Preliminary Service Information

Stag
PRELIMINARY
SERVICE INFORMATION

Introduction

The information contained in this provisional manual is issued as a temporary measure to assist Standard-Triumph Dealers in the servicing and repair of 'Stag' until a workshop manual is available.

Units new to the Triumph range are described and illustrated in detail, but where a unit is similar to one described in existing publications, reference is made to this source on the contents page.
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</table>
STAG —
GENERAL SPECIFICATION DATA
SECTION 04
## ENGINE

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cylinders</td>
<td>8, in 'V' configuration</td>
</tr>
<tr>
<td>Bore of cylinders</td>
<td>86 mm. (3.385 in.)</td>
</tr>
<tr>
<td>Stroke of crankshaft</td>
<td>64.5 mm. (2.529 in.)</td>
</tr>
<tr>
<td>Displacement</td>
<td>2997 cc (182.9 cu. in.)</td>
</tr>
<tr>
<td>Compression ratio</td>
<td>9.0 : 1</td>
</tr>
<tr>
<td>Firing order</td>
<td>1, 2, 7, 8, 4, 5, 6, 3</td>
</tr>
<tr>
<td>Valve operation</td>
<td>Overhead by single overhead camshaft for each bank</td>
</tr>
<tr>
<td>Main bearings</td>
<td>5 steel-backed lead–bronze with lead–indium overlay</td>
</tr>
<tr>
<td>Connecting rods</td>
<td>45-ton steel forging. Horizontally split big-end solid small-end. Fully-floating gudgeon pin</td>
</tr>
<tr>
<td>Big-end bearings</td>
<td>Steel-backed lead–bronze with lead–indium overlay</td>
</tr>
<tr>
<td>Pistons</td>
<td>Aluminium alloy, solid skirt</td>
</tr>
<tr>
<td>Camshafts</td>
<td>Single overhead camshaft for each bank</td>
</tr>
<tr>
<td>Drive</td>
<td>Chain and sprocket from crankshaft</td>
</tr>
<tr>
<td>Timing chains</td>
<td>R.H. bank: 9.52 mm. (0.375 in.) pitch x 104 pitches</td>
</tr>
<tr>
<td></td>
<td>L.H. bank: 9.52 mm. (0.375 in.) pitch x 106 pitches</td>
</tr>
<tr>
<td>Camshaft bearings</td>
<td>5 replaceable bearings per camshaft</td>
</tr>
<tr>
<td>Tappets</td>
<td>Inverted bucket type</td>
</tr>
<tr>
<td></td>
<td>Adjustment by internal pailets</td>
</tr>
</tbody>
</table>

### Lubrication

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>System type</td>
<td>Wet sump</td>
</tr>
<tr>
<td>Oil pump</td>
<td>4-lobe rotor-type pump, skew-gear driven from chain-driven jack shaft</td>
</tr>
<tr>
<td>Oil filter</td>
<td>Full-flow type, replaceable element</td>
</tr>
<tr>
<td>Oil warning-light</td>
<td>Extinguishes at 3 to 5 lb./in.2 (0.21 to 0.35 kg./cm²) oil pressure</td>
</tr>
</tbody>
</table>

### COOLING SYSTEM

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>13 lb./in.2 (0.91 kg./cm²)</td>
</tr>
<tr>
<td>Circulation</td>
<td>By impeller-type pump driven through skew gears from jackshaft</td>
</tr>
<tr>
<td>Fan</td>
<td>13 blades, 16¾ in. (418 mm.) dia., incorporating a viscous coupling to reduce noise and power loss at high engine speed</td>
</tr>
</tbody>
</table>


**FUEL SYSTEM**

- Tank located under luggage compartment floor.
- North America Market models incorporate an evaporative emission control system.
- Fuel pump: S.U. electric diaphragm pump (AUF 303)
  - Pressure: 2-7 lb/in², 20-19 kg/cm²
  - Pressure relief valve allows surplus fuel to return to tank.
- Carburetters: Twin sidedraught Stromberg 175–CDS.
- Needles: B.1AQ
- Springs: Blue
- Carburetters (North American markets): Twin sidedraught Stromberg 175–CDSE

**CLUTCH**

- Type: Laycock diaphragm type, single dry plate, hydraulically operated release mechanism.
- Clutch driven plate:
  - Diameter: 9 in. (228.6 mm.)
  - Facing material: Raybestos 1133c
  - Number of damper springs: 6
- Clutch release bearing: Ball journal

**GEARBOX**

**Manual**

- 4 forward speeds and 1 reverse, Synchromesh on all forward gears:
  - Gear ratios: 1.00 : 1, 1.386 : 1, 2.10 : 1, 2.995 : 1, 3.369 : 1
  - Overall ratios: 3.70 : 1, 5.13 : 1, 7.77 : 1, 11.08 : 1, 12.47 : 1

**Overdrive (Optional)**

- Laycock de Normanville, operative on 3rd and top gears
- Overall ratio: 0.82 : 1

**Automatic (Optional)**

- Borg-Warner type 35
  - Gearbox conversion: 1:00-2.50, 115-3-34, 2.39-5.50, 2.09-4.8 1
  - Overall ratio: 3.70-8.50, 5.37-12.37, 8.85-20.40, 7.75-17.80

**Maximum change-up speeds (full throttle, i.e. seven-eighths of pedal movement)**

<table>
<thead>
<tr>
<th>Gear</th>
<th>Road Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st to 2nd</td>
<td>34 to 42 m.p.h. (54 to 67 km.p.h.)</td>
</tr>
<tr>
<td>2nd to 3rd</td>
<td>64 to 70 m.p.h. (102 to 112 km.p.h.)</td>
</tr>
</tbody>
</table>

**Pre-set down-change speeds ('kick-down')**

<table>
<thead>
<tr>
<th>Gear</th>
<th>Road Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd to 2nd</td>
<td>56 to 66 m.p.h. (90 to 105 km.p.h.)</td>
</tr>
<tr>
<td>3rd to 2nd or 2nd to 1st</td>
<td>24 to 30 m.p.h. (38 to 48 km.p.h.)</td>
</tr>
</tbody>
</table>
FINAL DRIVE . . . . . . Hypoid bevel gears
Ratio . . . . . 3:7 : 1 (37 : 10)

EFFECTIVE GEARING (MANUAL TRANSMISSION)
Engine speeds (r.p.m.) at road speeds of:

<table>
<thead>
<tr>
<th>O/D</th>
<th>O/D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>Top</td>
</tr>
<tr>
<td>3rd</td>
<td>3rd</td>
</tr>
<tr>
<td>2nd</td>
<td>1st</td>
</tr>
<tr>
<td>Rev.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10 m.p.h.</th>
<th>10 km.p.h.</th>
</tr>
</thead>
<tbody>
<tr>
<td>432</td>
<td>279</td>
</tr>
<tr>
<td>527</td>
<td>328</td>
</tr>
<tr>
<td>599</td>
<td>372</td>
</tr>
<tr>
<td>730</td>
<td>454</td>
</tr>
<tr>
<td>1,107</td>
<td>687</td>
</tr>
<tr>
<td>1,580</td>
<td>980</td>
</tr>
<tr>
<td>1,178</td>
<td>1,102</td>
</tr>
</tbody>
</table>

(Goodyear 6.800 185/70 HR—14 tyres)

Engine speeds (r.p.m.) at road speeds of:

<table>
<thead>
<tr>
<th>O/D</th>
<th>O/D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>Top</td>
</tr>
<tr>
<td>3rd</td>
<td>3rd</td>
</tr>
<tr>
<td>2nd</td>
<td>1st</td>
</tr>
<tr>
<td>Rev.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10 m.p.h.</th>
<th>10 km.p.h.</th>
</tr>
</thead>
<tbody>
<tr>
<td>414</td>
<td>258</td>
</tr>
<tr>
<td>505</td>
<td>314</td>
</tr>
<tr>
<td>578</td>
<td>359</td>
</tr>
<tr>
<td>705</td>
<td>438</td>
</tr>
<tr>
<td>1,070</td>
<td>665</td>
</tr>
<tr>
<td>1,530</td>
<td>950</td>
</tr>
<tr>
<td>1,720</td>
<td>1,070</td>
</tr>
</tbody>
</table>

(Michelin XAS 185 HR—14 tyres)

ROAD SPEED DATA
Road speeds at 1,000 r.p.m. engine speed:

<table>
<thead>
<tr>
<th>In Top gear</th>
<th>In O/D Top gear</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 m.p.h. (30.4 km.p.h.)</td>
<td>23:1 m.p.h. (37 km.p.h.)</td>
</tr>
</tbody>
</table>

Tyres Goodyear G.800 185/70 GR—14

<table>
<thead>
<tr>
<th>In Top gear</th>
<th>In O/D Top gear</th>
</tr>
</thead>
<tbody>
<tr>
<td>19:8 m.p.h. (31.6 km.p.h.)</td>
<td>24:1 m.p.h. (38.5 km.p.h.)</td>
</tr>
</tbody>
</table>

Tyres Michelin XAS 185 HR—14

STEERING
Make/type . . . . . . Alford and Alder. Rack and pinion (power-assisted). Steering-column incorporates an anti-theft locking device

Steering-wheel diameter . . . . . . 16 in. (407 mm.)
Steering-wheel turns (lock to lock) . . . . . . 4
Steering-column adjustment . . . . . . 4 in. (102 mm.) approx. axially
2 in. (51 mm.) approx. vertically

BRAKE SYSTEM
Front . . . . . . Caliper disc brakes
Disc diameter: 10:625 in. (270 mm.)
Lining material: DON 225 FG

Rear . . . . . . Self-adjusting drum brakes
9 in. dia. × 2:25 in. wide (228 mm x 57 mm.) of leading and trailing shoe type
Lining material: DON 202 GG
Wheel cylinder diameter 0.6875 in. (17.46 mm.)
BRAKE SYSTEM—continued

Operation........... Divided hydraulic system operating front and rear brakes independently through a tandem master cylinder
Pressure differential switch operates warning lamp on facia

Servo........... Direct-acting servo providing 3:1 nominal boost ratio

Front lining area........... 24 in.² (150 cm.²)
Rear lining area........... 78 in.² (504 cm.²)
Total lining area........... 102 in.² (658 cm.²)
Front swept area........... 220 in.² (1420 cm.²)
Rear swept area........... 127 in.² (819 cm.²)
Total swept area........... 347 in.² (2240 cm.²)
Hand brake........... Centrally mounted lever operates rear brakes mechanically

WHEELS
Steel disc type........... 5J, flat hump, safety ledge rims
Wire wheels........... 5½J flat ledge rims

TYRES
Goodyear G.800, 185/70 HR—14 or Michelin XAS, 185 HR—14
Pressures: Front........... 26 lb./in.² (1.82 kg./cm.²)
Rear........... 30 lb./in.² (2.10 kg./cm.²)

ELECTRICAL EQUIPMENT
Spark plugs........... Champion N—11Y
Gap........... 0.024 to 0.026 in. (0.625 to 0.660 mm.)
Battery........... 12-volt
Capacity........... 56 amp.-hr. at 20-hour rate
Negative earth
Alternator........... Lucas 11AC ventilated type
540 watts output. Vee belt drive

Distributor........... Lucas type 35 D8, with centrifugal and vacuum automatic advance control

Coil........... Lucas type 16C6, 6-volt, incorporating ballast resistor

Starter motor........... Lucas type M418G, pre-engaged type
Wiper motor........... Lucas type 16 W, 2-speed. Self-parking

RECOMMENDED HYDRAULIC FLUIDS
Clutch and Brake Reservoirs: Lockheed Super Heavy Duty Brake Fluid.
Where this proprietary brand is not available other fluids which meet S.A.E. J.1703 specification may be used.
ANTI-FREEZE SOLUTIONS

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

<table>
<thead>
<tr>
<th>ANTI-FREEZE CONCENTRATION</th>
<th>25%</th>
<th>30%</th>
<th>35%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete Protection:</td>
<td>10° F. (−12° C.)</td>
<td>3° F. (−12° C.)</td>
<td>−4° F. (−20° C.)</td>
</tr>
<tr>
<td></td>
<td>(22 degrees of frost)</td>
<td>(29 degrees of frost)</td>
<td>(36 degrees of frost)</td>
</tr>
<tr>
<td>Safe Limit:</td>
<td>1° F. (−17° C.)</td>
<td>−8° F. (−22° C.)</td>
<td>−18° F. (−28° C.)</td>
</tr>
<tr>
<td></td>
<td>(31 degrees of frost)</td>
<td>(40 degrees of frost)</td>
<td>(50 degrees of frost)</td>
</tr>
<tr>
<td>Lower Protection Limit:</td>
<td>−14° F. (−26° C.)</td>
<td>−22° F. (−30° C.)</td>
<td>−28° F. (−33° C.)</td>
</tr>
<tr>
<td></td>
<td>(46 degrees of frost)</td>
<td>(54 degrees of frost)</td>
<td>(60 degrees of frost)</td>
</tr>
</tbody>
</table>

CAPACITIES

- Fuel tank: 14 gal. (16.9 U.S. gal., 63.5 litres)
- Engine sump: 8 pints (9.6 U.S. pints, 4.5 litres)
- Engine sump (drain and refill): 8 pints (9.6 U.S. pints, 4.5 litres)
- Engine sump (drain and refill with filter change): 9 pints (10.9 U.S. pints, 5.1 litres)
- Engine oil filter: 1 pint (1.2 U.S. pints, 0.56 litre)
- Gearbox (from dry): 2.25 pints (2.7 U.S. pints, 1.28 litres)
- Gearbox and overdrive (from dry): 3.75 pints (4.5 U.S. pints, 2.13 litres)
- Automatic transmission: 11.5 pints (13.9 U.S. pints, 6.5 litres)
- Rear axle (from dry): 2 pints (2.4 U.S. pints, 1.13 litres)
- Power steering reservoir: 1.25 pints (1.5 U.S. pints, 0.7 litre)
- Cooling system (with heater): 18.5 pints (22.3 pints, 10.5 litres)
**CHASSIS DATA**

<table>
<thead>
<tr>
<th></th>
<th>Wheelbase</th>
<th>Track: Front</th>
<th>Wheel Alignment (unladen): Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 ft. 4 in. (2540 mm.)</td>
<td>4 ft. 4.5 in. (1330 mm.)</td>
<td>0 to 1/8 in. toe-in (1.6 to 3.17 mm.)</td>
<td>0 to 1/8 in. toe-in (0 to 1.6 mm.)</td>
</tr>
</tbody>
</table>

**Camber and castor**

<table>
<thead>
<tr>
<th></th>
<th>Camber</th>
<th>Castor</th>
<th>King-pitz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic unladen weight</td>
<td>1 1/4°</td>
<td>2°</td>
<td>10°</td>
</tr>
<tr>
<td>Unladen weight (including automatic transmission or overdrive and/or air conditioning, hard top)</td>
<td>2°</td>
<td>2°</td>
<td>11&quot;</td>
</tr>
</tbody>
</table>

**Turning circle**

34 ft. 1 in. (10.4 m.) (between kerbs)

**OVERALL DIMENSIONS**

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Width</th>
<th>Height (unladen):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14 ft. 5.7 in. (4420 mm.)</td>
<td>5 ft. 3.5 in. (1612 mm.)</td>
<td></td>
</tr>
<tr>
<td>Soft top erect</td>
<td>4 ft. 1.5 in. (1258 mm.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hard top</td>
<td>4 ft. 1.5 in. (1258 mm.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top of screen</td>
<td>4 ft. 0 in. (1220 mm.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**WEIGHTS (approx.)**

<table>
<thead>
<tr>
<th></th>
<th>Dry (excluding extra equipment)</th>
<th>Basic unladen (including tools, fuel, oil, and water)</th>
<th>Kerb (including optional extras, automatic transmission or overdrive, air conditioning, hard top)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2,600 lb. (1180 kg.)</td>
<td>2,770 lb. (1255 kg.)</td>
<td>2,970 lb. (1350 kg.)</td>
</tr>
<tr>
<td>Maximum gross vehicle weight</td>
<td>3,750 lb. (1700 kg.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum trailer weight (trailer equipped with brakes)</td>
<td>2,800 lb. (1270 kg.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Engine (PE.188)

<table>
<thead>
<tr>
<th>Item Description</th>
<th>UNF</th>
<th>UNC</th>
<th>kgf. m</th>
<th>lbf. ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accelerator Mounting Bracket Assy. to Inlet Manifold</td>
<td>1/8&quot;</td>
<td>1/8&quot;</td>
<td>1.0-1.2</td>
<td>7-9</td>
</tr>
<tr>
<td>Alternator to Boss on Timing Cover</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Adjusting Link to Alternator</td>
<td>5/8&quot;</td>
<td>5/8&quot;</td>
<td>2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Camshaft Cover to Cylinder Head</td>
<td>3/4&quot;</td>
<td>3/4&quot;</td>
<td>14-30</td>
<td>1-2</td>
</tr>
<tr>
<td>Camshaft Bearing Cap &amp; Cover Stud</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>14-30</td>
<td>1-2</td>
</tr>
<tr>
<td>Camshaft Bearing Cap Stud</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>1-5-2-0</td>
<td>11-14</td>
</tr>
<tr>
<td>Cylinder Head Attachment Bolt</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>6-2-7-6</td>
<td>45-55</td>
</tr>
<tr>
<td>Cylinder Head Attachment Stud</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>6-2-7-6</td>
<td>45-55</td>
</tr>
<tr>
<td>Chainwheel to Camshaft</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>1-0-1-2</td>
<td>7-9</td>
</tr>
<tr>
<td>Carburator Adaptor Attachment</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>3-6-4-4</td>
<td>26-32</td>
</tr>
<tr>
<td>Carburator to Adaptor</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Clutch to Flywheel</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Clutch Extension Housing to Cylinder Block</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Chainwheel to Idler Shaft</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>4-1-5-1</td>
<td>30-37</td>
</tr>
<tr>
<td>Crankshaft Pulley to Crankshaft</td>
<td>5/8&quot;</td>
<td>5/8&quot;</td>
<td>12-4-15-2</td>
<td>90-110</td>
</tr>
<tr>
<td>Crankshaft to Cylinder Block Sealing Detail</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>1-0-1-2</td>
<td>7-9</td>
</tr>
<tr>
<td>Connecting Rod Bolt</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>5-2-6-2</td>
<td>38-45</td>
</tr>
<tr>
<td>Distributor Attachment</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>1-0-1-2</td>
<td>9-7</td>
</tr>
<tr>
<td>Exhaust Manifold Attachment</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>See Note*</td>
<td></td>
</tr>
<tr>
<td>Exhaust Manifold Outlet Stud</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>1-5-2-0</td>
<td>11-14</td>
</tr>
<tr>
<td>Engine Mounting Bracket to Cylinder Block R.H.</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>2-2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Engine Mounting Bracket to Cylinder Block L.H.</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>2-2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Flywheel to Crankshaft</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>5-2-6-2</td>
<td>38-45</td>
</tr>
<tr>
<td>Fan Coupling to Crankshaft</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>3-6-4-4</td>
<td>26-32</td>
</tr>
<tr>
<td>Fan Coupling to Fan</td>
<td>5/16&quot;</td>
<td>5/16&quot;</td>
<td>1-5-2-0</td>
<td>11-14</td>
</tr>
<tr>
<td>Elbow to Carburator</td>
<td>1/8&quot;</td>
<td>1/8&quot;</td>
<td>2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Inlet Manifold Attachment</td>
<td>1/8&quot;</td>
<td>1/8&quot;</td>
<td>2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Inlet Manifold Attachment</td>
<td>1/8&quot;</td>
<td>1/8&quot;</td>
<td>2-2-8</td>
<td>16-20</td>
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<tr>
<td>Idler Shaft Keep Plate Screw</td>
<td>5/32&quot;</td>
<td>5/32&quot;</td>
<td>2-2-8</td>
<td>16-20</td>
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<tr>
<td>Lifting Eye to Cylinder Head</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Main Bearing Caps to Block</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>7-9</td>
<td>50-65</td>
</tr>
<tr>
<td>Main Bearing Caps to Block</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>7-9</td>
<td>50-65</td>
</tr>
<tr>
<td>Oil Sump Drain Plug</td>
<td>3/8&quot; x 18</td>
<td>3/8&quot; x 18</td>
<td>2-8-3-3</td>
<td>20-24</td>
</tr>
<tr>
<td>Oil Sump to Cylinder Block</td>
<td>1/8&quot;</td>
<td>1/8&quot;</td>
<td>2-2-2-8</td>
<td>16-20</td>
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<tr>
<td>Oil Pressure Indicator Switch</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>1/4&quot; Dryseal</td>
<td>7-1-0</td>
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<tr>
<td>Oil Pump Assy. to Cylinder Block</td>
<td>1/8&quot;</td>
<td>1/8&quot;</td>
<td>2-2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Oil Filter to Block</td>
<td>5/32&quot;</td>
<td>5/32&quot;</td>
<td>2-2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Quadrant to Timing Cover</td>
<td>5/32&quot;</td>
<td>5/32&quot;</td>
<td>2-2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Sparking Plug</td>
<td>14 mm</td>
<td>14 mm</td>
<td>2-2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Suction Pipe to Cylinder Block</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>1-0-1-2</td>
<td>7-9</td>
</tr>
<tr>
<td>Timing Cover Attachment</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>2-2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Timing Cover to Cylinder Head</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>2-2-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Timing Chain Tensioner to Cylinder Block</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>1-0-1-2</td>
<td>7-9</td>
</tr>
</tbody>
</table>

(*) Outer 4 Sets. tightened to 16-20 lbf. ft. Inner 3 Sets. tightened to 26-32 lbf. ft.

† Should maintain a min. of 8 lbf. ft. after a settling period.
### Gearbox Torque Settings

<table>
<thead>
<tr>
<th>Connection</th>
<th>7-9 lbf. ft.</th>
<th>5-7 lbf. ft.</th>
<th>11-14 lbf. ft.</th>
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</thead>
<tbody>
<tr>
<td>Countershaft End Cover to G/Box</td>
<td></td>
<td></td>
<td>2-2-2.8 16-20</td>
</tr>
<tr>
<td>Countershaft &amp; Reverse Shaft to G/Box, Rear of</td>
<td></td>
<td></td>
<td>1-3-2.0 11-14</td>
</tr>
<tr>
<td>Countershaft</td>
<td></td>
<td></td>
<td>1-0-1.2 7-9</td>
</tr>
<tr>
<td>Cap to Top Cover</td>
<td></td>
<td></td>
<td>1-0-1.2 7-9</td>
</tr>
<tr>
<td>Change Speed Lever Attach.</td>
<td></td>
<td></td>
<td>1-0-1.2 7-9</td>
</tr>
<tr>
<td>Clutch Slave Cylinder to G/Box Extension Housing</td>
<td></td>
<td></td>
<td>2-2-2.8 16-20</td>
</tr>
<tr>
<td>Drain Plug (Magnetic)</td>
<td></td>
<td></td>
<td>2-2-2.8 16-20</td>
</tr>
<tr>
<td>Front End Cover to G/Box</td>
<td></td>
<td></td>
<td>2-2-2.8 16-20</td>
</tr>
<tr>
<td>Fulcrum Pin to G/Box</td>
<td></td>
<td></td>
<td>2-8-3.3 20-24</td>
</tr>
<tr>
<td>Gearbox Extension to Rear Mounting</td>
<td></td>
<td></td>
<td>1-5-2-0 11-14</td>
</tr>
<tr>
<td>Gearbox Extension to G/Box</td>
<td></td>
<td></td>
<td>2-2-2.8 16-20</td>
</tr>
<tr>
<td>Gearbox Casing to Clutch Housing Extension</td>
<td></td>
<td></td>
<td>2-2-2.8 16-20</td>
</tr>
<tr>
<td>Gearbox Casing to Clutch Housing Extension Att</td>
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<td></td>
<td>3-6-4-4 26-32</td>
</tr>
<tr>
<td>Mainshaft Flange to Shaft</td>
<td></td>
<td>3/8 UNC</td>
<td>3-6-4.4 26-32</td>
</tr>
<tr>
<td>Oil Level Plug</td>
<td>1/4 x18 Dryseal</td>
<td>3/8 UNC</td>
<td>12-4-15.2 90-110</td>
</tr>
<tr>
<td>Propeller Shaft Attachment</td>
<td>3/8 UNC</td>
<td>3/8 UNC</td>
<td>3-6-4.4 26-32</td>
</tr>
<tr>
<td>Speedo Driven Gear &amp; Brkt. to Extension</td>
<td>3/8 UNC</td>
<td>3/8 UNC</td>
<td>3-6-4.4 26-32</td>
</tr>
<tr>
<td>Selector to Shaft</td>
<td>3/8 UNC</td>
<td>3/8 UNC</td>
<td>3-6-4.4 26-32</td>
</tr>
<tr>
<td>Selector Cover Plate to G/Box</td>
<td>3/8 UNC</td>
<td>3/8 UNC</td>
<td>3-6-4.4 26-32</td>
</tr>
<tr>
<td>Starter Motor to Engine Extension</td>
<td>3/8 UNC</td>
<td>3/8 UNC</td>
<td>3-6-4.4 26-32</td>
</tr>
<tr>
<td>Top Cover to G/Box</td>
<td>3/8 UNC</td>
<td></td>
<td>2-2-2.8 16-20</td>
</tr>
</tbody>
</table>

### Borg Warner Transmission

<table>
<thead>
<tr>
<th>Connection</th>
<th>7-9 lbf. ft.</th>
<th>5-7 lbf. ft.</th>
<th>11-14 lbf. ft.</th>
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</thead>
<tbody>
<tr>
<td>Blanking Plate to Pedal Bracket Clutch M/Cylinder</td>
<td></td>
<td></td>
<td>2-2-2.8 16-20</td>
</tr>
<tr>
<td>Aperture</td>
<td></td>
<td></td>
<td>3-6-4.4 26-32</td>
</tr>
<tr>
<td>Drive Plate Attachment to Converter</td>
<td></td>
<td></td>
<td>3-6-4.4 26-32</td>
</tr>
<tr>
<td>Gear Lever Knob Locknut</td>
<td></td>
<td></td>
<td>1-0-1.2 7-9</td>
</tr>
<tr>
<td>Oil Cooler to Mtg. Brkt. L.H.</td>
<td></td>
<td></td>
<td>1-0-1.2 7-9</td>
</tr>
<tr>
<td>Oil Cooler to Mtg. Brkt. R.H.</td>
<td></td>
<td></td>
<td>1-0-1.2 7-9</td>
</tr>
<tr>
<td>Oil Cooler Mtg. Brkt. to Longitudinal Member</td>
<td></td>
<td></td>
<td>2-2-2.8 16-20</td>
</tr>
<tr>
<td>Kick Down Cable Trunnion to Mtg. Brkt</td>
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<td></td>
<td>1-0-1.2 7-9</td>
</tr>
<tr>
<td>Prop Shaft to Axle Extension Flange only</td>
<td></td>
<td></td>
<td>3-6-4.4 26-32</td>
</tr>
<tr>
<td>Selector Lever to Unit</td>
<td></td>
<td></td>
<td>2-2-2.8 16-20</td>
</tr>
<tr>
<td>Selector Lever Bolt</td>
<td></td>
<td></td>
<td>1-0-1.2 7-9</td>
</tr>
<tr>
<td>Spindle to Selector Box</td>
<td></td>
<td></td>
<td>1-0-1.2 7-9</td>
</tr>
<tr>
<td>Selector Lever to Spindle</td>
<td></td>
<td></td>
<td>2-2-2.8 16-20</td>
</tr>
<tr>
<td>Speedo Drive Attachment</td>
<td></td>
<td></td>
<td>3 /18 UNC</td>
</tr>
<tr>
<td>Starter Motor to Engine Adaptor &amp; Convertor Housing</td>
<td></td>
<td></td>
<td>3-6-4.4 26-32</td>
</tr>
<tr>
<td>Torque Convertor Housing to Adaptor &amp; Engine</td>
<td></td>
<td></td>
<td>2-2-2.8 16-20</td>
</tr>
<tr>
<td>Torque Convertor Housing to Adaptor</td>
<td></td>
<td></td>
<td>3-6-4.4 26-32</td>
</tr>
<tr>
<td>Torque Convertor Housing through Adaptor to Engine</td>
<td></td>
<td></td>
<td>2-2-2.8 16-20</td>
</tr>
<tr>
<td>Torque Convertor Housing to Adaptor</td>
<td></td>
<td></td>
<td>2-2-2.8 16-20</td>
</tr>
</tbody>
</table>

* Stud fitting torques as follows:
7-9 lbf. ft.—Standard; 5-7 lbf. ft.—Overdrive; 11-14 lbf. ft.—Borg Warner.
### Front Suspension

<table>
<thead>
<tr>
<th>Component</th>
<th>kgf. m</th>
<th>lbf. ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-Roll Bar Fixing</td>
<td>4-6</td>
<td>3-4</td>
</tr>
<tr>
<td>Ball Joint to Vertical Link</td>
<td>5-2-7-0</td>
<td>38-50</td>
</tr>
<tr>
<td>Caliper to Vertical Link</td>
<td>0-9</td>
<td>50-65</td>
</tr>
<tr>
<td>Damper Strut to Top Mounting</td>
<td>0-2-8</td>
<td>16-20</td>
</tr>
<tr>
<td>Damper Unit &amp; Caliper to Vertical Link</td>
<td>5-2-9-0</td>
<td>50-65</td>
</tr>
<tr>
<td>Damper Unit to Vertical Link</td>
<td>3-6-4-4</td>
<td>26-32</td>
</tr>
<tr>
<td>Damper Unit to Studs in Body Turret</td>
<td>1-5-2-0</td>
<td>11-14</td>
</tr>
<tr>
<td>Disc to Hub</td>
<td>3-6-4-4</td>
<td>26-32</td>
</tr>
<tr>
<td>Front Suspension Crossmember to Body</td>
<td>3-6-4-4</td>
<td>26-32</td>
</tr>
<tr>
<td>Hub to Stub Axle</td>
<td>8-3-10-3</td>
<td>60-75</td>
</tr>
<tr>
<td>Lower Strut to Body</td>
<td>4-1-5-1</td>
<td>30-37</td>
</tr>
<tr>
<td>Lower Strut to Lower Wishbone</td>
<td>7-9</td>
<td>50-65</td>
</tr>
<tr>
<td>Stub Axle to Vertical Link</td>
<td>7-9</td>
<td>50-65</td>
</tr>
</tbody>
</table>

### Rear Suspension

<table>
<thead>
<tr>
<th>Component</th>
<th>kgf. m</th>
<th>lbf. ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brake Backplate to Trailing Arin</td>
<td>1-5-2-0</td>
<td>11-14</td>
</tr>
<tr>
<td>Driving Flange to Outer Axle Shaft</td>
<td>12-4-15-2</td>
<td>90-110</td>
</tr>
<tr>
<td>Inner Driving Flange to Rear Hub &amp; Axle Shaft Assy.</td>
<td>3-6-4-4</td>
<td>26-32</td>
</tr>
<tr>
<td>Mounting Rubber to Sub-Frame</td>
<td>2-2-8-2</td>
<td>16-20</td>
</tr>
<tr>
<td>Mounting Rebound Rubber &amp; Sub-Frame L.H. &amp; R.H. to Floor</td>
<td>5-2-6-2</td>
<td>38-45</td>
</tr>
<tr>
<td>Road Wheel Retaining Stud</td>
<td>7-9</td>
<td>50-65</td>
</tr>
<tr>
<td>Rear Brake Drum to Flange</td>
<td>0-7-1-0</td>
<td>5-7</td>
</tr>
<tr>
<td>Rear Sub-Frame Member to Axle Extension Assy.</td>
<td>8-3-10-3</td>
<td>60-75</td>
</tr>
<tr>
<td>Rear Sub-Frame Strap Ends to Floor</td>
<td>7-9</td>
<td>50-65</td>
</tr>
<tr>
<td>Rear Sub-Frame to Body Outer</td>
<td>3-6-4-4</td>
<td>26-32</td>
</tr>
<tr>
<td>Rear Sub-Frame to Body Inner</td>
<td>3-6-4-4</td>
<td>26-32</td>
</tr>
<tr>
<td>Trailing Arms to Mounting Bracket</td>
<td>5-2-6-2</td>
<td>38-45</td>
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### Rear Axle

<table>
<thead>
<tr>
<th>Component</th>
<th>kgf. m</th>
<th>lbf. ft</th>
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<tbody>
<tr>
<td>Axle Extension Coupling Flange to Shaft</td>
<td>12-4-15-2</td>
<td>90-110</td>
</tr>
<tr>
<td>Axle Extension to Axle</td>
<td>3-6-4-4</td>
<td>26-32</td>
</tr>
<tr>
<td>Hypoid Bearing Caps to Housing</td>
<td>4-1-5-1</td>
<td>30-37</td>
</tr>
<tr>
<td>Hypoid Pinion Attachment Slotted Nut</td>
<td>12-4-15-2</td>
<td>90-110</td>
</tr>
<tr>
<td>Hypoid Housing to Rear Cover</td>
<td>2-2-8-2</td>
<td>16-20</td>
</tr>
<tr>
<td>Inner Axle Shaft to Driving Flange</td>
<td>12-4-15-2</td>
<td>90-110</td>
</tr>
<tr>
<td>Inner Axle Shaft Housing to Hypoid Housing</td>
<td>2-2-8-2</td>
<td>16-20</td>
</tr>
<tr>
<td>Oil Level Plug</td>
<td>2-8-3-3</td>
<td>20-24</td>
</tr>
<tr>
<td>Propeller Shaft Attachment</td>
<td>3-6-4-4</td>
<td>26-32</td>
</tr>
<tr>
<td>Rear Axle Housing Cover Attachment</td>
<td>3-6-4-4</td>
<td>26-32</td>
</tr>
</tbody>
</table>

* Tighten to 5 lbf. ft. & unscrew 1 flat.

† Used when up to 1 Shiin only is fitted.

‡ Used when 2-8 Shims are fitted.
## STAG TORQUE SETTINGS SECTION 06

### Steering

<table>
<thead>
<tr>
<th>Component</th>
<th>kgf.m.</th>
<th>lbf.ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Column Assembly to Dash</td>
<td>1-0-1.2</td>
<td>7-9</td>
</tr>
<tr>
<td>Lock to Steering Column</td>
<td>2-2-2.8</td>
<td>16-20</td>
</tr>
<tr>
<td>Mounting Bracket to Steering Column Facia</td>
<td>4-1-5.1</td>
<td>30-37</td>
</tr>
<tr>
<td>Mounting Bracket to Rack</td>
<td>4-1-5.1</td>
<td>30-37</td>
</tr>
<tr>
<td>Mounting Bracket to Crossmember</td>
<td>2-2-2.8</td>
<td>16-20</td>
</tr>
<tr>
<td>Outer Ball Joint to Tie Rod Lock Nut</td>
<td>2-2-2.8</td>
<td>16-20</td>
</tr>
<tr>
<td>Pinion Housing Stud</td>
<td>5-2-6.2</td>
<td>38-45</td>
</tr>
<tr>
<td>Steering Column to Rack</td>
<td>5-2-6.2</td>
<td>38-45</td>
</tr>
<tr>
<td>Steering Column to Lower Column</td>
<td>5-2-6.2</td>
<td>38-45</td>
</tr>
<tr>
<td>Steering Column Support Tube Assy. to Column Housing</td>
<td>5-2-6.2</td>
<td>38-45</td>
</tr>
<tr>
<td>Steering Column Clamp Lever Bolt</td>
<td>5-2-6.2</td>
<td>38-45</td>
</tr>
<tr>
<td>Tie Rod Ends to Steering Levers</td>
<td>5-2-6.2</td>
<td>38-45</td>
</tr>
</tbody>
</table>

### Chassis

<table>
<thead>
<tr>
<th>Component</th>
<th>kgf.m.</th>
<th>lbf.ft.</th>
</tr>
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<tbody>
<tr>
<td>Engine Mounting to Body</td>
<td>3-6-4.4</td>
<td>26-32</td>
</tr>
<tr>
<td>Exhaust Mounting Bracket to Rear Sub-Frame</td>
<td>2-2-2.8</td>
<td>16-20</td>
</tr>
<tr>
<td>Front Exhaust Pipes to Intermediate Pipes</td>
<td>7-1-0</td>
<td>5-7</td>
</tr>
<tr>
<td>Front Exhaust Pipes to Rear Engine Crossmember</td>
<td>2-2-2.8</td>
<td>16-20</td>
</tr>
<tr>
<td>Fixing L.H. to R.H. Silencer</td>
<td>2-2-2.8</td>
<td>16-20</td>
</tr>
<tr>
<td>Front Engine Mounting to Bracket</td>
<td>3-6-4.4</td>
<td>26-32</td>
</tr>
<tr>
<td>Rear Engine Mounting Brkt. to G/Box</td>
<td>2-2-2.8</td>
<td>16-20</td>
</tr>
<tr>
<td>Tailpipe Attachment</td>
<td>2-2-2.8</td>
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### Body

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<tr>
<th>Component</th>
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<tr>
<td>Accelerator Pedal Mtg. Brkt. to Dash</td>
<td>1-0-1.2</td>
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<tr>
<td>Assembly Expansion Tank Evaporation Loss Control to Body</td>
<td>1-0-1.2</td>
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<tr>
<td>Brake Master Cylinder to Body</td>
<td>2-2-2.8</td>
<td>16-20</td>
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<tr>
<td>Brake Pressure Diff. Warning Actuator Fixing</td>
<td>1-0-1.2</td>
<td>7-9</td>
</tr>
<tr>
<td>Bumper Brkt. to Body Side</td>
<td>3-6-4.4</td>
<td>26-32</td>
</tr>
<tr>
<td>Blanking Safety Harness Holes Front Floor &amp; Transmission Tunnel</td>
<td>3-6-4.4</td>
<td>26-32</td>
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<tr>
<td>Bracket to Inner Panel Lower Rear Door Glass Frame L.H.</td>
<td>1-0-1.2</td>
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<td>Bracket to Door Inner Panel Lower Door Glass Frame L.H.</td>
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<tr>
<td>Bracket to Trunk Lid &amp; Hinge to Tonneau Assy.</td>
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<tr>
<td>Bonnet Hinge to Body</td>
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<tr>
<td>Bonnet Fastener to Bonnet Rear</td>
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<tr>
<td>Boot Lock to Lid</td>
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</tr>
<tr>
<td>Clutch M/Cylinder &amp; Reservoir Support Brkt. to Pedal Mounting Brkt.</td>
<td>2-2-2.8</td>
<td>16-20</td>
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<td>Clutch M/Cylinder &amp; Reservoir Support Brkt. to Pedal Mounting Brkt.</td>
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<td>Catch Plate to Dash</td>
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<tr>
<td>Catch Plate Windscreen Rail</td>
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<tr>
<td>Console Support Brkt. Bottom Fixing</td>
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* Designed to Shear at 12-15 lbf. ft.
### Torque Settings

#### Body—continued

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<tr>
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<th>Thread Type</th>
<th>kgf. m.</th>
<th>lbf. ft.</th>
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<tr>
<td>Front Bumper Brkt. to Bumper</td>
<td>3/8&quot; UNF</td>
<td>3.6-4.4</td>
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<td>Front Bumper to Bumper &amp; Overrider</td>
<td>3/8&quot; UNF</td>
<td>3.6-4.4</td>
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<td>Front Bumper Brkts. to Body Front</td>
<td>3/8&quot; UNF</td>
<td>3.6-4.4</td>
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<tr>
<td>Front Bumper to Side Attachment Bracket</td>
<td>3/8&quot; UNF</td>
<td>3.6-4.4</td>
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<tr>
<td>Front Seat Adjusting Mechanism to Frame</td>
<td>1/4&quot; UNF</td>
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<tr>
<td>Front Seat Mounting Plate to Floor</td>
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<tr>
<td>Front Seat Slide to Floor &amp; Mounting Plate</td>
<td>3/16&quot; UNF</td>
<td>1.5-2.0</td>
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<tr>
<td>Fixings Door Glass Frame L.H.</td>
<td>3/8&quot; UNF</td>
<td>1.0-1.2</td>
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<tr>
<td>Facia to 'A' Post</td>
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<tr>
<td>Fuel Pump &amp; Brkt. Assy. to Body</td>
<td>3/16&quot; UNF</td>
<td>2.2-2.8</td>
<td>16-20</td>
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<tr>
<td>Horns &amp; Horn Plates to Battery Box Inner Panel</td>
<td>3/8&quot; UNF</td>
<td>2.8-3.3</td>
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<tr>
<td>Handbrake Ratchet to Levers</td>
<td>3/16&quot; UNF</td>
<td>2.2-2.8</td>
<td>16-20</td>
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<tr>
<td>Hard Top Fixings to Rear Deck</td>
<td>3/8&quot; UNF</td>
<td>1.0-1.2</td>
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<td>Heater to Dash</td>
<td>3/8&quot; UNF</td>
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<td>Handbrake Tunnel</td>
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<td>Harness to Dash Top Reinforcement</td>
<td>3/16&quot; UNF</td>
<td>2.2-2.8</td>
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<td>Hoodstick Bolts</td>
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<tr>
<td>Hoodstick Bolts</td>
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<td>Hinge. Lower L.H. &amp; R.H.. to 'A' Post</td>
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<td>Hinge. Upper L.H. &amp; R.H.. to 'A' Post</td>
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<tr>
<td>Hinge. Door. Attach.</td>
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<tr>
<td>Ignition Coil to Rear of Inlet Manifold</td>
<td>3/16&quot; UNC</td>
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<td>Lock Assy. (Hood Rail)</td>
<td>3/16&quot; UNF</td>
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<tr>
<td>Lock to Inner Door Panel</td>
<td>3/16&quot; UNF</td>
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<td>Outer Door Glass Frame L.H.</td>
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<tr>
<td>Petrol Tank Drain Plug</td>
<td>5/8&quot; x 18 T.P.I. Plug</td>
<td>4-1-5-1</td>
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<td>Petrol Filter Attach.</td>
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<td>Petrol Tank Mtg. to Mtg. Bracket</td>
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<tr>
<td>Rear Bumper Bracket to Bumper</td>
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<tr>
<td>Rear Bumper Bracket to Bumper &amp; Overrider</td>
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<td>Rear Bumper Rear Attachment to Body</td>
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<td>Rear Bumper Side Attachment to Body</td>
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<td>Rear Floor Frame Bolt</td>
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<tr>
<td>Roll Bar (Screen)</td>
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* German only.
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<thead>
<tr>
<th>Component</th>
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<th>kgf·m</th>
<th>lbf·ft</th>
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<tbody>
<tr>
<td>Sun Visor to Body</td>
<td>1/8 UNF</td>
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<td>Safety Harness Fixing Bracket to Plate to Tunnel</td>
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<td>3-6-4-4</td>
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<tr>
<td>Safety Harness Fixing Eyebolt Rear Harness</td>
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<td>3-6-4-4</td>
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<td>Striker Door Lock</td>
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<td>Seat Slides to Floor</td>
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<td>Soft Top to Body</td>
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<td>Striker Assy to Tonneau Cover</td>
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<td>Striker to Hard Top</td>
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<td>Single Claw Locks</td>
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<td>Trunk Lid Hinge to Body</td>
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<td>Trunk Lid Lock Striker Assy</td>
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<td>Vent Pipe Filter to Body</td>
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<td>Windscreen Wiper Mounting</td>
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<tr>
<td>Window Regulator to Door Inner Panel</td>
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<td>Window Regulator Vent Control L.H.</td>
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<td>Overdrive Unit Retaining</td>
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<tr>
<td>Speedo Driven Gear to O/Drive Rear Cover. Locking Screw</td>
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<td>Air Conditioner Unit Fixing to Body</td>
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<td>Air Conditioner Unit Fixing to Body</td>
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<td>Air Conditioner Unit Support</td>
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**Miscellaneous (Skid Plate)**

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<tr>
<td>Attach Rear Sub-Frame Skid Plate Inner</td>
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<td>Attach Rear Sub-Frame Skid Plate Outer</td>
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<tr>
<td>Attach Rear Sub-Frame Skid Plate Outer</td>
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<td>Bracket to Floor &amp; Skid Plate Rear to Bracket</td>
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<tr>
<td>Front and Inner Skid Plates to Bracket Assemblies</td>
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<td>Inter &amp; Rear Skid Plates to Bracket Assy. 153926</td>
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<td>Brake and Clutch Pipes</td>
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<td>Pipe Assy. (Bent) M/Cyl. to P.D. Valve—Rear—L.H. Stg.</td>
<td>Single Flare with ( \frac{3}{8} )'' UNF ‘Y’ Nut</td>
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<td>Pipe Assy. (Bent) M/Cyl. to P.D. Valve—Rear—R.H. Stg.</td>
<td>Single Flare with ( \frac{3}{8} )'' UNF ‘Y’ Nut</td>
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<td>Single Flare with ( \frac{3}{8} )'' UNF ‘Y’ Nut</td>
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<tr>
<td>Four-Way Connection to Front Hose</td>
<td>Single Flare with ( \frac{3}{8} )'' UNF ‘Y’ Nut</td>
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<td>Pipe Assy. (Bent) P.D. Valve to L.H. Hose Brkt. Front</td>
<td>Single Flare with ( \frac{7}{16} )'' UNF ‘X’ Nut</td>
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<td>Double Flare with ( \frac{3}{8} )'' UNF ‘W’ Nut</td>
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<td>Pipe Assy. (Bent) P.D. Valve to L.H. Hose Brkt. Front</td>
<td>Single Flare with ( \frac{7}{16} )'' UNF ‘X’ Nut</td>
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<td>Double Flare with ( \frac{3}{8} )'' UNF ‘W’ Nut</td>
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<td>Pipe Assy. (Bent) P.D. Valve to 3-Way Rear</td>
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<td>( \frac{3}{8} )'' UNF x 1( \frac{1}{8} )'' Ig. Bolt</td>
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<td>Single Flare with ( \frac{3}{8} )'' UNF ‘Y’ Nut</td>
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<td>5-7</td>
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<td>Single Flare with ( \frac{3}{8} )'' UNF ‘W’ Nut</td>
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<td>Pipe Assy. (Bent) Hose to L.H. Wheel Cylinder—Rear</td>
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<td>Single Flare with ( \frac{3}{8} )'' UNF ‘W’ Nut</td>
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<td>Double Flare with ( \frac{7}{16} )'' UNF ‘X’ Nut</td>
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<td>Nylon Clutch Pipe Assy. ( \frac{7}{16} )'' Box</td>
<td>Double Flare with ( \frac{7}{16} )'' UNF ‘X’ Nut</td>
<td>1-0-1-2</td>
<td>7-9</td>
</tr>
<tr>
<td></td>
<td>Double Flare with ( \frac{7}{16} )'' UNF ‘X’ Nut</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
STAG ENGINE
SECTION 12
ENGINE DIMENSIONS AND TOLERANCES

Timing chain:
- R.H. Bank: .375 in. pitch x 104 links Simplex
- L.H. Bank: .375 in. pitch x 106 links Simplex

Adjustable pallets: 0.070 by 0.001 to 0.114 in.
Sparking plug: Champion N 11 Y

Valves

Exhaust
- Chrome plated stem, Stellite seat
  - Major stem diameter: 0.3100 to 0.3105 in.
  - Minor stem diameter: 0.290 to 0.294 in.
  - Head diameter: 1.28 in.
  - Valve seat angle: 45° ± 1°

Inlet
- Chrome plated stem
  - Stem diameter: 0.3107 to 0.3112 in.
  - Head diameter: 1.44 in.
  - Valve seat angle: 45° 15' ± 1°

Flywheel: total permissible run-out: 0.004 in. at 4 in. radius T.I.R.

Drive plate and starter ring (automatic transmission) total permissible run-out (measured at starter ring face) = 0.040 in. T.I.R.

Cam followers
- Outside diameter: 1.3125 to 1.3130 in.
- Inside diameter: 1.183 to 1.188 in.

Oil pump
- Maximum permissible clearances:
  - Outer rotor and body: 0.010 in.
  - Outer and inner rotors: 0.010 in.
  - Rotor end to end face clearance: 0.0005 in.

Oil pressure relief valve spring
- Free length: 1.525 in.
- Fitted length: 0.925 in.
- Load at fitted length: 15.4 lb.
- Rate: 25.7 lb./in.

Valve guides
- Inlet and exhaust: Length: 1.94 in.
  - Internal diameter: 0.312 to 0.313
### Valve springs
- **Solid length (max.)**: 1.013 in.
- **Free length (approx.)**: 1.60 in.
- **Rate fitted**: 296.5 lbf./in.
- **No. of working coils**: 3¾
- **Spiral**: Left

### Crankshaft
- **Journal diameter**: 2.1260 to 2.1265 in.
- **Fillet (radius)**: 0.110 to 0.120 in.

### Crankpins
- **Diameter**: 1.7500 to 1.7505 in.
- **Fillet (radius)**: 0.100 to 0.120 in.
- **End-fiat**: 0.003 to 0.011 in.
- **Thrust bearing oversize available**: ±0.005 in.

### Connecting rods
- **Connecting rod end-float**: 0.015 to 0.024 in.
- **Maximum connecting rod bend**: 0.0015 in.
- **Maximum connecting rod twist (measured in length of gudgeon pin)**: 0.0045 in.

### Camshaft
- **Diameter of journals**: 1.1230 to 1.1235 in.

### Valve seat inserts

#### Inlet
- **Outside diameter**: 1.5235 to 1.5245 in.
- **Height**: 0.258 to 0.260 in.

#### Bore out cylinder head:
- **Diameter**: 1.519 to 1.520 in.
- **Depth (measured from centre of camshaft bearing)**: 4.863 to 4.867 in.

#### Exhaust
- **Outside diameter**: 1.3335 to 1.3345 in.
- **Height**: 0.258 to 0.260 in.

#### Bore of cylinder head:
- **Diameter**: 1.329 to 1.350 in.
- **Depth (measured from centre of camshaft bearing)**: 4.863 to 4.86 in.
Cylinder liner

<table>
<thead>
<tr>
<th>Length</th>
<th>4.750 in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside diameter</td>
<td>3.5186 to 3.5196 in.</td>
</tr>
<tr>
<td>Inside diameter</td>
<td>3.366 to 3.371 in.</td>
</tr>
</tbody>
</table>

Idler shaft

<table>
<thead>
<tr>
<th>Bearing diameter</th>
<th>1.4560 to 1.4565 in.</th>
</tr>
</thead>
</table>

Bearing—water pump shaft

<table>
<thead>
<tr>
<th>Length</th>
<th>0.50 in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside diameter</td>
<td>0.6562 in.</td>
</tr>
<tr>
<td>Inside diameter</td>
<td>0.562 in.</td>
</tr>
</tbody>
</table>

Piston rings

<table>
<thead>
<tr>
<th>Top compression: Height</th>
<th>0.0777 to 0.0787 in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gap</td>
<td>0.013 to 0.018 in.</td>
</tr>
<tr>
<td>2nd compression: Height</td>
<td>0.1171 to 0.1181 in.</td>
</tr>
<tr>
<td>Gap</td>
<td>0.010 to 0.015 in.</td>
</tr>
<tr>
<td>Oil control: Height</td>
<td>THREE PART RING</td>
</tr>
<tr>
<td>Gap</td>
<td>0.015 to 0.055 in.</td>
</tr>
</tbody>
</table>

Ring grooves

<table>
<thead>
<tr>
<th>Width: Compression ring (top)</th>
<th>0.0812 to 0.0802 in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compression ring (2nd)</td>
<td>0.1196 to 0.1206 in.</td>
</tr>
<tr>
<td>Oil control ring</td>
<td>0.157 to 0.158 in.</td>
</tr>
</tbody>
</table>

Gudgeon pin

<table>
<thead>
<tr>
<th>Length</th>
<th>2.995 to 3.000 in.</th>
</tr>
</thead>
</table>

Piston

<table>
<thead>
<tr>
<th>Dia. Top Land</th>
<th>Cylinder Bore</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3630 to 3.3650 in.</td>
<td>3.3853 to 3.3864 in.</td>
</tr>
</tbody>
</table>

Piston skirt to be graded at bottom of skirt only

Grade

<table>
<thead>
<tr>
<th>Bore</th>
<th>3.3853 to 3.3858 in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skirt diameter</td>
<td>3.3828 to 3.3833 in.</td>
</tr>
</tbody>
</table>

ENGINE—Remove and refit

NOTE: The vehicle must be positioned under a hoist and, preferably, over a pit or ramp. Alternatively, high stands will be required.

Remove

1. Remove the bonnet (three bolts each side plus stay).
2. Isolate the battery.
3. Drain coolant (tap on radiator plus two on cylinder block).
4. Disconnect top hose from radiator and the bottom hose from radiator, water pump, and bypass pipe at rubber to metal pipe connection.
5. Remove bottom hose assembly.
6. Remove radiator (two bolts top, two nuts bottom) complete with overflow bottle. 
   NOTE: Lower fan guard will come away with radiator nuts.
7. Remove centre-bolt from fan pulley.
8. Lift off fan and Torquatrol unit.
9. Disconnect pipes from steering rack and pump, and allow system to drain. Plug all ports in rack and pump to prevent the ingress of dirt.
10. Remove earth strap from alternator mounting bracket.
11. Disconnect cables from:
    Alternator
    Windscreen washer bottle
    Water temperature transmitters (each head)
    Oil pressure transmitter
    Coil
    Ballast resistor
    Starter motor
    Gearbox cables, from junction at L.H. side of bulkhead.
12. Disconnect:
    Fuel pipe from filter
    Accelerator and choke cables from carburettor
    Two heater hoses at bulkhead
    Servo hose from inlet manifold.
13. Remove windscreen washer bottle.
14. Raise the vehicle front by approx. 18 inches.
   NOTE: If the vehicle is not on a ramp, situate stands below the frame outriggers to the rear of the front wheels.
15. Drain engine and gearbox oils. (On automatic transmission remove dipstick tube to effect draining.)
16. Remove oil filter.
17. Remove front exhaust pipes and silencers.
18. On automatic transmission vehicle:
    (a) Disconnect gear control linkage (one clip).
    (b) Remove oil cooler pipes at box and cooler plus clip to frame.
19. Disconnect speedo cable (collect spacer).
20. Lift one rear wheel on jack.
21. Remove propeller shaft, plug rear of gearbox, lower wheel.
22. Place trolley jack below gearbox mounting cross-member, take weight.
23. Attach lifting sling to front lifting eyes on engine.
24. Remove bolts from front engine mountings (chassis connections).
25. Remove bolts securing gearbox mounting cross-member to frame (collect nylon spacers and large plain washers).
26. Raise engine at front to lift sump clear of cross-member.
27. Ease the engine forward whilst lowering the gearbox.
28. Carefully raise the engine and lower gearbox until the unit is almost vertically suspended from front lifting brackets.
29. Lift unit clear of vehicle.
Refit
1. Attach sling and hoist to front lifting brackets.
2. Lift unit suspended almost vertically from front lifting brackets.
3. Lower unit into engine compartment.
4. Place trolley jack below gearbox mounting cross-member.
5. Lower engine whilst raising and moving trolley jack back with gearbox until unit is situated in position for fitting mounting bolts.
6. Fit and tighten front engine mounting bolts and nuts.
7. Fit and tighten rear engine mounting nuts, nylon spacers and large plain washers (mountings consist of four rubber grommets, steel sleeves, nylon spacers, bolts, large plain washers, and nuts).
8. Raise one rear wheel.
9. Fit propeller shaft and lower wheel.
10. Fit speedometer cable and spacer.
11. Connect gear control linkage and oil cooler pipes (automatic transmission).
12. Fit oil filter.
13. Fit front exhaust pipes and silencers. Lower vehicle if on stands.
14. Fit windscreen washer bottle.
15. Connect:
   Servo hose
   Heater hoses
   Accelerator and choke cables
   Fuel supply pipe.
16. Connect cables to:
   Gearbox junction at L.H. side of bulkhead
   Starter motor
   Ballast resistor
   Coil
   Oil pressure transmitter
   Water temperature transmitters
   Windscreen washer bottle
   Alternator.
17. Fit earth strap to alternator bracket.
18. Connect steering pipes.
19. Fit fan and Torquatrol unit.
20. Fit and tighten fan pulley centre-bolt.
21. Fit radiator and lower fan guard.
22. Fit and tighten coolant hoses.
23. Fit bonnet.
24. Fill:
   Engine
   Gearbox
   Power steering system
   Radiator.
25. Connect battery.

SUMP — Remove and refit
Operation performed with engine in situ.

Remove
1. Drain oil.
2. Remove L.H. front exhaust pipe.
3. Disconnect anti-roll bar links from anti-roll bar.
4. Jack up front of vehicle, place stands below the outriggers to the rear of the front wheels.
5. Disconnect radius rods from lower wishbones.
6. Disconnect lower wishbones from cross-member, push aside.
7. Disconnect steering rack from cross-member and allow it to drop slightly.
8. Unclip brake pipe from nylon clips on cross-member.
9. Remove cross-member (four bolts on each side, plates on top of chassis members).
10. Remove all sump bolts and two nuts, lower sump.

Refit
1. Clean gasket faces; fit new gasket.
2. Lift sump into position and secure with bolts and nuts.
3. Fit cross-member (fit plates behind bolt heads, the two chamfered plates go inboard to accommodate chassis radii. Brake pipe brackets attach to the rear outer bolts).
4. Attach brake pipe to nylon clips on cross-member.
5. Position lower wishbone in cross-member hanger brackets.
6. Couple radius rods to lower wishbones; do not tighten.
7. Fit bolts through from rear of lower wishbone to cross-member; fit nuts; do not tighten.
8. Lower vehicle.
9. Fit steering rack to cross-member.
10. Tighten nuts and bolts on radius rods, lower wishbones and steering rack.
11. Fit anti-roll bar links.
12. Fit exhaust pipe.
13. Fill engine with correct grade of oil.

ENGINE ASSEMBLY—STRIP AND REBUILD
Special tools 4235A; S4235A/6; 38U3; S350; S349; S352.
1. Remove engine.
2. Remove ancillary equipment.
3. Remove cam covers.
4. Bend back tabs on camshaft drive gear bolts, turn the engine to obtain access to all bolts.
5. Screw one camshaft bearing nut on each of the camshaft drive gear spigots through support brackets.
6. Remove bolts and lockplates securing drive gears to camshaft.
7. Remove the twelve bolts attaching the inlet manifold to the cylinder heads.
8. Remove inlet manifold.
10. Lift off cylinder head and gasket.
11. Perform operation 9 and 10 on L.H. bank.
12. Remove oil pump and hexagonal drive shaft.
13. Remove oil pressure take-off
14. Remove oil filter.
15. Remove coolant drain taps.
16. Remove water pump cover bolts (three) and lift off cover.
17. Remove centre bolt from water pump impeller and use tool S4235A/6 to remove pump.
18. Remove flywheel securing bolts.
19. Remove flywheel. (Use, if necessary, a flat plate across the flywheel housing with two holes drilled coincident with two opposite (clutch securing) holes in the flywheel. Use two long bolts as pullers to withdraw the flywheel).
20. Remove front cover bolts and lift off cover.
22. Remove R.H. chain guides, support bracket, gear and chain.
23. Remove L.H. chain tensioner and keep plate.
24. Remove L.H. chain guides, support bracket, gear and chain.
25. Remove jackshaft keep plate using Allen key to remove screws.
26. Lift out jackshaft.
27. Lift engine on to flywheel cover.
28. Remove sump and gasket.
29. Remove oil strainer.
30. Remove caps from Nos. 1 and 2 connecting rods.
31. Push out piston and connecting rod assemblies, replace caps on connecting rods.
32. Repeat operations 30 and 31 on all assemblies.
33. Lift engine to crankshaft uppermost position.
34. Remove rear oil seal housing.
35. Remove main bearing caps and thrust washers from centre bearing.
36. Remove crankshaft.
   Keep bearings and thrust washers in correct order.

REBUILD
37. Ensure that all oil- and water-ways are clear and that all components and sub-assemblies are clean and dimensionally correct to the data given.
   CAUTION: Apply oil to all internal moving parts and bearing surfaces as the engine is built.
   Tighten all nuts and bolts in accordance with the torque figures given.
   All sub-assemblies are dealt with under their respective headings.
38. Insert main line-bearings to block and caps, noting that Nos. 1, 3 and 5 are wider bearings than 2 and 4. No. 5 bearing is not numbered.
39. Fit crankshaft.
40. Fit thrust washers to No. 3 bearing, bi-metal face to crank.
41. Fit main bearing caps with numbers on starter motor side of engine. (Fig. 12.02)
42. Fit bolts and tighten, continually checking for free rotation of crankshaft.
43. Check crankshaft end-float (0.003 to 0.011 in.; 0.08 to 0.28 mm.). (Fig. 12.03)
44. Using the ring compression tool 38U3, fit the connecting rod piston assemblies, taking care to avoid damage to the crankshaft, on the even bank i.e. rear of crankshaft journal. (Fig. 12.04)
45. Fit caps and tighten nuts to specified torque.
46. Perform operations 44 and 45 on odd bank.
47. Check clearance between big-end bearings (0.015 to 0.024 in.; 0.38 to 0.6 mm.) and free rotation of crankshaft. (Fig. 12.05)
48. Fit rear oil seal housing gasket.
49. Fit rear oil seal housing, locating on the two dowels and using the two longest bolts at the sump end. (Fig. 12.06)
50. Fit gasket for oil strainer.
51. Fit oil strainer and tighten the two securing bolts. (12.07)
52. Fit gasket and sump.
53. Fit 14 sump bolts and 2 nuts; do not tighten.
54. Place engine on stand correct way up.
55. Fit flywheel cover locating on the two dowels 10 bolts and washers.
56. Fit and tighten flywheel housing bolts. Check for high spots on face.
57. Fit flywheel, locating on dowel.
58. Fit and tighten flywheel bolts, using new bolts.
59. Check flywheel run-out, not to exceed 0.1 mm. T.I.R. at 10 cm. radius (0.004 in. T.I.R. at 4 in.).
60. Turn flywheel until No. 2 cylinder (front L.H. bank) is at T.D.C. mark.
61. Check that line on flywheel corresponds with line on flywheel housing. (Fig. 12.08)
62. Fit jackshaft and gear, threading the shaft carefully through the cylinder block to avoid damaging the bearing surfaces.

63. Fit jackshaft keeper plate and secure with two countersunk hexagon recessed screws. (Fig. 12.09)

64. Check jackshaft gear for run-out which may be caused by the dowel 'picking up'; run-out will cause excess noise and chain wear.

65. Fit inner crankshaft gear, using shims to align the gear to the jackshaft gear. (Figs. 12.10 and 12.11)

66. When gear alignment is correct, remove the gear, fit Woodruff keys to crankshaft and fit inner and outer crankshaft gears.

67. Fit the water pump, ensuring that the spigot bearing is in good condition and that the pump engages and seats the pump correctly.

68. Check water pump housing clearances; fit requisite gaskets and secure with the three bolts. (See 'Cooling System')

69. Fit inner chain tensioner and restrictor plate, using a cardboard spacer to prevent actuation of ratchet mechanism. (See Sub-assemblies)

70. Align jackshaft gear with line slightly tilted down to L.H. bank and dowel to L.H. bank No. 2 cylinder T.D.C.

71. Fit L.H. bank chain guides, chain (longer chain), camshaft drive gear and support bracket. Do not tighten bolts on the curved tensioner or support bracket at this stage. Use spigot and camshaft bearing nut to hold gear to support bracket. (Fig. 12.12)

72. Fit one stud at either end of cylinder block to locate cylinder head and gasket.

73. Fit cylinder head gasket.

74. Ensure that the camshaft is aligned correctly, i.e. line on camshaft flange in line with groove in No. 1 camshaft bearing. (Fig. 12.13)

75. Fit cylinder head. (Fig. 12.14)

CAUTION: On no account may the crankshaft or camshaft be turned with the head fitted and the camshaft gear not connected to the camshaft. If this is done, the valves will be damaged by the pistons.

76. Fit remaining cylinder head studs, washers and nuts.

77. Fit cylinder head bolts and washers.

78. Tighten cylinder head nuts, then bolts, to required torque in the sequence shown. (Fig. 12.15)

CAUTION: It is imperative that this tightening sequence is followed; failure to do so will distort the cylinder head.

79. Align camshaft gear to camshaft by disconnecting gear from support bracket and moving it round, one tooth at a time within the chain, until the bolt holes are aligned. Do not move jackshaft gear.

80. Fit top camshaft bolt and lockplate, carefully position lockplate to line up both holes then tighten top bolt and tab over.

81. Centralize boss on the camshaft spigot within the hole in the support bracket (this must run freely within bracket without touching); tighten lower bolt in support bracket.

82. Use a 1 mm. (0.040 in.) feeler between the shoe and body of the chain tensioner to attain correct clearance, apply pressure to the curved chain guide and tighten bolts. (Fig. 12.16)

83. Remove feeler gauge and check that chain is located squarely on pads of the chain guides.

84. Fit outer chain tensioner, keeper and spacer, using a cardboard spacer to prevent actuation of ratchet mechanism.

85. Fit R.H. bank chain, camshaft gear, chain guides and support bracket together with bolt spacers. Do not tighten bolts on curved guide or support bracket at this stage. (Fig. 12.17)

86. Ensure mating gasket faces of inlet manifold and cylinder head are clean; apply a smear of grease and attach gaskets.

87. Fit inlet manifold to L.H. head fitting longer (centre) bolts first then shorter (outer) bolts, start all bolts before tightening.

88. Perform operations 72 to 77 to R.H. bank. (Figs. 12.18 and 12.19)

89. Fit gasket between R.H. cylinder head and inlet manifold.
90. Fit and tighten bolts securing cylinder head to inlet manifold, ensuring that the gaskets remain in position.
91. Perform operations 78 to 83 to R.H. bank.
92. Fit oil thrower to crankshaft, dished face out.
93. Fit three timing cover gaskets, with smear of grease to retain in position, at the front of cylinder block.
94. Fit timing cover, locating on the two dowels. (Fig. 12.20)
   CAUTION: To prevent damaging the sump or head gaskets care must be taken fitting the front cover. It is good practice, using strips of shim steel, to slot the cover between the gaskets. (See Fig. 12.21)
95. Fit timing cover bolts and alternator mounting bracket start the cylinder head to front cover bolts first then the sump to cover bolts. (See illustration for bolt installation)
96. Fit crank-pulley timing plate.
97. Fit crank-pulley and Torquatrol unit. (Fig. 12.22)
98. Fit cam covers and gaskets.
99. Fit oil pump and hexagon drive shaft. (Fig. 12.23)
100. Fit oil transfer housing. (Fig. 12.24)
101. Fit oil filter. (Fig. 12.25)
102. Fit coolant drain taps.
103. Fit ancillary equipment.
104. Fit engine.

CYLINDER HEADS—OVERHAUL

Special tool S352.
1. Remove cylinder heads.
2. Remove camshaft bearing nuts, slackening evenly until the camshaft is no longer under valve spring tension.
3. Remove camshaft bearing caps and shells.
4. Remove camshaft and lower shells.
5. Remove tappets and pallets.
6. Using special tool S352, remove the valve cotters, collars, springs, valves, and spring seats. (Fig. 12.26)
   NOTE: All components should be kept in sets and replaced in the positions from which they came unless new components are required.
7. Remove exhaust manifold.
8. Remove all carbon from combustion chamber, exhaust ports and cylinder head face, using wire brushes and taking care to avoid scratching cylinder head face.
9. Examine condition of valve seats, re-cutting or renewing as required.
10. Examine condition of valve guides, renewing as required.
11. Blow all traces of carbon dust from the head, using an air line.
12. Inspect valve components for wear against data in 'Dimensions and Tolerances'. Renew as necessary.
13. Grind valves and remove all traces of paste before proceeding.
14. Fit exhaust manifold.
15. Using tool S356, fit valves, spring seats, collars and cotters.
   NOTE: The valve springs are fitted with closer coils to head.
16. Fit tappets and pallets—assemble dry.
17. Inspect camshaft and bearing shells renewing worn or scored components (see 'Dimensions and Tolerances').
18. Fit shells to cylinder head and bearing caps.
19. Fit camshaft.
   NOTE: L.H. bank camshaft has annular groove on the periphery of the camshaft gear flange.
20. Fit bearing caps, nuts and tighten, pulling down evenly to ensure satisfactory settling of the shaft.
22. Turn camshaft to the fitting position, i.e., line on shaft flange in line with groove in front bearing cap. (Fig. 12.13)
   CAUTION: It is imperative that the camshaft is lined up as above before the head is fitted; failure to do so will result in valve and/or piston damage.

VALVE CLEARANCE—CHECK AND ADJUST
NOTE: This operation may be performed with the cylinder head on the engine or with the head on the bench.
1. Remove air cleaner and air cleaners to carburettor elbows.
2. Remove distributor covers and H.T. leads.
3. Remove camshaft covers and half grommets in cylinder heads.
4. Use feeler gauges to check the clearance between the head of the cam and each tappet. Note the clearance of each valve and its location. (Fig. 12.28)
   NOTE: For a head on the bench, the hexagon forward to the rear camshaft bearing may be used to turn the camshaft.
   CAUTION: On no account may the camshaft be turned when the cylinder head is on the engine and not connected, by drive chain, to the crankshaft. Failure to observe this caution will result in damaged valves and/or pistons.
   Where valve clearances are found to be within the following limit, omit operations 5 to 19.
   Exhaust 0·016 to 0·018 in.
   Inlet 0·008 to 0·010 in.
5. On one bank; bend back tabs on lockplate, slacken bolts securing camshaft gear to camshaft.
6. Use a camshaft bearing nut to secure camshaft spigot bolt to support plate.
7. Turn the engine as required to remove the two bolts securing camshaft gear to camshaft but do not remove last one until the line on the camshaft flange is in line with the groove in the front bearing cap, i.e., No. 2 cylinder T.D.C. firing.
8. Remove camshaft bearing nuts, caps and lift off camshaft.
9. Remove each tappet and pallet requiring alteration to clearance. Keep in correct numbered sequence. (Fig. 12.29)
10. With a micrometer, measure and note the thickness of each pallet.
11. Using the following as an example, select the appropriate pallet give the correct valve clearance, e.g.,
   (a) Noted valve clearance (exhaust valve) . . . . . . . . . . . . . . . . . . 0·022 in.
   Required valve clearance . . . . . . . . . . . . . . . . . . . . . . . . . . 0·017 ± 0·001 in.
   i.e., excess valve clearance . . . . . . . . . . . . . . . . . . . . . . . . . +0·005 in.
   Noted pallet thickness . . . . . . . . . . . . . . . . . . . . . . . . . . . . 0·090 in.
   Pallet required . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 0·095 in.
   (b) Noted valve clearance (inlet valve) . . . . . . . . . . . . . . . . . . 0·006 in.
   Required valve clearance . . . . . . . . . . . . . . . . . . . . . . . . . . 0·009 ± 0·001 in.
   i.e., insufficient valve clearance . . . . . . . . . . . . . . . . . . . . . −0·003 in.
   Noted pallet thickness . . . . . . . . . . . . . . . . . . . . . . . . . . . . 0·100 in.
   Pallet required . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 0·097 in.
12. Having selected the correct pallets, fit pallets and tappets.
13. Fit camshaft (line on camshaft flange aligned with groove on front bearing cap). (Fig. 12.13).
14. Fit bearing caps and nuts, tighten down evenly.
15. Fit lockplates and bolts securing camshaft gear to camshaft.
   CAUTION: Do not turn engine until camshaft and crankshaft are connected by drive chain.
16. Re-check valve clearances; repeat operations 7 to 15 if necessary.
17. Tighten camshaft gear to camshaft bolts, tab over.
18. Remove nut securing camshaft gear spigot to support bracket.
19. Repeat operations 5 to 18 on other bank.
20. Fit cylinder head grommets—oil tappets and cams.
21. Fit camshaft covers—ensure gaskets are correctly seated.
22. Fit distributor cover and H.T. leads.
23. Fit air cleaner and air cleaner to carburetter elbows.

CRANKSHAFT PULLEY—REMOVE AND REFIT

Remove
1. Remove radiator.
2. Remove central retaining bolt.
3. Remove fan and Torquatrol unit.
4. Slacken alternator, steering pump and air conditioning unit (where fitted) belt adjustment bolts.
5. Remove drive belts.
6. Withdraw pulley.

Refit
1. Ensure Woodruff keys are correctly positioned in crankshaft.
2. Fit pulley, lining up keyway to keys.
3. Fit drive belt to alternator, steering pump and air conditioning unit (where fitted).
4. Adjust the drive belt tension.
5. Fit fan and Torquatrol unit.
6. Fit and tighten central bolt to 12-44 to 15-20 kg. m. (90 to 110 lbf. ft.).
7. Fit radiator.

LUBRICATION SYSTEM

A conventional wet sump system with eccentric rotor type pump providing oil of approximately 40 p.s.i. (2-8 kg/cm.²) at 1,000 r.p.m.

Oil flow (Fig. 12.30)

From the sump oil is drawn to the pump via a strainer. Oil at pressure is then fed to the full-flow filter and on to the main oil gallery.

The main oil gallery distributes the oil to all moving parts, to the hydraulic chain tensioners and, via an intermittent feed from the front jackshaft bearing, to the camshafts.

The fuel filter incorporates a safety valve, which in the event of a blockage allows unfiltered oil to by-pass the filter.

The oil pump incorporates a pressure relief valve which will open at approximately 50 p.s.i. (3-6 kg/cm.²).

Oil pump

The oil pump is an eccentric rotor type externally mounted and driven by the jackshaft via the distributor drive gear and an interconnecting drive shaft.
To remove (Fig. 12.23)

Working below the vehicle.
1. Drain engine oil.
2. Remove four bolts securing pump to cylinder block.
3. Remove pump.
   NOTE: The hexagon drive shaft may or may not come away with the pump. If not, it may be removed with the aid of long-nosed pliers.

To refit
1. Check cylinder block and pump faces.
2. Fit ‘O’ ring to oil pump groove.
3. Fit hexagonal drive shaft.
4. Offer up pump, turn to engage hexagonal drive shaft with distributor.
5. Fit and tighten the four securing bolts.
6. Refill engine with correct grade of oil.

Oil pump inspection (Fig. 12.32)

Correct oil pressure depends on the efficient operation of the pump. Wear in any of the component parts reduces the efficiency and thus the oil pressure.
1. Remove the pump, dismantle, clean and dry the components.
2. Examine the end faces for scoring and wear. The pressure relief valve end face may be skimmed lightly to remove surface scratches; ensure that it is perfectly flat.
3. Check the end-float of the rotors A Fig. This must not exceed 0.004 in. (0.1 mm.).
4. Check clearance between the rotors B Fig. This must not exceed 0.010 in. (0.25 mm.).
5. Check clearance between outer rotor and body C Fig. This must not exceed 0.008 in. (0.2 mm.).
6. Check the pump spindle bush for wear; renew if necessary. Fit a new pump if the above tolerances are exceeded.

Oil filter—remove, change element—refit (Fig. 12.25)

Working below the vehicle.
1. Drain the engine oil.
2. Unscrew the centre bolt in the filter.
3. Remove filter bowl complete with element, centre bolt and valve.
4. Discard element and ‘O’ rings (one from cylinder block groove).
5. Clean components; renew any defective part.
6. Fit new ‘O’ ring to cylinder block groove.
7. Fit new element.
8. Offer up filter and secure with centre bolt, ensuring that the filter bowl sits in the cylinder block groove squarely on the ‘O’ ring seat. Do not overtighten bolt—see torque figures.
9. Refill engine with correct grade of oil.

Oil Seals

The main crankcase oil seals are the front and rear crankshaft seals. Both seals are lip seals fitted flush in their housings.

To renew rear seal
1. Remove engine.
2. Separate engine from gearbox.
3. Remove clutch and flywheel.
4. Remove the two centre rear bolts in sump.
5. Remove six bolts securing seal housing to crankcase.
6. Remove seal housing.
7. Remove seal.
SECTION 12 ENGINE

8. Clean faces of cylinder block and seal housing.
9. Fit new seal to housing, tapping gently and evenly into position until the back face of the seal is flush with the seal housing (see Fig. 12.33).
10. Fit new gasket to cylinder block.
11. Fit seal housing, locating on the two dowels.
12. Fit the six securing bolts.
13. Fit two sump bolts.
14. Fit flywheel and clutch.
15. Fit gearbox.
16. Replace engine.

To renew front seal
1. Drain coolant.
2. Remove radiator.
3. Remove fan, drive unit, drive belts and pulley.
4. Drain engine oil.
5. Slacken sump bolts and allow sump to drop approximately 0.25 in. (6 mm.).
6. Remove front cover bolts— including two to each head and five front sump bolts.
7. Carefully remove front cover, taking great care not to damage head or sump gaskets.
8. Remove seal from cover.
9. Clean cover and cylinder block gasket faces.
10. Fit new seal to covers, tapping gently and evenly into position until the back face of the seal is flush with front face of cover (see Fig. 12.34).
11. Fit three new gaskets to cylinder block.
12. Fit front cover locating on dowels and using shim steel guides to prevent damage to cylinder head and sump gaskets. (Fig. 12.21)
13. Fit all bolts loosely before tightening.
14. Tighten sump bolts.
15. Fit pulley, belt, fan and Torquatrol unit.
16. Adjust belt tensions. (Fig. 12.41)
17. Fit radiator.
18. Refill cooling system.
19. Refill engine with correct grade oil.

ENGINE ASSEMBLY—REMOVE ANCILLARY EQUIPMENT
Special tool S349
1. Remove engine.
2. Remove gearbox.
3. Drain oil.
4. Remove air conditioning unit and drive belt.
5. Remove power steering pump and drive belt.
6. Remove alternator and drive belt.
7. Remove starter motor.
8. Remove air cleaner assembly.
9. Remove carburettors.
10. Remove distributor.
11. Remove heater pipes.
12. Remove coil and ballast resistor.
13. Remove sparking plugs. (If the engine is to be stored or returned for reconditioning, tape all ports and passages.)
14. Remove clutch.
ENGINE SUB-ASSEMBLIES

Pistons and connecting-rods
1. Check connecting-rods for bend and twist, using tool No. 336/3 in conjunction with jig. (Fig. 12.35)
   - Bend not to exceed 0.0015 in. (0.038 mm.) for length of gudgeon pin. Twist not to exceed 0.006 in. (0.15 mm.) for length of gudgeon pin.
2. Pistons are graded to cylinder bores; grading letters are stamped on piston head and cylinder block (see 'Dimensions and Tolerances').
3. The three piston rings are positioned as follows:
   - Top: parallel compression ring.
   - Centre: stepped, top face marked scraper ring.
   - Bottom: three-piece, two flat, one sprung—oil control ring.
   - Space the piston ring gaps evenly on non-thrust side of piston.
4. Gudgeon pins are floating retained by circlips, thumb push fit in piston.
5. Pistons are marked with a triangle to denote front.
6. The connecting rods are chamfered on the big-end on one side only; this side fits adjacent to the crankshaft throws. Thus the two big-ends are fitted to each journal with non-chamfered sides together.
7. Assemble pistons to connecting rods thus:
   - L.H. bank: chamfer on big-end opposite to front of piston.
   - R.H. bank: chamfer on big-end in line with front of piston.

Chain tensioners
Two hydraulically operated, self-adjusting chain tensioners are fitted, one for each chain.
- The assembly comprises a rubber slipper, on which the chain runs, mounted on a hollow plunger.
- A spring and ratchet cylinder are fitted in the bore of the plunger, locating the ratchet on a peg within the plunger bore. This assembly is housed in a casting in which an oil hole is drilled linked to the engine pressure lubricating system.
- When the engine is running, oil pressure plus internal spring pressure acts to force the plungers from the body and apply pressure to the chain.
- The ratchet cylinder retracts only as far as the nearest slot and as the chain lengths or the rubber slipper wears the effective length of the cylinder/plunger unit increases, thus maintaining chain tension.

Assembling the chain tensioners (Fig. 12.36)
- Place spring (2) into cylinder (3) and fit both into bore of plunger (1). Insert a ⅛ in. A.F. Allen key into rear of cylinder, press and turn in a clockwise direction until the cylinder is fully inserted and the assembly remains retracted (Fig. 12.37). Fit assembly in bore of body. To prevent actuation of the mechanism when fitting, cut a horseshoe-shaped piece of cardboard and interpose between head of plunger and body casting; keep in position until adjusting the chain tension.
- Situated between the tensioner and the crankcase, left-hand bank or tensioner and distance piece right-hand bank, is a restrictor plate (5) which restricts the length of expansion and acts as a guide.

Valve guides
1. Worn valve guides can be replaced using tool 60A/A.
2. Remove by pulling guide out to camshaft side of head. (Fig. 12.39)
3. Fit by pulling guide towards combustion chamber. (Fig. 12.40)
4. New valve guides must be reamed to ⅛" after fitting. (Fig. 12.38)

DRIVE BELTS
To adjust the drive belt tension, proceed as follows:

Alternator belt
1. Slacken the nut on the top rear bracket of the alternator.
2. Slacken the bolt on the front adjusting bracket of the alternator.
3. Ease the alternator away from the cylinder block, taking particular care not to apply pressure to the alternator centre. The pressure must be applied to the front flange with a soft material, preferably wood.

4. Tighten the bolt and check tension. This should be \( \frac{1}{2} \) to \( \frac{3}{4} \) in. (12 to 18 mm.) at the mid-point between pulleys.

5. When correct, tighten rear top bracket.

Steering pump drive belt
1. Slacken the three bolts securing the pump mounting bracket to cylinder head.
2. Lift the pump to provide \( \frac{3}{4} \) to 1 in. (18 to 25 mm.) total movement of the belt at the mid-point between pulleys.
3. Do not apply excess pressure to the pump as this will damage the drive shaft bearings.

Air conditioning unit drive belt (where fitted)
1. Slacken the nuts securing the jockey pulley to front cover.
2. Lift the pulley to give \( \frac{3}{4} \) to 1 in. (18 to 25 mm.) total movement between jockey pulley and unit pulley.
3. Do not apply excess pressure to pulley as this will damage bearings in the air condition unit.

DISTRIBUTOR AND IGNITION TIMING

The distributor is mounted between banks at the rear of the inlet manifold and is driven by the jackshaft.

Servicing (Fig. 12.42)

Every 6,000 miles (10,000 km.) remove cover and rotor. Apply a few drops of engine oil to felt pad (1) to lubricate cam spindle bearing. Inject a few drops of engine oil through centre aperture (2) to lubricate the centrifugal timing control. Lightly grease the cam (3) with Mobilgrease No. 1 or equivalent. Wipe away any surplus lubricant and ensure the contacts are oil-free.

If the contact surfaces are burned or pitted, clean with a fine carborundum stone or emery-cloth followed by a petrol-moistened cloth. If excessively worn or pitted, renew the contact set.

Two sets of contact points are used to achieve a dwell angle of satisfactory length on this eight-cylinder distributor. The contacts are electrically connected in parallel. The contact set adjacent to the vacuum unit operates in advance of the second set and controls the start of the dwell period. The second contact set controls the end of the dwell period and thus the engine timing.

For each contact set in turn, adjust the contact gap as follows. Rotate the cam by turning the crankshaft by applying a wrench to the boss inboard of the pulleys until a moving contact heel is positioned on a cam peak. Slacken lock screw (5). Position a \( 0.014 \) to 0.016 in. feeler gauge between the contacts. Move fixed contact (6) about moving contact pivot (7) to adjust gap. Tighten lock screw. Check \( 0.014 \) to 0.016 in. gap has been maintained. Repeat the operation for the second contact set.

Ignition timing

An ignition timing plate is bolted to the front cover. When the zero on the plate is coincident with the groove cut in the belt pulley, No. 2 cylinder is at T.D.C.

Remove distributor cap; check points gap.

Turn the engine, by means of a wrench on the boss inboard of the pulleys, until timing groove in drive belt pulley is \( 14^\circ \) B.T.D.C. and the rotor arm is pointing towards No. 2 H.T. connection.

NOTE: Turn engine forward to attain this position to take up backlash in gears and chains.

Connect a test lamp circuit as shown on Fig. 12.44.

1. Distributor fly-lead removed from coil negative terminal.
2. Test lamp—12 volt. 3. Vehicle battery.

Slacken distributor bolts (tool S349) (Fig. 12.43) and turn distributor full anti-clockwise, then clockwise until the timing lamp goes out. It is then the points nearest the left-hand bank will have commenced to open.

Tighten the distributor clamp bolts, remove test lamp circuit and fit distributor cap.

Connect leads as shown on Fig. 12.45.

Firing order 1, 2, 7, 8, 4, 5, 6, 3.
Fig. 12.02. Crankshaft fitted

Fig. 12.03. Checking crankshaft end-float

Fig. 12.04. Using ring compressor tool

Fig. 12.05. Checking big-end clearance

Fig. 12.06. Fitting rear oil seal housing

Fig. 12.07. Fitting oil strainer
Fig. 12.08. Flywheel alignment

Fig. 12.09. Fitting jackshaft keeper plate

Fig. 12.10. Aligning crankshaft and jackshaft gears

Fig. 12.11. Shims and alignment

Fig. 12.12. L.H. bank cam drive

Fig. 12.13. Camshaft aligned for fitting
Fig. 12.14. Fitting cylinder head L.H.

Fig. 12.15. Cylinder head tightening sequence

Fig. 12.16. Adjusting chain tension L.H.

Fig. 12.17. R.H. bank cam drive

Fig. 12.18. Fitting R.H. cylinder head

Fig. 12.19. Adjusting chain tension R.H.
Fig. 12.20. Fitting timing cover

Fig. 12.21. Using shim steel guides

Fig. 12.22. Fitting crank pulley

Fig. 12.23. Fitting oil pump

Fig. 12.24. Fitting oil transfer housing

Fig. 12.25. Fitting oil filter
Fig. 12.26. Using tool S352

Fig. 12.27. Valve components

Fig. 12.28. Checking tappet clearance

Fig. 12.29. Removing tappet and pallet

Fig. 12.30. Oil flow diagram

Fig. 12.31. Oil pump components
Fig. 12.32. Oil pump inspection

Fig. 12.33. Fitting rear oil seal

Fig. 12.34. Fitting front oil seal

Fig. 12.35. Checking connecting rods for bend and twist

Fig. 12.36. Chain tensioner components
Fig. 12.37. Fitting cylinder to plunger

Fig. 12.38. Reaming valve guide

Fig. 12.39. Removing valve guide

Fig. 12.40. Fitting valve guide
Fig. 12.41. Drive belt tensioning points

Fig. 12.42. Distributor

Fig. 12.43. Distributor tightening and rotor position
No. 2 cylinder firing
Fig. 12.44. Test lamp circuit

Fig. 12.45. H.T. lead positions
STAG EMISSION CONTROL
SECTION 17
EMISSION CONTROL

All Triumph Stag models entering the North American markets incorporate efficient emission control systems. These systems enable the vehicles to conform with all current State and Federal Regulations governing the emission of Hydrocarbons, Carbon Monoxide, Nitric Oxide and the emission of fuel, by evaporation, from the fuel delivery system.

The system is designed to work within the following limits:

- Emission: 2.2 grammes per mile Hydrocarbons.
- 23 grammes per mile Carbon Monoxide.
- 4 grammes per mile Nitric Oxide.

Evaporation: 6 grammes per test. The test is as defined by the Federal Authorities.

Special features

1. For emission control carburettors the most efficient engine air intake temperature is between 95° and 105° F.

   To maintain these temperatures a temperature sensing device is incorporated in the air cleaner. The sensor allows inlet manifold vacuum to operate a flap valve in the air cleaner intake. The flap valve permits cold air, from forward of the radiator, or hot air, from a scoop around the exhaust manifold, to mix in varying amounts to provide the required air temperature.

Servicing

No servicing of the system is required apart from visual checks on the condition of the hose and tubing to ensure that they are not kinked, loose or deteriorated.

If the operation of the system is suspect, check as follows:

(a) With the engine cold (below 90° F. (33° C.)), ensure that the control damper is in the cold air position 'A' (Fig. 17.01).

(b) Start the engine; the valve should move to the 'warm air' position 'B' (Fig. 17.01) and remain until the engine warms up, at which point it will assume a position according to ambient under-bonnet temperatures.

A mirror will be required to observe the control damper.

2. A flap valve between the L.H. exhaust pipe and manifold is closed when the engine is cold, partly blocking the L.H. exhaust pipe. In this condition ports through the cylinder heads and inlet manifold route the exhaust gases to the R.H. exhaust pipe.

   When the engine warms up, the valve opens to permit normal exhaust flow.

   The effect of this is to utilize exhaust gases to warm the water-heated inlet manifold until the cooling system is sufficiently heated.

   No servicing of the system is required. If the operation of the valve is suspect, disconnect the L.H. exhaust pipe from the exhaust manifold. The flap valve should be closed when cold and should be easily actuated by finger pressure.

   Renew defective units.
3. Crankcase breathing and evacuation of 'blow by' gases is achieved by utilizing the characteristic partial vacuum in the Constant Depression carburettors. By this method crankcase emissions are burned in the engine combustion process.

4. The twin carburettors are Stromberg 175 CDSE which are designed to be highly efficient and sensitive to varying conditions. The following features are incorporated:
   
   (a) Jet assembly and needle biased to achieve consistent air to fuel ratio.
   (b) Leak balancing screw for setting all carburettors to a common datum during manufacture, after which the screw is sealed.
   (c) Temperature compensator assembly which progressively opens in line with the engine temperature to correct the mixture and maintain even running.
   (d) Throttle by-pass valve which is set to open at a predetermined manifold depression to admit mixture during deceleration.
   (e) 'Free movement' built into the accelerator linkage permits fast idle without disturbing the otherwise closed position of the linkage.
   (f) Wire locked and sealed cover to discourage unauthorized tampering.

5. The evaporative control system uses an activated carbon filter (Fig. 17.02) through which the fuel tank is vented. From Fig. 17.03 it will be seen that:
   
   (a) The fuel tank filler cap is sealed.
   (b) An overflow tank allows for the expansion of fuel in high temperatures.
   (c) Each corner of the main fuel tank is connected, by piping, to the overflow tank. This allows, at any vehicle angle, fuel vapour to expand to the over-flow tank.
   (d) The canister containing the activated carbon is vented to atmosphere via a gauze filter. The activated carbon is purged and prevented from a fuel vapour build-up by a connection to the constant depression area of the carburettors.

   It will be appreciated that fuel overflowing into the expansion tank will be drawn back into the main fuel tank as the level of fuel drops and creates a depression.

   All air drawn into the tank to replace used fuel is via the activated carbon and piping circuit. The carburettor and associated equipment account for such small quantities of evaporated fuel that no special precautions are necessary provided all connections are kept tight and leak free.

   The carburettors are vented, by piping, to the air cleaner.

**EMISSION CONTROL SYSTEM—SERVICING**

The importance of servicing at the correct intervals cannot be overstressed as improvements in design and manufacturing techniques count for nothing if the servicing standards are not upheld.

Routine servicing, carried out at the mileage intervals quoted, will prevent any deterioration to the system. In addition to normal lubrication and nut tightness checks, those items which should receive attention during routine servicing include: distributor maintenance, carburettor dash-pot oil replenishment and slow running adjustment, spark plugs, valve rocker clearances, air cleaner, crankcase ventilation and fuel filter.

Ignition Distributor, refer to page 16 Section 12 for ignition timing.

Page 3
SECTION 17  EMISSION CONTROL

Compression check
Every 6,000 miles (10,000 km.) check the compression pressure of each cylinder. Maximum variation over eight cylinders 5 lb./in.² (0.35 kg./cm.²).

1,000 Mile Free Service
In addition to the operation listed in handbook, check to ensure that the correct ignition timing is maintained at engine idling speed. Repeat this check every 6,000 miles (10,000 km.).

EVAPORATION CONTROL SYSTEM—SERVICING
Minimal servicing is required on the evaporation control system apart from changing the filter gauze in the carbon canister every 12,000 miles (20,000 km.) and replacing the canister every 48,000 miles (80,000 km.).

CARBURETTORS
The twin Stromberg CDSE 175 emission carburettors are the prime components of the emission system and great care is exercised during the manufacture and initial adjustment of these instruments. Because of the precise manufacturing limits involved and the assembly methods adopted to prevent unauthorized tampering during use, the extent of permissible servicing is restricted to the following:

Adjustments
There are only three adjustments that can be made to emission carburettors in the field and these are:

1. **Idling speed**: Ensure that the fast idle screw (1) (Fig. 17.04) is clear of the cam (2) and the choke lever is against its stop with the facia control pushed fully in. Unscrew the idling screw (3) until the throttle is just closed. Turn the screw 1 ¼ turns to provide a datum setting.
   - Start the engine and attain normal running temperature before final adjustment of the idling screw achieves a constant 800 to 850 r.p.m.

2. **Fast idling**: Ensure that the choke lever is fully returned and the facia control knob pushed in. Set the gap 'A' between the fast idle screw (1) and the cam (2), at 0-075 to 0-080 in. Start the engine and while it is still cold (68–86° F.) pull the facia control fully out to check the fast idle speed and, if necessary, adjust to 1,100 r.p.m., with the screw. Tighten the locknut and re-check the fast idling speed.

3. **Idle emission**: An idle trimming screw (4) is provided to give very fine adjustment to compensate for the difference between a new 'stiff' engine and one that is 'run in'. THIS IS NOT AN ORDINARY MIXTURE ADJUSTING SCREW; it regulates a limited amount of air that can be introduced into the mixing chamber. It is important to remember that the ear will not detect any difference between the fully 'home' and fully 'open' position of the screw. The setting should, therefore, be checked by means of a CO meter or an air/fuel ratio meter to the exhaust pipe. (The correct CO level is 0.5–2.5% and air/fuel ratio is 14.4 : 1 to 13.6 : 1.)

Carburettor controls
The throttle rod linkage will not require adjustments during normal operation. To ensure complete throttle closure a degree of 'lost motion' or slackness is incorporated into the linkage; no attempt must be made to adjust this out.

Occasionally lubricate the linkage and choke cable with thin oil.

Carburettor servicing schedules
To maintain the carburettor at peak efficiency, regular servicing at 6,000 miles (10,000 km.) intervals is essential. This involves the use of coloured gaskets which give indication that the 24,000 mile (40,000 km.) service has been carried out. The appropriate servicing operations should be performed by authorized dealers who are trained in the use of the special equipment needed.
1 Temperature sensor  
2 Vacuum from manifold  
3 Restrictor valve  
4 Diaphragm  
5 Hot air from heat stove  
6 Control damper  
7 Cold air inlet  
8 Vacuum chamber  
9 Diaphragm spring  
10 Hot air pipe  
11 Air cleaner  
12 Control unit

Fig. 17.01. Air cleaner temperature control unit
A Cold air position  B Warm air position

Fig. 17.02. Adsorption canister
1 Canister casing  
2 Replaceable gauze filter  
3 Base plate
SECTION 17  EMISSION CONTROL  STAG

Fig. 17.03. Fuel delivery and evaporation control system

Fig. 17.04. Emission control carburettors
STAG FUEL SYSTEM
SECTION 19
FUEL SYSTEM (Fig. 19.01)

Fuel tank
The fuel tank is mounted below the luggage compartment floor. To gain access, lift carpet and right-hand panel of floor.

Fuel pump
An S.U. electrical fuel pump is used in the system and is situated behind luggage compartment panels above the wheel arch on the right-hand side. For full details of the pump see Electrical Section.

Fuel filter (Fig. 19.10)
A fuel filter is situated adjacent to the suspension turret at the right-hand side of the engine compartment and must be changed every 12,000 miles.

Carburettors
Twin Zenith CDS 175 carburettors are mounted on a pyramid casting which in turn is attached to the inlet manifold.

The carburettors used are of the same type used on the GT6 Mk. II and as such may be serviced by following instructions given in the manual with the following exceptions.

Carburettor linkage
Control of throttle, choke and kick-down (automatic transmission only) is by cable from their respective control points to the carburettors.

The throttles on the carburettors are inter-connected to provide synchronized operation by a spring-loaded operating lever centrally mounted and connected to each carburettor by link rods.

Setting procedure
Set slow running adjustment screws to $2\frac{1}{2}$ threads below bracket.

Insert a 5 mm. ($\frac{5}{32}$ in.) dia. bar through mounting bracket and operating lever slot as shown in Fig. 19.02. Fit fixed length link rod (6) to the ball joints on right-hand carburettor and operating lever. Adjust the other link rod (7) to the distance between left-hand carburettor and operating lever ball joints, fit rod and tighten locknut.

Position driving tag of slave lever (1) at the left-hand side of the slot in operating lever (2). Position outer throttle cable through abutment (3) and thread inner cable along guide (4). Thread inner cable into swivel pin (5), tighten clamp screw to cable holding relative positions of levers and ensuring that the cable is not tight (pulling pedal) or slack (allowing tag to move along the slot when released).

Choke control
The choke control knob operates twin cables connected to a starter box on each carburettor. The starter box type of choke is not described in the current GT6 Manual. A brief outline of this system is as follows.

Choke operation
Upon operation of the choke control, a lever on the side of the carburettor rotates a disc in the starter box. In the disc a set of holes of different diameters are drilled. When the disc is fully rotated, the largest hole is in communication with the starter circuit and provides the richest mixture.

Fuel is drawn from the float-chambers via a vertical drilling adjacent to the central main fuel channels through the starter box and into the throttle body on the atmospheric side of the throttle plate.

A cam, externally mounted on the choke lever, moves in conjunction with the starter disc, operating the throttle beyond the normal idle position to provide fast idle speed when the engine is cold.

Progressively pushing in the choke rotates the disc and cam, bringing smaller holes in communication with the starting circuit thus weakening the mixture, while the cam allows the throttle linkage to return to the normal idling position.
Carburettor jet needle adjustment

The adjustment of air/fuel ratio is now through the top of the carburettor, using tool S353 as illustrated. The effect of this modification is that the needle is moved in relation to the jet which is now fixed.

Adjustment of air/fuel ratio

Remove the carburettor dampers (Fig. 19.07) and insert the adjusting tool carefully to avoid spilling the dashpot oil.

Turn the outer tool to engage its lug in the recess of the air valve tube. Turn the inner bar to engage with the hexagon in the screw adjustment at the bottom of the air valve tube. (Fig. 19.06)

Hold the outer tool and turn the inner bar clockwise to enrich the mixture and anti-clockwise to weaken the mixture. (Fig. 19.08)

It is important to adjust both carburettors equally and to synchronize the throttle settings afterwards. Never attempt to set carburettor needles without appropriate equipment to measure the air/fuel ratio.

After use, remove the tool, top up dashpots and refit dampers.

CARBURETTORS—REMOVE AND REFIT

NOTE: It is convenient whether one or both carburettors are to be removed to take off the pair complete with air cleaner, induction pipes, mounting pedestal and inter-connecting linkage.

1. Disconnect the fuel feed pipes from carburettors.
2. Disconnect the crank case breather pipe from the rear right-hand camshaft cover.
3. Disconnect the choke cables.
4. Disconnect the accelerator cable.
5. Disconnect the vacuum pipe from left-hand carburettor.
6. Remove the vacuum advance union from left-hand carburettor.
7. Remove the centre retaining nut and washers.
8. Disconnect air cleaner elbows from carburettors.
9. Lift off carburettors complete with mounting bracket. (Fig. 19.03)
10. Refit carburettors, reversing above procedure.

NOTE: An ‘O’ ring seal is interposed between mounting bracket and inlet manifold. Check serviceability before refitting.

AIR CLEANER—REMOVE AND REFIT

1. Release two securing clips and lift off top casing.
2. Lift out element.
3. Remove six bolts securing air cleaner to air induction pipes.
4. Lift off air cleaner and two gaskets.
5. Refit by reversing above, but noting:
   - Fit gaskets, then the six bolts loosely before tightening to the correct torque figure.
   - Ensure that the element and the clip of the top cover are correctly positioned before attempting to secure retaining clips.

AIR CLEANER—RENEW ELEMENT (Fig. 19.09)

1. Release two securing clips and lift off top casing.
2. Lift out element.
3. Fit new element in position.
4. Refit top cover ensuring that the rear clip is engaged correctly and that the two clips make a secure fitting.
Fig. 19.01. Fuel system layout

Fig. 19.02. Setting throttle linkage

Fig. 19.03. Removing carburettors
Fig. 19.04. Carburettor details
### KEY TO FIG. 19.04

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carburettor</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Spring—idle trimming screw*</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Idle trimming screw*</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Gasket—by-pass valve*</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>By-pass valve*</td>
<td></td>
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<tr>
<td>6</td>
<td>Lockwasher under (7)*</td>
<td></td>
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<tr>
<td>7</td>
<td>Screw—securing (5)*</td>
<td></td>
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<td>Spring—idle adjusting screw</td>
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* Emission control carburettors only

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**Fig. 19.05. Carburettor controls and setting**
Fig. 19.06. Tool S353 positioned for use

Fig. 19.07. Remove carburettor dampers

Fig. 19.08. Using Tool S353 (early tool)

Fig. 19.09. Air cleaner

Fig. 19.10. Fuel filter
COOLING SYSTEM

General
The cooling system is pressurized, with an overflow bottle to effect a 'No Loss' system. System pressure release on filler cap at 13 lb./in.².

The principal components of the system are:

Radiator
Conveniently mounted by four bolts and easily removed.

Water pump
The impeller-type pump is mounted at the front end of the engine between banks and driven by a skew gear from the jackshaft.

To remove the water pump
1. Remove the air cleaner and elbows.
2. Disconnect carburettor controls.
3. Remove carburettors.
4. Drain coolant.
5. Disconnect water hoses from water pump and thermostat housing.
6. Remove inlet manifold.
7. Remove three bolts and lift off water pump cover.
8. Apply a spanner to the centre-bolt head, turn gently clockwise. This may release the pump from the jackshaft skew gear; if not, it will remove the bolt which has a left-hand thread. (Fig. 26.01)
9. Where the bolt has been removed, screw the impact tool and adaptor (54235A/6, 4235A (3072) ) into the threaded hole and remove pump.

Fitting pump
1. Check spigot bearing in cylinder block; renew if damaged.
2. Fit pump into cylinder block, ensuring that the gears of pump and jackshaft mesh correctly and that the pump is fully seated.
   NOTE: By turning the centre bolt gently in an anti-clockwise direction the pump will normally seat correctly.
   CAUTION: The use of impact to seat the pump will damage the graphite seal.
3. Ensure that the gasket faces of housing and cylinder block are clean.
4. Fit housing without gaskets; fit the three bolts and tighten evenly to finger tight.
5. Ensure that the housing is level by checking gap between housing and cylinder block at three points between the bolts. (Fig. 26.02)
6. Measure gap between cylinder block and water pump housing.
7. Select water pump gaskets to equal the gap noted in (6) above ±0.010 to 0.020 in. (0.25 to 0.5 mm.), which is the required running clearance between centre-bolt and lug in pump housing.
8. Remove pump housing.
9. Fit gaskets and pump housing, securing with three bolts and washers.
10. Fit inlet manifold.
11. Connect water hoses.
12. Refill with coolant.
13. Fit carburettors.
15. Fit air cleaners and elbows.
Fan and Torquatrol unit

A 13-bladed 16\frac{1}{2}-in. plastic fan driven via a torque limiting drive assists the engine cooling. The torque limiting device (Fig. 26.03) operates on a principle of a shear fluid coupling in which a driving plate anchored to the crankshaft, transmits drive to the driven plate via a film of silicone fluid. The driven plate is bolted to the fan which, at the maximum efficient fan speed, will apply sufficient torque to slip the drive. Thus a maximum fan speed of approximately 2,500 r.p.m. is maintained.

No servicing of the unit is required.

To remove
1. Remove radiator.
2. Remove centre-bolt into crankshaft pulley.
3. Lift out fan and Torquatrol unit.
4. Separate by removing the four nuts attaching the fan to the unit.
   Refit by reversing the above procedure.

Thermostat

The thermostat housing is secured to the inlet manifold directly above the water pump.

To remove (Fig. 26.04)
1. Drain off part of the coolant.
2. Disconnect water hose from thermostat housing.
3. Remove the two bolts in housing.
4. Remove the housing.
5. Lift out thermostat.
   Refit by reversing above procedure, clean gasket faces, use a new gasket coated with jointing compound. Thermostat opens at 82°C.
Fig. 26.01. Removing pump (engine strip)

Fig. 26.02. Checking housing clearance

Fig. 26.03. Torquatrol unit

Fig. 26.04. Removing thermostat housing
STAG EXHAUST

SECTION 30
EXHAUST SYSTEM

Twin conventional exhaust system with inter-connection forward of the silencers. Each component of the system is independently renewable.

The tail pipes are fitted with resonance mufflers which supplement the main silencers.

Fig. 30.01. Exhaust system
STAG STEERING
SECTION 57
SECTION 57

STEERING

STAG

STEERING-WHEEL AND COLUMN

The steering-wheel, steering-column, and related components are shown in Fig. 57.01. The steering-column comprises an upper shaft and a lower shaft, connected by a needle-bearing universal joint. The upper shaft is supported by a housing to which the light, trafficator, wiper stalks, and steering lock controls are fitted. The lower shaft is telescopic and is enclosed and supported by a two-piece tubular housing. In the event of impact, due to collision, both the lower shaft and its housing will collapse and prevent the steering-wheel being thrust towards the driver. (Fig. 57.02.)

An intermediate shaft connecting the rack pinion and the steering-column lower shaft is fitted with two splined universal joints. All universal joints are lubricated on assembly and require no attention in service.

Steering-column adjustment for both axial movement (4 in., 102 mm.) and rake (2 in., 51 mm.), is provided by a single clamp lever located in front of the nacelle.

The 16 in. (407 mm.) three-spoke steering-wheel incorporates a padded rim and boss. Four turns are required from lock to lock.

POWER STEERING EQUIPMENT

Power steering equipment shown in Fig. 57.03 comprises an hydraulic pump, a combined steering-rack and ram chamber, and a control valve and pinion assembly.

The function of the power steering equipment is to minimize the physical effort of turning the steering-wheel, especially when parking or manœuvring in restricted space. The input torque to operate the steering unit is 10 lb. in. (0.115 kg m.) per degree.

When the engine is not running, or if for any reason the hydraulic system is inoperative, the vehicle can be steered by direct mechanical effort.

The engine-driven hydraulic pump supplies pressurized oil to a rotary-type spool valve which forms an extension of the rack pinion shaft. Movement, imparted to the rotary valve from the steering-column is via a torsion bar, the deflection of which determines the relationship of the spool ports and thus the hydraulic power to be directed to one or other side of the steering-rack piston.

Initial power assistance is obtained at approximately ½° deflection of the torsion bar. Maximum assistance is obtained at approximately 4° deflection of the torsion bar. When the torsion bar is deflected to approximately 7°, direct mechanical drive is obtained.

The hydraulic pump

Description
A combined hydraulic pump and fluid reservoir unit, shown sectioned in Fig. 57.04, is secured to the engine by two brackets and 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 pump 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.

As its name suggests 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.

Briefly, 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. Fig. 57.04 shows the flow/relief valve and its associated ports. 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).

From Fig. 57.04 it will be evident that pump discharge pressure, acting on the piston of the flow valve, will tend 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 tend to restrict piston displacement, but since movement of the piston towards the outlet union must create restriction in oil flow and a 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. Influence on piston displacement is also applied by the orifice in the transfer passage to the spring chamber as its presence introduces a delay factor in pressure adjustment between spring chamber and piston crown. The interaction of these forces causes the flow piston to be hydraulically self-compensating to match pump pressure with steering power requirements, and by means of the relief valve to impose limitation on pressure increases within 750 to 850 p.s.i. (52.73 to 59.76 kg./cm.²).

**Maintaining the hydraulic pump**

Attention to the hydraulic pump in service requires only that the fluid level is maintained at the high mark on the reservoir dipstick, and that the drive belt is not damaged or unduly worn, and is adequately tensioned.
Dismantling the hydraulic pump (Refer Fig. 57.05)

Where 'front' and 'rear' are mentioned, interpret 'front' to indicate pulley end of pump.

1. Drain oil from reservoir and clean exterior of pump.
2. Remove nut and washer securing pulley to shaft.
3. Using a suitable puller withdraw pulley. Do not attempt to hammer shaft from pulley, or lever pulley from shaft as this may cause internal damage to pump.
4. Withdraw Woodruff key from pump shaft.
5. Remove mounting bolts and studs from front and rear of pump body.
6. Remove pressure outlet complete with 'O' ring and withdraw relief valve/flow valve and spring.
7. Separate reservoir from pump body.
8. Remove circlip securing end-plate. To facilitate the removal of this circlip a small hole is drilled in the body casing to permit the insertion of a pin punch or stiff wire (Fig. 57.06).
9. Withdraw end-plate and spring, and extract end-plate ‘O’ ring from pump body.
10. Carefully slide pump shaft to rear of body and withdraw shaft complete with pressure plate, thrust plate, and rotor assembly.
11. Remove thrust plate, dowel pins, eccentric ring, and rotor vanes, and examine all components.
12. The thrust plate and rotor hub may be separated from the pump shaft by removing the circlip from the shaft.

Assembling the hydraulic pump (Refer Fig. 57.05)

Where 'front' and 'rear' are mentioned, interpret 'front' to be pulley end of pump.

Ensure all components are thoroughly clean. The shaft oil seal, and all 'O' rings, should be renewed on assembly.

1. If the thrust plate and rotor hub have been disturbed, fit them to shaft and secure with new circlip. Ensure ported face of thrust plate is adjacent to rotor hub.
2. Lubricate shaft bush and lips of oil seal and carefully enter shaft in pump body.
3. Align pressure plate dowel holes with pump body and insert the two dowel pins.
4. Locate eccentric ring on dowel pins, making sure rotation arrow is to rear of pump.
5. Fit vanes to rotor hub slots (curved edges of vanes towards eccentric ring).
7. Install pressure plate ‘O’ ring in pump body and smear with hydraulic fluid.
8. Enter pressure plate evenly in body (ported face towards rotor hub) and engage dowel pins. Press gently into position (hand only).
9. Fit end plate ‘O’ ring to pump body.
10. Locate tapered coil spring in pump body, engaging larger diameter coil in recessed seat in pressure plate.
11. Smear perimeter of end plate with hydraulic fluid and evenly insert end plate into pump body until it is slightly below groove of retaining circlip.
12. Fit circlip to pump body and release end plate.
13. Fit reservoir ‘O’ ring to pump body.
14. Fit rubber seals into recesses in rear face of pump body.
15. Carefully and evenly slide reservoir over pump body, ensuring that mounting holes are aligned and mounting bolt sealing rings are not dislodged.
16. Fit reservoir mounting bolts and studs.
17. Insert relief valve spring, relief valve/flow valve.
18. Fit new ‘O’ ring to outlet union and screw union into position.
19. Install key in drive shaft and fit pulley and securing nut.
The power steering rack and control valve (Refer Fig. 57.03)

The power steering rack is similar to normal rack-type mechanisms except that the rack shaft is fitted with a single piston which operates in an enclosed sealed chamber. By means of the spool-type control valve/pinion assembly, pressurized oil from the engine-driven hydraulic pump is directed to one or other side of the rack piston, thus providing power assistance to deflect the front road wheels as required.

Dismantling power steering rack (Refer Fig. 57.07)

1. Remove rack complete from vehicle.
2. Slacken clips securing bellows seals and slide bellows seals along tie-rods to expose inner ends of tie-rods.
3. Wipe inner ends clear of grease and straighten tab ends of innermost lock washers.
4. Unscrew tie-rods from rack. Care must be taken not to disturb adjustment of the inner ball joint.
5. Disconnect unions connecting rack pipes to control valve and rack chamber, and remove pipes.
6. Slacken locknut on rack plunger adjusting screw and withdraw adjusting screw, spring, and plunger.
7. Remove the three Nyloc nuts and washers securing control valve flange to rack and withdraw control valve and gasket.
8. Withdraw seal housing and washer from rack.
9. Disconnect unions securing rack balance pipe and remove balance pipe.
10. Using a suitable 'C' spanner, release screw securing end-housing to rack cylinder and withdraw end-housing.
11. Remove union from centre of rack cylinder.
12. Withdraw rack shaft complete with piston in direction of end-housing.
   NOTE: This operation invariably results in the rack teeth being drawn through the lip-type seal in the cylinder sleeve. It is essential that this seal is renewed when the rack shaft is removed. It is recommended that all seals are renewed once they have been disturbed.
13. Withdraw cylinder sleeve from bore of cylinder.
14. Remove circlips and extract piston from rack shaft. Take care that circlips do not score rack shaft.
Assembling power steering rack (Refer Fig. 57.07)

1. Thoroughly clean all components.
2. Fit new seal and nylon backing ring to cylinder sleeve. Note that seal lip must be fitted adjacent to tapped locating hole and that square edge of nylon ring must abut against seal.
3. Fit new ‘O’ rings to cylinder sleeve and lubricate cylinder bore with hydraulic oil.
4. Lubricate seal lip and enter cylinder sleeve (seal leading) over rack shaft at opposite end to rack teeth.
5. Fit piston inner ‘O’ ring to rack shaft.
6. Carefully slide cylinder sleeve (seal end first) along plain end of rack shaft beyond location of piston. Do not slide cylinder sleeve over rack teeth.
7. Fit piston inner circlip to rack shaft, taking care not to mark or score rack shaft.
8. Fit piston ring to piston, slide piston into position on rack shaft and secure with circlip, taking care not to score or mark shaft.
9. Align tapped hole in cylinder sleeve with countersunk hole in cylinder and carefully slide sleeve and rack shaft into cylinder (Fig. 57.08).
10. Through countersunk hole in cylinder, locate tapped hole in cylinder sleeve.
11. Ensure end-cover securing ring towards open end of cylinder, smear conical seat of union with hydraulic sealing compound and fit and tighten union securing cylinder sleeve.
12. Fit new lip-type seal (lip of seal towards cylinder bore) and ‘O’ ring to end cover.
13. Lubricate seal lip and slide end cover into position.
14. Line up mounting feet and secure end cover by tightening screwed retaining ring.
15. Fit lip seal and ‘O’ ring to retainer. Fit washer into recess in pinion housing and fit ring (lip seal downwards). (Fig. 57.09.)
16. Fit new gasket to control valve flange.
17. Locate rack shaft in cylinder so that rack teeth are visible through control valve flange and are aligned to permit engagement of pinion.
18. Carefully enter pinion through seal and engage rack teeth, locating control valve over studs. Fit and tighten the three Nyloc nuts.
19. Rotate pinion until rack is centralized, i.e. the dimple on rack shaft lies in the middle of the thrust plunger aperture. (Fig. 57.10.)
20. Remove the small hexagonal plug from the screwed plug and using a dial gauge tighten screwed plug until plunger end-float (i.e. side movement of the rack shaft) does not exceed 0.007 in. (0.178 mm.). This measurement must not be confused with backlash or axial movement. Tighten locknut.
21. Fit grease nipple to screwed plug and grease rack.
22. Remove grease nipple and replace hexagonal plug.
23. Fit new end washers complete with ‘D’ plates to rack ends (recessed side of washer towards rack).
24. Fit and tighten tie-rod inner ends to correct torque figure. Both tie-rod inner ends should be tightened simultaneously to prevent stress to pinion. Secure by bending over lock tabs on ‘D’ plates, care being taken not to disturb ball housing tabs. Ball joints to be checked for free articulation following assembly to rack.
25. Grease rack ends and inner ball ends, slide bellows seals into position, and secure with clips.
26. Fit Bundy tubing to control valve and rack housing.

If necessary, during assembly of rack, the pinion lower needle bearing and rack shaft bush in end housing can be renewed.
The control valve

Description and operation

The steering rack control valve is a combined pinion shaft and spool valve assembly through which oil flow from the hydraulic pump is directed to either side of the rack piston as required. A cutaway view of the control valve is shown in Fig. 57.11 together with a sectioned plan view (Fig. 57.12). From these illustrations the construction and principle of operation can be seen.

The ports in the control valve body are connected, in order of descent, as follows:

- Top — return to reservoir.
- 1st intermediate — delivery to, or return from one side of rack piston.
- 2nd intermediate — pressure supply from pump.
- Bottom — delivery to or return from other side of rack piston.

Forming the spool valve is a shaft with six flutes, three long and three short, alternately disposed. This shaft is encased by a sleeve which has six internal axial channels, and on its external surface, three circumferential grooves interspaced with sealing rings. The centre circumferential groove has three drillings at 120° which penetrate the plain area of the internal bore. The top and bottom circumferential grooves also are drilled, but these holes (three at 120° each groove) are smaller than those of their centre counterpart and penetrate the top and bottom respectively of the internal axial channels as shown in Fig. 57.13. When assembled, the shaft and sleeve are as shown in Fig. 57.12, i.e., with the centre circumferential groove drillings aligned with the short flute and the smaller drillings in the top and bottom grooves aligned with the plain (unfluted) surface of the shaft. As illustrated (Fig. 57.12) this is neutral or straight-ahead position, a position which requires no steering assistance. This delicate relationship of sleeve and shaft is the responsibility of the eccentric screw shown in Fig. 57.11. No adjustment must be made to the eccentric screw in service.

So long as the hydraulic pump is running, oil is delivered under pressure to the central circumferential groove of the sleeve, and, via its three drillings, to the short flutes machined in the shaft.

A feature of the shaft flutes is the carefully ground tapered chamfers at the flute sides. These chamfers allow oil to flow, in neutral, to adjacent sleeve channels and also to the long flutes, where, with escape unrestricted, the oil can pass above the sleeve and return to the pump reservoir. The flute chamfers, however, serve the system in other ways: their presence prevents abrupt changes in pressure differentials, and also, because of the characteristics of oil flow, together with the torsion bar, provides the retention of driver 'feel'.

When the steering-wheel is turned to right or to left the deflection of the torsion bar to which the control valve shaft is pinned allows the shaft to move initially independent of the sleeve, thus altering the relationship of the shaft flutes to the internal axial channels of the sleeve. The result is that oil is now supplied to three of the sleeve internal channels only and is passed to either the top (left-hand turn) of the sleeve circumferential groove from whence it is fed to the appropriate side of the rack piston. Since pressure on one side of the rack piston necessitates oil displacement on the other side, the displaced oil from the unpressurized side of the rack piston is returned to the sleeve circumferential groove which is not pressurized and escapes to the reservoir via the long flutes.

When the torsion bar is no longer subjected to deflection, i.e., when effort has ceased to be applied to the steering-wheel rim, the shaft flutes are restored to their neutral position (Fig. 57.12) and pressure differences within the ram chamber cancelled.

Attention to the control valve is not recommended as its construction and setting does not favour dismantling. Where, however, the top oil seal requires renewal, this operation may be carried out provided care and scrupulous cleanliness are observed. It is necessary to emphasize that the eccentric screw locating the spool sleeve MUST NOT be disturbed.
Removing and replacing control valve top seal (Refer Figs. 57.11 and 57.14)
1. Thoroughly clean exterior of control valve end unions.
2. Disconnect flexible hoses and steel pipes at control valve and seal all apertures to prevent ingress of grit.
3. Release plunger load from rack shaft.
4. Remove the three Nyloc nuts from control valve flange and withdraw control valve.
5. Carefully press pinion shaft and extract pinion and shaft from underside of control valve. Note that pressure must not be applied to the pinion shaft torsion bar.
6. The withdrawal of the pinion shaft will expose the spool valve which is fitted with special sealing rings and is located by an eccentric screw (Fig. 57.14). Neither the special rings nor the eccentric screw are to be disturbed in any way. Disregard of this instruction may result in a requirement for a new control valve.
7. Remove circlip, backing washer and seal from control valve body; renew seal and replace in reverse order.
8. Using special sleeve (Tool No. J-34), insert pinion shaft and spool valve into body.
9. Remove special sleeve (Tool No. J-34) from pinion shaft.
10. Refit control valve to rack, ensuring pinion teeth do not damage lip of control valve lower seal.
11. Adjust and lock rack plunger.

Removing and replacing control valve seat inserts
Seat inserts are fitted to the inlet and return ports of the control valve housing. These seats can be damaged due to overtightening of the flexible hose unions.
Seat removal can be accomplished by using an 'Easy-Out' extractor. Carefully fit a new insert, observing scrupulous cleanliness as the admission of swarf or grit may render the control valve inoperative.
IMPORTANT: The insert in the control valve pressure inlet port is also a restrictor. This insert, or restrictor must be chosen to suit the hydraulic pump fitted.

Bleeding the steering system
The hydraulic steering system is self-bleeding, but care must be taken to ensure that at no time is the pump 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 all hydraulic connections are properly made and tight.
2. Fill hydraulic reservoir to high level mark on dipstick.
3. Place road wheels in straight-ahead position, and with drive belt slackened or removed rotate pump pulley by hand to prime system.
4. Fit and adjust drive belt.
5. Check, and top up hydraulic reservoir as necessary.
6. Start engine and allow to idle.
7. Turn driving wheel to full lock and return wheel to straight-ahead position.
8. Check and top up reservoir.
9. Turn driving wheel to opposite lock and return to straight-ahead position.
10. Again check reservoir level.
11. Turn wheels from lock to lock several times to permit air to be fully exhausted from system.
12. Return wheel to straight-ahead position and give final check to reservoir level.
NOTE: While repeated turning of the steering-wheel when the car is stationary will do the steering mechanism and hydraulic units no harm, the effect on tyre treads is not so favourable. When testing or bleeding the power steering, the road wheels should be rotating slowly to minimize tyre scrub.
Testing the steering system

Should steering defects arise in service, careful analysis is advised before attributing blame to the power steering equipment and embarking on the dismantling of hydraulic units. Heavy steering and pull to one side may be caused by mechanical faults; wheel track, tyre treads, tyre pressures, wheel bearings, steering geometry, and wear and stiffness in linkage must first be checked.

Where examination eliminates mechanical faults, the testing of the hydraulic system is explained below.

1. Check reservoir level and carefully examine steering units and hoses for leaks. All leaks must be rectified before attempting to test system.
2. Check pump drive belt for condition and tension.
3. Release rubber bellows seals from rack-ends and examine for fluid leakage.
4. Fit test gauge (JD10 and adaptor 10–2) to pump delivery (outlet) line as shown in Fig. 57.15.
5. Ensure all air is exhausted from the circuit, the oil level in the reservoir is correct, and that the oil is at working temperature.
6. With test-cock open and engine running, gently turn steering-wheel to left and right lock whilst observing gauge. A pressure of 750 to 850 p.s.i. (52.73 to 59.76 kg./cm.²) should be recorded in both cases. If pressure within this range is not obtained, or marked pressure imbalance is recorded, a fault exists in the system.
7. To determine if the fault is in the rack circuit or in the pump, close the test-cock for a period not exceeding five seconds. If the gauge fails to register 750 to 850 p.s.i. (52.73 to 59.76 kg./cm.²), the pump is inefficient and the pump relief valve/flow valve should be examined/renewed as necessary.
8. Repeat above test after renewing relief valve/flow valve and bleeding system. If the pump still fails to deliver oil at 750 to 850 p.s.i. (52.73 to 59.76 kg./cm.²), attention to the pump, or a new exchange unit is required.
9. If pump delivery is satisfactory and low pressure or marked imbalance exists, the fault must be in the rack control valve, or be caused by internal leakage in the rack cylinder.
10. Remove rack cylinder pipe unions from rack control valve body. Using suitable plugs, seal rack cylinder ports in control valve body.
11. With engine idling, turn steering-wheel gently to left and right, observing gauge reading. Do not hold wheel in either direction for periods exceeding five seconds. Check that pressures of 750 to 850 p.s.i. (52.73 to 59.76 kg./cm.²) are obtained in both directions.
   NOTE: Since fluid is now not being supplied to the rack the steering will naturally be heavier. It is quite unnecessary, however, to attempt to impart movement to the road wheels since the object of this test is merely to record pressure obtained at maximum torsion bar deflection.
12. If the control valve is found satisfactory, the fault must be within the rack.
## FAULT DIAGNOSIS

<table>
<thead>
<tr>
<th>FAULT</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy steering</td>
<td>Pump drive belt slack&lt;br&gt;Insufficient fluid in reservoir&lt;br&gt;Incorrect tyre pressures&lt;br&gt;Pump relief/control valve faulty&lt;br&gt;Restricted orifice to relief/control valve&lt;br&gt;Constricted delivery or return hose&lt;br&gt;Rack chamber or piston seals faulty&lt;br&gt;Faulty rack control valve</td>
<td>Adjust belt tension.&lt;br&gt;Top up reservoir.&lt;br&gt;Adjust tyre pressures.&lt;br&gt;Renew relief/control valve.&lt;br&gt;Clear obstruction.&lt;br&gt;Renew defective hose.&lt;br&gt;Renew rack seals.&lt;br&gt;Renew rack control valve.</td>
</tr>
<tr>
<td>Steering pulls to one side</td>
<td>Tyre pressures incorrect&lt;br&gt;Tyre tread differential on front wheels excessive&lt;br&gt;Loose or worn steering linkage&lt;br&gt;Geometry incorrect&lt;br&gt;Rack chamber or piston seals faulty&lt;br&gt;Faulty rack control valve</td>
<td>Adjust tyre pressures.&lt;br&gt;Fit equal treads to front wheels.&lt;br&gt;Rectify.&lt;br&gt;Check and adjust.&lt;br&gt;Renew rack seals.&lt;br&gt;Renew control valve.</td>
</tr>
<tr>
<td>Backlash in steering-wheel coupled with insensitive handling</td>
<td>Loose or worn steering connections&lt;br&gt;Defective torsion bar or sheared torsion pin</td>
<td>Tighten, adjust, or renew as necessary.&lt;br&gt;Renew rack control valve.</td>
</tr>
<tr>
<td>Jerky or inconsistent response when turning</td>
<td>Pump drive belt slack&lt;br&gt;Insufficient fluid in reservoir</td>
<td>Adjust belt tension.&lt;br&gt;Top up reservoir.</td>
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SERVICING POWER STEERING COMPONENTS IN SITU

Adjusting hydraulic pump drive belt

See Engine, Section 12.

Renewing hydraulic pump drive belt

See Engine, Section 12.

Remove and replace relief/flow valve

1. Raise car on ramp or jack.
2. Clean area in vicinity of flexible pipe unions on hydraulic pump.
3. Disconnect outlet union at pump. This will result in spillage of hydraulic fluid and a container should be available for this purpose.
4. Remove pump outlet union.
5. Withdraw relief/flow valve and spring.
6. Replace in reverse order, noting that filter end of valve is fitted adjacent to spring.
7. The outlet union ‘O’ ring should be renewed.
8. Top up reservoir, bleed system and check for leaks.

Removing and replacing flexible hoses (Refer Fig. 57.03)

1. Thoroughly clean areas in vicinity of flexible hose unions at control valve and hydraulic pump.
2. Disconnect unions at control valve and pump. (The oil return hose is fitted with a union at control valve end and a clip at pump end.)
3. Replace in reverse order.
4. Top up reservoir, bleed system and check for leaks.
   Flexible hoses must be renewed if signs of chafing, softness, or perishing become evident. Do not use substitute hoses.

Removing and replacing hydraulic pump

1. Disconnect oil delivery and return pipes at hydraulic pump.
2. Remove nut and washers securing pump to rear bracket.
3. Slacken the two bolts securing pump to front bracket, pivot pump towards engine, and release drive belt from pump pulley.
4. Remove the two bolts securing pump to front bracket.
5. Remove nuts and washers securing rear bracket to engine cylinder block.
6. Withdraw pump and rear bracket.
7. Replace in reverse order.
8. Adjust belt tension, top up reservoir and bleed steering system.
Renewing tie-rod outer end

1. Remove road wheel.
2. Scribe a line on one flat of the tie-rod outer end locknut and a corresponding line on tie-rod. Slacken locknut.
3. Release tie-rod from steering-arm and unscrew tie-rod outer end.
4. Screw on new outer end, ensuring it will be located in the same position on the tie-rod as the old one. That is, that the length between ball centres is not altered.
5. Connect and tighten tie-rod end to steering-arm.
6. Repeat above procedure on opposite side.
7. Fit road wheels and check track, adjusting as necessary.

Wear in tie-rod outer ends cannot be removed by adjustment; renewal of the complete end is necessary. Tie-rod outer ends should be renewed in pairs.

Renewing bellows seal

1. Remove front wheel.
2. Remove tie-rod outer end and locknut.
3. Clean area around bellows.
4. Release clips securing bellows seal to rack housing and tie-rod and slide off bellows seal.
5. Ensure tie-rod inner end is adequately greased, pack new bellows seal with approximately 2 oz. of grease and slide into position.
6. Secure inner end of seal to rack with a clip or twist of wire, taking care not to cut or bite into seal.
7. Position outer end of bellows seal 5.75 in. (146 mm.) from outer end of tie-rod and secure with clip.
8. Replace locknut and tie-rod outer end and secure to steering-arm.
9. Fit front wheel, lower vehicle to ground and check and adjust wheel track as necessary.

Renewing tie-rod (Fig. 57.16)

1. Remove front wheel, disconnect tie-rod outer end from steering-arm and withdraw outer end and bellows seal.
2. Turn steering-wheel as necessary to expose tie-rod inner end.
3. Straighten lock tabs securing ball end to rack on inner lock washer.
4. Unscrew tie-rod.
5. Replace in reverse order, ensuring inner lock tabs are renewed and properly secured. Both tie-rod inner ends must be tightened simultaneously to prevent stress being applied to pinion teeth.
6. Check tie-rod inner ball joints for free articulation.
7. Check and adjust wheel track as necessary.

Tie-rod inner end (Fig. 57.16)

Wear in tie-rod inner ends can be adjusted by shim removal provided the ball end is not stepped and ovality is not present in ball seats.

Properly adjusted, and with tab washer securely locked, the tie-rod should pivot evenly about its seat. Stiffness in tie-rod articulation, whether throughout its movement or in spots, must not be tolerated.

End-float should be within 0.0005 to 0.003 in. (0.0127 to 0.0762 mm.).

The torque setting of ball housing to adaptor is 80 to 90 lb. ft. This is critical.

If ball joints are secured to rack at a higher torque it could result in the tab washer being disturbed and also overtightening of the ball joints.
Tie-rod length

Tie-rod lengths should be set initially to 9.74 in. (247.396 mm.) between ball centres. Subsequent adjustment made to obtain correct track setting should be made equally to both rods.

Removing and replacing rack control valve

Should removal of the rack control valve be required, it is advised that the rack be removed from the vehicle. This recommendation is made principally to minimize the entry of grit to either rack or control valve and also to eliminate damage to the control valve lower seal if the pinion is inserted in situ.

NOTE: Before refitting control valve to rack it is advised that the rack thrust button is first released of load.

Removing rack (Fig. 57.17)

1. Raise car on ramp or jack.
2. Remove pinch-bolt and nut from pinion shaft universal joint.
3. Clean control valve in vicinity of pipe unions.
4. Disconnect, at control valve housing, the main oil supply and return unions (flexible pipes).
5. Plug, or seal off, disconnected unions and control valve ports to prevent entry of grit.
6. Disconnect tie-rod ends from steering-arms.
7. Remove the four bolts, plain and spring washers, and angle plates securing rack mounting feet to mounting brackets.
8. Withdraw rack forward to release pinion shaft from universal joint and remove from car.

Replacing rack

1. Centralize rack and position it on car.
2. With front road wheels and steering-wheel set in straight-ahead position, engage pinion shaft in steering shaft universal joint ensuring that the flat machined in pinion shaft corresponds with bolt location in universal joint.
3. Align tapped holes in rack feet with those in mounting brackets and engage single plates, bolts, plain and spring washers. Ensure single plates are in contact with mounting platform before tightening bolts.
4. Connect tie-rod ends to steering-arms.
5. Fit pinch-bolt to universal joint and pinion shaft.
6. Connect flexible pipe unions to control valve.
7. Top up hydraulic reservoir, bleed steering system and check for leaks.
8. Check also that the rack Bundy pipes do not make contact either with each other or any part of the car.
### DATA

**Hydraulic pump**

- Fluid capacity (including reservoir): 1.75 Imp. pts. (0.995 litres) approx.
- Pump delivery: Min. 1.04 Imp. g.p.m. (4.727 litres) at 170° F. at 465 r.p.m. against 665 to 735 p.s.i. (46.75 to 51.67 kg./cm.²)
  - Max. 1.79 Imp. g.p.m. (8.138 litres) at 170° F. at 1,500 r.p.m. against 50 p.s.i. (3.515 kg./cm.²)
- Relief valve 750 p.s.i. (52.73 kg./cm.²) min., not exceeding 850 p.s.i. (59.76 kg./cm.²) at 1,500 r.p.m.

### TORQUE FIGURES

**Hydraulic pump**

- Pump reservoir to housing: 35 lb. ft. (4.85 kg. m.)
- Pump to mounting bracket: 34 lb. ft. (4.84 kg. m.)
- Pressure hose unions: 25 lb. ft. (3.46 kg. m.)
- Relief valve union: 25 to 40 lb. ft. (3.46 to 5.53 kg. m.)

**Control valve**

- Flange nuts: 10 to 14 lb. ft. (1.38 to 1.94 kg. m.)
- Unions—Bundy tubing: 12 to 16 lb. ft. (1.66 to 2.21 kg. m.)

**Rack**

- Locknut—rack plunger: 55 to 65 lb. ft. (7.6 to 8.99 kg. m.)
- Slotted nut—cylinders and housing: 80 to 90 lb. ft. (11.06 to 12.44 kg. m.)
- Inner ball joint to adaptor: 80 to 90 lb. ft. (11.06 to 12.44 kg. m.)
- Adaptor—cylinder sleeve: 25 to 29 lb. ft. (3.46 to 4.02 kg. m.)
- Unions—Bundy tubing: 12 to 16 lb. ft. (1.66 to 2.21 kg. m.)
- Tie-rod—inner end: 40 to 50 lb. ft. (5.53 to 6.92 kg. m.)
Fig. 57.01. Exploded view of steering column and components
Fig. 57.02. Part sectioned view of steering column

Fig. 57.03. General arrangement of power steering equipment
1 Flow valve
2 Pressure relief valve
3 Shaft seal
4 Shaft
5 Thrust plate
6 Reservoir housing
7 Filler cap
8 Dipstick
9 Elliptical ring
10 Pressure plate
11 Discharge cavity
12 Spring
13 Rotor hub
14 End plate
15 Rotor vane
16 Orifice

Fig. 57.04. The hydraulic pump—sectioned view
SECTION 57 STEERING

Fig. 57.05. The hydraulic pump — exploded view

Fig. 57.06. Removing end-plate circlip
1 Seal—end housing  
2 End housing  
3 'O' ring—end housing  
4 Circlip (limiting stop)  
5 Slotted nut—end housing  
6 Cylinder (ram chamber)  
7 Union—cylinder sleeve  
8 Union—balance pipe  
9 Mounting flange—control valve  
10 Mounting feet  
11 Rack shaft  
12 Backing ring—seal—cylinder sleeve  
13 Seal—cylinder sleeve  
14 'O' ring—cylinder sleeve  
15 Cylinder sleeve  
16 Piston—rack shaft  
17 Piston ring  
18 Circlip

Fig. 57.07. The power steering rack dismantled

Fig. 57.08. Assembling rack, piston, and cylinder sleeve to cylinder
Fig. 57.09. Assembling control valve, pinion, and seals to rack

Fig. 57.10. Rack central location and plunger assembly

Fig. 57.11. The control valve and pinion assembly
Pressure supply ports
R.H. Ram inlet/outlet R.H.
L.H. Ram inlet/outlet L.H.
Long flute (oil to reservoir)
Short flute (pressure)

Fig. 57.12. Oil flow in neutral

Fig. 57.13. Internal drillings and channels in spool sleeve

Fig. 57.14. Pinion and spool assembly removed from housing

Fig. 57.15. Test gauge and valve fitted to steering system
Fig. 57.16. Tie-rod and ball ends

Fig. 57.17. Rack mounting bracket
STAG FRONT SUSPENSION
SECTION 60
FRONT SUSPENSION

Physically similar to Triumph 2000 and 2.5 models, the front suspension differs only in spring dimensions and the addition of an anti-roll bar.

Removing front suspension
1. Apply hand brake and chock rear wheels.
2. Disconnect battery.
3. If it is intended to remove road springs engage spring coils with hooks of Tool S320 before lifting vehicle.
4. Slacken front wheel nuts and raise front of car, ensuring sufficient height is attained to permit front suspension to be withdrawn from below car.
5. Support body on suitable stands.
6. Remove front wheels.

The front suspension may be removed with or without the power steering rack.

Leaving the steering rack in vehicle
7. Remove the two screws securing rack flexible hose clip to front cross-member and withdraw clip.
8. Release left and right tie-rod ends from steering arms.
9. Slacken the four bolts and nuts securing rack mounting brackets to front cross-member.
10. Remove the four bolts, spring and plain washers, and angle plates retaining rack to mounting brackets.
11. Support rack with string or wire to vehicle. Do not allow rack to hang suspended by flexible hoses.

Removing steering rack with suspension
12. Disconnect flexible hoses at hydraulic pump and seal off pump unions and hoses to prevent entry of grit and dust.
13. Remove bolt and nut clamping universal joint to rack pinion shaft.

Removing front suspension (continued)
14. Disconnect brake fluid supply line to brakes at union on three-way connector at rear of front cross-member.
15. Seal pipe and connector to keep out grit.
16. Remove the hairpin spring clip, Nyloc nut, washer and circular rubber block from rear end of wishbone radius rods.
17. Disconnect anti-roll bar links.
18. Support front cross-member on jack and remove the eight bolts and nuts (four either side) securing cross-member to body.
19. Remove the six nuts and washers securing damper and road spring assemblies to front wings.
20. Gently lower jack, easing front cross-member forward to disengage wishbone radius rods from body. If steering rack is attached to cross-member, disengage rack pinion shaft from steering shaft universal joint.
21. Carefully lower unit to ground and withdraw from vehicle.
Replacing front suspension

1. Thoroughly clean suspension turret mounting faces on underside of vehicle removing all trace of sealing compound.
2. Clean the mounting flanges on front damper and road spring assemblies removing all trace of sealing compound.
3. If cleaning spirit is used care must be taken to prevent its access to top swivel bearings.
4. Apply Telseal strip around mounting flanges of front damper and spring assemblies (Fig. 60.01). This prevents the entry of water and grit when fitted to the vehicle.
5. Position cross-member and suspension under car and raise on jack, guiding dampers and road springs into position in wings.
6. Fit washers and nuts to damper flange studs and tighten evenly.
7. Engage wishbone radius rods in mounting holes in body, noting the order of assembly of washers and circular rubber blocks. The flat faces of the blocks must face each other.
8. If the rack is fitted to cross-member, set road wheels and steering-wheel to straight-ahead positions and connect steering shaft universal joint to rack pinion shaft. Insert and tighten pinch bolt.
9. Align cross-member mounting holes with body. Locate the four reinforcing plates in the body above the cross-member mounting pads and enter the eight securing bolts (four either side). Fit washers and Nyloc nuts to bolts and tighten evenly.
10. Fit brake pipe to three-way connector at rear of cross-member.
11. Connect flexible pipe unions to hydraulic pump or fit clip to flexible pipes as appropriate.
13. Fit front wheels and lower vehicle to ground.
14. Top up and bleed brakes and power steering.

DAMPER/VERTICAL STRUT

Removing vertical strut

1. With the vehicle on its wheels, fit spring hooks (Tool S320) to engage as many coils of the road spring as possible. Secure spring hooks with safety strap.
2. Apply hand brake, chock rear wheels, and slacken front wheel nuts.
3. Raise vehicle on jack, support on stands, and remove front wheel.
4. Remove the three nuts and washers from top of suspension turret.
5. Remove the four bolts and two spacers from lower end of vertical strut and withdraw vertical strut complete with road spring.

Dismantling vertical strut (Refer Fig. 60.02)

1. A sectioned view of the damper/vertical strut assembly is shown in Fig. 60.02.
2. Ensure spring clips are securely fitted to spring coils (Fig. 60.03).
3. Remove cotter pin (10), nut (11), upper washer (6), lower washer (3), and lift off the rubber mounting (8), and road spring (48).
4. To release the spring hooks from the road spring, compress spring using Tool S421A (Fig. 60.04).
5. Examine all components and renew as necessary.
Dampers

The attempted repair or reconditioning of dampers is not advised. Examine and renew dampers if any of the following defects are apparent:

- damaged body.
- bent piston rod.
- worn piston rod or bush.
- fluid leakage.

If the dampers appear to be in order, check for operation as follows:

1. With the damper held in a vertical position, slowly extend and compress it to the limit of its travel approximately 10 times. Appreciable and constant resistance should be felt throughout each stroke.

2. Reject damper if:
   - little or no resistance is felt during extension or compression.
   - resistance is excessive.
   - a pocket of no resistance is felt when reversing direction.

   Where doubt exists, comparison may be made against a new damper but allowance must be made for the slightly increased resistance of the new damper due to the closer tolerances of unworn bushes and seals.

Assembling vertical strut (Refer Fig. 60.02)

1. Compress road spring, fit spring hooks (Tool S320) over five spring coils and secure hooks with safety strap (Fig. 60.05).
2. Fit washer (12) into grooved top end of gaiter (13) and slide over piston rod. Attach lower end of gaiter to damper body.
3. Place insulator ring (49) on road spring lower seat.
4. Extend damper and fit compressed road spring.
5. Fit insulator ring (1) to underside of spring upper flange and slide spring and upper flange over piston rod.
6. Coat sleeve (4) and bearing (5) with grease and insert in rubber mounting (8).
7. Fit the tongued plastic-faced thrust washers (2) and (3) to top and bottom of rubber mounting block taking care that plastic surfaces face away from bearing (5).
8. Slide rubber block, flange to top, complete with bearings and thrust washers onto piston rod.
9. Fit washer and nut. Tighten nut and secure with cotter pin.

Refitting vertical strut

1. Thoroughly clean the inside of the suspension turret, taking care that all trace of sealing compound is removed from underside of turret flange.
2. Apply Telseal sealing strip \( \frac{3}{4} \) in. (19.05 mm.) wide around upper face of rubber mounting flange (Fig. 60.01).
3. Offer up damper/vertical strut assembly to turret and secure with its three washers and nuts.
4. Locate road wheels in straight-ahead position, offer lower end of vertical strut to vertical link and secure with its two spacers and four bolts.
5. Fit and tighten front wheels and lower vehicle to ground.
6. Remove spring hooks from road spring.
VERTICAL LINK BALL JOINT
Remove and replace
1. Remove front wheel.
2. Remove cotter pin and nut and release tapered shank of ball joint from lower strut.
3. Remove gaiter, circlip and extract ball joint assembly from wishbone.
4. Replace in reverse order.

FRONT HUB AND DISC ASSEMBLY
Removing front hub
1. Remove front wheel.
2. Remove the top rear bolt securing vertical strut to stub axle and slacken the remaining three bolts on vertical strut.
3. Remove lower bolt securing caliper brake to stub axle.
4. Detach caliper brake from disc and tie with wire or string to vehicle ensuring weight is not supported by brake hose.
5. Prise off hub cap and remove cotter pin, slotted nut and washer.
   NOTE: Hub removal necessitates the renewal of the hub seals.

Renewing hub bearings
1. Withdraw outer bearing from hub and evenly tap out the bearing outer track.
2. Remove oil seal from inner face of hub, withdraw bearing and evenly tap out the outer track.
3. Thoroughly clean hub.
4. Evenly press bearing outer tracks into hub.

Fitting hub and disc assembly to stub axle
1. Slide hub complete with inner and outer bearings (dry) but minus hub seals onto stub axle.
2. Fit plain washer and slotted nut to stub axle and gently tighten, at the same time rotating the hub clockwise until free movement or end-float is taken up. Excessive tightening of the slotted nut must be avoided as this will cause damage to the bearings.
3. Slacken the slotted nut to align the split pin hole with the first slot. Scribe the stub axle nut and plain washer to ensure reassembly in identical location.
4. Remove slotted nut, washer and withdraw hub. Fit oil seal to hub (lips of seal towards inner bearing) and pack hub and bearings with grease. Fit hub to stub axle and locate washer and nut in scribed positions. Check hub for absence of end-float and freedom to spin, making due allowance for the drag of the new seal. Fit split pin and partially fill hub cap with grease before pressing into position.

Hub adjustment in service
1. Remove road wheel, disc brake friction pads, hub cap and cotter pin from nut.
2. Rotate hub clockwise and apply a torque not exceeding 5 lb. ft. to the hub nut. Slacken hub nut to nearest slot and secure with new cotter pin.
3. Replace hub cap, brake pads and road wheel.
VERTICAL LINK

Removing and replacing vertical link

1. Remove front wheel.
2. Release lower end of vertical strut/damper assembly from vertical link.
3. Detach caliper brake unit. Ensure weight of caliper is not supported by brake hose.
4. Disconnect steering-arm ball joint.
5. Disconnect lower strut ball joint.
6. Withdraw vertical link complete with hub.
7. Replace in reverse order.

STUB AXLE

Removing and replacing stub axle

1. Remove hub.
2. Remove vertical link.
3. Remove nut and bolt securing steering-arm to vertical link and withdraw steering-arm.
4. Using a press, separate stub axle from vertical link.
5. Reverse above procedure for assembly.

STEERING ARM

Removing and replace steering-arm

1. Disconnect steering-rod ball joint from steering-arm.
2. Remove the single bolt securing steering-arm to vertical link.
3. Remove the nut securing stub axle and steering-arm to vertical link and withdraw steering-arm.
4. Replace in reverse order.
Fig. 60.01. Sealer strip

Fig. 60.02. Damper/vertical strut assembly

Fig. 60.03. Attachment of spring clips

Fig. 60.04. Spring compressor
STAG—REAR SUSPENSION

SECTION 64
REAR SUSPENSION

A rear sub-frame which employs the differential casing as a stiffening member is rubber mounted to the body at four points. Trailing arms, pivoted on rubber bushes, accommodate attachment points for the coil road springs, rear dampers and wheel hubs. Two universal joints fitted to the drive shaft provide for articulation of the trailing arms.

Construction and servicing are similar to Triumph 2000 and 2.5 models. Figure 64.01 shows the rear sub-frame and drive assembly.

Fig. 64.01. Rear suspension and sub-frame
STAG BRAKES

SECTION 70
SECTION 70  BRAKES  STAG

GENERAL

A Lockheed combined vacuum servo and tandem master cylinder unit operates the front disc calipers and rear wheel brake cylinders of the rear drum leading and trailing type brakes. Also fitted is a pressure differential warning actuator (P.D.W.A.) switch which illuminates a warning light on the fascia should pressure imbalance exist between the front and rear brake circuits.

The tandem type master cylinder (Fig. 70.01)

In contrast to single-type master cylinders, which employ one pressure outlet to supply hydraulic force for both axles of a vehicle, the tandem-type master cylinder has two pressure outlets, each serving a single axle; thus, front and rear axles are provided with separate and independent circuits.

Two in-line pistons in a common bore are each supplied with brake fluid from a reservoir with a vertical partition in its base. The partition ensures, in the event of total failure of a brake circuit, e.g. a burst rear or front wheel hose, that sufficient fluid will be retained in the reservoir to allow the operation of the undamaged circuit.

Operation

The operation of the tandem-type master cylinder is explained pictorially in illustrations 70.02 a–g.

Front caliper units

The front discs are straddled by a caliper unit (Fig. 70.03) which houses two pistons and brake pad assemblies. The pistons share a common fluid inlet from the brake master cylinder and are self-adjusting to compensate for brake pad wear. This is arranged by the absence of piston return springs, the design of the piston seal, and the relatively small piston movement required from idle to full brake application. The action of the piston fluid seal shown in Fig. 70.04 ensures piston retraction and the restoration of pad/disc clearance when pressure is released from the master cylinder.

Shims, fitted between the brake pads and piston crowns, in conjunction with the relieved face of the piston crown, prevent brake squeal.

Renewing friction pads (Figs. 70.05 and 70.06)

Friction pads should be renewed when the friction material has worn to approximately \( \frac{1}{8} \) in. (3.0 mm.). Brake pads must be renewed in sets, i.e., all four pads of both calipers of an axle, otherwise unbalanced braking will result. Where friction pads are removed, but not renewed, they must be replaced in their original positions.

Procedure:

1. Remove front road wheel.
2. Withdraw cotter pins (1), pad springs (2) (Fig. 70.05), and lift out brake pads complete with shims (Fig. 70.06).
   NOTE: The brake pedal must not be depressed whilst the pads are removed.
3. Clean the recesses into which the pads fit and also the exposed faces of the piston crowns.
4. Press both pistons into their respective cylinders. This will displace brake fluid back to the master cylinder reservoir. To prevent spillage from the reservoir it may be necessary to reduce the level of fluid before disturbing the brake pads. This can be done by siphoning fluid from the reservoir, or by opening the caliper bleed screw while the brake pedal is depressed.
5. Insert new friction pads and shims into caliper and fit pad springs and cotter pins.
6. Depress brake pedal several times to restore brake adjustment and spin brake discs to ensure brakes do not drag. Refit road wheel and repeat above procedure on opposite wheel.
Renewing piston fluid and wiper seals

1. Remove caliper assembly from hub disc without disconnecting the flexible brake hose. Tie or support the caliper assembly on the vehicle to prevent stress to the flexible hose.
2. Remove friction pads from caliper. If friction pads are not to be renewed, ensure they are not intermixed.
3. Fit clamp (Fig. 70.07) without distance piece, to the mounting half of the caliper assembly. Place a tray or container under the caliper assembly to catch fluid spillage when pistons are withdrawn.
4. Apply gentle pressure to brake pedal to expel the unclamped piston from its bore until it can be grasped by hand. Release pressure from brake pedal and withdraw piston by hand.
5. Prise out wiper seal retainer and extract wiper fluid seals from bore.
6. Using methylated spirit (ethyl alcohol) or brake fluid, thoroughly clean piston and seal grooves in cylinder bore and examine. Damaged seal grooves and a pitted or scored piston or bore will necessitate the renewal of the caliper assembly.
7. Smear cylinder bore and new fluid seal with clean brake fluid and fit fluid seal into its groove in bore.
8. Coat piston with Lockheed lubricant and insert squarely into bore. Press piston into bore until approximately $\frac{3}{8}$ in. (8 mm.) projects.
9. Coat wiper seal with Lockheed lubricant and fit it to the seal retainer.
10. Carefully slide wiper seal and retainer over piston into position in caliper.
11. Remove clamp from caliper, fit distance piece to clamp and press wiper seal assembly into position.
12. Slacken clamp, withdraw distance piece, and clamp piston.
13. Repeat procedure to extract piston from other caliper half; renew fluid and wiper seals as described above and assemble piston in caliper.
14. Fit friction pads, top up reservoir, bleed brakes, and re-check reservoir level, topping-up again as necessary.

Removing and replacing caliper unit

1. Remove road wheel and disconnect flexible brake hose at Bundy tubing and support bracket. Collect fluid spillage in tray or container.
2. Remove friction pads and the two bolts securing caliper to vertical strut and link.
3. Withdraw caliper from disc.
4. Replace in reverse order and bleed brakes.

Rear brakes

The rear brakes are self-adjusting and maintain a constant shoe/brake-drum running clearance. This feature also maintains the hand brake linkage adjustment. Should excessive travel of the hand brake lever develop in service, it is indicative of a defect in the hand brake linkage, or non-operation of the brake-shoe adjusting mechanism. Indiscriminate adjustment to brake cables without first ascertaining the cause is not advised.

Operation of self-adjusting mechanism

Leading/trailing shoe characteristics apply in both directions of rotation.

Fluid under pressure from the master cylinder expands the wheel cylinder pistons and forces the brake-shoes into contact with the brake-drum. Centralization of the shoes in the brake-drum is achieved by the ability of each shoe web to slide in its locating slots in the wheel cylinder pistons and anchor block.
On release of fluid pressure in the wheel cylinder the brake-shoe pull-off springs force the pistons to retract, restoring the running clearance between linings and drum.

When the brake linings are new and the drum unworn the adjuster adopts a position similar to that shown in Fig. 70.08. The inner edges of the adjuster plate and the leading shoe web butt against the shoulders of the cross-lever at points A and B. Running clearance is controlled by the gap C between the projection on the cross-lever and the inner edge of the slot in the adjuster plate.

When significant lining wear occurs the combined movement of the shoes to contact the drum will exceed gap C. The cross-lever, which is spring-loaded to bear on the web at point B, is carried with the leading shoe to close gap C, thereby rotating the lower adjuster plate inwards against the spring-loaded adjuster plate. The mating serrations prevent loss of the new relationship until further lining wear causes adjustment to again take place.

When the fluid pressure is released the shoes return to abut against the shoulders of the cross-lever at A and B, thus maintaining running clearance proportionate to Gap C (Fig. 70.08).

Hand brake application does not cause the self-adjusting mechanism to operate.

Removing and refitting brake-shoes
1. Release hand brake fully.
2. Remove road wheel and the countersunk screw securing brake-drum, and withdraw brake-drum. Where brake-drum removal is found to be difficult due to wear or ridging of the brake-drum, until hose in drum flange is aligned with ratchet spring. Lever upper adjuster plate upward to release ratchet (Fig. 70.08) and withdraw drum.
3. Remove shoe steady pin cups and springs and extract shoe steady pins.
4. Ease toe of leading shoe and heel of trailing shoe clear of piston. Unhook the pull-off springs, the cross-lever tension and withdraw brake-shoes.
5. To prevent ejection of wheel cylinder pistons, restrain them in position with a twist of wire or suitable clip.
6. Replace in reverse order. Note that the upper pull-off spring is fitted inboard. Do not lubricate teeth on brake-shoe adjuster plates.

The functioning of the adjuster can be checked by gently operating the footbrake with the drum removed. After a short movement of the shoe the ratchet will be heard to click. This adjustment can be cancelled by raising the ratchet plate (Fig. 70.01) and allowing the pull-off springs to restore the original condition.

After fitting brake-drum, apply foot brake several times to obtain brake adjustment.

Removing and refitting expander linkage
1. Remove clevis pin from operating lever at rear of backplate.
2. Remove brake-shoes.
3. Remove rubber boot from backplate and expander linkage and lift out expander linkage.
4. Replace in reverse order.

Removing and refitting wheel cylinder
1. Remove brake-drum and brake-shoes.
2. Disconnect fluid pipe union from wheel cylinder and plug or seal both pipe and cylinder to prevent ingress of grit.
3. Remove bleed nipple and seal aperture.
4. Prise off spring clip securing cylinder at rear of backplate and withdraw cylinder and gasket.
5. Replace in reverse order, using new gasket and spring clip.
Overhauling wheel cylinder
1. Remove brake-drum and brake-shoes.
2. Disengage rubber boots from wheel cylinder body and pistons.
3. Extract pistons from wheel cylinder and remove rubber seal from each piston, taking care not to damage seal groove.
4. Thoroughly clean and examine all components for scoring, wear, and corrosion. Renew the complete wheel cylinder if components are damaged.
5. If the cylinder bore and pistons are undamaged, lightly smear pistons (seal lip facing away from piston slot).
6. Fit new rubber boot to piston and partially fill boot with approved lubricant.
7. Smear cylinder bore with clean brake fluid and carefully insert pistons.
8. Secure boots in position in cylinder grooves.
9. Refit brake-shoes and drum and bleed brakes.

The pressure differential warning actuator (P.D.W.A.)
The P.D.W.A. is an ‘in-line’ hydraulic valve through which fluid supply to front and rear brake circuits is routed. The purpose of this valve is to register failure or defect in either front or rear braking by illuminating a warning light on the facia.

Under conditions of normal operation the shuttle of the P.D.W.A. is centralized by balanced hydraulic pressure in both front and rear circuits. A defect or leak occurring in either circuit will create a pressure difference and actuate the shuttle causing it to move out of centre towards the defective circuit.

Following rectification and bleeding of the defective circuit the P.D.W.A. shuttle will require it to be recentralized.

Centralizing the P.D.W.A. shuttle
1. Attach a bleed tube to a bleed nipple of the circuit which was not defective, i.e., following the repair and bleeding of rear brakes fit bleed tube to front calipers: if defect was in front circuit, attach bleed tube to rear wheel cylinder.
2. Switch on ignition (do not start engine). The P.D.W.A. warning light will be seen to glow brightly.
3. Open bleed nipple and gently depress brake pedal until warning light dims. This indicates that the shuttle has moved to centre.
4. Close bleed nipple and release brake pedal. If pedal pressure is contained after the light dims, the shuttle will move beyond centre to its opposite extreme, the P.D.W.A. light will again glow brightly and the bleeding process will require to be repeated on one of the opposite brake cylinders

Removing and replacing P.D.W.A.
1. Release electric connection on P.D.W.A. switch.
2. Disconnect the two outlet and inlet unions on P.D.W.A. unit and plug or seal exposed ports to prevent entry of dust and grit.
3. Remove the bolt securing P.D.W.A. unit to unit and withdraw unit.
4. Replace in reverse order after first ensuring shuttle is centralized and warning light is operative.
5. Bleed brakes and check for leaks.
Bleeding the brakes

The pressure of air in the brake system will cause the brake pedal to feel 'soft' and 'springy' and to lack the positive, firm resistance present when the brakes are in proper order. Air can be introduced to the system by slack bleed nipples, leaky unions, worn and perished seals, simply because there is insufficient fluid in the brake reservoir.

While bleeding, i.e., the evacuation of air from the system, will restore firmness to the brake pedal, improvement will only be temporary if all seals, unions, and fluid pipes are not sound and free of leaks. Since brake fluid is not generally subject to loss due to evaporation, a falling level in the fluid reservoir is indicative of leakage in the system. An exception to this rule applies when self-adjusting brakes are fitted since movement of the caliper and wheel cylinder pistons to compensate for wear of friction material will cause fluid to be drawn from the reservoir. Such displacement from the reservoir is, however, small and relatively constant. Sudden abnormal reductions in fluid level and/or a reduction in brake efficiency necessitates examination of the brake system to locate the leakage or defect.

Before commencing to bleed the brakes ensure that all bleed nipples are clean and that the reservoir is topped-up.

1. Release self-adjusting ratchet on rear brakes.
2. Attach bleed tube to bleed nipple of rear brake cylinder farthest from master cylinder, allowing free end of bleed tube to hang submerged in fluid in a transparent container.
3. Slacken bleed nipple (90 to 180° is usually sufficient), and depress brake pedal using light pressure. Do not use the full travel of the brake pedal as this will cause the shuttle of the P.D.W.A. switch to be decentralized. Allow brake pedal to return to its idle position and again depress pedal lightly. Continue until fluid free from air bubbles issues from brake cylinder.
4. Hold brake pedal depressed and tighten bleed nipple.
5. Check fluid level in reservoir, and top up as necessary using fresh fluid. Do not use the aerated fluid discharged from the brake cylinder.
6. Transfer bleed tube to nipple of opposite brake cylinder and repeat instructions 3, 4, and 5. If during the bleeding either rear cylinder or the P.D.W.A. shuttle was disturbed, no action need be taken at this stage.
7. Attach bleed tube to front disc brake caliper farthest from master cylinder.
8. Again, using light pressure on brake pedal, depress and release until fluid free from air bubbles into transparent container.
10. Repeat instructions 7 to 9 on opposite front caliper.
11. If the P.D.W.A. shuttle was decentralized while bleeding the rear brakes it can now be centralized by again opening the bleed nipple to which the bleed tube is still attached and with the ignition switched on gently apply pressure to the brake pedal until the P.D.W.A. light is seen to dim. Hold brake pedal in this position, tighten bleed nipple and release pedal. NOTE: Excessive pressure applied to the brake pedal will cause the P.D.W.A. shuttle to pass over-centre to the opposite side of its housing. Should this occur, it will be necessary to repeat the above procedure using a bleed nipple on one of the rear brake cylinders.
12. Top-up fluid reservoir, remove bleed tube and container, and apply brakes several times to adjust rear brakes. Check system for leaks and road-test car.
Fig. 70.02. The operation of the tandem master cylinder.
Pressure on brake pedal removed. Hydraulic pressure in front of both pistons.

Leaking front circuit — brake pedal depressed. Front piston at end of stroke. Front brakes inoperative. Rear piston passing fluid under pressure to rear brakes.

Leaking rear circuit — brake pedal depressed. Absence of hydraulic resistance in front of rear piston causes piston to move forward and physically slide front piston along bore.

Fig. 70.02. The operation of the tandem master cylinder (continued)
Fig. 70.03. The front caliper unit

Fig. 70.04. Caliper unit showing fluid seal idle and operated

Fig. 70.05. Friction pad location

Fig. 70.06. Withdrawing friction pad
Fig. 70.07. Piston retaining clamp

Fig. 70.08. Self adjuster
Fig. 70.09. Front brake details

Fig. 70.10. Rear brake details
General

This system is designed to provide either heated air to warm the interior as available in a conventional heater-equipped vehicle or cooled, dried, and cleaned air for increased comfort in hot climates.

Controls

*Lever 'A'*

The system draws either fresh air at ambient temperature through the bulkhead aperture or recirculated air from the vehicle interior. The choice is a driver function by selection at lever 'A'. To obtain maximum heating and particularly maximum benefit from the cooling system in hot climates select 'RECIRC'.

*Lever 'B'*

Moving lever 'B' to the right of its central 'OFF' position will cause any air flowing from the screen outlets or footwell outlets to be heated. The position of lever 'B' between 'OFF' and 'HOT' initially directs the degree of heat required. The interior temperature is continually sensed, and the hot matrix temperature automatically adjusted, to maintain an approximately constant temperature within the vehicle.

Moving lever 'B' to the left of its central 'OFF' position will select the cooling system. The refrigeration circuit is energized to cool the cold matrix, two blower units are brought into operation and flaps are automatically positioned within the unit to cause the total cold air volume to be split into the vehicle interior from the central facia vent and the two facia louvres. The position of lever 'B' between 'OFF' and 'COLD' initially directs the degree of cooling required. The interior temperature is continually sensed, and the cold matrix temperature automatically adjusted, to maintain an approximately constant temperature within the vehicle.

*Lever 'C'*

When the cooling system is selected the position of lever 'C' has no relevance.

Lever 'C' is effective when heated or ambient air is being delivered. When selected to 'SCREEN' the total air volume is directed to the screen vents. Moving the lever down progressively decreases the flow to the screen and increases the flow to the footwells. A selection to 'CAR' will cause the majority of air to be delivered to the footwells.

Fig. 82.01. Controls.
Blower switch

Two blower units may be used to increase the fresh air flow when the car is operating in extremes of temperature or at low road speeds. When the recirculating system is employed the blower units must be used to induce the flow. To operate, pull the knob to the first position for low speed and fully out for high speed. It may be noted that selecting the cooling system will automatically bring into operation the blower units at low speed. From this condition high speed may be obtained by pulling the switch knob fully out.

Outlets

*Screen outlets*

Heated or ambient air may be used to demist or defrost the windscreen.

*Footwell outlets*

Heated or ambient air may be provided to heat or ventilate the vehicle interior.

*Central facia vent*

Refrigerated air only may be split into the vehicle interior from this outlet. It may be noted that unless 'COLD' is selected no flow occurs.

*Facia louvres*

When lever ‘B’ is selected to ‘OFF’ or ‘HOT’ a flow at ambient temperature is available. The flow direction and volume is adjustable at each facia louvre. When lever ‘B’ is selected to ‘COLD’ a flow of refrigerated air is available. Again the direction and volume is adjustable at each facia louvre.

Hot water circuit

The hot water flow is induced by the engine water pump. Hot water is drawn from the water transfer housing at the rear of the left-hand bank and passes through the water flow valve to the hot matrix. From the hot matrix outlet the flow is forward between the two banks to enter the water pump housing. Thus entry is on the section side of the water pump.

Hot temperature sensing system

This system comprises three main components. A vacuum tank exhausted by engine suction; a manually set temperature-sensing air bleed valve; and a diaphragm-operated water flow valve.

The air bleed valve is located in the control box. The position of lever ‘B’ between ‘OFF’ and ‘HOT’ determines the initial setting of the valve. This is achieved by a large cam plate within the control box. The interior temperature of the car further affects the valve to govern the exact degree of air bleeding.

The degree of air bleeding directly affects the vacuum above the diaphragm which determines the water flow volume. The hot matrix temperature is therefore automatically adjusted to maintain an approximately constant temperature within the vehicle.
Air conditioner unit

Introduction

The air conditioner unit is positioned on the centre line of the vehicle between the bulkhead and the facia/console panels. The function of the unit is to receive air, process and deliver it to the outlets as directed by the control positions.

To comprehend the following system descriptions it should be appreciated that control lever ‘A’ positions flap ‘A’ in the air conditioner unit. Similarly lever ‘B’ positions the two flaps ‘B’—this time by vacuum actuator—and lever ‘C’ positions the two flaps ‘C’.

Intakes

The system draws fresh air at ambient temperature through the bulkhead aperture, or recirculated air from the vehicle interior, into the air conditioner unit plenum chamber. The choice is directed by the cable-controlled flap ‘A’.

Blowers

Two blower units transfer air from the plenum chamber to the distribution area,

Matrixes

Two separate matrixes are employed. A hot matrix which may be supplied with hot water from the engine cooling system and a cold matrix which may be cooled by the refrigeration circuit.

Hot air

When hot air is demanded the two flaps ‘B’ are positioned by an unenergized vacuum actuator to the closed/hot position. Air from the distribution area flows down across the hot matrix to the hot distribution area. The heated air then flows to the screen outlets and the footwell outlet in the proportions directed by the two interconnected cable-controlled flaps ‘C’.

Cold air

When cold air is selected the two flaps ‘B’ are positioned by an energized vacuum actuator to the open/cold position. Air from the distribution area flows across the cold matrix and the total cold air volume is split into the vehicle interior from the central facia vent and the two facia louvres.

Cooled, dried, and cleaned air

The air conditioner unit is capable of supplying cooled, dried, and cleaned air when cold air is selected. Air of the above description is obtained by passing air across the cold matrix. Heat is extracted from the air and absorbed by the refrigerant. Moisture carried in the air condenses on the exterior surfaces of the cold matrix and is removed by draining off into a tray below the matrix. Dust suspended in the air tends to be retained by the moisture and also collects in the tray. Twin drain pipes lead down from the tray to beneath the vehicle.
Refrigeration circuit

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.

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
- Cold matrix.

Hoses are employed to transport the refrigerant between components.

Expansion valve and cold matrix

Liquid refrigerant at high pressure 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 \(-6^\circ C\), 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 heat is extracted from the air flowing across the matrix.

Compressor

The compressor draws the refrigerant from the cold matrix as a cold, low pressure gas. It is compressed, and therefore heated, and passed on to the condenser as a hot, high pressure gas.

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 gas at a temperature of approximately \(55^\circ C\). Air flow across the tubes, induced by vehicle movement and assisted by two electric fans, cools the gas 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

The refrigerant, in the form of a high pressure liquid, is then passed through the receiver drier. This unit filters, removes all moisture, and acts as a reservoir for the liquid. To prevent icing inside the system, extreme precautions are taken during changing to exclude moisture. The receiver drier should be considered as a second stage insurance to prevent the serious consequences of ice obstructing the flow.

Second cycle

The refrigerant, in the form of a high pressure liquid, is then delivered to the expansion valve and a second cycle commences.
Cold temperature sensing system

This system is electro-mechanical. It consists of a manually set cold matrix thermostat operating a relay to control the refrigeration circuit.

The cold matrix thermostat is located in the control box. The position of lever 'B' between 'OFF' and 'COLD' determines the initial setting of the thermostat. This is achieved by a large cam plate within the control box. The temperature of the cold matrix is recognized by a vapour charged capillary and this signal further affects the thermostat to govern the exact cut in—cut out of the relay.

The relay switches an electrical supply to either the heated back-light circuit or the refrigeration circuit. Energizing the refrigeration circuit engages the electro-magnetic clutch of the compressor and brings into operation the two electric condenser fans.

The electro-magnetic clutch is the means of cutting the compressor in and out to achieve on—off control of the refrigeration circuit. The cold matrix temperature is therefore automatically adjusted to maintain an approximately constant temperature within the vehicle.

High pressure cut-out

WARNING: ADJUSTMENT OF THE HIGH PRESSURE CUT-OUT SWITCH MUST ONLY BE UNDERTAKEN BY A QUALIFIED REFRIGERATION ENGINEER POSSESSING THE REQUIRED SPECIAL SERVICING EQUIPMENT.

This system consists of a permanently set refrigerant pressure switch controlling the refrigeration circuit.

A Ranco high pressure cut-out switch is located at the left-hand engine valance. Refrigerant pressure is sensed at the receiver drier and governs the cut in—cut out of the electric switch. The switch directly controls the electrical supply to the electro-magnetic clutch of the compressor.

The electro-magnetic clutch is the means of cutting the compressor in and out to achieve on-off control of the refrigeration circuit. The refrigerant pressure is therefore automatically adjusted to maintain the correct pressure limits.

Vacuum actuator

The two flaps ‘B’ are positioned by vacuum actuator to closed/hot or open/cold. No intermediate positions are used.

This system comprises three main components. A vacuum tank exhausted by engine suction; a manually controlled air bleed valve; and a diaphragm—operated actuator.

The air bleed valve is located in the control box. Moving lever 'B' to the left of its central 'OFF' position will cause the valve to close. This is achieved by a large cam plate within the control box.

The air bleeding directly affects the vacuum above the diaphragm which determines the position of the actuator. The actuator drives a simple rod and lever system to position the two flaps 'B'.

Facia louvres

Air flow to the facia louvres may be considered as a variation on the two main airflow patterns of the air conditioner unit. These are downward through the hot matrix for hot air and horizontal through the cold matrix for cold air.

When lever 'B' is selected to 'OFF' or 'HOT' a flow at ambient temperature is available as follows. The two flaps 'B' are positioned by an unenergized vacuum actuator to the closed/hot position and the cold matrix is blanked off. However, a limited flow is permitted from the distribution area over the upper edge of the flap and across the cold matrix to the facia louvres. It may be noted that in this selection the air is not cooled below ambient. The flow direction and volume is adjustable at each facia louvre.

When lever ‘B’ is selected to 'COLD' a flow of refrigerated air is available as detailed under 'Air conditioner unit—cold air'.
A FRESH RECIRC. flap controlled by lever 'A'

B COLD/OFF/HOT flaps controlled by lever 'B'. The two flaps are positioned by vacuum servo to closed/hot or open/cold. No intermediate positions are used.

C SCREEN/CAR flaps controlled by lever 'C'

1 Recirculated air inlet
2 Fresh air inlet
3 Air transfer at each side via two blower units from plenum chamber to distribution area
4 Hot matrix
5 Plenum chamber water drain
6 Footwell outlet
7 Screen outlets
8 Water and dust drain
9 Cold matrix
10 Facia louvre outlets
11 Central facia vent outlet

Fig. 82.02. Air conditioner unit section
A  Fresh hot air to footwells
B  Recirc. hot air to screen
C  Fresh cold air to facia
D  Recirc. cold air to facia

Fig. 82.03. Typical air flows
Fig. 82.04. Refrigeration circuit

1  Compressor
2  Condenser
3  Receiver drier
4  Expansion valve
5  Cold matrix
6  High pressure cut out
STAG ELECTRICAL
SECTION 86

WIRING DIAGRAM—STAG
RIGHT HAND STEER—HEATER
KEY TO WIRING DIAGRAM — STAG

RIGHT HAND STEER — HEATER

1. Alternator
2. Charging system relay
3. Alternator control unit
4. Ignition warning light
5. Battery
6. Battery condition indicator
7. Ignition/starter switch
8. Radio supply
9. Herring cut out
10. Petrol pump
11. Inhibitor switch—Borg Warner automatic only
12. Starter motor
13. Ballast resistor
14. Ignition coil—6 volt
15. Ignition distributor
16. Master light switch
17. Fog lamp supply
18. R.H. tail lamp
19. R.H. front parking lamp
20. L.H. tail lamp
21. L.H. front parking lamp
22. Night dimming relay
23. Plate illumination lamp
24. Panel rheostat
25. Cigarette lighter illumination
26. Selector panel illumination—Borg Warner automatic only
27. Instrument illumination
28. Dip and main beam
29. Main/dip/flash switch
30. Main beam
31. Main beam warning light
32. Horn relay
33. Horn push
34. Horn
35. Cigarette lighter
36. Luggage boot lamp
37. Luggage boot lamp switch
38. R.H. door switch
39. R.H. puddle lamp
40. Interior lamp switch
41. R.H. ‘B’ post lamp
42. R.H. console lamp
43. L.H. door switch
44. L.H. puddle lamp
45. L.H. ‘B’ post lamp
46. L.H. console lamp
47. Glove box/map lamp
48. Glove box/map lamp switch
49. Clock
50. Windscreen wiper switch
51. Windscreen wiper motor
52. Tachometer
53. Voltage stabilizer
54. Fuel indicator
55. Fuel tank unit
56. Fuel warning light
57. Temperature indicator
58. Temperature transmitter
59. Windscreen washer pump
60. Windscreen washer switch
61. Reverse lamp switch
62. Reverse lamp
63. Stop lamp switch
64. Stop lamp
65. Turn signal flasher unit
66. Turn signal switch
67. L.H. front flasher lamp
68. L.H. flasher repeater lamp
69. L.H. rear flasher lamp
70. R.H. front flasher lamp
71. R.H. flasher repeater lamp
72. R.H. rear flasher lamp
73. Turn signal warning light
74. Hand brake warning light
75. Hand brake switch
76. Temperature warning light
77. Temperature switch
78. Choke warming light
79. Choke switch
80. Brake line failure warning light
81. Brake line failure switch
82. Oil pressure warning light
83. Oil pressure switch
84. Ignition controlled relay
85. Overdrive gear lever switch—optional extra
86. Overdrive gearbox switch—optional extra
87. Overdrive solenoid—optional extra
88. Window lift circuit breaker
89. L.H. window lift switch
90. L.H. window lift motor
91. R.H. window lift switch
92. R.H. window lift motor
93. Ignition controlled relay
94. Heated backlight switch
95. Heated backlight
96. Heated backlight warning light
97. Heater switch
98. Heater rheostat
99. Heater motor

WIRING DIAGRAM—STAG

LEFT HAND STEER — HEATER
KEY TO WIRING DIAGRAM — STAG

LEFT HAND STEER — HEATER

1 Alternator
2 Charging system relay
3 Alternator control unit
4 Ignition warning light
5 Battery
6 Battery condition indicator
7 Ignition/starter switch
8 Radio supply
9 Inertia cut out
10 Petrol pump
11 Inhibitor switch—Borg Warner automatic only
12 Starter motor
13 Ballast resistor
14 Ignition coil—6 volt
15 Ignition distributor
16 Master light switch
17 Fog lamp supply
18 L.H. tail lamp
19 L.H. front parking lamp
20 R.H. tail lamp
21 R.H. front parking lamp
22 Night dimming relay
23 Plate illumination lamp
24 Panel rheostat
25 Cigarette lighter illumination
26 Selector panel illumination—Borg Warner automatic only
27 Instrument illumination
28 Main/dip switch
29 Dip beam
30 Main beam
31 Main beam warning light
32 Horn relay
33 Horn push
34 Horn
35 Hazard flasher unit
36 Hazard switch
37 Hazard warning light
38 Cigarette lighter
39 Luggage boot lamp
40 Luggage boot lamp switch
41 R.H. door switch
42 R.H. paddle lamp
43 Interior lamp switch
44 L.H. 'B' post lamp
45 L.H. console lamp
46 R.H. door switch
47 L.H. paddle lamp
48 L.H. 'B' post lamp
49 L.H. console lamp
50 Glove box/lamp switch
51 Glove box/lamp switch
52 Clock
53 Windscreen wiper switch
54 Windscreen wiper motor
55 Tachometer
56 Voltage stabilizer
57 Fuel indicator
58 Fuel tank unit
59 Fuel warning light
60 Temperature indicator
61 Temperature transmitter
62 Windscreen washer pump
63 Windscreen washer switch
64 Reverse lamp switch
65 Reverse lamp
66 Stop lamp switch
67 Stop lamp
68 Turn signal flasher unit
69 Turn signal switch
70 L.H. front flasher lamp
71 L.H. flasher repeater lamp
72 L.H. rear flasher lamp
73 R.H. front flasher lamp
74 R.H. flasher repeater lamp
75 R.H. rear flasher lamp
76 Turn signal warning light
77 Hand brake warning light
78 Hand brake switch
79 Temperature warning light
80 Temperature switch
81 Choke warning light
82 Choke switch
83 Brake line failure warning light
84 Brake line failure switch
85 Oil pressure warning light
86 Oil pressure switch
87 Ignition controlled relay
88 Overdrive gear lever switch—optional extra
89 Overdrive gear selector switch—optional extra
90 Overdrive selector—optional extra
91 Window lift circuit breaker
92 L.H. window lift switch
93 L.H. window lift motor
94 R.H. window lift switch
95 R.H. window lift motor
96 Ignition controlled relay
97 Heated back light switch
98 Heated back light
99 Heated back light warning light
100 Heater switch
101 Heater rheostat
102 Heater motor

WIRING DIAGRAM—STAG

U.S.A. MARKET—HEATER
KEY TO WIRING DIAGRAM — STAG
U.S.A. MARKET — HEATER

1 Alternator
2 Charging system relay
3 Alternator control unit
4 Ignition warning light
5 Battery
6 Battery condition indicator
7 Ignition/starter switch
8 Radio supply
9 Inertia cut out
10 Petrol pump
11 Inhibitor switch — Borg Warner automatic only
12 Starter motor
13 Ballast resistor
14 Ignition cut-off—6 volt
15 Ignition distributor
16 Master light switch
17 Fog lamp supply
18 L.H. tail lamp
19 L.H. front parking lamp
20 R.H. tail lamp
21 L.H. front marker lamp
22 R.H. front parking lamp
23 R.H. front marker lamp
24 R.H. rear marker lamp
25 Plate illumination lamp
26 L.H. rear marker lamp
27 Panel rheostat
28 Cigarette lighter illumination
29 Selector panel illumination — Borg Warner automatic only
30 Instrument illumination
31 Main dip/far switch
32 Dip beam
33 Main beam
34 Main beam warning light
35 Horn relay
36 Horn push
37 Horn
38 Hazard flasher unit
39 Hazard switch
40 Hazard warning light
41 Cigarette lighter
42 Luggage boot lamp
43 Luggage boot lamp switch
44 R.H. door switch
45 R.H. paddle lamp
46 Interior lamp switch
47 R.H. 'B post' lamp
48 R.H. console lamp
49 L.H. door switch
50 L.H. paddle lamp
51 L.H. 'B post' lamp
52 L.H. console lamp
53 Key warning buzzer
54 Key switch
55 Glove box/map lamp
56 Glove box/map lamp switch
57 Check
58 Windsreen wiper switch
59 Windsreen wiper motor
60 Tachometer
61 Voltage stabilizer
62 Fuel indicator
63 Fuel tank unit
64 Fuel warning light
65 Temperature indicator
66 Temperature transmitter
67 Windsreen washer pump
68 Windsreen washer switch
69 Reverse lamp switch
70 Reverse lamp
71 Stop lamp switch
72 Stop lamp
73 Turn signal flasher unit
74 Turn signal switch
75 L.H. flasher lamp
76 R.H. flasher lamp
77 Turn signal warning light
78 Hand brake warning light
79 Hand brake switch
80 Temperature warning light
81 Temperature switch
82 Choke warning light
83 Choke switch
84 Brake line failure warning light
85 Brake line failure switch
86 Oil pressure warning light
87 Oil pressure switch
88 Ignition controlled relay
89 Overdrive gear lever switch — optional extra
90 Overdrive gearbox switch — optional extra
91 Overdrive selector — optional extra
92 Window lift circuit breaker
93 L.H. window lift switch
94 L.H. window lift motor
95 R.H. Window lift switch
96 R.H. window lift motor
97 Ignition controlled relay
98 Heated backlight switch
99 Heated backlight
100 Heated backlight warning light
101 Heater switch
102 Heater rheostat
103 Heater motor
KEY TO WIRING DIAGRAM — STAG

RIGHT HAND STEER — AIR CONDITIONING

1 Alternator
2 Charging system relay
3 Alternator control unit
4 Ignition warning light
5 Battery
6 Battery condition indicator
7 Ignition/starter switch
8 Radio supply
9 Inertia cut out
10 Petrol pump
11 Inhibitor switch—Borg Warner automatic only
12 Starter motor
13 Ballast resistor
14 Ignition coil—6 volt
15 Ignition distributor
16 Master light switch
17 Fog lamp supply
18 R.H. tail lamp
19 R.H. front parking lamp
20 L.H. tail lamp
21 L.H. front parking lamp
22 Night dimming relay
23 Plate illumination lamp
24 Panel thermostat
25 Cigarette lighter illumination
26 Selector panel illumination—Borg Warner automatic only
27 Instrument illumination
28 Dip and main beam
29 Main/dip/flash switch
30 Main beam
31 Main beam warning light
32 Horn relay
33 Horn push
34 Horn
35 Cigarette lighter
36 Luggage boot lamp
37 Luggage boot lamp switch
38 R.H. door switch
39 R.H. puddle lamp
40 Interior lamp switch
41 R.H. 'B post' lamp
42 R.H. console lamp
43 L.H. door switch
44 L.H. puddle lamp
45 L.H. 'B post' lamp
46 L.H. console lamp
47 Glove boxlamp
48 Glove boxlamp switch
49 Clock
50 Windscreen wiper switch
51 Windscreen wiper motor
52 Tachometer
53 Voltage stabilizer
54 Fuel indicator
55 Fuel tank unit
56 Fuel warning light
57 Temperature indicator
58 Temperature transmitter
59 Windscreen washer pump
60 Windscreen washer switch
61 Reverse lamp switch
62 Reverse lamp
63 Stop lamp switch
64 Stop lamp
65 Turn signal flasher unit
66 Turn signal switch
67 L.H. front flasher lamp
68 L.H. flasher repeater lamp
69 L.H. rear flasher lamp
70 R.H. front flasher lamp
71 R.H. flasher repeater lamp
72 R.H. rear flasher lamp
73 Turn signal warning light
74 Hand brake warning light
75 Hand brake switch
76 Temperature warning light
77 Temperature switch
78 Choke warning light
79 Choke switch
80 Brake line failure warning light
81 Brake line failure switch
82 Oil pressure warning light
83 Oil pressure switch
84 Ignition controlled relay
85 Overdrive gear lever switch—optional extra
86 Overdrive gearbox switch—optional extra
87 Overdrive solenoid—optional extra
88 Window lift circuit breaker
89 L.H. window lift switch
90 L.H. window lift motor
91 R.H. window lift switch
92 R.H. window lift motor
93 Ignition and starter controlled relay
94 Heated back light switch
95 Heated back light
96 Heated back light warning light
97 Air conditioning master switch
98 Master switch controlled relay
99 Cold matrix thermostat
100 Condenser fan motor
101 Refrigeration circuit high pressure cut out
102 Compressor clutch
103 Blower switch
104 Blower switch controlled relay
105 L.H. blower motor
106 R.H. blower motor

WIRING DIAGRAM — STAG

LEFT HAND STEER — AIR CONDITIONING
KEY TO WIRING DIAGRAM — STAG

LEFT HAND STEER — AIR CONDITIONING

1. Alternator
2. Charging system relay
3. Alternator control unit
4. Ignition warning light
5. Battery
6. Battery condition indicator
7. Ignition/starter switch
8. Radio supply
9. Inertia cut out
10. Petrol pump
11. Inhibitor switch—Borg Warner automatic only
12. Starter
13. Ballast resistor
14. Ignition coil—6 volt
15. Ignition distributor
16. Master light switch
17. Fog lamp supply
18. L.H. tail lamp
19. L.H. front parking lamp
20. R.H. tail lamp
21. R.H. front parking lamp
22. Night dimming relay
23. Plate illumination lamp
24. Panel rheostat
25. Cigarette lighter illumination
26. Selector panel illumination—Borg Warner automatic only
27. Instrument illumination
28. Main/High beam switch
29. Dip beam
30. Main beam
31. Main beam warning light
32. Horn relay
33. Horn
34. Hazard switch
35. Hazard warning light
36. Cigarette lighter
37. Hazard flasher unit
38. Hazard warning light
39. Luggage boot lamp
40. Luggage boot lamp switch
41. R.H. door switch
42. R.H. puddle lamp
43. Interior lamp switch
44. R.H. ‘B’ post lamp
45. R.H. console lamp
46. L.H. door switch
47. L.H. puddle lamp
48. L.H. ‘B’ post lamp
49. L.H. console lamp
50. Glove box lamp switch
51. Glove box lamp switch
52. Clock
53. Windscreen wiper switch
54. Windscreen wiper motor
55. Tachometer
56. Voltage stabilizer
57. Fuel indicator
58. Fuel tank unit
59. Fuel warning light
60. Temperature indicator
61. Temperature transmitter
62. Windscreen washer pump
63. Windscreen washer switch
64. Reverse lamp switch
65. Reverse lamp
66. Stop lamp switch
67. Stop lamp
68. Turn signal flasher unit
69. Turn signal switch
70. L.H. front flasher lamp
71. L.H.闪光 relay, starter
72. L.H. rear flasher lamp
73. R.H. front flasher lamp
74. R.H. flasher repeater lamp
75. R.H. rear flasher lamp
76. Turn signal warning light
77. Hand brake warning light
78. Hand brake switch
79. Temperature warning light
80. Temperature switch
81. Choke warning light
82. Choke switch
83. Brake line failure warning light
84. Brake line failure switch
85. Oil pressure warning light
86. Oil pressure switch
87. Ignition controlled relay
88. Overdrive gear lever switch—optional extra
89. Overdrive gearbox switch—optional extra
90. Overdrive solenoid—optional extra
91. Window lift circuit breaker
92. L.H. window lift switch
93. L.H. window lift motor
94. R.H. window lift switch
95. R.H. window lift motor
96. Ignition and starter controlled relay
97. Heated back light switch
98. Heated back light
99. Heated back light warning light
100. Air conditioning master switch
101. Master switch controlled relay
102. Cold matrix thermostat
103. Condenser fan motor
104. Refrigeration circuit high pressure cut out
105. Compressor clutch
106. Blower switch
107. Blower switch controlled relay
108. L.H. blower motor
109. R.H. blower motor
KEY TO WIRING DIAGRAM — STAG
U.S.A. MARKET — AIR CONDITIONING

1 Alternator
2 Charging system relay
3 Alternator control unit
4 Ignition warning light
5 Battery
6 Battery condition indicator
7 Ignition/starter switch
8 Radio supply
9 Inertia cut out
10 Petrol pump
11 Inhibitor switch—Borg Warner automatic only
12 Starter motor
13 Ballast resistor
14 Ignition coil—6 volt
15 Ignition distributor
16 Master light switch
17 Fog lamp supply
18 L.H. tail lamp
19 L.H. front parking lamp
20 R.H. tail lamp
21 L.H. front marker lamp
22 R.H. front parking lamp
23 R.H. front marker lamp
24 R.H. rear marker lamp
25 Plate illumination lamp
26 L.H. rear marker lamp
27 Pattern rheostat
28 Cigarette lighter illumination
29 Selector panel illumination—Borg Warner automatic only
30 Instrument illumination
31 Main/dip/flash switch
32 Dip beam
33 Main beam
34 Main beam warning light
35 Horn relay
36 Horn push
37 Horn
38 Hazard flasher unit
39 Hazard switch
40 Hazard warning light
41 Cigarette lighter
42 Luggage boot lamp
43 Luggage boot lamp switch
44 R.H. door switch
45 R.H. puddle lamp
46 Interior lamp switch
47 R.H. 'B post' lamp
48 R.H. console lamp
49 L.H. door switch
50 L.H. puddle lamp
51 L.H. 'B post' lamp
52 L.H. console lamp
53 Key warning buzzer
54 Key switch
55 Glove box/map lamp
56 Glove box/map lamp switch
57 Clock
58 Windscreen wiper switch
59 Windscreen wiper motor
60 Tachometer
61 Voltage stabilizer
62 Fuel indicator
63 Fuel tank unit
64 Fuel warning light
65 Temperature indicator
66 Temperature transmitter
67 Windscreen washer pump
68 Windscreen washer switch
69 Reverse lamp switch
70 Reverse lamp
71 Stop lamp switch
72 Stop lamp
73 Turn signal flasher unit
74 Turn signal switch
75 L.H. flasher lamp
76 R.H. flasher lamp
77 Turn signal warning light
78 Hand brake warning light
79 Hand brake switch
80 Temperature warning light
81 Temperature switch
82 Choke warning light
83 Choke switch
84 Brake line failure warning light
85 Brake line failure switch
86 Oil pressure warning light
87 Oil pressure switch
88 Ignition controlled relay
89 Overdrive gear lever switch—optional extra
90 Overdrive gearbox switch—optional extra
91 Overdrive solenoid—optional extra
92 Window lift circuit breaker
93 L.H. window lift switch
94 L.H. window lift motor
95 R.H. window lift switch
96 R.H. window lift motor
97 Ignition and starter controlled relay
98 Heated back light switch
99 Heated back light
100 Heated back light warning light
101 Air conditioning master switch
102 Master switch controlled relay
103 Cold matrix thermostat
104 Condenser fan motor
105 Refrigeration circuit high pressure cut out
106 Compressor clutch
107 Blower switch
108 Blower switch controlled relay
109 L.H. blower motor
110 R.H. blower motor
The Stag employs a conventional 12-volt negative earth electrical system.

**Charging system**

The system employs a Lucas 11AC alternator, a Lucas 16RA relay, and a Lucas 4TR alternator control unit.

The alternator has a nominal output of 43 amps. The rotor runs on a ball bearing and a needle-roller bearing which do not require periodic lubrication.

The dual-purpose relay contains a resistor which provides a low current path for battery excitation of the alternator field winding preparatory to starting the engine. With rising alternator output the contacts close to connect the field winding direct to the battery. This second action also extinguishes the ignition warning light. If the warning light remains illuminated during normal running, a fault is indicated.

The alternator control unit adjusts the current flow through the field winding to control the alternator output to suit the electrical requirements of the vehicle and the state of charge of the battery. Control is achieved by a voltage-sensitive electronic circuit.

**Battery**

A conventional battery is located in the engine bay. Battery removal is complicated by the power steering pump. Instructions to renew the battery are therefore included in this Provisional Service Information.

**Renew battery**

NOTE: To achieve this operation, it is not necessary to disturb the power steering hydraulic circuit.

1. Lift windscreen washer bottle from bracket and position as shown on Fig. 86.07. Take care to avoid water spillage from vent hole.

2. *U.S.A. market vehicles only:* Lift absorption canister from bracket and position as shown on Fig. 86.07.

3. Slacken pivot bolt (1) and adjustment bolts (2) and (3). Swing pump down and remove belt from pulley. Supporting weight of pump, remove three bolts. Lift to position shown on Fig. 86.07.

4. Remove battery leads.

5. Slacken wing-nuts and swing down battery retaining assembly. Using carrier, lift battery from vehicle.

6. Fit carrier to new battery.

7. Lift battery into tray. Swing up battery retaining assembly. Pull looseness of carrier to lay on top of battery clear of pulley and belt and tighten wing-nuts. See Fig. 86.09.

8. Fit battery leads. Do not hammer terminals to terminal posts; such action may damage battery. Coat terminals with petroleum jelly (Vaseline) to prevent corrosion.

9. Position pump and insert three bolts. Fit belt to pulley.

10. Adjust belt tension as detailed in Section 10—Maintenance.

11. *U.S.A. market vehicles only:* Fit absorption canister to bracket.

12. Fit windscreen washer bottle to bracket.
Battery condition indicator

The battery condition indicator is fitted in place of an ammeter. The unit measures the voltage existing across the battery terminals. Operation of both the charging system and the battery may be assessed.

With the engine running, the indicator should register approximately 14 volts. A reading above 15 volts maintained after 10 minutes’ running is too high and necessitates investigation of the charging system. A reading of 13 volts is too low unless the headlamps and other electrical equipment are in use.

With the engine not running but with ignition, headlamps and other electrical equipment switched on, the indicator should register approximately 12 volts. If the reading is below 11 volts, the battery or charging system requires attention.

This is a Smiths bi-metal strip type instrument which has an intentional slow reaction. When taking any readings allow ample time (approximately one minute) for the unit to react. The indicator should be ignored when the engine is idling as readings may vary at low engine speeds.

Fuse system

The fusebox is located on the bulkhead. The unit contains 12 fuse positions and has provision to house three spares.

To obtain access to the fuses, lift the bonnet and pull off the fusebox cover. Note that the cover is keyed and may only be replaced the correct way round. Each fuse position relates to circuits that should be protected by a fuse of specific value. It is therefore important to ensure that a replacement fuse is of the correct amperage as detailed in the ‘Fuse Chart’.

Two line fuses are also employed. They are components of the main harness and are positioned adjacent to the component mounting plate which is located on the rear side of the bulkhead on the passenger’s side of the vehicle. Each unit contains one operational fuse.

To obtain access to the line fuses, remove four screws and withdraw the passenger side parcel tray. The two parts of each fuse holder are retained together by a bayonet fitting.

Failure of a particular fuse is indicated when all the circuits protected by it become inoperative. If a new fuse fails, establish the cause and rectify the fault before fitting a second replacement.

Ignition/starter switch

This unit is a component of the steering-column lock assembly but may be renewed independently.

Radio facility

The wiring harnesses include a facility for this optional extra item. A white/pink wire located in the radio aperture provides a positive radio supply. The radio circuit is controlled by the ignition/starter switch.

Inertia cut-out

Designed to cut out electrical supply to S.U. petrol pump after crash or severe stop. Has to be manually reset after actuation by pressing button on top face of unit. Located on bulkhead adjacent to fusebox.
## Fuse Chart

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BATTERY CONTROL 2&lt;br&gt; Horn&lt;br&gt; Cigarette lighter&lt;br&gt; Puddle lamps&lt;br&gt; &quot;B&quot; post lamps&lt;br&gt; Console lamps&lt;br&gt; Glove box/map lamp&lt;br&gt; Clock&lt;br&gt; Headlamp flash</td>
<td>35</td>
<td>White</td>
<td>188218</td>
<td>58465</td>
</tr>
<tr>
<td>3</td>
<td>IGNITION CONTROL 4&lt;br&gt; Fuel indication&lt;br&gt; Temperature indication&lt;br&gt; Tachometer&lt;br&gt; Windscreen washer pump&lt;br&gt; Stop lamps&lt;br&gt; Reverse lamps&lt;br&gt; Turn signal</td>
<td>35</td>
<td>White</td>
<td>188218</td>
<td>58465</td>
</tr>
<tr>
<td>5</td>
<td>PARKING LIGHTS 6&lt;br&gt; Tail lamp&lt;br&gt; Front side lamp</td>
<td>5</td>
<td>Yellow</td>
<td>188206</td>
<td>518442</td>
</tr>
<tr>
<td>7</td>
<td>SIDE AND TAIL LIGHTS 8&lt;br&gt; Tail lamp&lt;br&gt; Front side lamp&lt;br&gt; Night dimming relay winding&lt;br&gt; Plate illumination lamps&lt;br&gt; Cigarette lighter illumination&lt;br&gt; Selector panel illumination — Borg&lt;br&gt; Warner automatic only&lt;br&gt; Instrument illumination</td>
<td>10</td>
<td>Black</td>
<td>188211</td>
<td>518443</td>
</tr>
<tr>
<td>11</td>
<td>HEADLIGHTS MAIN BEAM '1'</td>
<td>25</td>
<td>Pink</td>
<td>188216</td>
<td>503488</td>
</tr>
<tr>
<td>13</td>
<td>HEADLIGHTS MAIN BEAM '2'</td>
<td>25</td>
<td>Pink</td>
<td>188216</td>
<td>503488</td>
</tr>
<tr>
<td>15</td>
<td>HEADLIGHT DIP BEAM R.H.</td>
<td>10</td>
<td>Black</td>
<td>188211</td>
<td>518443</td>
</tr>
<tr>
<td>17</td>
<td>HEADLIGHT DIP BEAM L.H.</td>
<td>10</td>
<td>Black</td>
<td>188211</td>
<td>518443</td>
</tr>
<tr>
<td>19</td>
<td>SCREEN WIPER MOTOR 20&lt;br&gt; Light brown</td>
<td>15</td>
<td>Light brown</td>
<td>188220</td>
<td>518444</td>
</tr>
<tr>
<td>21</td>
<td>HEATER MOTOR 22&lt;br&gt; Radio (optional extra)</td>
<td>25</td>
<td>Pink</td>
<td>188216</td>
<td>503488</td>
</tr>
<tr>
<td>23</td>
<td>OVERDRIVE 24&lt;br&gt; Fog lamp (optional extra)</td>
<td>10</td>
<td>Black</td>
<td>188211</td>
<td>518443</td>
</tr>
<tr>
<td></td>
<td>LINE FUSE&lt;br&gt; Radio (optional extra)</td>
<td>5</td>
<td>Yellow</td>
<td>188206</td>
<td>518442</td>
</tr>
<tr>
<td></td>
<td>LINE FUSE&lt;br&gt; Fog lamp (optional extra)</td>
<td>10</td>
<td>Black</td>
<td>188211</td>
<td>518443</td>
</tr>
</tbody>
</table>
Petrol pump

The following high pressure type unit is fitted.

Manufacturer . . . . . . . . . . . . S.U.
Type . . . . . . . . . . . . . . . . . . AUF 306
Stanpart No. . . . . . . . . . . . . 150916
Maximum delivery . . . . . 140 pints per hour at a point three feet above tank level with \( \frac{3}{4} \) in. fuel lines
Cut-off pressure . . . . . . . . . 2.7 p.s.i.

The petrol pump is located in the luggage boot behind the right-hand-side trim panel. The outlet connection is positioned uppermost.

The pump is attached to a flexible mounting unit. It is essential that the harness earth connector is fitted to maintain a good electrical earth between the pump and the vehicle body.

Starter motor

The following pre-engaged type unit is fitted.

Manufacturer . . . . . . . . . . . . Lucas
Type . . . . . . . . . . . . . . . . . . M418G pre-engaged
Lucas Part No. . . . . . . . . . . . . 25627
Stanpart No. . . . . . . . . . . . . 215111

This starter motor is similar to the unit fitted to the Triumph 2000 Mark 2. The electrical circuit is identical but the mounting lugs on the fixing bracket and the pinion details are changed to suit the Stag engine.

Ballast resistor and ignition coil

To assist engine starting under adverse starting conditions the following system is fitted. A Lucas 3BR ballast resistor is positioned in series in the normal supply to the Lucas 16C6 six-volt ignition coil. During engine start the resistor is by-passed and a full 12-volts are applied to the coil direct from the starter solenoid.

Ignition distributor

A Lucas 35D8 eight-cylinder ignition distributor is fitted. Distributor lubrication, contact gap adjustment, and engine timing are detailed in Section 12—Engine.

Master light switch

A rotary switch located on the right-hand side of the steering-column similar to Triumph 2000 Mark 2.

Steering-column combination switches

A multi-selector switch is mounted on the steering-column. Headlamp MAIN/DIP/FLASH are provided for in one plane. A selection up or down operates the turn signal flasher lamps. Press the end of the control inwards to sound the horns.

The second switch mounted on the steering-column operates the two-speed wipers in the up/down plane. A 'sweep wipe' facility is also provided. Pulling the lever rearwards against spring pressure energizes the motor to perform a single wipe or to operate for the held period. Press the end of the control inwards to operate the windscreen washers.
Fog lamp facility

The wiring harnesses include a facility for these optional extra items. A red/yellow wire located at the left-hand engine valance provides the fog lamp connection. To energize the fog lamp circuit, depress the knob of the master light switch and turn to position ‘F’. In this position the headlights are extinguished.

Night dimming system (Not U.S.A.)

The system used on the Triumph 1300 is retained on the Stag. The relay is mounted on the left-hand side of the luggage boot. Dims stop lamps and flasher lamps when sidelamps are illuminated.

It should be noted that the night dimming relay fitted to the Triumph 1300 and the Stag should not be interchanged. For reference the following information is given.

Night dimming relay data:

<table>
<thead>
<tr>
<th></th>
<th>Triumph 1300</th>
<th>Stag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
<td>Lucas</td>
<td>Lucas</td>
</tr>
<tr>
<td>Type</td>
<td>11RA</td>
<td>11RA</td>
</tr>
<tr>
<td>Lucas Part No.</td>
<td>33248</td>
<td>33245</td>
</tr>
<tr>
<td>Stanpart No.</td>
<td>212878</td>
<td>216112</td>
</tr>
<tr>
<td>Lucas colour code</td>
<td>Blue</td>
<td>Yellow</td>
</tr>
</tbody>
</table>

Headlamps

Stag is to be fitted with four 52-inch diameter headlamp units. In the case of home market vehicles these are to be light units fitted with 55-watt halogen bulbs. The beams may be adjusted without removing the grilles.

Windscreen wiper motor

A two-speed Lucas 16W permanent magnet motor is fitted. This is essentially the same as the Lucas 14W motor fitted to the Triumph 2000 Mark 2, but the design of the limit switch is amended.

The 14W limit switch plunger is actuated by a cam on the final gear. On the 16W the plunger is actuated by a cam on a moulded slider block moved parallel to the cross-head guide channel by a side extension of the cable rack cross-head.

If the motor is disassembled it is essential on assembly to maintain the correct relationship between the cam of the moulded slider block and the limit switch plunger. The block must be positioned with the deeper of its two end slots facing the plunger. If this instruction is not observed, damage will occur when the motor is started. It may also be noted that the limit switch screw holes are elongated to allow adjustment of the ‘park’ position.

The circuit is conventional permanent-magnet wiper motor design. When manually switched to ‘off’ the motor continues to operate by a supply from the limit switch back to the manual switch and thus to the positive brush. When the parked position is reached the first stage contacts open and the supply is terminated. 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.
Tachometer

A Smiths negative-earth eight-cylinder impulse tachometer is fitted.

The tachometer contains polarity-sensitive components that may be irreparably damaged if subjected to incorrect polarity. For reference the following information is given.

**TACHOMETER CONNECTIONS**

<table>
<thead>
<tr>
<th>Circuit</th>
<th>Wire Colour Code</th>
<th>Terminal on Tachometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrument power</td>
<td>Fused ignition-controlled positive supply</td>
<td>Green</td>
</tr>
<tr>
<td>Negative earth</td>
<td>Black</td>
<td>10-amp. Lucar blade on instrument body.</td>
</tr>
<tr>
<td>Pulse lead</td>
<td>From ignition-controlled positive supply</td>
<td>White</td>
</tr>
<tr>
<td></td>
<td>To ignition coil via ballast resistor</td>
<td>White/Slate</td>
</tr>
</tbody>
</table>

**Smiths bi-metal instruments**

The temperature indicator and fuel indicator are mounted in separate 50 mm. units. The voltage stabilizer is mounted on the rear of the speedometer.

**Windscreen washer pump**

A Trico windscreen washer pump is fitted as standard equipment. The pump motor is polarity-sensitive. The green wire should be connected to the terminal blade marked 12V DC+ and the green-black wire to the remaining blade.

**Turn signal flasher unit**

A Lucas 8FL 'snap action metal vane' type flasher unit is fitted. The unit is attached to a clip secured to the component mounting plate which is located on the rear side of the bulkhead on the passenger's side of the vehicle. To obtain access to the plate, remove four screws and withdraw the passenger side parcel tray.

**Temperature warning system**

In addition to the conventional temperature indicator, a temperature warning light is included in the warning light cluster.

A Delco Remy heat-sensitive switch is located on the water transfer housing at the rear of the right-hand bank. The alert is actuated at a water temperature of 230 to 240°F.
Window lift system

An A.C. Delco polarity-sensitive, reversible, permanent-magnet motor is located in each door to actuate the window regulator.

Two spring-loaded tilt switches located on the console control the motors on the appropriate sides of the vehicle.

The system electrical supply is via an ignition-controlled relay and an Otter current/heat-sensitive circuit-breaker. If the motion of the window is obstructed, the motor will draw an excess current and the circuit breaker will actuate. This unit is self-resetting and has a quick recovery time. Both the relay and the circuit-breaker are located on the component mounting plate.

To ensure the greatest possible personal safety, Triumph engineers have chosen to use a weak motor and a circuit-breaker that will operate on a small overload.

Heated backlight

A Triplex heated back-light is fitted to all hardtops. The unit is controlled by a console-mounted pull-push switch and a green warning light.