness plug.
5. Protect the eyes with safety goggles and wear gloves during instruction 6.
6. Carefully disconnect the capillary tube from the receiver drier. Blank exposed connections immediately.
7. Remove two bolts, spring washers and washers to release the relay mounting plate from the engine bay panel.
8. Tilt the top edge of the panel rearwards as shown to obtain access to two bolt heads on the forward face of the panel. Do not strain the refrigerant hoses.
9. Using a \( \frac{1}{2}\) in A.F. spanner, remove two bolts and spring washers. Remove unit from vehicle.

Refitting
10. Position the unit. Secure with two bolts and spring washers.
11. Position the relay mounting plate. Secure with two bolts, spring washers and washers.
12. Carefully connect the capillary tube to the receiver drier. Use refrigerant compressor oil on all mating surfaces to assist leakage prevention.
13. Connect the harness plug.
14. Evacuate, see 82.30.06.
15. Charge, see 82.30.08.
16. Perform a leak test on all disturbed joints, see 82.30.09.
17. Functional check, see 82.30.16.
18. Disconnect gauge set, see 82.30.01.
19. Push on the cold air inlet hose.
HOT THERMOSTAT

Removing
1. Isolate the battery.
2. Remove the fascia, see 76.46.01.
3. Drain the coolant, see 26.10.01.
4. Note the run of the capillary tube.
5. Cut the metal case between the screen outlet and grommet aperture. This will allow the capillary tube to be withdrawn sideways.
6. Hold the hot thermostat trunnion hexagon and slacken the screw. Detach the control rod.
7. Centre-punch and drill out three rivets. Use a short ½ in drill and right-angle drive to remove the forward two rivets. Use a ⅛ in drill from below to remove the rear rivet.
8. Slacken four hose clips.
9. Using a wide-bladed screwdriver carefully prise the capillary tube loop from the four plastic clips securing it against the face of the hot matrix.
10. Carefully remove the hot thermostat from the vehicle. Maintain the shape of the capillary tube loop as a guide for the new unit.
11. Collect up the split rubber grommet.

Refitting
12. Bend the capillary tube of the new hot thermostat to the correct shape. Use the old unit as a guide.
13. Fit three spire nuts FJ 2544 to the mounting bracket.
14. Insert the capillary tube loop into position against the face of the hot matrix. Secure to the four plastic clips.
15. Manoeuvre the hot thermostat to position the two hose connections and achieve the capillary tube run noted at operation 4 above. Position the hot thermostat on the mounting bracket. Secure with three screws YZ 3404 and washers WP 0005.
16. Tighten four hose clips.
17. Attach the control rod. Adjust linkage B, see 82.25.08.
18. Fit the split rubber grommet.
19. Apply suitable sealer to the cut in the metal case.
20. Refill the coolant, see 26.10.01.
21. Fit the fascia, see 76.46.01.
22. Connect the battery.
SUPERHEAT SWITCH
Remove and refit 82.20.43

WARNING: The superheat switch communicates with the pressurized refrigerant system. Do not attempt to remove while the system is charged.

Triumph spares supply the compressor and clutch assembly complete to be used as a replacement unit.

Superheat switch remove and refit is therefore not detailed in this Manual.

The superheat switch may be removed in a workshop specializing in Delco Air compressors.

HIGH PRESSURE RELIEF VALVE
Remove and refit 82.20.44

WARNING: The high pressure relief valve communicates with the pressurized refrigerant system. Do not attempt to remove while the system is charged.

Triumph spares supply the compressor and clutch assembly complete to be used as a replacement unit.

High pressure relief valve remove and refit is therefore not detailed in this Manual.

The high pressure relief valve may be removed in a workshop specializing in Delco Air compressors.

ENGINE TEMPERATURE SWITCH
Remove and refit 82.20.45

Removing
1 Locate the engine temperature switch on the inlet manifold forward of the carburetters.
2 Drain part of the coolant, see 26.10.01.
3 Disconnect the harness plug.
4 Remove three bolts and spring washers. Remove switch and gasket from inlet manifold.

Refitting
5 Reverse 2 to 4. Use a new gasket if available. Assemble gasket dry.
CLUTCH RELAY
Remove and refit 82.20.46

Removing
1. Open the bonnet.
2. Locate the relay mounting plate secured to the engine bay front left-hand panel.
3. The clutch relay should be positioned as shown. Confirm identity by checking colour codes of wires connected to relay harness plug:
   - Light green
   - Purple/brown
   - White/pink
   - Slate/black
4. Pull the relay from the harness plug.

Refitting
5. Connect the relay to the harness plug.

FAN HIGH SPEED—SUPPLY LINE RELAY
Remove and refit 82.20.48

Removing
1. Open the bonnet.
2. Locate the relay mounting plate secured to the engine bay front left-hand panel.
3. The fan high speed—supply line relay should be positioned as shown. Confirm identity by checking colour codes of wires connected to relay harness plug:
   - Slate/red
   - White/red
   - Purple/blue
   - Purple/green
   - Slate/orange
4. Pull the relay from the harness plug.

Refitting
5. Connect the relay to the harness plug.

FAN HIGH SPEED—EARTH LINE RELAY
Remove and refit 82.20.47

Removing
1. Open the bonnet.
2. Locate the relay mounting plate secured to the engine bay front left-hand panel.
3. The fan high speed—earth line relay should be positioned as shown. Confirm identity by checking colour codes of wires connected to relay harness plug:
   - Slate/red
   - White/red
   - Slate/yellow
   - Black
   - Purple/light green
4. Pull the relay from the harness plug.

Refitting
5. Connect the relay to the harness plug.

FAN LOW SPEED RELAY
Remove and refit 82.20.49

Removing
1. Open the bonnet.
2. Locate the relay mounting plate secured to the engine bay front left-hand panel.
3. The fan low speed relay should be positioned as shown. Confirm identity by checking colour codes of wires connected to relay harness plug:
   - Light green/white
   - White/red
   - Slate/yellow
   - Purple/red
   - Purple/blue
4. Pull the relay from the harness plug.

Refitting
5. Connect the relay to the harness plug.
THERMAL FUSE
Remove and refit 82.20.50

CAUTION: After a thermal fuse melt establish the cause. Refer to the 'thermal fuse melt chart', see 82.20.00.

Removing
1. Locate the thermal fuse and harness plug clipped to the refrigerant pipe adjacent to the compressor.
2. Unclip the assembly from the pipe.
3. Release two claws and pull the thermal fuse from the harness plug.

Refitting
4. Push the thermal fuse to the harness plug. The connection is keyed by a blade tag and harness plug slot and must be fitted in the correct position.
5. Clip the assembly to the pipe.

AIR CONDITIONER UNIT
Description

The air conditioner unit is positioned on the centre line of the vehicle between the bulkhead and the fascia/centre console. The function of the unit is to receive air, process and deliver it to the outlets as directed by the control positions.

Controls: To comprehend the system it should be appreciated that control lever 'A' positions flap 'A' via linkage 'A'. Similarly control lever 'B' operates linkage 'B'. Control lever 'C' positions flap 'C' via linkage 'C'. Finally control lever 'D' positions flap 'D' via linkage 'D'.

Intakes: The system draws fresh air at ambient temperature through the fresh air duct, or recirculated air from the vehicle interior, into the blower motor intake. The choice is directed by control lever and flap 'C'.

Blower motor: One blower motor which may be considered as an integral component of the air conditioner unit transfers air into the cold matrix.

Cold matrix: This unit is cooled by the cold refrigeration circuit. All air flow passes across the cold matrix to be conditioned. Cooling is achieved by heat being absorbed by the cold surfaces. Dehumidifying is achieved by moisture carried in the air condensing on the pipes of the cold matrix. Cleaning is achieved by the dust suspended in the air tending to be retained by the moisture. Water drains into a tray below the cold matrix. From the tray it escapes into the air inlet chamber via a short drain pipe. A second drain pipe runs vertically through the mounting rubber to the underside of the vehicle.

Hot matrix: This unit is heated by the hot water circuit. All air flow which is not permitted to escape cold through the three fascia vents is passed through the hot matrix to be heated.
EXPANSION VALVE

Remove and refit  82.25.01

Removing
1 Connect gauge set, see 82.30.01.
2 Discharge, see 82.30.05.
3 Isolate the battery.
4 Remove the fascia, see 76.46.01.
5 Note the run of the two capillary tubes.
6 Carefully cut and pull back the insulating material to expose the temperature capillary tube clamp and the pressure capillary tube union.
7 Slacken the clamp screw. Carefully withdraw the temperature capillary tube coil.
8 Carefully disconnect the pressure capillary tube union. Blank the exposed connections immediately.
9 Carefully disconnect the hose connection. Blank the exposed connections immediately.
10 Carefully disconnect the expansion valve mounting connection. Use two spanners at the joint to protect the delicate air conditioner unit pipe joint. Note that the larger rearward hexagon is the union to be rotated. Blank the exposed connections immediately.

Refitting
11 Apply refrigerant compressor oil to the mating surfaces of the three connections to assist leakage prevention.
12 Position the expansion valve with the run of the two capillary tubes as noted at operation 5 above. Carefully insert the temperature capillary tube coil in the clamp. Assemble the three connections finger tight.
13 Tighten the expansion valve mounting connection.
14 Tighten the hose connection.
15 Tighten the pressure capillary tube union.
16 Ensure that the temperature capillary tube coil is clean and in good contact with the refrigerant outlet pipe. Tighten the clamp screw.

17 Evacuate, see 82.30.06.
18 Connect the battery.
19 Charge, see 82.30.08.
20 Isolate the battery.
21 Perform a leak test on all disturbed joints, see 82.30.09.
22 Restore the insulating material. Ensure that the refrigerant outlet pipe is fully covered.
23 Fit the fascia, see 76.46.01.
24 Connect the battery.
25 Functional check, see 82.30.16.
26 Disconnect gauge set, see 82.30.01.

AIR CONDITIONING 283

A82 038
AIR CONDITIONER UNIT
LINKAGES

Adjust 82.25.08

Linkage A
This is the linkage between control lever 'A' and flap 'A'.

1. Isolate the battery.
2. Remove the front console, see 76.25.01. This is necessary to obtain access to two screws.
3. Remove the control cowl, see 76.25.03.
4. Hold the trunnion hexagon and slacken the screw.
5. Position control lever 'A' up to the 'OFF' position.
6. Hold the flap arm in the close position. Tighten the screw.
7. Fit the control cowl, see 76.25.03.
8. Fit the front console, see 76.25.01.
9. Connect the battery.

10. Position control lever 'B' up to the 'COLD' position. Maintain in this position during operations 17 to 19.
11. Hold the bell crank so that the bell crank pin is positioned at the lower end of the swinging link slot. Tighten the screw.
12. Hold the cold thermostat input lever at its rearmost limit of travel with the forward projection against the metal stop. Tighten the screw.
13. Hold the hot thermostat input lever at its rearmost limit of travel with the forward projection against the metal stop. Tighten the screw.
14. Position control lever 'B' up to the 'COLD' position. Maintain in this position during operations 17 to 19.
15. Hold the bell crank trunnion hexagon and slacken the screw.
16. Connect the battery.
Linkage C
This is the linkage between control lever 'C' and the recirculate/fresh air flap 'C'.

23 Isolate the battery.
24 Remove the fascia, see 76.46.01.
25 Hold the trunnion hexagon and slacken the screw.
26 Position control lever 'C' to the 'MAX' position. This is one stop down from the full up position.
27 Hold the position of the 'quick changeover' lever to achieve the dimension shown. This is a nominal dimension of 2.75 mm from the lever reference face to the follower hole centre line. Tighten the screw.
28 Fit the fascia, see 76.46.01.
29 Connect the battery.

Linkage D
This is the linkage between control lever 'D' and flap 'D'.

30 Isolate the battery.
31 Remove the front console, see 76.25.01. This is necessary to obtain access to two screws.
32 Remove the control cowl, see 76.25.03.
33 Hold the trunnion hexagon and slacken the screw.
34 Position control lever 'D' up to the 'SCREEN' position.
35 Hold the flap arm in the close position. Tighten the screw.
36 Fit the control cowl, see 76.25.03.
37 Fit the front console, see 76.25.01.
38 Connect the battery.
SERVICING 82.30.00

WARNING

The refrigeration circuit must only be disturbed by a qualified refrigeration engineer possessing the required special servicing equipment. Failure to observe this instruction may result in severe personal injury.

When discharging or subsequently breaking open any pipe connections, protect the eyes with safety goggles and wear gloves.

If any liquid refrigerant should contact the eyes, splash with cold water to slowly raise the temperature. Mineral or cod liver oil on the area will reduce the chance of infection. Consult an eye specialist as soon as possible.

Ensure that no refrigerant vapour comes into contact with an open flame. Should this occur a poisonous, corrosive gas may be produced. This vapour may attack metal.

Refrigerant in containers must be protected from heat. Do not expose to radiant heat from the sun. Do not place in water above 50°C (122°F). Do not heat with any flame. Do not carry a container in the vehicle interior.

REFRIGERANT

DATA

<table>
<thead>
<tr>
<th>Type</th>
<th>Refrigerant 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approved trade names</td>
<td>Arcton 12, Freon 12, Isceon 12</td>
</tr>
</tbody>
</table>

Properties at normal atmospheric pressure and temperature

- Vapour
- Odourless
- Colourless
- Heavier than air
- Non-corrosive
- Non-explosive
- Non-inflammable
- Non-poisonous

Dangerous at normal atmospheric pressure and temperature

- contact with the skin
- contact with an open flame

Liquid refrigerant will freeze anything it contacts. Severe burns may result. Especially dangerous to the eyes. Always protect with safety goggles.

A poisonous, corrosive gas may be produced. This vapour may attack metal.
SERVICING

Description

Servicing equipment must include a suitable gauge set or service trolley. Other tools are shown below.

When it is necessary to 'break into' the refrigeration circuit the system must first be discharged.

To prevent icing or corrosion inside the refrigeration system extreme precautions must be observed during servicing to exclude moisture. Component connections and hose ends must only be open to atmosphere for a brief period. Blanking caps must be fitted immediately to any exposed connections. Replacement components will be supplied sealed and must only be opened immediately prior to making the connections.

After assembly the system must be evacuated. This should remove air, moisture and old refrigerant from the system.

The system should then be immediately charged with fresh refrigerant.

Refrigerant may be provided from single cans, from a multi-can manifold or from a service trolley container. The container should be replenished from a heavy bottle.

A method of calculating the weight of refrigerant introduced into the system is required. This may be by a spring balance or a service trolley container with a graduated scale.

1. Goggles
2. Gloves
3. Thermometer
4. 'Schrader valve' core tool — two required
5. Spanner — 1/8 A.F. to fit service valve hexagon caps
1. Position the vehicle in a suitable area. This should be:
   a. Well ventilated for the discharge of refrigerant.
   b. Away from any naked flame.
   c. Suitable for an engine run.
2. Pull off the cold air inlet hose.
3. Provide a suitable gauge set or service trolley.
4. Close all gauge set or service trolley valves.
5. Remove two service valve hexagon caps.
6. Provide two 'Schrader valve' core tools. Robinair part No. 10515.
7. Pull up two shafts. Fit one core tool to each service valve.
8. Connect the gauge set discharge hose to the discharge core tool.
9. Connect the gauge set suction hose to the suction core tool.
10. Purge the air from the two gauge set hoses as follows:
    a. Provide a supply of refrigerant to the gauge set centre manifold hose.
    NOTE: This may be from a single can, a multi-can manifold or from a service trolley container.
    b. Protect the eyes with safety goggles and wear gloves during operations c and d.
    c. Loosen the gauge set hose connection to the discharge core tool. Carefully open the gauge set discharge valve. When refrigerant is seen to be escaping tighten the hose connection. Close the gauge set discharge valve.
    d. Loosen the gauge set hose connection to the suction core tool. Carefully open the gauge set suction valve. When refrigerant is seen to be escaping tighten the hose connection. Close the gauge set suction valve.
    e. Close all gauge set or service trolley valves.

11. At discharge core tool engage shaft to 'Schrader valve'. Rotate knob anticlockwise to release valve from threads. Pull shaft up to withdraw valve.
12. At suction core tool engage shaft to 'Schrader valve'. Rotate knob anticlockwise to release valve from threads. Pull shaft up to withdraw valve.
13 Close all gauge set or service trolley valves.
14 At discharge core tool push shaft down to insert 'Schrader valve'. Rotate knob clockwise to engage valve to threads. Apply light finger torque to tighten.
15 At suction core tool push shaft down to insert 'Schrader valve'. Rotate knob clockwise to engage valve to threads. Apply light finger torque to tighten.
16 Protect the eyes with safety goggles and wear gloves during operations 17 and 18.
17 Disconnect both gauge set hoses from the core tools.
18 Pull up two shafts. Remove two core tools from the service valves.
19 Fit two service valve hexagon caps.
20 Push on the cold air inlet hose.
1. Connect gauge set, see 82.30.01.
2. Immobilize the refrigerant circuit by disconnecting the thermal fuse.
3. Hold the gauge set centre manifold hose end in a suitable rag.
4. Protect the eyes with safety goggles and wear gloves during operations 5 and 6.
5. Slightly open the gauge set discharge valve to allow the refrigerant vapour to slowly discharge to atmosphere via the hose end. If oil from the compressor is discharged, reduce the gauge set discharge valve opening.
6. When the discharge has nearly stopped open the gauge set suction valve.
7. When the discharge has stopped ensure that both gauges read zero.
8. Close both gauge set valves.
SERVICING
Evacuate 82.30.06

1. Connect gauge set, see 82.30.01.
2. Discharge, see 82.30.05.
3. Connect a vacuum pump to the gauge set centre manifold hose.
4. Open both gauge set valves fully.
5. Run the vacuum pump for 20 minutes. A vacuum of 28 in Hg should be indicated on the suction gauge. If this is not achieved, consider the possibility of a system leak.
6. Perform operation 7 with the vacuum pump running.
7. Close both gauge set valves.
8. Stop the vacuum pump.
9. Disconnect the vacuum pump from the gauge set centre manifold hose.
SERVICING

Flush 82.30.07

Two refrigerants are required. R11 and normal charge refrigerant R12.

Flushing the system assembled will remove as much soluble residue and almost as much loose corrosion debris as removing each component for manual agitation and flush. It is recommended that the system be flushed in situ.

Flushing may be performed to thoroughly clean the interior of a system for the following reasons:

To clean a system that has been left open to atmosphere. This will not occur if correct servicing procedures regarding blanking are followed. If left open atmospheric dust and moisture will enter the system. Some moisture will be absorbed by the oil and this will not be removed by evacuation. The oil itself must be removed by flushing. The following table is a guide to when flushing becomes necessary. It should be used with discretion as an intermediate time may be appropriate in certain local conditions.

<table>
<thead>
<tr>
<th>Conditions in which system has been left open in dusty or damp atmosphere</th>
<th>Flush if stated hours are exceeded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside in dusty or damp atmosphere</td>
<td>4 hours</td>
</tr>
<tr>
<td>Outside in normal atmosphere</td>
<td>48 hours</td>
</tr>
<tr>
<td>Inside in clean and dry atmosphere</td>
<td>60 hours</td>
</tr>
</tbody>
</table>

To clean a system that has suffered a component failure. A component failure may deposit swarf or other foreign matter into the system. It may be possible to remove this by flushing.

1. Connect gauge set, see 82.30.01.
2. Discharge, see 82.30.05.
3. Remove receiver drier, see 82.17.01.
4. Remove compressor, see 82.10.20.
5. Provide a suitable catch container under the two compressor pipes.
6. Provide a method to gently warm the R11 bottle to 40 to 50°C (104 to 122°F). This may be by a container of hot water. Maintain near this temperature during use.
7. Connect a hose to the R11 bottle. Position the R11 bottle above the level of the engine to discharge liquid downwards.
8. Ensure that the catch container is empty and clean.
9. Connect the R11 hose to the forward running receiver drier hose.
10. Open the R11 bottle valve. Allow R11 to drain through the half system into the catch container. Close the R11 bottle valve.
11. Allow the R11 to drain through the system for 2 to 3 minutes.
12. Disconnect the R11 hose from the receiver drier hose.
13. Connect a hose to the R12 bottle. This will discharge gas.
14. Connect the R12 hose to the forward running receiver drier hose.
15. Slightly open the R12 bottle valve. Allow R12 gas to blow through the half system to clean out the R11. Allow a further 10 second gas flow. Close the R12 bottle valve.
16. Disconnect the R12 hose from the receiver drier hose.
17. Consider the collected fluid. If it is not clean repeat instructions 8 to 17.
18. Ensure that the catch container is empty and clean.
19. Connect the R11 hose to the rearward running receiver drier hose.
20. Open the R11 bottle valve. Allow R11 to drain through the half system into the catch container. Close the R11 bottle valve.

NOTE: If the flow is restricted the filter at the expansion valve inlet connection may be blocked.
To rectify obtain access to expansion valve. Disconnect inlet hose. Remove and clean filter.

In bad cases remove expansion valve. Provide slave connection. Flush through half system. Fit new expansion valve.

21. Allow the R11 to drain through the half system for 2 to 3 minutes.
22. Disconnect the R11 hose from the receiver drier hose.

23. Connect the R12 hose to the rearward running receiver drier hose.
24. Slightly open the R12 bottle valve. Allow R12 gas to blow through the half system to clean out the R11. Allow a further 10 second gas flow. Close the R12 bottle valve.
25. Disconnect the R12 hose from the receiver drier hose.
26. Consider the collected fluid. If it is not clean repeat instructions 18 to 26.
27. Remove catch container.
28. Ensure that the system is returned to service containing the correct quantity of lubricant. Refer to 82.10.14.
29. Fit compressor, see 82.10.20.
30. Fit NEW receiver drier, see 82.17.01.
31. Evacuate, see 82.30.06.
32. Charge, see 82.30.08.
33. Functional check, see 82.30.16.
34. Disconnect gauge set, see 82.30.01.
CAUTION: Charge with refrigerant 12 of approved trade names:

- Arcton 12
- Freon 12
- Isceon 12

1. Connect gauge set, see 82.30.01.
2. Discharge, see 82.30.05.
3. Evacuate, see 82.30.06.
4. Provide a supply of refrigerant to the gauge set centre manifold hose.

**NOTE:** This may be from single cans, from a multi-can manifold or from a service trolley container.

5. If the centre manifold hose contains air purge with refrigerant as follows:
   a. Protect the eyes with safety goggles and wear gloves during operation b.
   b. Carefully loosen the gauge set centre manifold hose connection. When refrigerant is seen to be escaping tighten the hose connection.

6. Provide a method of calculating at any time during the operation, the weight of refrigerant put into the system.

**NOTE:** A single can or a multi-can manifold may be weighed by hanging from a spring balance. A service trolley container should have a graduated scale.

7. Note the datum refrigerant weight.
Slightly open the gauge set suction valve. Allow approximately ½ lb (230 g) of refrigerant to enter the system. Close the gauge set suction valve.

**NOTE:** High pressure liquid refrigerant from the container will vaporize on entering the evacuated low pressure system. Flow will continue until container pressure equals system pressure or until the gauge set suction valve is closed.

Perform a first leak test on any disturbed joints, see 82.30.09.

Slightly open the gauge set suction valve. If the pressure differential between the container and the system permits allow the flow to continue until a total of 2½ lb (1130 g) of refrigerant - from the datum weight operation 7 - has entered the system. Close the gauge set suction valve.

**NOTE:** High pressure liquid refrigerant from the container will vaporize on entering the evacuated low pressure system. Flow will continue until container pressure equals system pressure or until the gauge set suction valve is closed.

If a total of 2½ lb (1130 g) of refrigerant is in the system ignore operations 12 to 17.

If the container pressure and the system pressure equalize before a total of 2½ lb (1130 g) of refrigerant is in the system perform operations 13 to 17.

Ensure that the gauge set suction valve is closed.

Connect the thermal fuse.

Run the engine at 1000 to 1500 rev/min for 5 minutes with the control levers set as follows:
- Lever A to MAX
- Lever B to COLD
- Lever C to 3
- Lever D to CAR
- Manual cut out switch to ON

This is to warm the engine and stabilize the system.

**NOTE:** Warm air from above the engine will enter the fresh air duct to be presented to the cold matrix. This condition will cause the system to operate hard and prevent frequent cutting in and out of the compressor clutch.

Slightly open the gauge set suction valve. Allow the flow to continue until a total of 2½ lb (1130 g) of refrigerant - from the datum weight operation 7 - has entered the system. Close the gauge set suction valve.

**NOTE:** Compressor suction will draw further vaporized refrigerant into the system. The refrigeration circuit will commence to function and vapour passed into the condenser will accumulate as liquid refrigerant in the receiver drier.

Stop the engine.

Close all gauge set or service trolley valves.
A major leak in the system should be shown up during the evacuate operation prior to charging with fresh refrigerant.

Minor leaks should be searched for as instructed in the charge operation using one of the two basic types of leak testing equipment in common use.

The burner type has a hand held burner connected by hose to a cylinder of gas. A second hose attached to the burner is the search hose which draws in air or refrigerant vapour. This hose is of some length so its end may be positioned close to the unions while the burner is held and observed by a second operator a safe distance from the vehicle. A leak is indicated by the flame changing colour to green or purple. The product of burning gas and refrigerant is a poisonous corrosive gas which should not be inhaled.

The electronic type may be semi portable with mains electric power or fully portable with batteries. The sensors are sensitive to refrigerant vapour. The sensor may be positioned at the end of a search cable or the air sample may be drawn through a search hose by a small electric air pump to be passed across a sensor in the unit. The sensor signal is amplified. A leak is indicated by audible warning, a light signal or meter reading.

Whether a burner type or electronic type unit is used the equipment should be employed as detailed by the manufacturer. The following instructions are provided to assist leak testing.

**General**
Place the vehicle in a well ventilated area or refrigerant may persist in the vicinity and give misleading results. Strong draughts should be avoided as a leak may be dissipated without detection. Refrigerant is heavier than air. When checking each union pass the detector slowly round each joint with special attention to the underside.

**Compressor**
Check two pipe connections, front and rear shell to cylinder housing joints, front cover to cylinder housing joint, superheat switch seal and high pressure relief valve seal.

Check shaft seal assembly by positioning the detector between the pulley to front cover gap and the pulley to hub drive plate gap.

**Condenser**
Check two hose connections. Check all soldered joints and pass detector across underside of unit.

**Receiver drier**
Check two hose connections and high pressure cut in capillary.

**Expansion valve and air conditioner unit pipes**
Check all accessible pipes and joints. If a known leak cannot be located it may finally be necessary to perform the following:

Remove the facia. Carefully cut and pull back the insulating material to expose the pipe runs. After the leak test restore the insulating material. Ensure that the refrigerant outlet pipe is fully covered.

**Cold matrix**
Select lever ‘A’ to MAX. Insert the probe through the central facia vent. Select lever ‘D’ to CAR. Insert the probe into the footwell outlet. Check below the matrix by positioning the probe into the recirculated air inlet and checking near the drain pipe. (See 82.25.00, Sheet 1, Item 9.)
SERVICING

1. Ensure that the two compressor drive belts are correctly adjusted, see 82.10.01 and 82.10.04.
2. Connect gauge set, see 82.30.01.
3. Note the ambient air temperature.
4. Run the engine at 1000 to 1500 rev/min for 5 minutes with the control levers set as follows:
   - Lever A to MAX
   - Lever B to COLD
   - Lever C to MAX
   - Lever D to CAR
   - Manual cut out switch to ON

   **NOTE:** In humid conditions it may be necessary to reduce lever 'B' setting from full 'COLD' towards 'HOT' to prevent icing of the cold matrix. Slightly higher central facia vent air temperatures should then be expected.

5. Check that the two fan motors cycle or run continuously when the engine is hot.
6. Check that the receiver drier sight glass is clear of bubbles or foam.
7. Note the maximum discharge gauge reading when the compressor clutch is pulled in.
8. Note the minimum suction gauge reading when the compressor clutch is pulled in.
9. Insert a thermometer into the central facia vent and note the minimum temperature.
10. Stop the engine.
11. Compare all readings with the values given in the table.
12. Disconnect gauge set, see 82.30.01.

---

### Table: Ambient, Discharge, Suction, Central Facia Vent

<table>
<thead>
<tr>
<th>Ambient air temperature °F</th>
<th>Discharge gauge — maximum psi</th>
<th>Suction gauge — minimum psi</th>
<th>Central facia vent temperature — minimum °F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kg/cm²</td>
<td>kg/cm²</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>16</td>
<td>12 to 20</td>
<td>80 to 130</td>
</tr>
<tr>
<td>80</td>
<td>27</td>
<td>16 to 25</td>
<td>130 to 180</td>
</tr>
<tr>
<td>100</td>
<td>38</td>
<td>18 to 28</td>
<td>200 to 240</td>
</tr>
<tr>
<td>110</td>
<td>43</td>
<td>19 to 29</td>
<td>240 to 275</td>
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<table>
<thead>
<tr>
<th>°F</th>
<th>°C</th>
<th>psi</th>
<th>kg/cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>16</td>
<td>12 to 20</td>
<td>0.8 to 1.4</td>
</tr>
<tr>
<td>80</td>
<td>27</td>
<td>16 to 25</td>
<td>1.1 to 1.8</td>
</tr>
<tr>
<td>100</td>
<td>38</td>
<td>18 to 28</td>
<td>1.3 to 2.0</td>
</tr>
<tr>
<td>110</td>
<td>43</td>
<td>19 to 29</td>
<td>1.3 to 2.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>°F</th>
<th>°C</th>
<th>psi</th>
<th>kg/cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>27</td>
<td>16 to 25</td>
<td>1.1 to 1.8</td>
</tr>
<tr>
<td>100</td>
<td>38</td>
<td>18 to 28</td>
<td>1.3 to 2.0</td>
</tr>
<tr>
<td>110</td>
<td>43</td>
<td>19 to 29</td>
<td>1.3 to 2.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>°F</th>
<th>°C</th>
<th>psi</th>
<th>kg/cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>16</td>
<td>12 to 20</td>
<td>0.8 to 1.4</td>
</tr>
<tr>
<td>80</td>
<td>27</td>
<td>16 to 25</td>
<td>1.1 to 1.8</td>
</tr>
<tr>
<td>100</td>
<td>38</td>
<td>18 to 28</td>
<td>1.3 to 2.0</td>
</tr>
<tr>
<td>110</td>
<td>43</td>
<td>19 to 29</td>
<td>1.3 to 2.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>°F</th>
<th>°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 to 40</td>
<td>0 to 4</td>
</tr>
<tr>
<td>35 to 44</td>
<td>2 to 7</td>
</tr>
<tr>
<td>38 to 47</td>
<td>3 to 8</td>
</tr>
<tr>
<td>39 to 48</td>
<td>4 to 9</td>
</tr>
</tbody>
</table>

The above figures are not specific to the TR8 installation. All readings obtained should be approximately equal to the values given in the table.
WINDSCREEN WASHER RESERVOIR
Remove and refit 84.10.01
Removing
1 Pull the windscreen washer reservoir pipe from the windscreen washer pump.
2 Lift the windscreen washer reservoir from the retaining bracket.
Refitting
3 Reverse 1 to 2.

WINDSCREEN WASHER JET
Remove and refit 84.10.09
Removing
1 Pull the pipe from the jet.
2 Remove the nut and anti-vibration washer.
   NOTE: Take care not to drop the nut and anti-vibration washer as retrieval may prove difficult.
3 Remove the jet and rubber sealing washer.
Refitting
4 Reverse 1 to 3. Fit the jet with the jet outlet in the correct location to the bonnet.
5 Close the bonnet and operate the pump to check the jet aim.
6 If necessary adjust the jet aim by using a screwdriver in the slot to slightly rotate the jet outlet.

WINDSCREEN WASHER PUMP
Remove and refit 84.10.21
Removing
1 Remove the windscreen washer reservoir, see 84.10.01 to obtain improved access.
2 Disconnect two Lucar connectors.
3 Note the positions of the inlet and outlet pipes. IN and OUT are stamped on the mounting bracket.
4 Pull the outlet pipe from the windscreen washer pump.
5 Remove two Pozidriv screws and washers. Remove the windscreen washer pump.
   NOTE: Take care not to drop the two Pozidriv screws and washers as retrieval may prove difficult.
Refitting
6 Position the windscreen washer pump. Secure with two Pozidriv screws and washers.
7 Push the outlet pipe onto the windscreen washer pump in the position noted at operation 3 above.
8 Connect two Lucar connectors as follows: Light green/black wire to the positive terminal. Black wire to the negative terminal.
9 Refit windscreen washer reservoir, see 84.10.01.

WINDSCREEN WASHER PUMP
Overhaul 84.10.24
The motor is a sealed unit and cannot be serviced. It is possible to dismantle and clean the interior of the pump as detailed below.
Dismantling
1 Remove three screws.
2 Lift off the bracket.
3 Remove the pump cover.
4 Remove the rubber disc.
5 Remove the metal disc.
6 Remove the plastic disc.
7 Carefully withdraw the rotor.
8 Withdraw the rotor housing.
Reassembling
9 Reverse 1 to 8. Ensure that all the components are assembled the correct way round as shown.
A switching feature stops the blades in the park position irrespective of their position when the steering column switch is selected OFF. This is effected by a two stage limit switch unit attached to the gearbox. The contacts are actuated by a straight cam slope on a slider block which is traversed by a projection from the cross head.

When the steering column switch is selected OFF, the motor will continue to run until the limit switch first stage contacts open. A momentary period follows during which no contact is made. The second stage contacts then close causing regenerative braking of the armature which maintains consistent parking of the blades.

**DATA**

<table>
<thead>
<tr>
<th>Motor</th>
<th>84.15.00</th>
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</thead>
<tbody>
<tr>
<td>Manufacturer</td>
<td>Lucas</td>
</tr>
<tr>
<td>Type</td>
<td>16W</td>
</tr>
<tr>
<td>Running current—after 60 seconds from cold with connecting rod removed:</td>
<td></td>
</tr>
<tr>
<td>Normal speed</td>
<td>1.5 amp</td>
</tr>
<tr>
<td>High speed</td>
<td>2.0 amp</td>
</tr>
<tr>
<td>Running speed—final gear after 60 seconds from cold with connecting rod removed:</td>
<td></td>
</tr>
<tr>
<td>Normal speed</td>
<td>46 to 52 rev/min.</td>
</tr>
<tr>
<td>High speed</td>
<td>60 to 80 rev/min</td>
</tr>
<tr>
<td>Armature end-float</td>
<td>0.002 to 0.008 in. (0.05 to 0.20 mm)</td>
</tr>
<tr>
<td>Brush length—normal speed: new</td>
<td>0.380 in. (9.65 mm)</td>
</tr>
<tr>
<td>Brush length—normal speed: renew if less than</td>
<td>0.380 in. (9.65 mm)</td>
</tr>
<tr>
<td>Brush length—high speed: new</td>
<td>0.280 in. (7.11 mm) (i.e. when narrow section is worn to step into full width section)</td>
</tr>
<tr>
<td>Brush length—high speed: renew if less than</td>
<td>0.380 in. (9.65 mm)</td>
</tr>
<tr>
<td>Brush length—earth: new</td>
<td>0.180 in. (4.76 mm)</td>
</tr>
<tr>
<td>Brush length—earth: renew if less than</td>
<td>0.180 in. (4.76 mm)</td>
</tr>
<tr>
<td>Brush spring pressure—when compressed so brush bottom is aligned with brushbox slot end</td>
<td>5 to 7 ozf (140 to 200 gf)</td>
</tr>
<tr>
<td>Maximum permissible force to move cable rack in tubing—arms and blades removed</td>
<td>6 lbf (3 kgf)</td>
</tr>
</tbody>
</table>
WINDSCREEN WIPER ARM
Driver’s – remove and refit 84.15.02
Removing
1 Position a screwdriver as shown and impart a twisting action to lift the clip from the spindle groove.
2 The arm may now be removed from the spindle by hand.
3 Remove the spindle nut.
4 Remove the distance piece.
5 Remove the wiper arm pivot plate.
Refitting
6 Position the wiper arm pivot plate.
7 Position the distance piece with the tongue correctly located through the pivot plate, rubber gasket and body slot.
8 Fit the spindle nut.
9 Ensure that the spindle is in the ‘park’ position.
10 Locate the splines for a suitable ‘park’ position. Push on to engage the clip to the spindle groove.

WINDSCREEN WIPER BLADE
Driver’s – remove and refit 84.15.06
Removing
1 Lift the wiper arm and blade away from the screen.
2 Simultaneously depress the clip and withdraw the blade pin from the pivot block.
CAUTION: If the wiper blade refit is not to take place immediately protect the windscreen glass as follows: Bind the arm end with suitable tape. Isolate the battery to ensure that the wiper motor is not energised.
Refitting
3 Reverse 1 to 2.

WINDSCREEN WIPER ARM
Passenger’s – remove and refit 84.15.03
Removing
1 Lift the wiper arm and blade from the screen so that it falls into its service position.
2 Position a screwdriver as shown and impart a twisting action to lift the clip from the spindle groove.
3 The assembly may now be removed by hand.
Refitting
4 Ensure that the spindles are in the ‘park’ position.
5 Hinge the wiper arm against the spring to adopt its service position.
6 Locate the splines for a suitable ‘park’ position. Push on to engage the clip to the spindle groove.
7 Lower the wiper arm to the screen.

WINDSCREEN WIPER BLADE
Passenger’s – remove and refit 84.15.07
Removing
1 Lift the wiper arm and blade from the screen so that it falls into its service position.
2 Simultaneously lift the clip and withdraw the blade pin from the arm.
Refitting
3 Reverse 1 to 2.
WINDSCREEN WIPER SYSTEM

Removing
1. Remove the passenger's wiper arm, see 84.15.03.
2. Remove the driver's wiper arm from the wheelbox spindle, see 84.15.02 operations 1 to 2.
3. Remove the fresh air duct, see 80.15.31.
4. Remove the windscreen washer reservoir tank.
5. Disconnect the harness plug.
6. Remove single screw. Disengage the clamp strap from the vehicle body slot.
7. Remove two Pozidriv screws and washers. Withdraw the plate adjacent to the brake master cylinder servo.
8. At the driver's wheelbox remove the rubber gasket.
9. At the passenger's wheelbox remove the spindle nut, distance piece and rubber gasket.
10. Maneuvre the motor and drive assembly from the vehicle.

Refitting
11. Position the motor and drive assembly to the vehicle.
12. At the passenger's wheelbox fit the rubber gasket, distance piece and spindle nut.
13. At the driver's wheelbox fit the rubber gasket.
14. Insert the plate adjacent to the brake master cylinder servo. Secure with two Pozidriv screws and washers.
15. Slacken the olive nut.
16. Ensure that the rubber pad is correctly positioned.
17. Position the motor and tubes for the best alignment.
18. Engage the clamp strap to the vehicle body slot. Secure with single screw.
19. Tighten the olive nut.
20. Connect the harness plug.
21. Fit the windscreen washer reservoir tank.
22. Fit the fresh air duct, see 80.15.31.
23. Run the motor and 'switch off' using the windscreen wiper switch so that the wheelbox spindles assume the 'park' position.
24. Fit the driver's wiper arm to the wheelbox spindle, see 84.15.02 operations 9 to 10.
25. Fit the passenger's wiper arm, see 84.15.03.
WINDSCREEN WIPER SYSTEM
Motor – remove and refit 84.15.12

Removing
1 Remove the motor and drive assembly, see 84.15.10.
2 Remove five screws. Lift off the gearbox cover.
3 Remove the crankpin spring clip by withdrawing sideways. Remove the washer.
4 Carefully withdraw the connecting rod. Remove the washer.
5 Lift out the cross-head, rack and tube assembly.

Refitting
6 Lubricate all moving parts of the motor during assembly as instructed on the illustration.
7 Position the slider block with the direction of cam slope as shown.
8 Position the cross-head, rack and tube assembly locating the projection in the slider block slot.
9 Fit the washer. Carefully insert the connecting rod.
10 Fit the washer. Fit the crankpin spring clip by inserting sideways.
11 Position the gearbox cover. Secure with five screws.
12 Fit the motor and drive assembly, see 84.15.10.

RLG Ragosite Listate grease
ST410 Shell Turbo 41 oil
**WINDSCREEN WIPER MOTOR**

**Overhaul 84.15.18**

**Dismantling**

1. Remove five screws. Lift off the gearbox cover.
2. Lift out the slider block.
3. Remove the crankpin spring clip by withdrawing sideways. Remove the washer.
4. Carefully withdraw the connecting rod. Remove the washer.
5. Remove the final gear shaft spring clip by withdrawing sideways. Remove the washer.
6. Ensure that the shaft is burr-free and withdraw it. Remove the dished washer.
7. Remove the thrust screw and locknut.
8. Remove the through bolts.
9. Carefully withdraw the cover and armature about 0.2 in (5 mm). Continue withdrawal allowing the brushes to drop clear of the commutator. Ensure that the three bushes are not contaminated with grease.
10. Pull the armature from the cover against the action of the permanent magnet.
11. Scribe a line round the limit switch to note its position on the gearbox.
12. Remove three screws to release the brush assembly.
13. Remove two screws and washers to release the limit switch.
14. Remove both units joined together by the wires.
15. Remove the plate.

**Reassembling**

16. Lubricate all moving parts of the motor during assembly as instructed in the text and on the illustration.
17. Position the plate so that the round hole will accommodate the limit switch plunger.
18. Position the limit switch to the scribe lines made at operation 11 above. Secure with two screws and washers.
19. Secure the brush assembly with three screws.
20. Lubricate the cover bearing and saturate the cover bearing felt washer with Shell Turbo 41 oil.
21. Position the armature to the cover against the action of the permanent magnet.
22. Lubricate the self-aligning bearing with Shell Turbo 41 oil.
23. Ensure that the three brush springs and brushes are correctly positioned. Retain in position using slave clips locally made from paper clips or similar wire as shown.
24. Carefully insert the armature shaft through the bearing. Ensure that the brushes are not contaminated with lubricant. Ensure that the commutator clears the brushes.
25. With the brushes over the commutator remove the slave clips.

*continued*
26 Seat the cover against the gearbox. Turn the cover to align the marks shown. Fit the through bolts.
27 Fit the thrust screw and locknut.
28 Adjust the armature end-float as follows: Slacken the locknut. Screw the thrust screw in until resistance is felt. Screw the thrust screw out a quarter of a turn — maintain in this position and tighten the locknut.
29 Lubricate the final gear bushes with Shell Turbo 41 oil.
30 Fit the dished washer with its concave surface facing the final gear. Insert the shaft.
31 Fit the washer. Fit the spring clip by inserting sideways.

NOTE: If the motor is to be immediately fitted to the motor and drive assembly, ignore operations 32 to 35. Refit the motor, see 84.15.12. If the motor is to be stored, perform the remaining operations.
32 Position the slider block with the direction of cam slope as shown.
33 Fit the washer. Carefully insert the connecting rod.
34 Fit the washer. Fit the crankpin spring clip by inserting sideways.
35 Position the gearbox cover. Secure with five screws.

WINDSCREEN WIPER SYSTEM
Rack — remove and refit 84.15.24

Removing
1 Remove the motor and drive assembly, see 84.15.10.
2 Remove the motor, see 84.15.12.
3 Withdraw the rack from the tube assembly.
4 Remove the ferrule.

Refitting
5 Fit the ferrule.
6 Lubricate the rack with Ragosine Listate grease.
7 Insert the rack into the tube assembly. If necessary slightly rotate the wheelbox spindles by hand to facilitate rack engagement.
8 Fit the motor, see 84.15.12.
9 Fit the motor and drive assembly, see 84.15.10.
WINDSCREEN WIPER SYSTEM

Wheelbox – driver’s – remove and refit 84.15.28

Removing
1 Remove the motor and drive assembly, see 84.15.10.
2 Scribe a line to note the radial position of the tube.
3 Remove two nuts. Remove the wheelbox plate.
4 Disengage and remove the short straight tube.
5 Disengage and remove the wheelbox.

Refitting
6 If a new wheelbox is to be fitted reproduce the scribe line on the new unit.
7 Fit the wheelbox the correct way round.
8 Lubricate the wheelbox and exposed section of the rack with Ragosine Listate grease.
9 Reverse 1 to 4.

WINDSCREEN WIPER SYSTEM

Wheelbox – passenger’s – remove and refit 84.15.29

Removing
1 Remove the motor and drive assembly, see 84.15.10.
2 Scribe two lines to note the radial position of the tube.
3 Remove two nuts. Remove the wheelbox plate.
4 Disengage and remove the tube and far wheelbox assembly.
5 Disengage and remove the wheelbox.

Refitting
6 If a new wheelbox is to be fitted reproduce the scribe lines on the new unit.
7 Fit the wheelbox the correct way round.
8 Lubricate the wheelbox and exposed section of the rack with Ragosine Listate grease.
9 Reverse 1 to 4.
WIRING DIAGRAM — TR8 — 1978/79 U.S.A. MARKET — CARBURETTER CARS WITH AIR CONDITIONING
<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Battery</td>
</tr>
<tr>
<td>2</td>
<td>Alternator</td>
</tr>
<tr>
<td>3</td>
<td>Starter motor</td>
</tr>
<tr>
<td>4</td>
<td>Starter motor relay</td>
</tr>
<tr>
<td>5</td>
<td>R.H. headlamp relay</td>
</tr>
<tr>
<td>6</td>
<td>L.H. headlamp relay</td>
</tr>
<tr>
<td>7</td>
<td>Headlamp motor circuit breaker</td>
</tr>
<tr>
<td>8</td>
<td>Start inhibit switch (Automatic)</td>
</tr>
<tr>
<td>9</td>
<td>Ignition switch</td>
</tr>
<tr>
<td>10</td>
<td>Buzzer timer unit</td>
</tr>
<tr>
<td>11</td>
<td>L.H. headlamp motor</td>
</tr>
<tr>
<td>12</td>
<td>R.H. headlamp motor</td>
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<tr>
<td>13</td>
<td>Master light switch</td>
</tr>
<tr>
<td>14</td>
<td>Cigar lighter</td>
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<tr>
<td>15</td>
<td>Seat belt warning light</td>
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<tr>
<td>16</td>
<td>Buckle switch</td>
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<td>17</td>
<td>Door switch</td>
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<td>Radio</td>
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<td>Hazard unit</td>
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<td>Hazard switch</td>
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<tr>
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<td>Main/dip/flash switch</td>
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<td>Main beam warning light</td>
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<td>R.H. main beam</td>
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<td>L.H. main beam</td>
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<td>R.H. dip beam</td>
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<tr>
<td>34</td>
<td>L.H. side indicator</td>
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<tr>
<td>35</td>
<td>Front fog lamps junction</td>
</tr>
<tr>
<td>36</td>
<td>Heater control illumination</td>
</tr>
<tr>
<td>37</td>
<td>Borg-Warner illumination</td>
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<tr>
<td>38</td>
<td>Cigar lighter illumination</td>
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<td>39</td>
<td>Panel rheostats</td>
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<td>Switch panel illumination</td>
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<td>41</td>
<td>Panel illumination</td>
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<td>42</td>
<td>Rear fog lamps illumination</td>
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<td>43</td>
<td>Rear fog lamps warning light</td>
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<td>44</td>
<td>Fog lamps switch</td>
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<tr>
<td>45</td>
<td>L.H. indicator warning light</td>
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<td>46</td>
<td>R.H. indicator warning light</td>
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<td>47</td>
<td>Flasher unit</td>
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<td>Direction indicator switch</td>
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<td>Horn-push</td>
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<td>Horn relay</td>
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<td>Horns</td>
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<td>Windscreen wiper motor</td>
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<td>Windscreen wipe/wash switch</td>
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<td>Windscreen washer motor</td>
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<td>55</td>
<td>Door switch</td>
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<td>Courtesy light</td>
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<td>Door switch</td>
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<td>Courtesy light</td>
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<td>Boot lamp</td>
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<td>Boot lamp switch</td>
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<td>Reverse light switch</td>
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<td>Stop light switch</td>
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<td>Heated rear screen — TR8 coupe</td>
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<tr>
<td>66</td>
<td>Heated rear screen</td>
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<tr>
<td>67</td>
<td>Heated rear screen relay</td>
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<tr>
<td>68</td>
<td>Heated rear screen switch</td>
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<td>Heated rear screen warning light</td>
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<tr>
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<td>L.H. side indicator</td>
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<td>71</td>
<td>R.H. side indicator</td>
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<td>72</td>
<td>L.H. stop light</td>
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<td>73</td>
<td>R.H. stop light</td>
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<tr>
<td>74</td>
<td>L.H. reverse light</td>
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<tr>
<td>75</td>
<td>R.H. reverse light</td>
</tr>
<tr>
<td>76</td>
<td>Number-plate lights</td>
</tr>
<tr>
<td>77</td>
<td>R.H. side marker</td>
</tr>
<tr>
<td>78</td>
<td>R.H. tail lights</td>
</tr>
<tr>
<td>79</td>
<td>L.H. tail lights</td>
</tr>
<tr>
<td>80</td>
<td>L.H. side marker</td>
</tr>
<tr>
<td>81</td>
<td>Distributor</td>
</tr>
<tr>
<td>82</td>
<td>Ignition coil</td>
</tr>
<tr>
<td>83</td>
<td>Ballast resistor</td>
</tr>
<tr>
<td>84</td>
<td>Fuel pump</td>
</tr>
<tr>
<td>85</td>
<td>Inertia switch</td>
</tr>
<tr>
<td>86</td>
<td>Tank unit</td>
</tr>
<tr>
<td>87</td>
<td>Low fuel delay unit</td>
</tr>
<tr>
<td>88</td>
<td>Brake pressure differential switch</td>
</tr>
<tr>
<td>89</td>
<td>Handbrake switch</td>
</tr>
<tr>
<td>90</td>
<td>Oil pressure switch</td>
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<tr>
<td>91</td>
<td>Ignition warning light</td>
</tr>
<tr>
<td>92</td>
<td>Oil warning light</td>
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<tr>
<td>93</td>
<td>Brake warning light</td>
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<tr>
<td>94</td>
<td>Choke warning light</td>
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<td>95</td>
<td>Low fuel warning light</td>
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<tr>
<td>96</td>
<td>Fuel gauge</td>
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<tr>
<td>97</td>
<td>Tachometer</td>
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<tr>
<td>98</td>
<td>Temperature gauge</td>
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<tr>
<td>99</td>
<td>Battery condition indicator</td>
</tr>
<tr>
<td>100</td>
<td>Temperature gauge</td>
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<tr>
<td>101</td>
<td>Air conditioning circuit</td>
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<tr>
<td>102</td>
<td>Fan motor</td>
</tr>
<tr>
<td>103</td>
<td>Fan motor</td>
</tr>
<tr>
<td>104</td>
<td>Heater/air conditioning blower unit</td>
</tr>
<tr>
<td>105</td>
<td>Cold thermostat</td>
</tr>
<tr>
<td>106</td>
<td>Fan high speed — supply line relay</td>
</tr>
<tr>
<td>107</td>
<td>Manual cut-out switch</td>
</tr>
<tr>
<td>108</td>
<td>Radiator temperature switch</td>
</tr>
<tr>
<td>109</td>
<td>Fan low speed relay</td>
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<tr>
<td>110</td>
<td>High pressure cut-in</td>
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<tr>
<td>111</td>
<td>Delay circuit relay</td>
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<td>112</td>
<td>Thermal fuse</td>
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<tr>
<td>113</td>
<td>Compressor clutch</td>
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<tr>
<td>114</td>
<td>Superheat switch</td>
</tr>
<tr>
<td>115</td>
<td>Engine temperature switch</td>
</tr>
<tr>
<td>116</td>
<td>Fan high speed — earth line relay</td>
</tr>
</tbody>
</table>

**COLOUR CODE**

<table>
<thead>
<tr>
<th>Colour</th>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>Brown</td>
<td>B</td>
<td>Purple</td>
</tr>
<tr>
<td>Blue</td>
<td>U</td>
<td>Green</td>
</tr>
<tr>
<td>Red</td>
<td>R</td>
<td>Pink</td>
</tr>
<tr>
<td>White</td>
<td>W</td>
<td>Yellow</td>
</tr>
<tr>
<td>Slate</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Orange</td>
<td>G</td>
<td></td>
</tr>
<tr>
<td>Light Green</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>W</td>
<td></td>
</tr>
</tbody>
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MAIN WIRING DIAGRAM — TR8 — 1980 U.S.A. MARKET — FUEL INJECTION CARS WITH AIR CONDITIONING
KEY TO TR8 — 1980 U.S.A. MARKET — FUEL INJECTION CARS WIRING DIAGRAMS

1 Battery
2 Alternator
3 Starter motor
4 Headlamp relay
5 Headlamp motor circuit breaker
6 Starter motor relay
7 Starter inhibitor switch (Automatic transmission)
8 Ignition switch
9 Battery condition indicator
10 Fan relay
11 Fan motor
12 Temperature switch
13 Temperature gauge sensor
14 Battery condition indicator
15 Manual cut-out switch
16 Heater/air conditioning blower unit
17 High pressure cut-in
18 Manual cut-out switch
19 Temperature switch
20 Temperature gauge
21 Battery condition indicator
22 Temperature gauge
23 Battery condition indicator
24 Tachometer
25 Fuel gauge
26 Low coolant warning light
27 Brake warning light
28 Choke warning light
29 Oil warning light
30 Ignition warning light
31 L.H. headlamp motor
32 R.H. headlamp motor
33 Master light switch
34 Loudspeakers
35 Radio
36 Buzzers
37 Seat belt warning light

38 Buckle switch
39 Audible warning
40 Hazard unit
41 Cigarette lighter
42 Horn-push
43 Delay circuit relay
44 Horn relay
45 Windscreen washer motor
46 Horns
47 Windscreen wash/wipe switch
48 Windscreen wiper motor
49 Low fuel warning light
50 Low fuel delay unit
51 Tank unit
52 Ignition coil
53 Distributor
54 Oil pressure switch
55 Oil pressure switch
56 Choke switch
57 Brake pressure differential switch
58 Heated rear screen switch
59 Heated rear screen
60 Main beam warning light
61 R.H. main beam
62 L.H. main beam
63 R.H. dip beam
64 L.H. dip beam
65 R.H. dipped beam
66 L.H. dipped beam
67 R.H. side marker
68 L.H. side marker
69 R.H. sidelight
70 L.H. sidelight
71 L.H. fog lamp
72 R.H. fog lamp
73 L.H. fog lamp
74 R.H. fog lamp
75 L.H. tail lamp
76 R.H. tail lamp
77 L.H. side marker
78 Number-plate illumination
79 R.H. side marker
80 Hazard switch
81 Borg-Warner illumination
82 Cigarette lighter illumination
83 Main/dip/flash headlamp switch
84 Windscreen washer motor
85 Flasher unit
86 Number-plate illumination
87 Clock
88 Fog lamp switch
89 Panel rheostat
90 Boot lamp
91 Boot lamp switch
92 Panel illumination
93 Courtesy light
94 Door switch
95 Service interval counter
96 Rear screen relay
97 Low coolant level indicator unit
98 Low coolant level sensor
99 Lambda (oxygen) sensors warning light
100 Direction indicator switch
101 Reverse lamp switch
102 Stop lamp switch
103 L.H. indicator warning light
104 R.H. indicator warning light
105 R.H. reverse lamp
106 L.H. reverse lamp
107 R.H. stop lamp
108 L.H. stop lamp
109 R.H. side indicator
110 L.H. side indicator
111 R.H. side indicator
112 L.H. side indicator
113 Fuel pump
114 Inertia switch
115 Combination relay
116 Temperature switch/water thermostor
117 Throttle potentiometer
118 Extra air valve
119 Lambda (oxygen) sensor
120 Air-flow meter
121 Thermostat switch
122 Cold start injector
123 Injectors
124 Junction
125 Thermal fuse
126 Compressor clutch
127 Superheat switch
128 Ballast resistor
129 Solenoid valve
130 Heated rear screen relay
131 Aerial motor junction
132 Cold thermostat
133 Electronic control unit
134 Injector ballast resistors
135 Feedback monitor point
136 N Brown
137 A To combination relay (115)
138 From main harness
139 D To heated rear screen switch
140 E To terminal 1 on E.C.U.
141 F To ballast resistor

COLOUR CODE

N Brown
U Blue
R Red

P Purple
G Green
K Pink

LG Light Green
W White
Y Yellow

S Slate
B Black
O Orange
The Lucas alternator — type 17 or 25-ACR is fitted according to specification of the car, and is a high output three-phase machine which produces current at idling speed.

The heatsink — rectifier terminal block assembly can be removed complete. There are six silicon diodes connected to form a full-wave rectifier bridge circuit, and three silicon diodes which supply current to the rotor winding. Individual diodes cannot be removed from the heatsink assemblies. Regulation is by a Lucas type 8TRD control unit mounted in the slip-ring end bracket. There is no provision for adjustment in service.

Individual connectors are used to connect external wiring to the alternator. The alternators main negative terminals are connected internally to the body of the machine. Provision is made for the connection of external negative wiring if required.

Surge protection device
The surge protection device is a special avalanche-diode, fitted to the outer face of the slip-ring end bracket (not to be confused with a suppression capacitor, similarly fitted in the end bracket). The avalanche diode is connected between terminal ‘IND’ and frame and its purpose is to protect the regulator from damage by absorbing high transient voltages which occur in the charging system due to faulty cable connections, or if the cables are temporarily disconnected at the battery whilst the engine is running. (The surge protection device is intended to provide limited protection for the regulator under normal working conditions and therefore the service precaution not to disconnect any of the charging system cables, particularly those at the battery, while the engine is running, should still be observed.)

CAUTION: No part of the charging circuit should be connected or disconnected while the engine is running.

When using electric-arc welding equipment in the vicinity of the engine take the following precautions to avoid damage to the semi-conductor devices used in the alternator and control box, and also the ignition system.

Disconnect battery earthed lead.
Disconnect alternator output cables.
Disconnect ignition and amplifier unit.

---

### ALTERNATOR DATA CHART

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Lucas 17 ACR</th>
<th>Lucas 25 ACR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>TRC 3407</td>
<td>PRC 0671</td>
</tr>
<tr>
<td>Polarity</td>
<td>Negative earth only</td>
<td>Negative earth only</td>
</tr>
<tr>
<td>Brush length</td>
<td>0.5 in (12.70 mm)</td>
<td>0.5 in (12.70 mm)</td>
</tr>
<tr>
<td>— new</td>
<td>0.2 in (5.00 mm) protrudes from brushbox when free</td>
<td>0.3 in (8.00 mm) protrudes from brushbox when free</td>
</tr>
<tr>
<td>Brush spring pressure</td>
<td>9 to 13 oz (255 to 370 g) at face flush with brushbox</td>
<td>9 to 13 oz (255 to 370 g) at face flush with brushbox</td>
</tr>
<tr>
<td>Rectifier pack</td>
<td>6 diodes (3 live side and 3 earth side)</td>
<td>6 diodes (3 live side and 3 earth side)</td>
</tr>
<tr>
<td>— output rectification</td>
<td>3 diodes</td>
<td>3 diodes</td>
</tr>
<tr>
<td>— field winding supply rectification</td>
<td>3 diodes</td>
<td>3 diodes</td>
</tr>
<tr>
<td>Stator windings</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Field winding rotor</td>
<td>15,000 rev/min</td>
<td>15,000 rev/min</td>
</tr>
<tr>
<td>— poles</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>— shaft thread</td>
<td>15,000 rev/min</td>
<td>15,000 rev/min</td>
</tr>
<tr>
<td>Field winding resistance at 20°C</td>
<td>3.2 ± 5% ohms</td>
<td>3.0 to 3.5 ohms</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td>Dual sensed-battery sensed with machine sensed safety control</td>
</tr>
<tr>
<td>— temperature</td>
<td>European</td>
<td>European</td>
</tr>
<tr>
<td>Regulation — type</td>
<td>14TR</td>
<td>14TR</td>
</tr>
<tr>
<td>Terminations</td>
<td>European</td>
<td>BSH</td>
</tr>
<tr>
<td>Adjustment bolt tapping</td>
<td>Metric M8–1.25</td>
<td>Metric M8–1.25</td>
</tr>
<tr>
<td>Nominal output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— condition</td>
<td>Hot</td>
<td>Hot</td>
</tr>
<tr>
<td>— alternator speed</td>
<td>6000 rev/min</td>
<td>6000 rev/min</td>
</tr>
<tr>
<td>— control voltage</td>
<td>14 volt</td>
<td>14 volt</td>
</tr>
<tr>
<td>— amp</td>
<td>36 amp</td>
<td>65 amp</td>
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ALTERNATOR WIRING DIAGRAM
Lucas 17ACR Alternator with 14TR Regulator
### Key to Alternator Wiring Diagram

**Lucas 17ACR Alternator with 14TR Regulator**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stator windings</td>
</tr>
<tr>
<td>2</td>
<td>Live side output diodes</td>
</tr>
<tr>
<td>3</td>
<td>Earth side output diodes</td>
</tr>
<tr>
<td>4</td>
<td>Field winding supply diodes</td>
</tr>
<tr>
<td>5</td>
<td>European terminations</td>
</tr>
<tr>
<td>6</td>
<td>Brushes to slip-rings</td>
</tr>
<tr>
<td>7</td>
<td>Field winding</td>
</tr>
<tr>
<td>8</td>
<td>Battery sensed lead—white</td>
</tr>
<tr>
<td>R4</td>
<td>Resistor</td>
</tr>
<tr>
<td>T2</td>
<td>Intermediate transistor</td>
</tr>
<tr>
<td>9</td>
<td>Metal connector link</td>
</tr>
<tr>
<td>T3</td>
<td>Output transistor</td>
</tr>
<tr>
<td>R1 and R2</td>
<td>Resistors</td>
</tr>
<tr>
<td>ZD</td>
<td>Zener diode</td>
</tr>
<tr>
<td>T1</td>
<td>Input transistor</td>
</tr>
<tr>
<td>C1 and R5</td>
<td>Capacitor and resistor</td>
</tr>
<tr>
<td>R3</td>
<td>Resistor</td>
</tr>
<tr>
<td>10</td>
<td>Surge lead—yellow</td>
</tr>
<tr>
<td>D1</td>
<td>Surge quench diode</td>
</tr>
<tr>
<td>C2</td>
<td>Condenser</td>
</tr>
<tr>
<td>11</td>
<td>Machine-sensed lead—red</td>
</tr>
<tr>
<td>R6</td>
<td>Resistor</td>
</tr>
<tr>
<td>D2</td>
<td>Diode</td>
</tr>
<tr>
<td>AD</td>
<td>Avalanche diode</td>
</tr>
<tr>
<td>12</td>
<td>Earth lead—black</td>
</tr>
</tbody>
</table>

### Symbols and Notes:
- **IND**: Ignition warning light
- **S**: Sense to battery
- **+**: Main to battery
- **ELECTRICAL SYSTEM 315**
ALTERNATOR
Test (in situ) Lucas alternators only
86.10.01
(a) Output test
Equipment required: A moving coil ammeter or multi-range test meter on range 0–75 amperes.
This test should be carried out with the alternator at normal temperature. Run cold engine at 3,000 rev/min for 3 to 4 minutes.
1 Disconnect battery earth lead.
2 Connect ammeter in series with alternator main output cable and starter solenoid.
3 Remove connectors from alternator. Remove moulded end cover and remake connectors.
4 Connect jumper lead to short out the 'F' and '-' terminals of the control unit.
(This makes regulator inoperative by effectively linking 'F' green lead to alternator frame.)
5 Re-connect battery earth lead.
6 Switch off all vehicle lighting, headlights on main beam. Switch on ignition and check warning light is on.
7 Start engine, slowly increase speed to 3,000 rev/min. Ammeter reading should equal maximum rated output of 36 amperes (65 amperes for 25 ACR alternator).
(b) Voltage drop test (in situ)
Equipment required: A moving coil voltmeter multi-range test meter on 0–30 volt range.
To check for high resistance in the charging circuit:
1 Connect voltmeter between battery +ve terminal and alternator main output terminal.
2 Switch on all vehicle lighting, headlights on main beam. Start engine and run at 3,000 rev/min. Note voltmeter reading. Stop engine.
3 Transfer voltmeter connections to battery earth and alternator negative terminal.
4 Repeat operation 2. Note voltmeter reading.
5 Voltage should not exceed 0.5 volts for positive side. Higher readings indicate high resistance in the circuit.
(c) Control unit test
Equipment required: A moving coil ammeter and moving coil voltmeter or multi-range test meters.
Circuit wiring must be in good condition, and all connections clean and secure. The battery must be in a well charged condition, or be temporarily replaced by a charged unit.
1 Connect ammeter in series with starter solenoid and alternator main output cable.
2 Connect voltmeter between battery terminals.
3 Start engine and run at 3,000 rev/min until the ammeter reads less than 10 amperes. Voltmeter reading should be between 13.0 volts and 14.4 volts.
4 An unstable reading or a reading outside the specified limits indicates a faulty control unit.
ALTERNATOR

86.10.02

Removing
1. Disconnect the battery.
2. Slacken the alternator tensioner bracket bolts.
3. Slacken the alternator pivot bolts.
4. Release the tension on the drive belt.
5. Disconnect the drive belt from the alternator.
6. Disconnect the multi-plug from the alternator.
7. Remove the bolt from the tensioner bracket.
8. Remove the alternator pivot bolts.
9. Slacken the clip on the temperature sensor at the air cleaner.
10. Disconnect the temperature sensor from the air cleaner.
11. Disconnect the air intake hose from the temperature sensor.
12. Remove the alternator.
13. Remove spacer from mounting.

Refitting
14. Fit spacer and position the alternator.
15. Loosely fit the alternator pivot bolts and ensure that the earth strap is in position.
16. Re-connect the temperature sensor to the air cleaner.
17. Tighten the sensor clip.
18. Re-connect the air intake hose to the temperature sensor.
19. Re-connect the multi-plug to the alternator.
20. Re-connect the drive belt to the alternator.
21. Locate the tensioner strap to the alternator.
22. Refit, but do not tighten the tensioner fixing bolt.
23. Tension the belt.
24. Tighten the tensioner fixing bolt.
25. Tighten the pivot bolts.
26. Re-connect the battery.

ALTERNATOR DRIVE BELT

86.10.05

Adjust
1. Slacken the adjustment bolt.
2. Slacken the support bracket bolt.
3. Slacken the main mounting bolt.
4. Carefully lever the alternator away from the engine to tension the belt.
5. Check the belt tension. Total movement should be 0.75 to 1.00 in (20 to 25 mm) at the mid-point of the longest run.
6. Tighten the support bracket bolt.
7. Tighten the main mounting bolt.
ALTERNATOR — LUCAS TYPE 17ACR

Overhaul 86.10.08

This overhaul instruction is specific to alternator Lucas part number 23818. Other units may differ slightly.

Dismantling

1. Remove the moulded cover.
2. Before disturbing any wires note the wire positions and colours.
3. Remove the brushbox, regulator and surge protection diode assembly as follows:
   - Remove screw to release surge protection diode.
   - Disconnect four Lucar connectors from the rectifier pack.
   - Remove two screws to release the brushbox. Lift away the assembly.
4. If required, the regulator may be detached from the assembly as follows:
   - Remove screw to release one wire eyelet.
   - Remove the brushbox, regulator and surge protection diode assembly as follows:

   - Position the three stator wires on the rectifier pack as noted in operation 6.
   - Solder three stator wire connections. Note the precautions stated in operation 7 and use 'M' grade 45–55 resin core solder.
   - Position the radio capacitor. Fit the screw to secure.
   - If required, attach the regulator to the brushbox, regulator and surge protection diode assembly as follows:

   - Fit the moulded cover.
Dismantling
1. Remove two bolts. Remove the cover.
2. Note the wire positions and the colour codes.
3. Disconnect the yellow wire small Lucar connector from the rectifier pack.
4. Remove the screw securing the avalanche diode.
5. Disconnect the white wire Lucar connector from the terminal block.
6. Disconnect the yellow wire Lucar connector from the terminal block.
7. Remove the nut, spring washer and two red wire tags from the terminal block.
8. Remove the two screws. Lift out the brushbox, regulator and avalanche diode assembly.
9. If necessary detach the regulator from the brushbox as follows:
   - Remove the screw to release the wire eyelet. Remove the screw to release the regulator.
   - Remove the plate.
10. Remove screw and radio capacitor.
11. Remove the three through-bolts.
12. Provide an extractor tool as shown.

To remove the slip-ring end bracket, stator, rectifier and terminal block assembly position the extractor tool to engage with the outer journal of the slip-ring end bearing.

Employ a second operator to support the slip-ring end bracket and stator by hand.

NOTE: It may be necessary to carefully file away surplus solder from the two field winding connections on the slip-ring moulding if the extractor tool will not pass over the moulding.

The rubber 'O' ring fitted in the slip-ring end bracket bearing housing may remain in situ unless replacement is contemplated.

If necessary detach the stator, rectifier and terminal block from the slip-ring end bracket as follows:

Unsolder three wires. At each apply solder iron, bend out centre limb and disconnect wire. Remove stator. Slacken nut and withdraw rectifier. Remove two screws and terminal block.

Prevent the rotor turning by wrapping a scrap fan belt round the pulley and retaining by hand or vice. Remove the nut and spring washer.

Remove the pulley.

Remove the fan.

Remove the key.

Remove the outer spacer.

Using a suitable press remove the rotor from the drive-end bracket. CAUTION: Do not attempt to remove the rotor by applying hammer blows to the shaft end. Such action may burr over and damage the thread.

Remove the inner spacer.

Remove three screws. Remove the plate.

Press the bearing from the drive end bracket.

To reassemble the stator, rectifier and terminal block to the slip-ring end bracket as follows:

Position terminal block and secure with two screws. Insert rectifier and tighten nut. Position stator. Solder three wires using standard resin-cored solder.

Ensure that rubber 'O' ring is fitted in the slip-ring end bracket bearing housing.

Position stator, rectifier and terminal block assembly by carefully pushing the bearing into the housing. Align the main mounting lugs.

If necessary, assemble the stator, rectifier and terminal block to the slip-ring end bracket as follows:

Position terminal block and secure with two screws. Insert rectifier and tighten nut. Position stator. Solder three wires using standard resin-cored solder.

Employ a second operator to support the slip-ring end bracket.

CAUTION: Do not use the drive end bracket as a support while fitting the rotor.

Position the felt washer and metal retainer.

Fit the bearing into the drive end bracket.

Position the plate. Secure with three screws.

Fit the inner spacer.

Using a suitable press, the outer spacer and a slave tube fit the drive end bracket to the rotor by applying pressure to the bearing inner journal.

CAUTION: Do not use the drive end bracket as a support while fitting the rotor.

Fit the outer spacer.

Fit the key.

Fit the fan.

Fit the pulley.

Fit the spring washer and nut. Retain as at instruction 15 and torque load nut to 41 Nm (30 lbf ft).

If necessary, assemble the stator, rectifier and terminal block to the slip-ring end bracket as follows:

Position terminal block and secure with two screws. Insert rectifier and tighten nut. Position stator. Solder three wires using standard resin-cored solder.

Ensure that rubber 'O' ring is fitted in the slip-ring end bracket bearing housing.

Position the felt washer and metal retainer.

Press the bearing into the drive end bracket.

Position the outer spacer.

Secure with two bolts.
ALTERNATOR

86.10.14

Brush gear and slip-ring inspection

The serviceability of the brushes is gauged by the length protruding beyond the brush moulding in the free position. This amount should exceed 0.3 in (8 mm). If renewal is necessary care must be taken to replace the leaf spring at the side of the inner brush. The surface of the slip-rings should be smooth and free from grease or dirt. Servicing is confined to cleaning with a petrol-moistened cloth or finest grade glass-paper.

NOTE: Emery cloth or similar abrasive must not be used. The slip-rings cannot be machined.

(a) Brush replacement

1. Remove the small screws securing the brush retaining plates and regulator cables.
2. Replace brushes with new units and refit brush retaining plates and regulator cables.
3. Brush spring pressure should be checked with a push-type spring tension gauge. This should indicate 9 to 13 oz (255 to 368 grammes) when brush face is flush with the moulding.

(b) ROTOR

Testing

Equipment required: An ohmmeter, or a 12 volt battery and ammeter. A 110 volt a.c. supply and a 15 watt test lamp.

1. Connect the ohmmeter between the slip-rings. Resistance should be 3.2 ohms at 20°C.
2. Alternatively, connect ammeter and battery between slip-rings. The ammeter should read approximately 3 amperes.
3. To test for defective insulation between slip-rings and rotor poles connect the 110 volt supply and 15 watt test lamp between slip-rings and rotor poles in turn. If the lamp lights, the coil is earthed to the rotor core. A replacement stator must be fitted.

(c) STATOR

Testing

Equipment required: A 12 volt battery and 36 watt test lamp. A 110 volt a.c. supply and a 15 watt test lamp.

1. Check continuity of stator windings between any pair of wires by connecting in series a 12 volt battery and test lamp of not less than 36 watts. Failure of the test lamp to light means that part of the stator winding is open-circuit and a replacement stator must be fitted.
2. Test stator insulation with 110 volt test lamp. Connect test leads to laminated yoke and any one of the three stator cables. If the lamp lights, the stator coils are earthed. A replacement stator must be fitted.

(d) DIODES

Testing

1. Connect one battery terminal to the heatsink under test.
2. Connect the other battery terminal in series with the test lamp and each diode pin in turn.
3. Reverse connections to heatsinks and diode pins. The lamp should light in one direction only. Should the lamp light in both tests, or not light at all the diode is defective and a new rectifier heatsink assembly must be fitted.
4. To prevent damage to diode assemblies during soldering operations it is important that a thermal shunt is used.

NOTE: Only 'M' grade 45-55 tin-lead solder should be used.
CONTROL UNIT
Remove and refit 86.10.26

Removing
1 Disconnect battery, see 86.15.20.
2 Remove alternator, see 86.10.02.
3 Remove alternator end cover by withdrawing two retaining screws.
4 Unsolder stator winding connections at rectifier diodes.
   CAUTION: It is essential to use a thermal shunt and a lightweight soldering iron.
5 Note position of cables at rectifier plates and disconnect.
6 Remove three hexagon headed screws securing brush moulding and regulator to slip-ring end bracket.
7 Remove brush gear and regulator from alternator.

Refitting
Reverse instructions 1 to 7.

BATTERY
Remove and refit 86.15.01

Removing
1 Open the boot lid.
2 Release the clips retaining the battery cover.
3 Remove the cover.
4 Slacken the battery terminal bolts, disconnect the battery leads and move aside.
5 Remove battery clamp bracket retaining nuts.
6 Remove the clamp bracket.
7 Lift out the battery.

Refitting
8 Grease the battery terminals.
9 Close the boot lid.

Reverse instructions 2 to 7.
IGNITION DISTRIBUTOR — CARBURETTER ENGINES

### DATA

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<th>Manufacturer</th>
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<td>Triumph part number</td>
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### Centrifugal advance

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<th>Crankshaft rev/min</th>
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### Vacuum advance

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IGNITION DISTRIBUTOR — FUEL INJECTION ENGINES

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<td>Rotation — viewed on rotor</td>
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<tr>
<td>Firing angle</td>
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### Vacuum retard

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IGNITION TIMING

Adjust 86.35.15

If the engine can be run, adjust dynamically as follows. If the engine cannot be run, adjust statically as follows.

**Static**
1. Isolate the battery.
2. Rotate the crankshaft in the engine run direction to align the timing pointer with 7 degrees B.T.D.C. on the crankshaft pulley scale.
3. Pull off the high tension lead from the ignition coil.
4. Release four left-hand bank high tension leads from the rocker cover retainer.
5. Pull off four left-hand bank high tension leads from the spark plugs.
6. Remove the cover. Position to rest on the alternator mounting bracket.
7. Pull off the rotor.
8. Remove the plastic anti-flash cover.
9. Inspect the relationship of the pick-up to the nearest ferrite rod on the timing rotor. This should be positioned as shown.
10. If the position is correct, operations 11 to 13 may be ignored.
11. Slacken the clamp bracket bolt.
12. Rotate the distributor body as required to achieve the position shown.
13. Tighten the clamp bracket bolt.
14. Fit the plastic anti-flash cover with the recess positioned to the wire grommet.
15. Push on the rotor.
16. Fit the cover.
17. Push on four left-hand bank high tension leads to the spark plugs.
18. Secure four left-hand bank high tension leads to the rocker cover retainer.
19. Push on the high tension lead to the ignition coil.
20. Connect the battery.
21. When the engine can be run, adjust dynamically as follows.

**Dynamic - using timing light**
22. Pull off the advance and retard unit pipes.
23. Connect a tachometer to the engine as instructed by the manufacturer.
   
   **NOTE:** The vehicle instrument panel tachometer may be used if no other instrument is available.
24. Connect a timing light as instructed by the manufacturer. The engine is timed on number one cylinder which is at the front of the engine on the left-hand bank.
25. Run the engine.
26. Position the timing light to illuminate the crankshaft pulley scale and timing pointer.
27. Hold the speed at each of the engine r.p.m. indicated. The ignition timing should be as stated in 86.35.00.
28. Stop the engine.
29. If the ignition timing is correct, operations 30 to 33 may be ignored.
30. Slacken the clamp bracket bolt.
31. Rotate the distributor body slightly anti-clockwise to advance the timing or clockwise to retard the timing.
32. Tighten the clamp bracket bolt.
33. Repeat operation 25 onwards.
34. Remove the timing light.
35. Remove the tachometer.
36. Push on the advance and retard unit pipes.
IGNITION DISTRIBUTOR

Removing
1. Isolate the battery.
2. Disconnect two Lucar connectors from the ignition coil.
3. Disconnect one harness plug from the ballast resistor.
4. Pull off the vacuum unit pipes.
5. Pull off the high tension lead from the ignition coil.
6. Release four left-hand bank high tension leads from the retainer on oil filler neck.
7. Pull off four left-hand bank high tension leads from the spark plugs.
8. Remove the cover. Position to rest on the alternator mounting bracket.
9. Pull off the rotor.
10. Remove the plastic anti-flash cover.
11. Temporarily push on the rotor.
12. Rotate the crankshaft in the engine run direction to obtain T.D.C. number one cylinder firing. This is indicated when the rotor is at number one cylinder position and the timing pointer is aligned with T.D.C. on the crankshaft pulley scale.
13. Remove one bolt and the clamp bracket.
14. Withdraw the distributor from the timing gear cover complete with the ignition distributor harness.

Refitting
15. Using a large screwdriver, rotate the oil pump shaft to position the tongue as shown.
16. Prepare the distributor by positioning the body as shown and positioning the rotor vertical relative to the engine.
17. Insert the distributor into the timing gear cover. Engage first the drive gear. Push the distributor body down to enter the rubber 'O' ring into the bore. Finally locate the slotted adaptor to the oil pump shaft tongue. The small angular movement of the centrifugal advance mechanism may facilitate this final operation.
18. With the distributor flange against the timing gear cover the rotor should be pointing as shown relative to the engine.
19. Position the clamp bracket. Secure with one bolt finger tight.
20. Temporarily pull off the rotor.
21. Perform 86.35.15, operations 2 and 9 to 19 and retard.
22. Push on the advance unit pipes.
23. Connect one harness plug to the ballast resistor.
24. Connect two Lucar connectors to the ignition coil as follows:
   - Black wire with both a white ident and a green ident to the positive terminal.
   - White wire with both a white ident and a black ident to the negative terminal.
25. Connect the battery.
26. When the engine can be run, adjust dynamically as detailed in 86.35.15.
IGNITION DISTRIBUTOR

Overhaul 86.35.26

Dismantling
1. Remove the cover.
2. Pull off the rotor.
3. Remove the plastic anti-flash cover.
4. Withdraw the felt pad.
5. Using a suitable pair of small circlip pliers, remove the circlip.
6. Remove the plain washer.
7. Remove the rubber 'O' ring.
8. Carefully withdraw the timing rotor.
9. Remove three Pozidriv screws, spring washers and washers.
10. Carefully withdraw the wire grommet and electronic assembly plate together.
11. Remove two Pozidriv screws, two spring washers and one washer to release the vacuum unit, rubber gasket and capacitor.
12. Tap out the drive gear pin. Remove the drive gear and thrust washer. Ensure that the shaft is burr-free and withdraw it.
13. Remove the plastic distance collar.
14. Remove the control springs, exercising care not to distort the springs.

NOTE: Do not attempt to dismantle the shaft and mechanism further.

Reassembling
15. Lubricate the weight assembly working surfaces with Rocol 'Moly pad'.
16. Fit the control springs, exercising care not to distort the springs.
17. Fit the plastic distance collar with the concave surface facing upwards.
18. Lubricate the shaft with Rocol 'Moly pad'.
19. Insert the shaft into the body. Fit the thrust washer and drive gear. Secure with the drive gear pin.
20. Position the vacuum unit, rubber gasket and capacitor. Secure with two Pozidriv screws, two spring washers and one washer.

CAUTION: Ensure that the assembly seats correctly to the distributor body step.
21. Lubricate the pick-up moving plate pin with Rocol 'Moly pad'.
22. Carefully insert the pick-up moving plate pin into the vacuum unit link. Carefully position the electronic assembly plate and wire grommet together.
23. Fit three Pozidriv screws, spring washers and washers.
24. Carefully insert the timing rotor. Ensure that the master projection locates correctly in the master slot.
25. Fit the rubber 'O' ring.
26. Fit the plain washer.
27. Fit the circlip.
28. Adjust the pick-up air gap, see 86.35.31.
29. Insert the felt pad.
30. Lubricate the felt pad with a few drops of engine oil.
31. Fit the plastic anti-flash cover.
32. Push on the rotor.
33. Fit the cover.
COIL
Remove and refit (Air-conditioned vehicles) 86.35.32

Removing
1 Disconnect the low tension and high tension leads to the coil.
2 Disconnect the ballast resistor multi-plug adjacent to the coil and move the wires aside.
3 Remove the coil retaining bolts and lift out the coil.

Refitting
4 Reverse instructions 1 to 3.

COIL
Remove and refit (Non air-conditioned vehicles only) 86.35.32

Removing
1 Disconnect the high tension and low tension leads from the coil.
2 Slacken the coil/ballast resistor retaining bolts.
3 Move aside the distributor cables and remove the heatsink.
4 Remove the coil retaining bolts and allow the ballast resistor to hang by its wire.

Refitting
5 Reverse instructions 1 to 4, fitting coil retaining bolts loosely in order to fit the heatsink before tightening.

BALLAST RESISTOR
Remove and refit (Air-conditioned vehicles) 86.35.33

Removing
1 Disconnect the multi-plugs from the resistor.
2 Remove the retaining bolts from the resistor.
3 Remove the resistor.

Refitting
Reverse instructions 1 to 3.

BALLAST RESISTOR
Remove and refit (Non air-conditioned vehicles) 86.35.33

Removing
1 Remove the coil.
2 Disconnect one multi-plug from the resistor.
3 Remove the resistor from the second multi-plug.

Refitting
4 Reverse instructions 1 to 3.
HEADLAMP

Data

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<th>Actuator</th>
<th>Manufacturer</th>
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Polarity: Negative earth only

Running current after 60 seconds from cold with link rod disconnected from crank: 1.5 amp.

Running speed — crank after 60 seconds from cold with link rod disconnected from crank: 46 to 52 rev/min

Armature end-float: 0.002 to 0.008 in (0.05 to 0.20 mm)

Brush length — new: 0.250 in (6.35 mm)

Brush spring pressure when compressed so brush bottom is aligned with brush-box slot end: 0.187 in (4.75 mm)

Brush length — renew if less than: 0.250 in (6.35 mm)

Polarity: Negative earth only

Running current after 60 seconds from cold with link rod disconnected from crank: 1.5 amp.

Running speed — crank after 60 seconds from cold with link rod disconnected from crank: 46 to 52 rev/min

Armature end-float: 0.002 to 0.008 in (0.05 to 0.20 mm)

Brush length — new: 0.250 in (6.35 mm)

Brush spring pressure when compressed so brush bottom is aligned with brush-box slot end: 0.187 in (4.75 mm)

Description 86.40.00

A base bracket is bolted rigidly to the vehicle body. A substantial light alloy member is hinged to the base bracket. The light alloy member is traversed from one position to the other by an electric actuator. Mounted to the light alloy member is a 'body colour' box casting which contains the headlamp.

Actuator — this consists of a permanent magnet motor and a gearbox unit which drives a single direction rotating crank arm. The gearbox unit includes a limit switch.

Action — rotation of the actuator crank arm is converted to an up and down motion of the light alloy member by a link rod. The weight of the assembly is counter-balanced by a spring.

Box casting — with the headlamp in the close position the top surface of the box casting provides the visible panel which follows the vehicle body contours. In the open position the box casting forms the visible fairing. The headlamp is a conventional Lucas seven inch housing and light unit assembly.

Hand knob — the actuator is provided with a hand knob. This may be used to open or close a headlamp during service or if an actuator should fail. Rotate only in the direction shown.

**WARNING:** Exercise care when using the hand knob. If the battery is not isolated slight rotation of the hand knob may initiate a full cycle movement. Keep all limbs clear of the mechanism to avoid personal injury.

Design — to assist manufacture and service the base bracket, light alloy member, actuator and link rod assembly is not handed. To follow the vehicle body contours the box casting is handed.

Service — special precautions must be taken to avoid scratching the visible paint surfaces of the box casting. If the headlamp assembly is removed from the vehicle onto a bench, the bench should be covered with a thick protective cloth.
**HEADLAMP RUBBER BEZEL**

Remove and refit 86.40.01

Removing
1. Select the master light switch to raise the headlamps.
2. Isolate the battery to extinguish the headlamps.
3. Uncrew four Pozidriv screws and lock washers.
4. Pull the rubber bezel from the box casting.
5. Maneuvre the rubber bezel downwards into the headlamp cavity. If necessary maneuvre further downwards to remove from the vehicle. The rubber bezel may be distorted slightly to facilitate this operation.
6. Collect up four Pozidriv screws and lock washers.

Refitting
7. Reverse 1 to 5.

**HEADLAMP ASSEMBLY**

Remove and refit 86.40.02

Removing
1. Remove the rubber bezel, see 86.40.01.
2. To assist refitting, note the actuator harness and headlamp wire runs relative to the components.
3. Disconnect the actuator harness plug.
4. Disconnect three headlamp snap connectors.
5. Support the weight of the headlamp assembly. Remove four nuts, lock washers and washers. Carefully manoeuvre the headlamp assembly upwards through the body aperture.
6. Carefully manoeuvre the headlamp assembly downwards through the body aperture. Fit four washers, lock washers and nuts.
7. Connect three headlamp snap connectors. Ensure that the wire runs are as noted at operation 2 above. Connect the wires as follows:
   - Blue/red wire to blue/red wire
   - Blue/white wire to blue/white wire
   - Black wire to black wire.
8. Connect the actuator harness plug. Ensure that the harness run is as noted at operation 2 above.
9. Inspect the actuator harness and headlamp wire runs to ensure that no foul occurs while using the actuator manual thumb screw to traverse the mechanism over its full travel.
10. Adjust the headlamp assembly, see 86.40.16.
11. Refit the rubber bezel, see 86.40.01.

Refitting

**HEADLAMP LIGHT UNIT**

Remove and refit 86.40.09

Removing
1. Remove the rubber bezel, see 86.40.01.
2. Remove three screws to release the retaining rim and light unit.
3. Pull the connector block from the light unit.

Refitting
4. Reverse 1 to 3.

**HEADLAMP LINK ROD**

Remove and refit 86.40.12

The upper end of the link rod contains a rubber bush. This provides a measure of compliance to the link rod alignment and to the primary and secondary adjustments.

After an extended period of service wear of the upper rubber bush and the lower Oilite bush may dictate renewal of the link rod.

Removing
1. Remove the headlamp assembly, see 86.40.02.
2. Perform 86.40.15 operations 2 to 11.

Refitting
3. Perform 86.40.15 operations 39 to 49.
4. Refit the headlamp assembly, see 86.40.02.
HEADLAMP ACTUATOR

Removing 86.40.13

1 Remove the headlamp assembly, see 86.40.02.
2 Safely retain the spring by rotating the actuator manual thumb screw to position the light alloy member against the metal up stop on the base bracket.
3 Remove the circlip and washer.
4 Remove the nut, lock washer, washer and screw. Remove the harness 'P' clip.
5 Remove three screws and lock washers.
6 Maneuver the link rod from the bush.
7 Remove the bush from the crank arm.
8 Maneuver the crank arm through the aperture.

Refitting

9 Maneuver the crank arm through the aperture.
10 Lubricate the bush working surfaces with engine oil.
11 Fit the bush to the crank arm.
12 Position the link rod ends in the turnbuckle so that an equal number of threads are visible at each end.
13 Maneuver the link rod to the bush. It may be necessary to rotate the manual thumb screw to position the crank arm.
14 Position the actuator. It may be necessary to rotate the manual thumb screw to position the crank arm. Ensure that the actuator harness is looped up between the actuator and the base bracket. Secure with three screws and lock washers.
15 Position the harness 'P' clip. Secure with the screw, washer, lock washer and nut.
16 Fit the washer and circlip.
17 With the headlamp assembly removed from the vehicle perform the primary adjustment and the secondary adjustment, see 86.40.16.
18 Refit the headlamp assembly, see 86.40.02.

HEADLAMP ACTUATOR

Overhaul 86.40.14

CAUTION: The actuator operates in a hostile environment. After overhaul or disturbing any joint the unit must be sealed as detailed in operation 33.

Dismantling

1 Remove three hexagon screws and two Pozidriv screws. Lift off the cover and gasket.
2 Disconnect two Lucar connectors.
3 Remove one hexagon screw. Lift off the limit switch and harness.
4 Remove the nut. Withdraw the crank arm and washer.
5 Ensure that the shaft is burr-free and withdraw it. Remove the dished washer.
6 Using a large screwdriver blade carefully prise the hand knob from the armature shaft.
7 Remove the thrust screw or the thrust screw and locknut as fitted.
8 Remove the through bolts.
9 Carefully withdraw the cover and armature about 0.2 in (5 mm). Continue withdrawal, allowing the brushes to drop clear of the commutator. Ensure that the two brushes are not contaminated with grease.
10 Pull the armature from the cover against the action of the permanent magnet.
11 Remove two thrust washers. NOTE: These may be on the armature shaft or in the cover bearing recess.
12 Remove three screws to release the brush assembly. Break the wire slot seal. Lift the assembly from the recess.

continued
Reassembling

NOTE: The following lubricants are required during assembly:
- Molybdenum disulphide oil.
- Shell Turbo 41 oil.
- Ragovine Listate grease.
13. Position the brush assembly. Insert the wires in the slot. Secure with three screws.
14. Lubricate two thrust washers with Molybdenum di-sulphide oil.
15. Fit two thrust washers into the cover bearing recess.
16. Lubricate the cover bearing with Shell Turbo 41 oil.
17. Position the armature to the cover against the action of the permanent magnet. Ensure that the two thrust washers remain in position during this operation.
18. Lubricate the self-aligning bearing with Shell Turbo 41 oil.
19. Carefully insert the armature shaft through the bearing. Ensure that the brushes are not contaminated with lubricant. Push the two brushes back to clear the commutator.
20. Seat the cover against the gearbox. Turn the cover to align the marks shown. Fit the through bolts.
21. Fit the thrust screw or the thrust screw and locknut as fitted.
22. If a non-adjustable thrust screw is fitted check the armature end-float as follows:
   Position a feeler gauge between the armature shaft and the thrust screw. Push the armature towards the cover. End-float should be 0.002 to 0.008 in. In the unlikely event of adjustment being required end-float may be increased by fitting shim washer/washers under the thrust screw head or reduced by mounting the thrust screw in a lathe and removing metal from the underside of the head.
23. If an adjustable thrust screw and locknut is fitted adjust the armature end-float as follows:
   Slacken the locknut. Screw the thrust screw in until resistance is felt. Screw the thrust screw out a quarter of a turn — maintain in this position and tighten the locknut.
24. Push the hand knob onto the armature shaft.
25. Lubricate the final gear bushes with Shell Turbo 41 oil.
26. Fit the dished washer with its concave surface facing the final gear. Insert the shaft.
27. Fit the washer. Fit the crank arm. Ensure that the relationship of the crank arm to the final gear cam is as shown. Secure with the nut.
28. Lubricate the final gear cam with Ragovine Listate grease.
29. Position the limit switch and harness. Secure with one hexagon screw.
30. Connect two Lucar connectors as follows:
   - Red/light green wire to red wire.
   - Black/light green wire to blue wire.
31. Pack the wires into the limit switch recesses as shown.
32. Position the gasket and cover. Secure with three hexagon screws and two Pozidriv screws.
33. Seal the exterior of the unit by applying a rubberised sealing compound such as vehicle body underseal. Special attention must be given to disturbed joints and the wire slot seal.
HEADLAMP ASSEMBLY

Overhaul 86.40.15

Dismantling
1 Remove the headlamp assembly, see 86.40.02.
2 Remove the nut, lock washer, washer and screw. Remove the harness 'P' clip.
3 To assist refitting, scribe the outline of the mounting bracket sides onto the light alloy member.
4 Remove four bolts, lock washers and washers. Separate the two assemblies.
5 Withdraw the headlamp harness from the light alloy member.
6 Safely restrain the spring by rotating the actuator hand knob to position the light alloy member against the metal up stop on the base bracket.
7 Remove the circlip and washer.
8 Remove the nut, lock washer, washer and special screw.
9 Slide the upper end of the link rod from the light alloy member.
10 Remove the link rod from the crank arm.
11 Remove the bush from the crank arm.
12 Remove three screws and lock washers. Manoeuvre the crank arm through the aperture and remove the actuator.
13 Ensure that the spring is safely restrained and extended to its weakest working position by checking that the light alloy member is against the metal up stop on the base bracket.
14 Retain the spring by strong hand pressure. Carefully remove the nut, lock washer, small washer, large washer and special bolt.
15 Remove the nut, lock washer, small washer, large washer and special bolt. Lift away the spring.
16 Remove the nut, washer, washer and bolt. Withdraw the light alloy member.
17 Withdraw the hinge pin.
18 Slacken the locknut. Remove the rubber down stop including the locknut and washer.
19 Remove three screws to release the retaining rim and light unit.

20 Pull the connector block from the light unit.
21 Remove four screws and lock washers. Withdraw the housing and plate.
22 If necessary drill out four 'pop rivets' to separate the housing plate.
23 To assist refitting, scribe the outline of the mounting bracket onto the box casting.
24 Remove four nuts, lock washers and washers. Remove the mounting bracket.
25 Remove the grommet from the mounting bracket to release the headlamp harness.

continued
Reassembling
26 Position the headlamp harness and fit the grommet to the mounting bracket.
27 Position the mounting bracket to the scribe lines on the box casting. Secure with four nuts, lock washers and washers.
28 If necessary, fit four 'pop rivets' to unite the housing and plate.
29 Insert the housing and plate. Secure with four screws and lock washers.
30 Push the connector block on to the light unit.
31 Position the retaining rim and light unit. Secure with three screws.
32 Fit the rubber down stop including the locknut and washer.
33 Lubricate the hinge pin working surfaces with P.B.C. (Poly Butyl Cuprysil) grease.
34 Insert the hinge pin into the light alloy member.
35 Insert the light alloy member into the base bracket. Secure with the bolt, washer, washer and nut.
36 Position the spring. Secure with the special bolt, large washer, small washer, lock washer and nut.
37 Retain the spring by strong hand pressure. Secure with the special bolt, large washer, small washer, lock washer and nut.
38 Manoeuvre the crank arm through the aperture and position the actuator. Ensure that the actuator harness is looped up between the actuator and the base bracket. Secure with three screws and lock washers.
39 Lubricate the bush working surfaces with engine oil.
40 Fit the bush to the crank arm.
41 Position the link rod ends in the turnbuckle so that an equal number of threads are visible at each end.
42 Fit the link rod to the bush.
43 Slide the upper end of the link rod to the light alloy member.
44 Fit the special screw, washer, lock washer and nut.
45 Fit the washer and circlip.
46 With the headlamp assembly removed from the vehicle perform the primary and secondary adjustment, see 86.40.16.
47 Insert the headlamp harness through the light alloy member.
48 Position the mounting bracket to the scribe lines on the light alloy member. Secure with four bolts, lock washers and washers.
49 Position the harness 'P' clip. Secure with the screw, washer, lock washer and nut.
50 Fit the headlamp assembly, see 86.40.02.
HEADLAMP ASSEMBLY

Primary adjustment

The primary adjustment is to ensure that the light alloy member is forced hard against the metal up stop on the base bracket when the crank arm stops for the up position. This condition is achieved by adjusting the length of the link rod.

This adjustment may be made with the headlamp assembly in situ or removed from the vehicle.

1. Headlamp assembly in situ only:
   Select the master light switch to raise the headlamps.

2. Headlamp assembly removed from the vehicle only:
   Using the actuator hand knob rotate the crank arm to obtain the T.D.C. position as shown.

3. Slacken two link rod lock nuts. Note that the upper lock nut has a left-hand thread.

4. Rotate the turnbuckle by hand — do not use a spanner — until slight resistance is felt as the light alloy member contacts the metal up stop on the base bracket. This is the datum point.

5. Rotate a further 4½ flats (270 degrees) using a spanner. NOTE: This will provide a 'crowd' of 1.20 to 1.40 mm to the length of the link rod. Correct pre-load will then be applied to the up stop.

6. Hold the turnbuckle in this position and tighten two lock nuts.

Secondary adjustment

The secondary adjustment is to ensure that the rubber down stop mounted on the base bracket is suitably compressed by the light alloy member when the crank arm stops for the down position. This condition is achieved by adjusting the position of the rubber down stop.

This adjustment may be made with the headlamp assembly in situ or removed from the vehicle.

7. Perform the primary adjustment, see 86.40.16. CAUTION: The position the light alloy member assumes in the down position is dependent on the length of the link rod. A correct secondary adjustment cannot be achieved until the primary adjustment is correctly set.

8. Slacken the rubber down stop lock nut. Screw the rubber down stop to its lowest position.

9. Headlamp assembly in situ only:
   Select the master light switch to retract the headlamps.

10. Headlamp assembly removed from vehicle only:
    Using the actuator hand knob rotate the crank arm to obtain B.D.C. position as shown.

11. Screw the rubber down stop out by hand until it just contacts the light alloy member. This is the datum point.

12. Screw out a further 11/4 turns (480 degrees). NOTE: This will provide a 'crowd' of 1.00 to 1.20 mm to the downstop.

13. Hold the rubber down stop in this position and tighten the lock nut.
Box casting adjustment

The box casting adjustment is to ensure that the top surface of the box casting is correctly aligned with the vehicle body contours when the headlamp is retracted. This condition is achieved by adjusting the position of components.

This adjustment may only be made with the headlamp assembly in situ.

14 Perform the primary and secondary adjustment, see 86.40.16.

CAUTION: The position the light alloy member assumes in the down position is dependent on the length of the link rod. A correct box casting adjustment cannot be achieved until the primary adjustment is correctly set.

15 Ensure that the headlamps are in the retracted position.

16 Slacken four nuts securing the base bracket to the vehicle body.

17 Move the complete headlamp assembly to align the top surface of the box casting with the vehicle body contours.

18 Hold the headlamp assembly in this position and tighten four nuts.

19 If sufficient adjustment is not available to achieve alignment perform operations 20 to 22.

20 Slacken four bolts securing the mounting bracket to the light alloy member.

21 Adjust the relationship of the components to facilitate the operation.

22 Hold the components in position and tighten four bolts.

23 Repeat operation 15 onwards.

HEADLAMP

Beam aiming

Beam aiming can be best be accomplished using equipment such as Lucas 'Beamsetter', 'Lev-L-Lite' or 'Beam tester'. This service is available at Triumph distributors or dealers and will ensure maximum road illumination with minimum discomfort to other road users.

With the headlamps in the up position the adjustment is achieved in the same way as for conventional solid mounted Lucas headlamp units. One screw positions the beam in the horizontal plane while a second screw controls beam height.

1 Select the master light switch to raise the headlamps.

2 Ensure that the headlamp assembly is correctly adjusted, see 86.40.16.

3 Gain access to the beam aiming screws by inserting a screwdriver through the 'cut outs' provided in the rubber bezel.

4 Screw 'A' positions the beam in the horizontal plane.

5 Screw 'B' controls beam height.

HEADLAMP CIRCUIT BREAKER

Removing

1 Open the cubby box lid.

2 Remove the two Pozidriv screws. Withdraw the lower panel to obtain access to the component mounting plate.

3 Place the circuit breaker attached to the harness using the appropriate illustration.

4 Pull off two electrical connectors to detach the circuit breaker from the vehicle.

Refitting

5 Push on two electrical connectors. The connectors may be fitted either way round.

6 Stow the circuit breaker in a suitable position.

7 Reverse 1 to 2.
FRONT PARKING AND FLASHER LAMP
Remove and refit 86.40.26

Removing
1 Remove the lamp harness from the body clip.
2 Disconnect three snap connectors.
3 Remove two Pozidriv screws and washers. Withdraw the clear lens and the amber plate lens.
4 Remove the lens gasket.
5 Remove two bulbs from the bayonet fittings.
6 Remove two nuts, spring washers and washers.
7 Withdraw the lamp base and gasket.

Refitting
8 Insert the lamp base and gasket. Ensure that it is the correct way up with the lens securing tappings horizontal.
9 Fit two nuts, spring washers and washers.
10 Fit two bulbs to the bayonet fittings.
11 Position the amber plate lens to the clear lens. Ensure that the assembly is the correct way up with the screw holes horizontal and the amber plate lens the correct end.
12 Insert the lens assembly. Secure with two Pozidriv screws and washers.
13 Connect three snap connectors as follows:
   - Left-hand lamp only – Red wire to red wire.
   - Green/red wire to green wire.
   - Black wire to black wire.
   - Right-hand lamp only – Red wire to red wire.
   - Green/white wire to green wire.
   - Black wire to black wire.
14 Connect the lamp unit to the vehicle body. Ensure that the assembly is the correct way up with the screw holes horizontal and the amber plate lens the correct end.
15 Fit the lamp harness to the body clip.

USA Specification Vehicles
FRONT MARKER LAMP
Remove and refit 86.40.59

Removing
1 Select the master light switch to raise the headlamps.
2 Isolate the battery to extinguish the headlamps.
3 Pull the bulb holder from the lamp base.
4 Pull the bulb from the bulb holder.
5 Disconnect two Lucar connectors.
6 Remove two nuts, spring washers and washers.
7 Withdraw the lamp assembly. Do not attempt to disassemble the lens from the lamp base.

Refitting
8 Ensure that the rubber gasket is secured to the vehicle body.
9 Reverse 1 to 7.

REAR MARKER LAMP
Remove and refit 86.40.64

Removing
1 Open the luggage boot lid.
2 Remove two nuts, spring washers and washers.
3 Remove the clamp cover.
4 Pull the bulb holder from the lamp base.
5 Pull the bulb from the bulb holder.
6 Disconnect two Lucar connectors.
7 Withdraw the lamp assembly. Do not attempt to disassemble the lens from the lamp base.

Refitting
8 Ensure that the rubber gasket is secured to the vehicle body.
9 Reverse 1 to 7.
REAR LAMP ASSEMBLY

Remove and refit 86.40.70

Removing

1. Open the luggage boot lid.
2. Turn back the floor mat on the appropriate side.
3. Remove two trim panel top longer Pozidriv screws.
4. Remove two trim panel bottom shorter Pozidriv screws.
5. Remove the trim panel.
6. Rotate four bulb holders anti-clockwise and remove from the bayonet fittings.
7. Remove four bulbs from the bayonet fittings.
8. Remove one nut and spring washer.
9. Remove five nuts, spring washers and washers.
10. Withdraw the lens and lens gasket. The lens is a one piece assembly. The lens section may not be replaced individually.
11. Withdraw the lamp base and lamp base gasket.

Refitting

12. Reverse 1 to 11. Fit the four bulb holders so that the wire colour codes are as the left-hand assembly shown. On a right-hand assembly the last wire is GW Green/White.

PLATE ILLUMINATION LAMP

Remove and refit 86.40.86

Removing

1. Open the luggage boot lid to obtain improved access.
2. Remove two Pozidriv screws.
3. Manoeuvre the lamp from the body panel aperture. Take care not to break the festoon bulb.
4. Carefully remove the festoon bulb.
5. Remove two Lucar connectors.

Refitting

6. Reverse 1 to 5. The two Lucar connectors may be fitted either way round.

MAP/COURTESY LAMP

Remove and refit 86.45.10

Removing

1. Isolate the battery.
2. Carefully prise the rearward edge of the lamp outwards to free it from the door trim pad.
3. Carefully remove the festoon bulb.
4. Note the wire colour codes and positions.
5. Remove the three Lucar connectors.

Refitting

6. Reverse 1 to 5.
INSTRUMENT ILLUMINATION
Remove and refit 86.45.32

The four instrument illumination assemblies may be considered as a composite part of the instrument panel. Each instrument illumination assembly consists of three parts. The bulb and bulb holder which may best be removed from the concealed side of the instrument panel. The green dome cover which will not normally require to be removed.

Removing
All operations:
1  Isolate the battery.
2  Remove the fascia centre grille, see 76.55.14.
3  Remove the fascia instrument cowl, see 76.46.17.
4  Read the remainder of this operation and decide the best approach for the specific operation that is to be performed.
Any bulb and bulb holder may be removed as follows:
5  At the concealed side of the instrument panel proceed as follows: Rotate the appropriate bulb holder anti-clockwise and carefully withdraw from the bayonet fitting.
6  If satisfactory access is not available at the concealed side of the instrument panel proceed as follows: Perform 88.20.01 operations 3 to 9. Withdraw the instrument panel as shown. Rotate the appropriate bulb holder anti-clockwise and carefully withdraw from the bayonet fitting.
7  Pull the bulb from the bulb holder.
Any green dome cover may be removed as follows:
8  Remove three Pozidriv screws and washers.
9  Carefully slide the lens upwards following the path of its natural arc.
10  Lift out the face panel.
11  Remove the speedometer, see 88.30.01 or the tachometer, see 88.30.21 to obtain access to the appropriate green dome cover.
12  Remove the green dome cover from the housing claws. Take care not to break a claw.

Refitting
13  Reverse all operations performed.

HEATER CONTROL ILLUMINATION
Remove and refit 86.45.44

Removing
1  Remove two Pozidriv screws.
2  Lower the panel downwards.
3  Any of the four bulb holders may now be removed by tilting the panel and sliding out a bulb holder.
4  Remove the bulb from the bayonet fitting.

Refitting
5  Reverse 1 to 4.

FASCIA SWITCH PANEL ILLUMINATION
Remove and refit 86.45.47

Removing
1  Isolate the battery.
2  Remove two Pozidriv screws and washers.
3  Withdraw the panel.
4  Either of the two bulb holders may now be removed by carefully pulling from the housing.
5  Pull the bulb from the bulb holder.

Refitting
6  Reverse 1 to 5.
WARNING LIGHT

Remove and refit 86.45.60

The warning light assemblies may be considered as a composite part of the instrument panel. Each warning light assembly consists of three parts. The bulb holder which may only be removed from the concealed side of the instrument panel. The bulb which may be removed from either side of the instrument panel. The annotated lens which may only be removed from the exposed side of the instrument panel.

Removing

All operations:
1. Isolate the battery.
2. Remove the fascia centre grille, see 76:55.14.
3. Remove the fascia instrument cowl, see 76.46.17.
4. Read the remainder of this operation and decide the best approach for the specific operation that is to be performed.

Any bulb holder may be removed as follows:

5. At the concealed side of the instrument panel proceed as follows: Rotate the appropriate bulb holder anti-clockwise and carefully withdraw from the bayonet fitting.
6. If satisfactory access is not available at the concealed side of the instrument panel proceed as follows: Perform 88.20.01 operations 3 to 9. Withdraw the instrument panel as shown. Rotate the appropriate bulb holder anti-clockwise and carefully withdraw from the bayonet fitting.
7. Pull the bulb from the bulb holder.

Any bulb or annotated lens may be removed as follows:

8. Remove three Pozidriv screws and washers.
9. Carefully slide the lens upwards following the path of its natural arc.
10. Lift out the face panel.
11. Lift out the appropriate annotated lens.
12. Pull the bulb from the bulb holder.

Refitting

13. Reverse all operations performed.

HAZARD WARNING LIGHT

Remove and refit 86.45.76

Removing

1. Isolate the battery.
2. Remove two Pozidriv screws and washers.
3. Withdraw the panel.
4. Disconnect the hazard switch harness plug.
5. Pull the bulb from the harness plug.

Refitting

6. Reverse 1 to 5.

RADIO

USA Specification Vehicles

Door speaker—remove and refit 86.50.13

Removing

1. Remove the door trim pad. 76.34.01.
2. Remove the four Pozidrive screws and spring clips securing the speaker to the trim pad.
3. Withdraw the speaker.

Refitting

4. Reverse instructions 1 to 3.
RELAYS
Remove and refit
Starter motor relay 86.55.05
Horn relay 86.55.09
Heated rear window relay 86.55.19
Headlamp run/stop relay 86.55.20

Removing
1 Open the glove box lid.
2 Withdraw the lower panel to obtain access to the component mounting plate.
3 Locate the approximate relay, using the relevant wiring diagram.
4 Remove the Pozidriv fixing screw.
5 Pull the relay from the harness plug.

Refitting
6 Reverse instructions 1 to 5.

TURN SIGNAL FLASHER UNIT
Remove and refit 86.55.11

Removing
1 Locate the flasher unit mounted in a clip attached to the fascia support rail forward of the choke and bonnet release controls.
2 Pull the flasher unit from the clip.
3 Disconnect two Lucar connectors.

Refitting
4 Reverse 1 to 3. Connect two Lucar connectors as follows:
   - Light green/slate wire to terminal B.
   - Light green/brown wire to terminal L.

HEADLAMP FLASH RELAY
Remove and refit 86.55.37

Removing
1 Open the cubby box lid.
2 Remove two Pozidriv screws. Withdraw the lower panel to obtain access to the component mounting plate.
3 Locate the headlamp flash relay using the appropriate illustration.
4 Remove the Pozidriv screw.
5 Pull the relay from the harness plug.

Refitting
6 Reverse instructions 1 to 5.

HAZARD FLASHER UNIT
Remove and refit (No. 5) 86.55.12

Removing
1 Locate the flasher unit mounted in a clip attached to the component mounted plate by placing the head near the floor under the glovebox and looking upwards.
2 Pull the clip from the component mounting plate.
3 Disconnect two Lucar connectors.
4 Remove the flasher unit from the clip.

Refitting
5 Reverse 1 to 4. Connect two Lucar connectors as follows:
   - Purple wire to terminal B.
   - Light green/pink wire to terminal L.

CONTROL UNIT
Headlamp — flash control unit — remove and refit 86.55.38

Removing
1 Open the cubby box lid.
2 Remove two Pozidriv screws. Withdraw the lower panel to obtain access to the component mounting plate.
3 Locate the headlamp flash control unit using the appropriate illustration.
4 Remove the Pozidriv screw.
5 Depress the claw lever and pull the control unit from the harness multi-contact plug.

Refitting
6 Reverse instructions 1 to 5.

SEAT BELT — TIMER BUZZER MODULE
Remove and refit 86.57.08

Removing
1 Open the cubby box lid.
2 Withdraw the lower panel to obtain access to the component mounting plate.
3 Locate the timer/buzzer module.
4 Remove the Pozidriv screw.
5 Withdraw the module from the harness multi-contact plug.

Refitting
6 Reverse instructions 1 to 5.
STARTER MOTOR  86.60.00

DATA
Manufacturer ........................................ Lucas
Type .................................................. 3M100 PE
Lucas part number ................................. 25724
Rover part number ................................. DRC 1743

Motor
Yoke diameter ........................................ 4 in (101.60 mm)
Light running - speed ............................... 6,000 rev/min
- current .............................................. 65A
- torque ................................................ Not stated
Load running - speed ................................. 1,000 rev/min
- current .............................................. 365A
- torque ................................................ 9.0 lbf ft (12.2 Nm)
Locked - speed ........................................ Nil
- current .............................................. 545A
- torque ................................................ 16.5 lbf ft (22.4 Nm)

Commutator minimum skimming thickness ....... 0.140 in (3.56 mm)
Brush length - new .................................. 0.170 in (18.03 mm)
- renew if less than ................................. 0.375 in (9.53 mm)
Brush spring pressure ................................ 36 ozf (1000 gf)
Shaft end float: maximum between bush and spire retaining ring .... 0.010 in (0.25 mm)
- commutator end cover bearing ................. 0.4377 in (11.18 mm)
- drive end bracket bearing ....................... 0.4729 in (12.012 mm)

Solenoid
Pull-in winding resistance - measured between unmarked 'WN' wire connector and 'STA' terminal 0.25 to 0.27 ohm
Hold-in winding resistance - measured between unmarked 'WN' wire connector and unit body 0.76 to 0.80 ohm

STARTER MOTOR
Remove and refit 86.60.01

Removing
1 Drive the vehicle onto a ramp and allow the exhaust system to cool.
2 Isolate the battery (luggage compartment).
3 Working below the vehicle, remove the front two grass shields and the right-hand catalytic converter, see 17.50.01.
4 Remove the lower cable screw from the starter solenoid.
5 Remove the main cable nut and disconnect the cable.
6 Remove the upper cable screw and move the harness aside.
7 Remove the two securing bolts and lift out the starter motor.

Refitting
8 Fit the starter motor and locate with the two bolts fitted loosely before tightening, then reverse instructions 1 to 6.

STARTER MOTOR SOLENOID
Remove and refit 86.60.08

Removing
1 Remove the starter motor from the vehicle, see 86.60.01.
2 Remove the nut and spring washer. Remove the battery lead from the solenoid.
3 Remove the nut and spring washer. Remove the motor lead from the solenoid.
4 Remove the smaller Posidriv screw and spring washer to release the white/yellow wire tag.
5 Remove the larger Posidriv screw and spring washer to release the white/brown wire tag.
6 Prise out the grommet.
7 Remove two bolts and spring washers. Withdraw the solenoid from the plunger.
8 Unhook the plunger from the engaging lever.
9 Remove the return spring from the plunger.
10 Remove the spring cup from the plunger.
11 Fit the spring cup to the plunger.
12 Fit the return spring to the plunger.
13 Push the engaging lever forward by inserting a finger into the grommet hole. Insert the plunger. Compress the spring to hook the plunger to the engaging lever.
14 Carefully insert the solenoid over the plunger. Ensure that the plunger remains hooked to the engaging lever. Secure with two bolts and spring washers.
15 Ensure that the plunger is still hooked to the engaging lever.
16 Fit the grommet.
17 Reverse instructions 1 to 5. Connect the electrical connections as shown.

STARTER MOTOR SOLENOID UNIT
Test  86.60.09

The following checks assume that the pinion travel has been correctly set.
1 Remove the bridge strap connecting the solenoid to the motor.
2 Connect a 12 volt d.c. supply with a switch between the solenoid 'Lucar' and large terminal 'STA'. DO NOT CLOSE SWITCH
3 Connect a separately energized D+E 60 watt test lamp across solenoid main terminals.
4 Close the switch. The solenoid should be heard to operate, and lamp should light with full brilliance.
5 Open the switch. The lamp should go out.
STARTER MOTOR
Overhaul 86.60.13

Dismantling
1. Remove the starter motor, see 86.60.01.
2. Remove the connecting link between the starter and the solenoid terminal 'STA'.
3. Remove the solenoid from the drive-end bracket.
4. Grasp the solenoid plunger and lift the front end to release it from the top of the drive engagement lever.
5. Remove the end cap seal.
6. Using an engineer's chisel, cut through a number of the retaining ring claws until the grip on the armature shaft is sufficiently relieved to allow the retaining ring to be removed.
7. Remove the two through-bolts.
8. Partially withdraw the commutator end cover and disengage the two field coil brushes from the brush box.
9. Remove the commutator end cover.
10. Withdraw the yoke and field coil assembly.
11. Remove the retaining ring from the drive engagement lever pivot pin, using the method previously described.
12. Withdraw the pivot pin.
13. Withdraw the armature.
14. Using a suitable tube, remove the collar and jump-ring from the armature shaft.
15. Slide the thrust collar and the roller clutch drive and lever assembly off the shaft.

Inspecting

Clutch
16. Check that the clutch gives instantaneous take-up of the drive in one direction and rotates easily and smoothly in the other direction.
17. Ensure that the clutch is free to move round and along the shaft splines without any tendency to bind.
NOTE: The roller clutch drive is sealed in a rolled steel cover and cannot be dismantled.
18. Lubricate all clutch moving parts with Shell SB 2628 grease for cold and temperate climates or Shell Retinax 'A' for hot climates.

Brasses
19. Check that the brushes move freely in the brush box moulding. Rectify sticking brushes by wiping with a petrol-moistened cloth.
20. Fit new brushes if they are damaged or worn to approximately 9.5 mm (0.375 in).
21. Using a push-type spring gauge, check the brush spring pressure. With new brushes pushed in until the top of the brush protrudes about 1.5 mm (0.065 in) from the brush box moulding, the spring pressure reading should be 1.0 kgf (42 ozf).
22. Check the insulation of the brush springs by connecting a 110V a.c. 15W test lamp between any one of the commutator segments and the shaft. The lamp should not light. If it does light, fit a new armature.

Armature
23. Check the commutator. If cleaning only is necessary, use a flat surface of very fine glass paper, and then wipe the commutator surface with a petrol-moistened cloth.
24. If necessary, the commutator may be machined providing a finished surface can be obtained without reducing the thickness of the commutator copper below 3.5 mm (0.140 in), otherwise a new armature must be fitted. Do not undercut the insulation slots.
25. Check the armature insulation by connecting a 110V a.c. 15W test lamp between any one of the commutator segments and the shaft. The lamp should not light. If it does light, fit a new armature.

Field coil insulation
26. Disconnect the end of the field winding where it is riveted to the yoke, by filing away the riveted-over end of the connecting-eyelet securing rivet, sufficient to enable the rivet to be tapped out of the yoke.
27. Connect a 110V a.c. 15W test lamp between the disconnected end of the winding and a clean part of the yoke.
28. Ensure that the brushes or bare parts of their flexibles are not touching the yoke during the test.
29. The lamp should not light. If it does light, fit a new field coil assembly.
30. Re-secure the end of the field winding to the yoke.
31. Connect a 12V battery-operated test lamp between each of the brushes in turn and a clean part of the yoke.
The lamp should light. If it does not light, fit a new coil assembly.

**Solenoid**

33 Disconnect all cables from the solenoid terminals and connectors.
34 Connect a 12V battery and a 12V 60W test lamp between the solenoid main terminals. The lamp should not light. If it does light, fit new solenoid contacts or a new solenoid complete.

35 Leave the test lamp connected and, using the same 12V battery supply, energize the solenoid by connecting 12V between the small solenoid operating Lucar terminal blade and a good earth point on the solenoid body.

36 The solenoid should be heard to operate and the test lamp should light with full brilliance, otherwise fit new solenoid contacts or a new solenoid complete.

**STARTER MOTOR**

**Bench Testing**

The following bench tests will determine if the fault is with the motor or solenoid unit.

1. Clamp the motor in a vice.
2. Connect a 12 volt battery, using heavy-duty cables, to the motor frame and motor terminal.
3. Check that the motor operates under light running conditions. If necessary, check light running current and speed against figures stated under 'Performance Data'.
4. If starter motor fails test, dismantle for overhaul.
   If starter operates, check or replace solenoid unit as follows:
5. Transfer cable from motor terminal to main selector terminal.
6. Fit jumper lead and touch to Lucar solenoid connector.
7. If motor does not operate, solenoid or solenoid contacts are faulty. Check and replace as necessary.

Reassembling

37 Reverse 1 to 15, including the following:
38 Fit the commutator end cover before refitting the solenoid to facilitate assembly of the block shaped grommet which, when assembled, is compressed between the yoke, solenoid and fixing bracket.
39 Ensure that the internal thrust washer is fitted to the commutator end of the armature shaft.
40 Tightening torques:
   Through-bolts 1.1 kgf m (8.0 lbf ft)
IGNITION/STARTER SWITCH

Remove and refit 86.65.02

Removing
1. Isolate the battery.
2. Un screw two long Pozidriv screws and remove the nacelle upper and lower halves.

NOTE: The screws have a long threaded length of approximately 20 mm. A long 'unscrew time' should be expected.
3. Note the switch harness wire run.
4. Disconnect one harness plug.
5. Remove two small Pozidriv screws.
6. Remove the switch complete with its harness from the vehicle.

Refitting
7. Position the switch harness wire run as noted at operation 3 above. Insert the switch into the steering column lock assembly. Note the keyway and ensure that the lock shaft and switch shaft align correctly.
8. Fit two small Pozidriv screws.
9. Connect one harness plug.
11. Connect the battery.

MASTER LIGHT SWITCH

Remove and refit 86.65.09

Removing
1. Remove the fascia switch panel, see 86.65.06.
2. Using a small screwdriver, carefully prise off two Spire clips.
3. Remove the face panel and the switch identification strip assembly.
4. Push inwards one plastic clip on the switch and withdraw the switch from the panel.

Refitting
5. Reverse instructions 1 to 4.

DOOR SWITCH

Remove and refit 86.65.14

Removing
1. Open the appropriate door.
2. Remove the single screw.
3. Withdraw the switch.
4. Disconnect one Lucar connector.

Refitting
5. Reverse instructions 1 to 4.

FRONT FOG LAMP SWITCH

Remove and refit 86.65.19

When fitted

Removing
1. Remove the fascia switch panel, see 86.65.06.
2. Using a small screwdriver carefully prise off two Spire clips.
3. Remove the face panel and the switch identification strip assembly.
4. Push inwards one plastic clip on the switch and withdraw the switch from the panel.

Refitting
5. Reverse instructions 1 to 4. Insert the switch so that the 'symbol' is at the lower edge.

PANEL RHEOSTAT

Remove and refit 86.65.12

Removing
1. Isolate the battery.
2. Pull out the centre console tray.
3. Locate the hole in the knob. Insert a suitable probe into the hole and while depressing pull the knob from the shaft.
4. Unscrew the bezel.
5. Withdraw the panel rheostat downwards from the centre console panel.
6. Remove the spring washer.
7. Note the wire colour codes and positions.
8. Disconnect two Lucar connectors.

Refitting
9. Reverse instructions 1 to 8.
REVERSE LAMP SWITCH
Remove and refit 86.65.20

Removing
1. Drive the vehicle onto a ramp.
2. Unscrew the gear lever knob.
3. Lift off the gear lever gaiter.
4. Remove four Pozidriv screws and washers. Lift out the draught excluder and plate.
5. Raise the ramp.
6. Disconnect two snap connectors.
7. Lower the ramp.
8. Slacken the locknut.
9. Unscrew the switch from the gearbox extension.

Refitting
10. Ensure that the locknut is fitted to the switch.
11. Screw the switch into the gearbox extension.
12. Adjust the switch position as follows:
   Provide a test lamp circuit as shown. Select reverse gear. Screw the switch inwards until the lamp just illuminates. This is the datum position. Screw the switch inwards a further 3 flats (180 degrees). Hold the switch in this position and tighten the locknut.
13. Raise the ramp.
14. Connect two snap connectors. The connectors may be fitted either way round.
15. Lower the ramp.
16. Perform a function test as follows:
   Switch on ignition. Select reverse. The reverse lamps should now be illuminated. Select any other gear. The reverse lamps should now be off.
17. Reverse instructions 2 to 4.

OIL PRESSURE SWITCH – USA Specification Vehicles
Remove and refit 86.65.30

Removing
1. Locate the switch on the right-hand side of the engine below the alternator.
2. Disconnect the Lucar connector.
3. Using a spanner, unscrew the switch from the oil transfer adaptor.

Refitting
4. Screw the switch into the oil transfer adaptor.
5. Connect the Lucar connector.

HEATED BACK-LIGHT SWITCH
Remove and refit 86.65.36

Removing
1. Remove the fascia switch panel, see 86.65.66.
2. Using a small screwdriver, carefully prise off two Spire clips.
3. Remove the face panel and the switch identification strip assembly.
4. Push inwards two spring clips on the switch and withdraw the switch from the panel.

Refitting
5. Reverse instructions 1 to 4.

SEAT BELT SWITCH
Remove and refit – Driver’s 86.65.31 – Passenger’s 86.65.32

Removing
1. Remove the driver’s seat, see 76.70.04, or the passenger’s seat, see 76.70.05.
2. Remove the single bolt to release the integral buckle and switch unit.
3. Collect up the wavy washer, flange bush and distance piece.

Refitting
4. Reverse instructions 1 to 3.

HANDBRAKE SWITCH
Remove and refit 86.65.45

Removing
1. Remove the console assembly, see 76.25.01.
2. Pull apart the Velcro ‘touch and close’ fastener strips along the top edge of the handbrake gauntlet.
3. Remove the single Pozidriv screw and detach the switch.
4. Disconnect the Lucar connector.

Refitting
5. Reverse instructions 1 to 4.
### BRAKE LINE FAILURE SWITCH
Remove and refit 86.65.47

**Removing**
1. Locate the brake line failure switch on the brake master cylinder.
2. Release the harness plug claws and disconnect the harness plug from the switch.
3. Using a spanner on the nylon switch body carefully unscrew the switch.

**Refitting**
4. Carefully screw the switch to the brake master cylinder. Do not overtighten. Torque load to only 15 lbf in (0.17 kgf m).
5. Connect the harness plug. The harness plug may be fitted either way round.

### HAZARD SWITCH
Remove and refit 86.65.50

**Removing**
1. Remove the fascia switch panel, see 86.65.66.
2. Using a small screwdriver, carefully prise off two Spire clips.
3. Remove the face panel and the switch identification strip assembly.
4. Push inwards one plastic clip on the switch and withdraw the switch from the panel.

**Refitting**
5. Reverse instructions 1 to 4. Insert the switch so that the 'symbol' is at the lower edge.
   
   **NOTE:** The hazard warning light built into the switch has a bulb housed in the switch harness plug.

### STOP LAMP SWITCH
Remove and refit 86.65.51

**Removing**
1. Locate the switch adjacent to the brake pedal arm attachment to the brake servo.
2. Disconnect two Lucar connectors.
3. Slacken the large hexagon nut.
4. Push the brake pedal forward and remove the nut and washer/washers.
   
   **CAUTION:** Do not attempt to rotate the switch in the bracket as the switch has a locating flat.
5. Remove the switch from the bracket.

**Refitting**
6. Position the switch to the bracket.
7. Push the brake pedal forward and fit the washer/washers and nut finger-tight.
8. Tighten the nut lightly. Do not overtighten the nut on the plastic threads or the switch may be damaged.
9. Connect two Lucar connectors. The connectors may be fitted either way round.

### FUEL PUMP INERTIA CUT-OUT SWITCH
Remove and refit 86.65.58

**Reset**
86.65.59

The inertia cut-out switch is situated below the bonnet locating hook bracket on the L.H. side of the car.

**Removing**
1. Release the switch unit from the securing clip.
2. Disconnect the two Lucar connectors.

**Refitting**
3. Reverse instructions 1 and 2.

**Resetting**
1. Depress the button switch on the top of the unit.
CIGARETTE LIGHTER
Remove and refit 86.65.60

Removing
1. Isolate the battery.
2. Pull out the centre console tray.
3. Withdraw the cigarette lighter heating unit.
4. Pull the purple wire 3 mm connector from the centre terminal.
5. Carefully insert a pair of long-nosed pliers into the inner well to locate on the stronger cross-piece as shown.
6. Holding the outer well, unscrew the inner well from the outer well.
7. Remove the illumination ring.
8. Disconnect the black earth wire Lucar connector.
9. Disconnect the red/white wire single-pin harness plug.
10. If necessary renew the bulb as follows: Squeeze the sides of the bulb cowl and withdraw. Unclip the bulb cowl from the bulb holder. Remove the bulb from the bayonet fitting.

Refitting
10. Reverse instructions 1 to 9. Fit the cigarette lighter so that the bulb cowl is suitably positioned.

STEERING COLUMN MULTI-PURPOSE SWITCH
Remove and refit 86.65.64

Removing
1. Isolate the battery.
2. UnscREW two long Pozidriv screws and remove the nacelle upper and lower halves.
   NOTE: The screws have a long threaded length of approximately 20 mm. A long ‘unscrew time’ should be expected.
3. Remove the steering wheel, see 57.60.01.
4. Note the switch harness wire runs.
5. Remove the Insuloid harness clip securing the switch harness to the fascia rail support strut. The clip is released by squeezing the projection as shown.
6. Disconnect two harness plugs.
7. Slacken the switch clamp screw.
8. Withdraw the switch complete with its harness from the column.

Individual switch renew
The multi-purpose switch is initially fitted as a complete unit. In service either half of the switch may be renewed as follows:
9. Do not slacken or remove two hexagon-headed screws.
10. Drill out two rivets.
11. Remove one hexagon-headed screw and washer.
12. Discard the defective switch.
13. Position the new switch.
14. Fit two bolts and nuts supplied with the new switch.
15. Fit one hexagon-headed screw and washer. Do not fully tighten as the screw head is required to move with the switch arm.

continued
Refitting
16 Insert the switch harnesses into position.
   Position the switch to the column with the
   switch tongue located into the outer tube
   assembly slot.
17 Push the switch against the outer tube
   assembly and tighten the switch clamp
   screw.
18 Position the switch harness wire runs as
   noted at instruction 4 above.
19 Connect two harness plugs.
20 Fit the Insuloid harness clip to secure the
   switch harness to the fascia rail support
   strut.
21 Fit the steering wheel, see 57.60.01.
   NOTE: The turn signal cancelling collar
   must be correctly aligned at this stage.
   Refer to 57.60.01.
22 Position the nacelle upper and lower
   halves. Secure with two long Pozidriv
   screws.
23 Connect the battery.
REAR FOG LAMP SWITCH
Remove and refit 86.65.65

When fitted this switch can be one of two types

Removing
1 Remove the fascia switch panel, see 86.65.66.
2 Using a small screwdriver carefully prise off two Spire clips.
3 Remove the face panel and the switch identification strip assembly.
4 Push inwards two spring clips on the switch and withdraw the switch from the panel.

Refitting
5 Reverse instructions 1 to 4.

Alternative procedure:
Removing
1 From behind and below the switch disconnect the multi-pin plug.
2 Unscrew the switch knob.
3 Unscrew the securing collar.
4 Withdraw the switch back through the panel, taking care not to lose the locking washer.

Refitting
5 Reverse instructions 1 to 4.

FASCIA SWITCH PANEL
Remove and refit 86.65.66

Removing
1 Remove two Pozidriv screws.
2 Remove one Pozidriv screw securing the instrument cowl.
3 Push the instrument cowl up slightly to clear the top corner of the panel. Withdraw the fascia switch panel.
4 Pull out two switch identification strip bulb holders.
5 Disconnect all switch harness plugs.
6 Remove the fascia switch panel from the vehicle.

Refitting
7 Reverse instructions 1 to 6.

FUSE
Remove and refit 86.70.02

Fuse box
Removing
1 Open the cubby box lid.
2 Remove two Pozidriv screws. Withdraw the lower panel to obtain access to the component mounting plate.
3 Locate the fuse box attached to the component mounting plate.
4 Pull off the plastic cover.
5 Identify the defective fuse.
6 Carefully lever the fuse from the contacts.

Refitting
7 Reverse instructions 1 to 6.

In line
Removing
1 Open the cubby box lid.
2 Remove two Pozidriv screws. Withdraw the lower panel to obtain access to the component mounting plate.
3 Locate the two in-line fuses using the appropriate illustration.
4 Identify the two in-line fuses as follows: Front parking lamp and cockpit illumination to red/green and red wires. Heated back-light to white and white/black wires.
5 Release the bayonet-type fitting to separate the two parts of the fuse holder.
6 Remove the fuse.

Refitting
7 Reverse instructions 1 to 6.
BATTERY CONDITION INDICATION

Data
Manufacturer ................................ Smith's
Type ........................................ Bi-metal resistance
Smith's part number ...................... BV 8115/00
Triumph part number .................. UKC 0512
Illumination ............................... Remote by instrument panel illumination

Description
The Smith's 'bi-metal resistance' battery condition indicator measures the system voltage. Instrument response is slow to damp out short period variations. The indicator produces no radio interference and no suppression equipment is required.

The battery condition indicator contains a bi-metal strip surrounded by a heater series winding. Current flow through the series winding heats the bi-metal strip which consequently distorts. The pointer is suspended between the moving end of the bi-metal strip and a spring blade. This arrangement causes the pointer to take up a position over the scale that is related to current flow through the indicator. Current flow through the indicator is related to system voltage.

CLOCK

Data
Manufacturer ................................ Smith's—made in France
Type ........................................ Transistor
Smith's part number ..................... CTJ 2702/00
Triumph part number .................. UKC 2408

Description
The clock is precision regulated during manufacture and no further adjustment is possible in service. If the clock is gaining or losing more than five minutes per week the clock should be replaced.

Adjust
Set the hands to the correct time—Locate the adjustment knob below the fascia and to the left of the speedometer trip reset knob. Push the clock adjustment knob upwards and rotate to set the hands.

Regulate the clock—

The clock is precision regulated during manufacture and no further adjustment is possible in service. If the clock is gaining or losing more than five minutes per week the clock should be replaced.

BATTERY CONDITION INDICATOR

Removing
1 Remove the lens, see 88.20.17.
2 Lift away the face panel.
3 Remove one Pozidriv screw.
4 Carefully withdraw the battery condition indicator.

Refitting
5 Reverse 1 to 4.

CLOCK

Removing
1 Remove the lens, see 88.20.17.
2 Lift away the face panel.
3 Unscrew the knurled nut. Withdraw the clock cable.
4 Remove two Pozidriv screws.
5 Withdraw the clock.

Refitting
6 Reverse 1 to 5.
The instrument panel is an independent unit which contains a set of instruments and a comprehensive set of warning lights. These are enclosed in a plastic housing. The exposed side of the instrument panel is finished with a face panel and a one-piece curved lens produced from ICI Acrylic. The individual instruments therefore require no bodies or glasses.

Electrical connections from the vehicle harness to the printed circuit attached to the concealed side of the instrument panel is by two multi-contact harness plugs.

The mechanisms of the individual instruments are screw mounted into the housing. Electrical input to the instruments is via the instrument pillars. The electrical path from the printed circuit to the instrument pillars is by metal clips screwed down against exposed sections of the printed circuit. This design allows any instrument to be removed and refitted without making any conscious electrical connections.

The warning light bulbs are retained in bulb holders which are fitted into the concealed side of the instrument panel by bayonet fittings. The warning light annotated lens blocks are positioned by housing dowels and are retained by being sandwiched between the housing and the face panel. The warning light electrical connections are made automatically by two bulb holder strips making direct contact against exposed sections of the printed circuit.
INSTRUMENT PANEL

Remove and refit 88.20.01

Removing

1. Remove the fascia centre grille, see 76.55.14.
2. Remove the fascia instrument cowl, see 76.46.17.
3. Unscrew two long Pozidriv screws and remove the nacelle upper and lower halves.
   NOTE: The screws have a long threaded length of approximately 20 mm. A long 'unscrew time' should be expected.
4. Slacken the speedometer trip reset cable knurled nut. Withdraw the cable from the bracket slot.
5. Slacken the clock cable knurled nut. Withdraw the cable from the bracket slot.
6. Depress the lever to release the catch from the annular groove in the boss. Pull the speedometer cable from the instrument.
7. Remove two upper Pozidriv screws and washers.
8. Remove two lower Pozidriv screws and washers.
9. Withdraw the instrument panel slightly.
10. Disconnect two harness multi-contact plugs.
11. Remove the instrument panel from the vehicle.

Refitting

12. Ensure that two lower Spire nuts are correctly fitted.
13. Position the instrument panel with the clock cable and the speedometer trip reset cable inserted either side of the fascia rail support strut and harnesses.
15. Insert the instrument panel to its correct position.
16. To help establish the correct position, fit two upper Pozidriv screws and washers finger-tight.
17. Fit two lower Pozidriv screws and washers.
18. Tighten two upper Pozidriv screws and washers.
19. Push the speedometer cable onto the instrument. Ensure that the catch engages into the annular groove in the boss.
20. Insert the clock cable into the appropriate bracket slot. Hand tighten the knurled nut.
21. Insert the speedometer trip reset cable into the appropriate bracket slot. Hand tighten the knurled nut.
22. Position the nacelle upper and lower halves. Secure with two long Pozidriv screws.
23. Fit the fascia instrument cowl, see 76.46.17.
24. Fit the fascia centre grille, see 76.55.14.
INSTRUMENT PANEL
Lens — remove and refit 88.20.17

Removing
1 Remove the fascia centre grille, see 76.55.14.
2 Remove the fascia instrument cowl, see 76.46.17.
3 Remove three Pozidriv screws and washers.
4 Carefully slide the lens upwards following the path of its natural arc.

Refitting
5 Reverse 1 to 4. If difficulty is experienced to engage the four lens tongues, slacken two lower Pozidriv screws and slightly reposition the instrument panel.

INSTRUMENT PANEL
Printed circuit — remove and refit 88.20.19

Removing
1 Remove the instrument panel, see 88.20.01.
2 Remove a number of small Pozidriv screws.
3 Lift out a number of contact clips.
4 Rotate four large bulb holders anti-clockwise and lift from the bayonet fittings.
5 Rotate a number of small bulb holders anti-clockwise and lift from the bayonet fittings.
6 Use a small screwdriver to carefully prise up two plastic press clips. Take care not to damage the printed circuit.
7 Release any sticky tape.
8 Lift away the printed circuit.

Refitting
9 Reverse 1 to 8.

FUEL AND TEMPERATURE INDICATION

Data 88.25.00

Fuel indicator
Manufacturer .................. Smith's
Type .......................... Air cored
Smith's part number .......... ACF 8103/00
Triumph part number ......... UKC 0511
Body .......................... None—assembled into instrument panel
Illumination .................. Remote by instrument panel illumination

Fuel tank unit
Manufacturer .................. Smith's
Smith's part number .......... TBS 5232/000EC
Triumph part number ......... TKC 0147

Temperature indicator
Manufacturer .................. Smith's
Type .......................... Air cored
Smith's part number .......... ACT 8102/00
Triumph part number ......... UKC 0510
Body .......................... None—assembled into instrument panel
Illumination .................. Remote by instrument panel illumination

Temperature transmitter
Manufacturer .................. Smith's
Type .......................... Semi-conductor
Smith's part number .......... TT 4803/00A
Triumph part number ......... 150843
Colour code ........................ Black
Indication range ............... 50 to 140 deg. centigrade
Thread .......................... § in—18 UNF

FUll AND TEMPERATURE INDICATION

Data 88.25.00

Fuel indicator
Manufacturer .................. Smith's
Type .......................... Air cored
Smith's part number .......... ACF 8103/00
Triumph part number ......... UKC 0511
Body .......................... None—assembled into instrument panel
Illumination .................. Remote by instrument panel illumination

Fuel tank unit
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Smith's part number .......... TBS 5232/000EC
Triumph part number ......... TKC 0147

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Type .......................... Air cored
Smith's part number .......... ACT 8102/00
Triumph part number ......... UKC 0510
Body .......................... None—assembled into instrument panel
Illumination .................. Remote by instrument panel illumination

Temperature transmitter
Manufacturer .................. Smith's
Type .......................... Semi-conductor
Smith's part number .......... TT 4803/00A
Triumph part number ......... 150843
Colour code ........................ Black
Indication range ............... 50 to 140 deg. centigrade
Thread .......................... § in—18 UNF
Description 88.25.00

The Smith's 'air cored' indication system is suitable for rugged environments and able to withstand high levels of vibration. Instrument response is rapid. The system is self-compensating for variation in voltage supply and no voltage stabilizer is required. The system produces no radio interference and no suppression equipment is required.

The 'air cored' indicator consists of three individual coil windings positioned relative to each other as shown. A central shaft carries a magnet bar which is free to swing in the area enclosed by the coils. The end of the shaft carries the pointer.

The magnetic field direction produced by any one coil is fixed. The magnetic field strength produced by any one coil may be varied by adjusting the current through the appropriate coil. The final magnetic field direction is the resultant of the currents through all three coils.

The design is that two of the coils receive a constant current. The third coil receives a current managed by a variable resistor which is the appropriate system sensor. The sensor therefore controls the final magnetic field direction. The magnet bar aligns itself with this magnetic field direction and the pointer is positioned to indicate the correct dial reading.

Switch off - when the circuit supply is switched off a small permanent magnet located in the assembly influences the magnet bar and the pointer returns to the zero position. The effect of this 'pull off' magnet is allowed for when calibrating the instrument during manufacture.

The circuit diagram for the fuel indication system and the temperature indication system is shown. Coils 'A' and 'B' receive an almost constant current. In this circuit the current through coils 'A' and 'B' will vary but to a small amount compared to the variation through coil 'C'. Coil 'C' receives a current managed by the fuel tank unit or the temperature transmitter. A ballast resistor and calibration resistor are included in the circuit as shown.
SUMMARY OF WORK

TEMPERATURE INDICATION

TEMPERATURE INDICATOR

Remove and refit 88.25.14

Removing
1. Remove the lens, see 88.20.17.
2. Lift away the face panel.
3. Remove one Pozidriv screw.
4. Carefully withdraw the temperature indicator.

Refitting
5. Reverse 1 to 4.

TEMPERATURE TRANSMITTER

Remove and refit 88.25.20

Removing
1. Drain part of the coolant, see 26.10.01.
2. Locate the transmitter on the inlet manifold.
3. Disconnect the Lucar connector.
4. Unscrew the transmitter from the inlet manifold.

Refitting
5. Reverse 1 to 4. Fit a new sealing washer if available.

FUEL INDICATION

FUEL INDICATOR

Remove and refit 88.25.26

Removing
1. Remove the lens, see 88.20.17.
2. Lift away the face panel.
3. Remove one Pozidriv screw.
4. Carefully withdraw the fuel indicator.

Refitting
5. Reverse 1 to 4.

FUEL TANK UNIT

Remove and refit 88.25.32

Removing
1. Drive the vehicle onto a ramp.
2. Estimate the quantity of fuel in the fuel tank.
3. Provide a suitable container to receive the quantity.
4. Raise the ramp.
5. Disconnect the Lucar connectors.
6. Prepare for fuel spillage. Pull off the rubber fuel outlet pipe and drain the tank contents into the container.
7. Release the locking ring by tapping anti-clockwise. Remove the locking ring.

NOTE: This operation may be facilitated by employing a service tool – Churchill number 18G1001.

8. Carefully withdraw the tank unit.
9. Remove the sealing washer.

Refitting
SPEEDOMETER
Remove and refit 88.30.01

Removing
1 Remove the lens, see 88.20.17.
2 Lift away the face panel.
3 Depress the lever to release the catch from the annular groove in the boss. Pull the speedometer cable from the instrument.
4 Remove three Pozidriv screws.
5 Withdraw the speedometer.

Refitting
6 To assist engagement of the speedometer trip reset cable rotate the control to pre-set the alignment.
7 Insert the speedometer.
8 Fit three Pozidriv screws.
9 Push the speedometer cable onto the instrument. Ensure that the catch engages into the annular groove in the boss.
10 Position the face panel.
11 Fit the lens, see 88.20.17.

SPEEDOMETER
Trip reset cable — remove and refit 88.30.02

Removing
1 Remove the speedometer, see 88.30.01.
2 Note the run of the trip reset cable.
3 Slacken the trip reset cable knurled nut. Withdraw the cable from the bracket slot.
4 To assist withdrawal of the trip reset cable rotate the control to pre-set the alignment.
5 Using a small screwdriver release the trip reset cable claws. Withdraw the trip reset cable attachment from the instrument panel housing.

Refitting
6 To assist insertion of the trip reset cable rotate the control to pre-set the alignment.
7 Insert the trip reset cable attachment into the instrument panel housing. Ensure that the claws engage correctly.
8 Ensure that the trip reset cable run is as noted at operation 2 above.
9 Insert the trip reset cable into the bracket slot. Hand tighten the knurled nut.
10 Fit the speedometer, see 88.30.01.

TACHOMETER
Remove and refit 88.30.21

Removing
1 Remove the lens, see 88.20.17.
2 Lift away the face panel.
3 Remove three Pozidriv screws.
4 Carefully withdraw the tachometer.

Refitting
5 Reverse 1 to 4.
The following tool list is divided into two sections: 'New Tools' that have been specially designed for use on the Triumph TR8, and 'Existing Tools' that may already be in the possession of Distributors and Dealers, and are suitable for the Triumph TR8.

### NEW TOOLS

<table>
<thead>
<tr>
<th>Tool No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>18G 1319</td>
<td>Upper pinnion seal replacer</td>
</tr>
<tr>
<td>18G 1320</td>
<td>Steering rack pinion upper bearing/seal replacer</td>
</tr>
<tr>
<td>18G 1321</td>
<td>Steering rack end housing assembly sleeve</td>
</tr>
<tr>
<td>18G 1322</td>
<td>Steering rack assembly sleeve</td>
</tr>
<tr>
<td>18G 1323</td>
<td>Steering rack valve and circlip assembly sleeve</td>
</tr>
<tr>
<td>18G 1326</td>
<td>Power steering pump pulley remover/replacer</td>
</tr>
<tr>
<td>18G 1327</td>
<td>Steering rack end housing locknut spanner</td>
</tr>
</tbody>
</table>

### EXISTING TOOLS

<table>
<thead>
<tr>
<th>Tool No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>18G 2 (6312 A)</td>
<td>Universal two-legged puller</td>
</tr>
<tr>
<td>18G 2-1</td>
<td>Pinion oil seal remover adaptor</td>
</tr>
<tr>
<td>18G 45</td>
<td>Valve spring compressor (alternative to 18G 106)</td>
</tr>
<tr>
<td>18G 47</td>
<td>Hand press</td>
</tr>
<tr>
<td>18G 47-1</td>
<td>Layshaft cluster bearings remanadator</td>
</tr>
<tr>
<td>18G 47-3</td>
<td>Constant pinion and mainshaft bearing remover/replacer adaptor</td>
</tr>
<tr>
<td>18G 47 AJ</td>
<td>Pinion bearing remover/replacer adaptor</td>
</tr>
<tr>
<td>18G 55 A (38 U 3)</td>
<td>Valve spring compressor (alternative to 18G 45)</td>
</tr>
<tr>
<td>18G 191</td>
<td>Bevel pinion setting gauge</td>
</tr>
<tr>
<td>18G 191-1</td>
<td>Dummy pinion</td>
</tr>
<tr>
<td>18G 257</td>
<td>Circlip pliers</td>
</tr>
<tr>
<td>18G 257 Q</td>
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|S 4235 A-1  | Rear clutch pivot bolt spanner                                             |
|S 4235 A-10 | Clutch withdrawal pivot bolt spanner (Snap-on Tools supply item)           |
| ST 1136    | (Snap-on Tools supply item)                                               |

All service tools mentioned in the Manual must be obtained direct from the manufacturers:
Messenrs. V. L. Churchill & Co. Ltd.
P.O. Box No. 3
London Road, Daventry, Northants.
EXISTING TOOLS

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(6312 A)

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