
Land-Rover Workshop Manual—PART TWO

Series II & IIA



Part No. 606408

Covering:

Propeller shafts
Rear axle and suspension
Front axle and suspension
Steering and linkage
Brake system
Chassis
Cooling system
Fuel system
Exhaust system
Electrical equipment
Instruments and controls
Body
Wheels and tyres
Lubricants and servicing materials
Tools

PDF by roby65to

Land-Rover Workshop Manual—PART TWO Series II and IIA Bonneted Control Models

1st Edition

March 1969

The Rover Company Limited
Solihull, Warwickshire, England

Part No. 606408



Service Department
Solihull, Warwickshire
Telephone: 021-743 4242
Telegrams: Rovrepair Solihull
Telex: 33-156

Parts Department
P.O. Box 79
Cardiff
Great Britain
Telephone: Cardiff 33681
Telegrams: Rovparts, Cardiff
Telex: 49-359

London Service Depot
Seagrave Road
Fulham, London SW6
Telephone:
Administration and Appointments: 01-385 1221
Reception: 01-385 7721
Parts Department: 01-385 6231
Telegrams: Rovrepair, Wesphone, London

Please note that all prices and specifications are
subject to alteration without notice

**Always quote type and number of vehicle in
any correspondence and when ordering parts**

By Appointment to
Her Majesty
Queen Elizabeth II



Manufacturers
of Motor Cars and
Land-Rovers

By Appointment to
Her Majesty
Queen Elizabeth
the Queen Mother



Suppliers
of
Motor Cars and
Land-Rovers

The Rover Company Limited



THE "LAND-ROVER 88"
(88 inch—2,23 m—wheel base)



THE "LAND-ROVER 109"
(109 inch—2,76 m—wheel base)

The two models shown are typical examples of their range, which are produced with a wide choice of body designs

INTRODUCTION

The Land-Rover Workshop Manual is produced in two parts for convenience in handling. Part one (Part No. 606407) covers engines, clutches and gearboxes. Part two (Part No. 606408) covers all remaining items. The complete Workshop Manual covers all overhaul and repair procedures for the 'basic' Land-Rover, briefly described below, but does not include the use and overhaul of 'Optional extra equipment', which is the subject of a separate publication.

The 'basic' Land-Rover is produced in two wheel base lengths, 88 inch and 109 inch (2,23 m and 2,76 m), with a choice of three engine types; $2\frac{1}{4}$ litre—four cylinder Petrol and Diesel and 2.6 litre—six cylinder Petrol. Other equipment, including fuel system, electrical equipment, drive units, brakes and body vary according to model and choice.

Identification of a particular model can be made by referring to the vehicle number and the chart on the following page. The vehicle number is stamped on a plate mounted inside the driving compartment.

Although this Manual applies specifically to Bonneted Control models, most of the overhaul procedures also apply to Forward Control models when the units are removed from the vehicle.

COMMENCING VEHICLE NUMBERS

PETROL MODELS, 4 CYLINDER—2¼ LITRE ENGINE

	1959	88	1960	88	1961	88	88	
Home, RHStg	Series II	141900001	Series II	141000001	Series II	141100001	Series IIA	
Export, RHStg		142900001		142000001		142100001	24100001A	
Export, RHStg, CKD		143900001		143000001		143100001	24200001A	
Export, LHStg		144900001		144000001		144100001	24300001A	
Export, LHStg, CKD		145900001		145000001		145100001	24400001A	
							24500001A	
	1958	109	1959	109	1960	109	1961	109
Home, RHStg	Series II	151800001	Series II	151900001	Series II	151000001	Series II	Series IIA
Export, RHStg		152800001		152900001		152000001		25100001A
Export, RHStg, CKD		153800001		153900001		153000001		25200001A
Export, LHStg		154800001		154900001		154000001		25300001A
Export, LHStg, CKD		155800001		155900001		155000001		25400001A
								25500001A
Home, RHStg, 88 Station Wagon								Series IIA
Export, RHStg, 88 Station Wagon								31500001B
Export, RHStg, CKD, 88 Station Wagon								31600001B
Export, LHStg, 88 Station Wagon								31700001B
Export, LHStg, CKD, 88 Station Wagon								31800001B
								31900001B
	1959	Series II	1960	Series II	1961	Series II	Series IIA	
Home, RHStg, 109 Station Wagon		161900001		161000001		161100001	26100001A	
Export, RHStg, 109 Station Wagon		162900001		162000001		162100001	26200001A	
Export, RHStg, CKD, 109 Station Wagon		163900001		163000001		163100001	26300001A	
Export, LHStg, 109 Station Wagon		164900001		164000001		164100001	26400001A	
Export, LHStg, CKD, 109 Station Wagon		165900001		165000001		165100001	26500001A	

From March 1965 onwards.
Vehicle numbers prior to this date are the same as for 88

PETROL MODELS, 6 CYLINDER—2.6 LITRE ENGINE

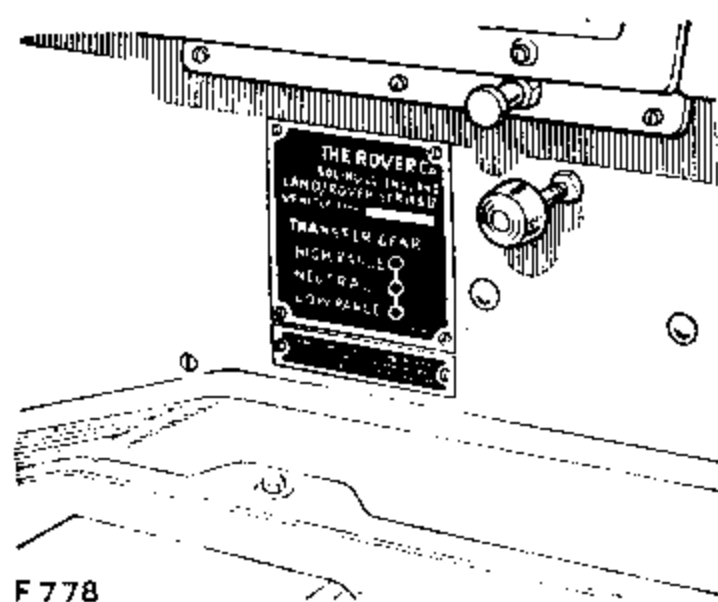
	1959	88	1960	88	1961	88	109
Home, RHStg							Series IIA
Export, RHStg							34500001D
Export, RHStg, CKD							34600001D
Export, LHStg							34700001D
Export, LHStg, CKD							34800001D
							34900001D
	1959	Series II	1960	Series II	1961	Series II	Series IIA
Home, RHStg, 109 Station Wagon		35000001D		35100001D		35200001D	35000001D
Export, RHStg, 109 Station Wagon		35100001D		35200001D		35300001D	35100001D
Export, RHStg, CKD, 109 Station Wagon		35200001D		35300001D		35400001D	35200001D
Export, LHStg, 109 Station Wagon		35300001D		35400001D			35300001D
Export, LHStg, CKD, 109 Station Wagon		35400001D					35400001D

DIESEL MODELS, 4 CYLINDER—2¼ LITRE ENGINE

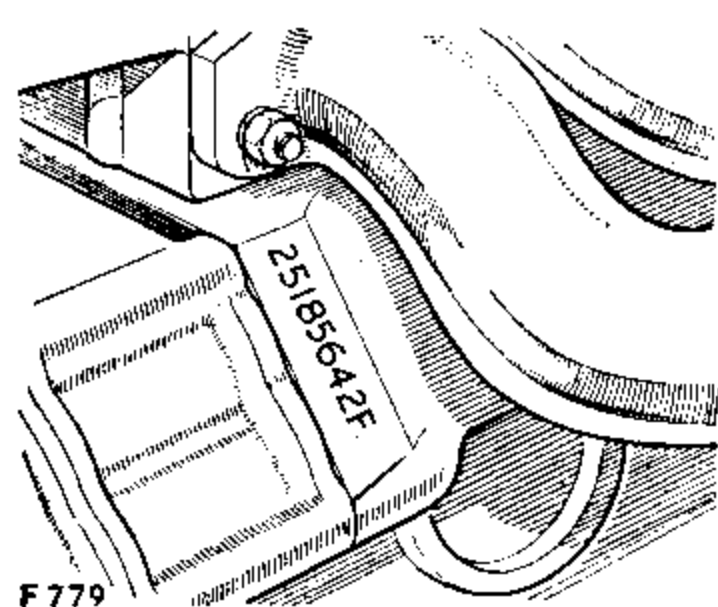
	1959	88	1960	88	1961	88	88
Home, RHStg							Series IIA
Export, RHStg							27100001A
Export, RHStg, CKD							27200001A
Export, LHStg							27300001A
Export, LHStg, CKD							27400001A
							27500001A
	1959	Series IIA	1960	Series IIA	1961	Series IIA	Series IIA
Home, RHStg		27600001A		27700001A		27800001A	27600001A
Export, RHStg		27700001A		27800001A		27900001A	27700001A
Export, RHStg, CKD		27800001A		27900001A		28000001A	27800001A
Export, LHStg		27900001A		28000001A			27900001A
Export, LHStg, CKD		28000001A					28000001A
	1959	Series IIA	1960	Series IIA	1961	Series IIA	Series IIA
Home, RHStg, 88 Station Wagon		32000001B		32100001B		32200001B	32000001B
Export, RHStg, 88 Station Wagon		32100001B		32200001B		32300001B	32100001B
Export, RHStg, CKD, 88 Station Wagon		32200001B		32300001B		32400001B	32200001B
Export, LHStg, 88 Station Wagon		32300001B		32400001B			32300001B
Export, LHStg, CKD, 88 Station Wagon		32400001B					32400001B
	1959	Series IIA	1960	Series IIA	1961	Series IIA	Series IIA
Home, RHStg, 109 Station Wagon		28100001A		28200001A		28300001A	28100001A
Export, RHStg, 109 Station Wagon		28200001A		28300001A		28400001A	28200001A
Export, RHStg, CKD, 109 Station Wagon		28300001A		28400001A		28500001A	28300001A
Export, LHStg, 109 Station Wagon		28400001A		28500001A			28400001A
Export, LHStg, CKD, 109 Station Wagon		28500001A					28500001A

From March 1965 onwards.
Vehicle numbers prior to this date are the same as for 88

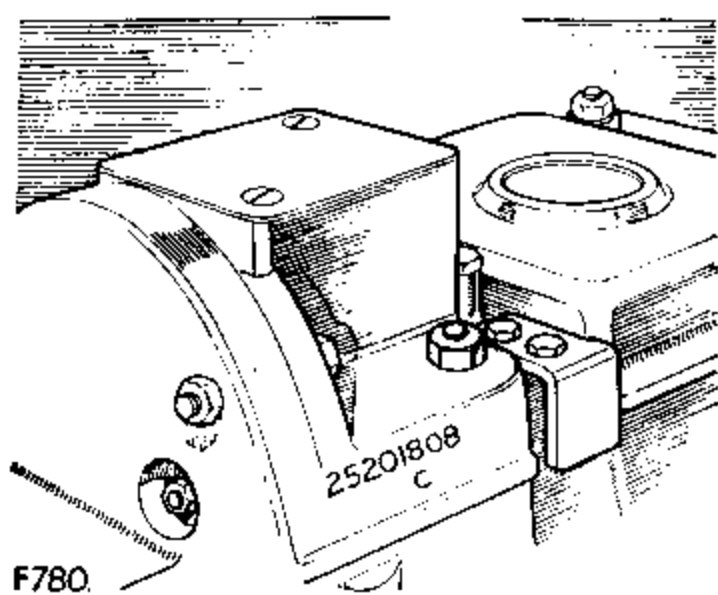
LOCATION OF CAR AND UNIT NUMBERS



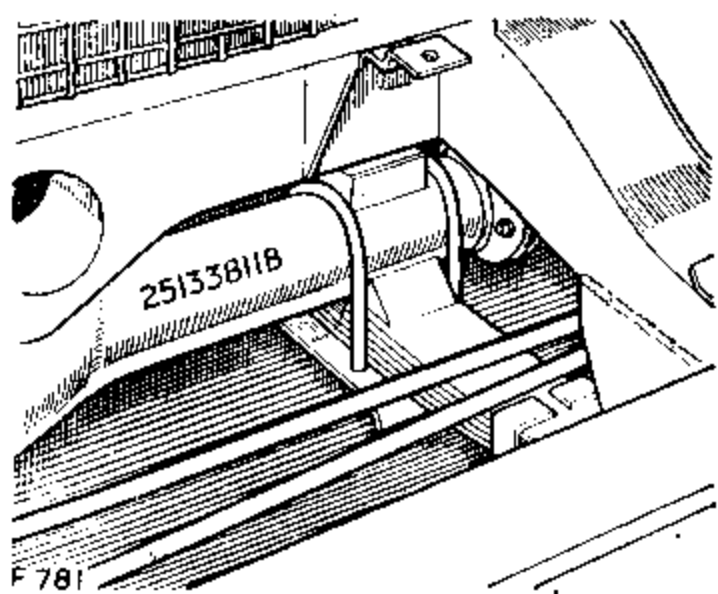
Vehicle and chassis number



Engine number



Gearbox number



Front and rear axle number

Layout of the Workshop Manual

This Workshop Manual is designed to assist those responsible for the maintenance and overhaul of the Land-Rover. The subject matter is sectionalised as detailed in the General Index, and the pages are numbered within those sections. A further sub-index will be found at the beginning of each section.

Operating instructions and details of routine maintenance will be found in the Owner's, Instruction and Maintenance Manuals, a copy of each will be found in the literature pack supplied with the car.

As the Manual covers both Home and Export models, reference is made throughout the text to the 'left-hand' (LH) and 'right-hand' (RH) sides of the vehicle, rather than to 'near-side' and 'off-side'. The 'left-hand side' is that to the left hand when the vehicle is viewed from the rear; similarly, 'left-hand steering' (LHStg) models are those having the driving controls on the left-hand side, again when the vehicle is viewed from the rear.

Measurements

All measurements are given in Imperial measure with US and metric equivalents added where possible, but in certain cases this is not practicable and the Imperial figure must be used.

Workshop technique

When undertaking any overhaul operation, it is advisable to follow a standard technique, which will ultimately save both time and trouble. Prior to dismantling, the unit should be thoroughly cleaned externally and, as the stripping progresses, components washed in paraffin or petrol before setting out in order on a large drip tray. Small parts, such as nuts and bolts, should be placed in boxes to prevent loss, and shims attached to their respective components to facilitate assembly. All joint washers, lockers, tab washers and split pins must be renewed on assembly.

When the unit is finally rebuilt, use only the recommended lubricants. See Section X.

Operation times

These are not included in this Manual and are the subject of a separate publication.

Workshop tools

In order to assist the operator when following details given in this Manual, a list of the tools required for the operation has been included.

In addition, details of any special tools which are necessary, are included in the heading of the operation for which they are required. See also Section Z.

This new edition incorporates all applicable workshop information appertaining to the Land-Rover circulated by means of Land-Rover Service News Letters up to Vol. 3, No. 2.

Index to Sections

See section title pages for detailed operation indexes

Section	Title	Applicable Workshop Manual
A-1	ENGINE—2½ litre Petrol	} Part One (Part No. 606407)
A-2	ENGINE—2½ litre Diesel	
A-3	ENGINE—2.6 litre Petrol	
B	CLUTCH UNITS	
C	GEARBOX	
D	PROPELLER SHAFTS	
E	REAR AXLE AND SUSPENSION	
F	FRONT AXLE AND SUSPENSION	
G	STEERING AND LINKAGE	
H	BRAKE SYSTEM	
J	CHASSIS	} Part Two (Part No. 606408)
K	COOLING SYSTEM	
L	FUEL SYSTEM	
M	EXHAUST SYSTEM	
N	ELECTRICAL EQUIPMENT	
P	INSTRUMENTS AND CONTROLS	
Q	BODY	
R	WHEELS AND TYRES	
X	LUBRICANTS AND SERVICING MATERIALS	
Z	TOOLS	

Note: A comprehensive, detailed index is included at the end of this manual.

SECTION D—PROPELLER SHAFTS

INDEX—PROPELLER SHAFTS

Note: A comprehensive, detailed index is included at the end of this manual

Description	Operation No.
Exploded view and description	At beginning of section
FRONT PROPELLER SHAFT	2-3
Lubrication	1
Sliding joint	3
Universal joints	3
REAR PROPELLER SHAFT	2-3
Lubrication	1
Sliding joint	3
Universal joints	3
FAULT DIAGNOSIS	} At end of section
DATA	

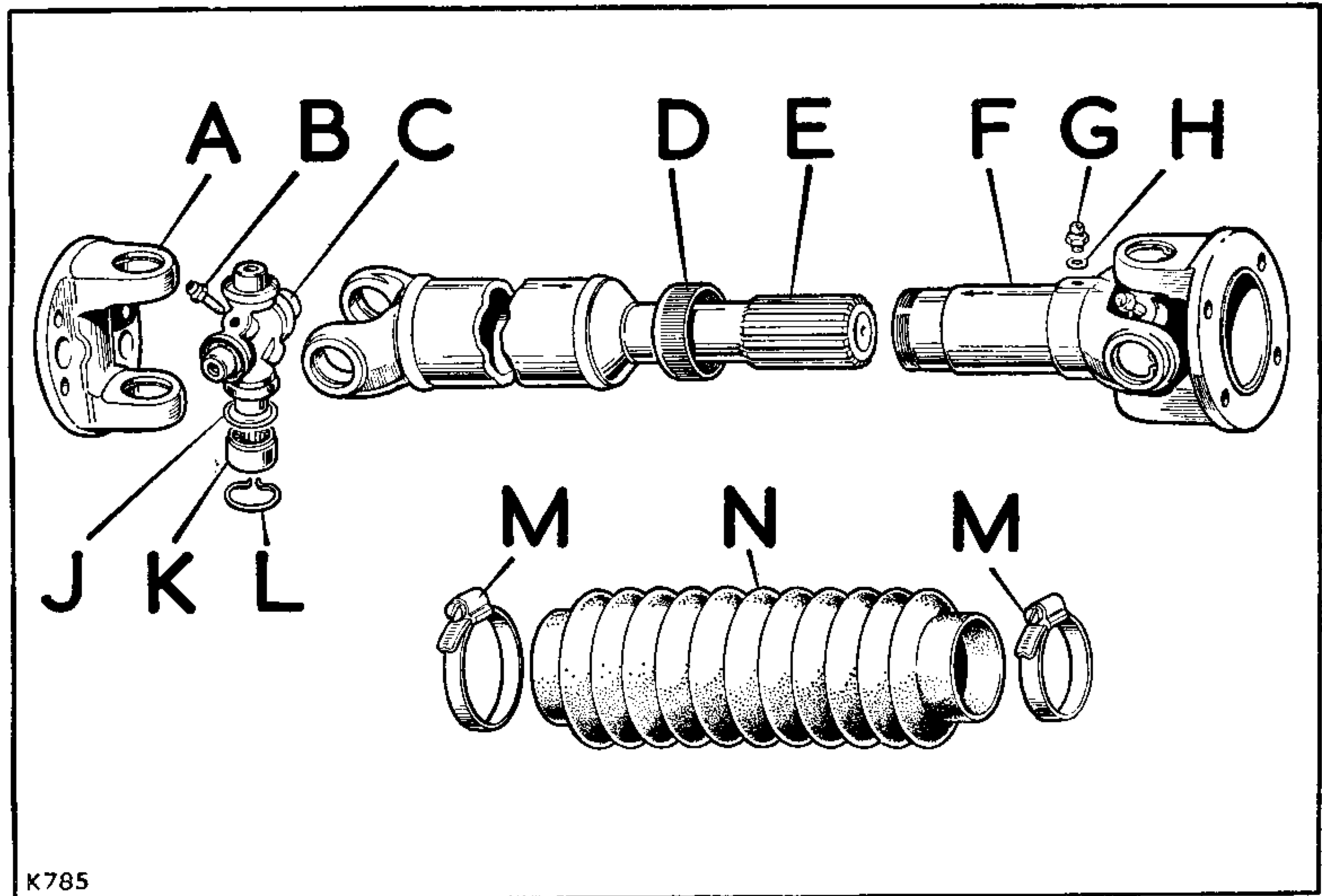


Fig. D1-1. Exploded view of propeller shaft

- | | |
|-------------------------------------|------------------------------------|
| A—Flanged yoke | H—Washer for nipple |
| B—Grease nipple for universal joint | J—Seal for journal bearing |
| C—Journal for bearings | K—Needle roller bearing assembly |
| D—Dust cap | L—Circlip retaining bearing |
| E—Splined shaft | M—Clips fixing rubber grommet |
| F—Splined sleeve | N—Rubber grommet for sliding joint |
| G—Grease nipple for splined joint | |

Lubrication, propeller shafts (front and rear axle drives)—Operation D1-1

Workshop hand tools:
Grease gun

Universal joints

1. Using the correct grade of grease, see Section X, apply grease at the lubrication nipples fitted to the universal joints at both ends of the propeller shaft.

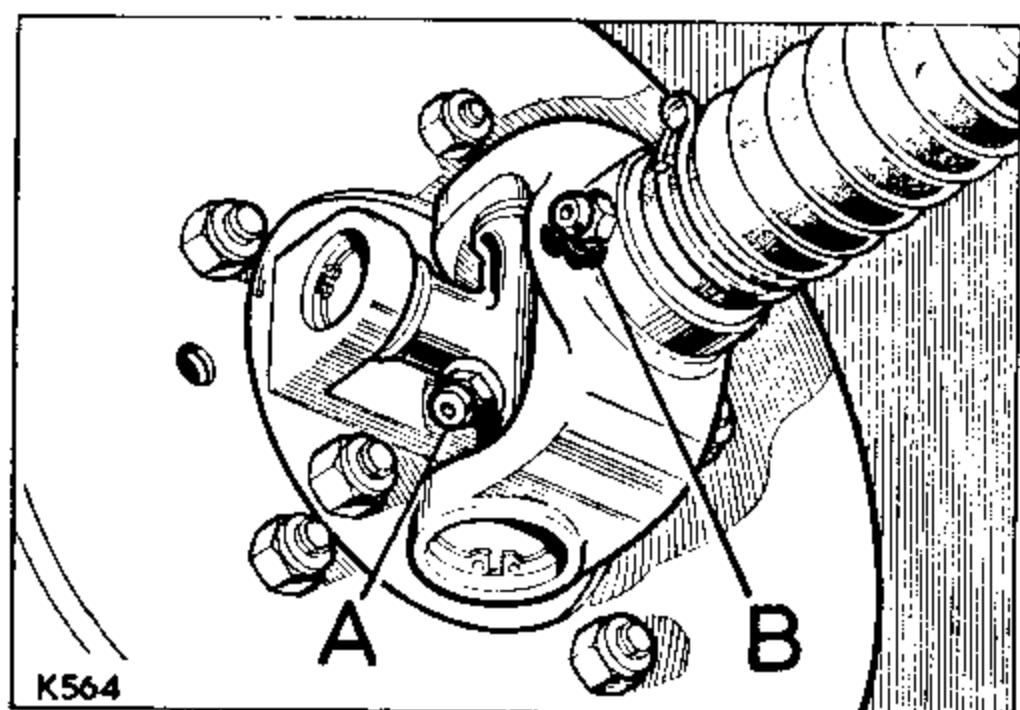


Fig. D1-2. Lubricating points for propeller shafts

A—Nipple for universal joint
B—Nipple for sliding joint

Sliding joints

1. Using the correct grade of grease, apply grease at the lubrication nipple fitted to the splined sleeve.

Note: If the propeller shaft is fitted with a plug at the sliding joint lubrication point, replace the plug with a lubrication nipple.

Important: If the propeller shafts are lubricated while they are removed from the vehicle, compress the sliding joint to avoid overfilling, then apply grease.

Front wheel alignment, to adjust—Operation G1-2

Workshop hand tools:
Spanner size: $\frac{7}{8}$ in. AF Mallet

To check

Toe-in dimension: $\frac{3}{64}$ in. to $\frac{3}{32}$ in. (1,2 mm to 2,4 mm).

Note: No adjustment is provided for caster, camber or swivel pin inclination.

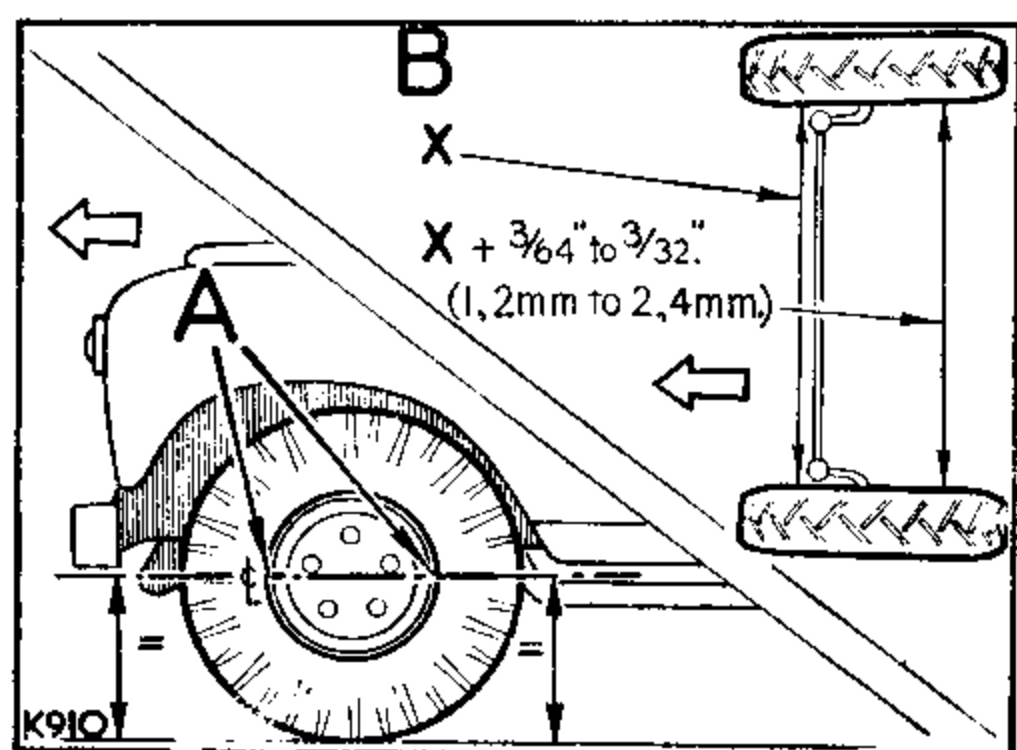


Fig. G1-7. Front wheel toe in

A—Check at horizontal centre line of wheel rim
B—Toe in setting

1. Set the vehicle on level ground with the road wheels in the straight-ahead position, and push it forward a short distance.
2. Measure the toe-in with the aid of a tracking stick or suitable proprietary equipment; it should be $\frac{3}{64}$ in. to $\frac{3}{32}$ in. (1,2 mm to 2,4 mm).
3. If necessary, adjust the toe in as follows:

To adjust

1. Slacken the clamps securing the ball joints at each end of the track rod.

2. Turn the track rod to decrease or increase its effective length as necessary, until the toe in is correct.

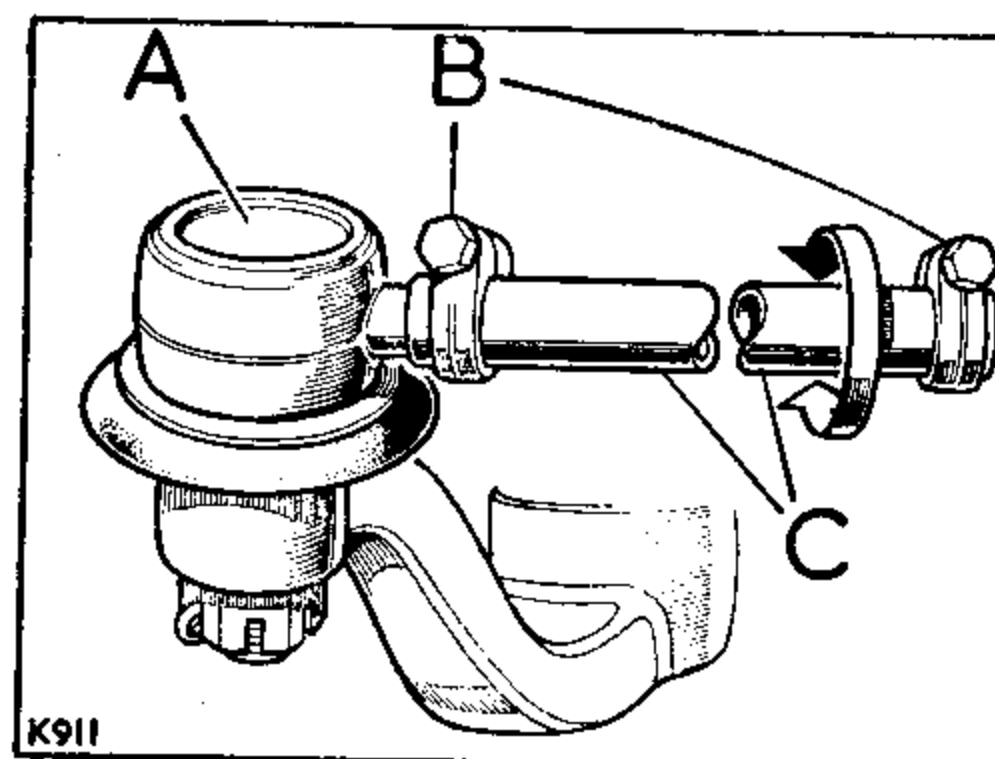


Fig. G1-8. Track rod adjustment

A—Ball joint
B—Clamp for ball joint
C—Track rod, turn as required

3. Push the vehicle rearwards turning the steering wheel from side to side to settle the ball joints. Then, with the road wheels in the straight ahead position, push the vehicle forward a short distance.
4. Recheck the toe in. If necessary carry out further adjustment.
5. When the toe in is correct, lightly tap the track rod ball joints in the direction indicated to the maximum of their travel, to ensure full unrestricted movement of the track rod, then secure the ball joint clamps.

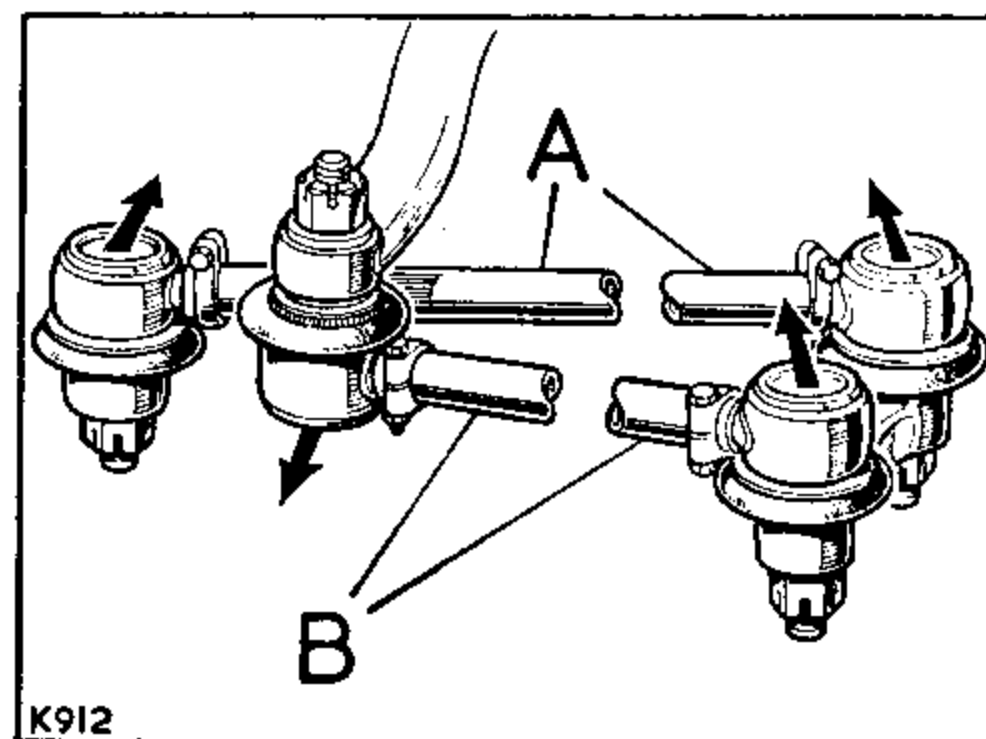


Fig. G1-9. Setting ball joints

A—Track rod
B—Drag link
(Set ball joints as indicated)

Steering wheel, remove and refit—Operation G1-3

Workshop hand tools:
Spanner sizes: ½ in. AF, 1 in. AF sockets
Screwdriver (medium)

Note: Two types of steering wheel are in use, utilising different fixings.

To remove early type

1. If the electric horn push is fitted to the steering wheel centre, disconnect the battery to prevent the possibility of an electrical short, then disconnect the horn lead from the snap connector at the dash panel.

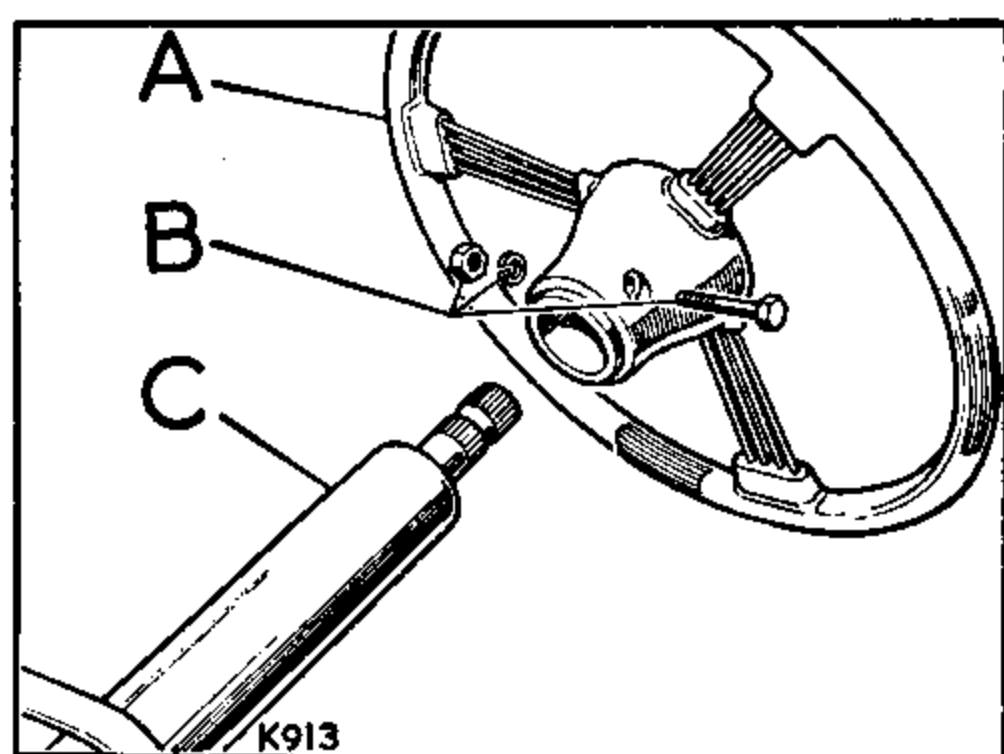


Fig. G1-10. Early type steering wheel
A—Steering wheel
B—Fixings, steering wheel to column
C—Steering column

2. Remove the fixings and withdraw the steering wheel from the splined column.

To remove, latest type

1. Disconnect the battery to prevent the possibility of an electrical short.

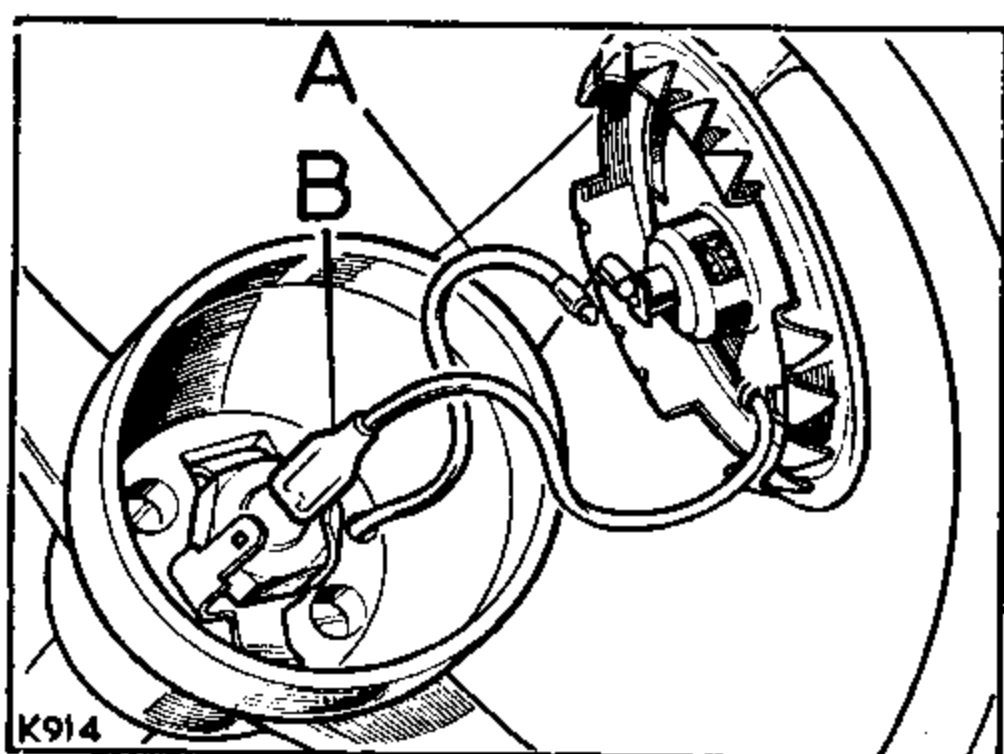


Fig. G1-11. Electrical leads for horn push
A—Connection at horn push
B—Connection at steering wheel

2. Disconnect the horn push lead from the snap connector at the dash panel
3. Prise the centre cover from the steering wheel and disconnect the horn push leads.
4. Remove the fixings and withdraw the steering wheel from the splined column.

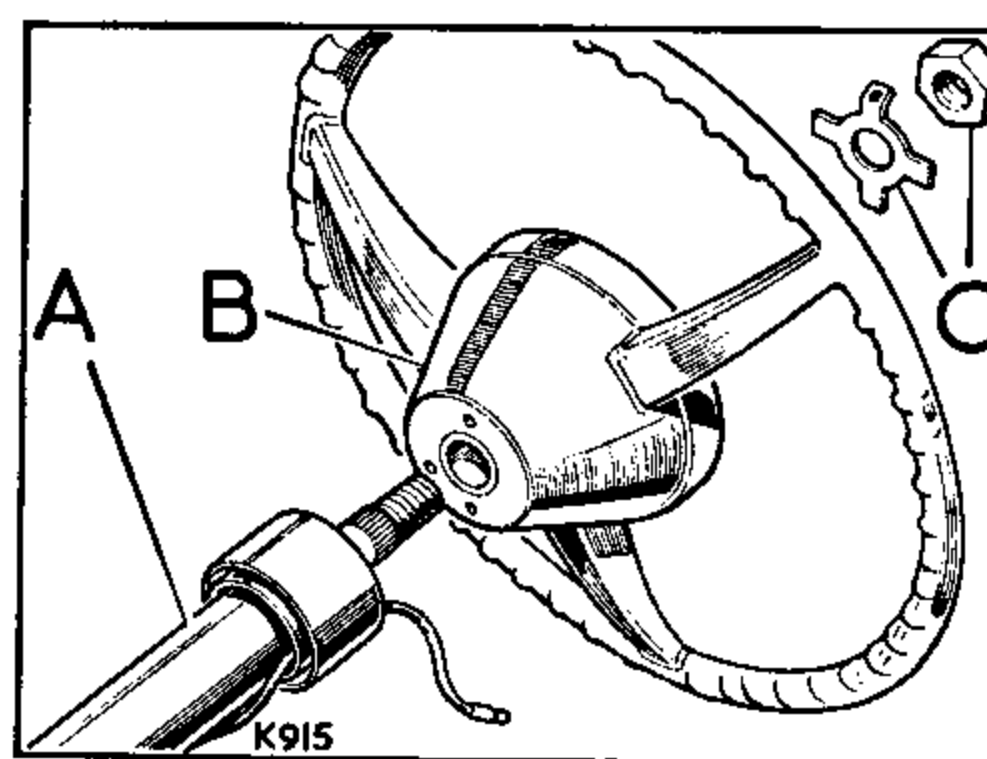


Fig. G1-12. Latest type steering wheel
A—Steering column
B—Steering wheel
C—Fixings, steering wheel to column

To refit, early type

1. Turn the inner steering column lock-to-lock and select the intermediate position (front road wheels straight ahead).
2. Fit the steering wheel with the fixing bolt and nut to the rear and one of the series of spokes pointing forward.

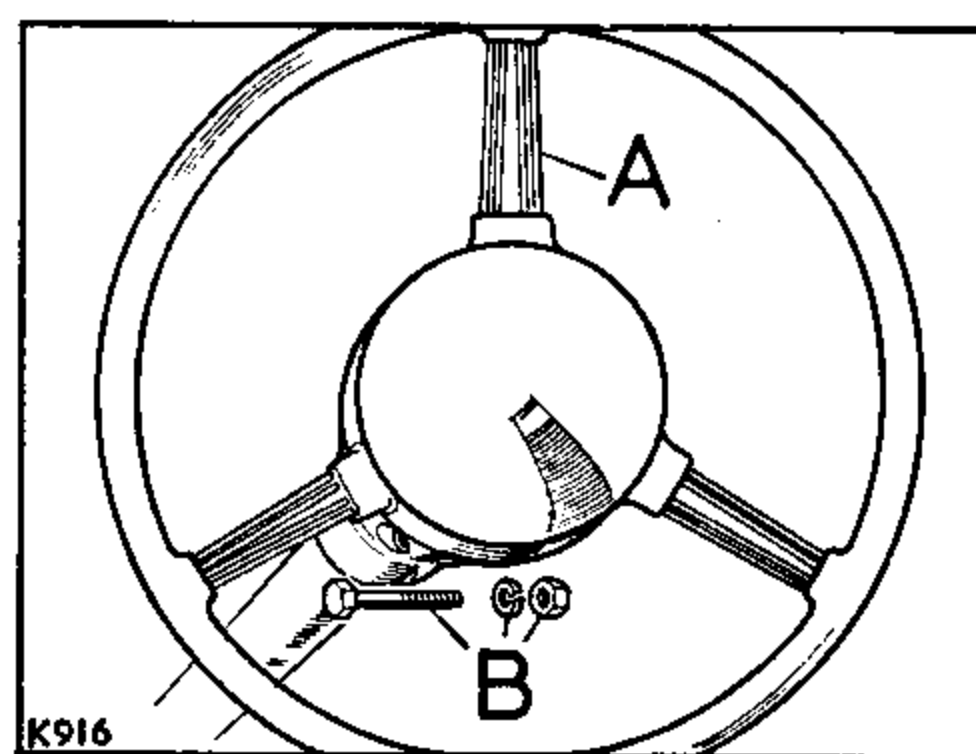


Fig. G1-13. Steering wheel location
A—Spoke facing forward
B—Fixing bolt at rear

Operation L1-3—continued

19. Fit the diaphragm to the valve ensuring that the locating tab is inserted in the recess in the air valve then fully secure with retaining ring.
20. Carefully fit the metering needle to the air valve aligning the shoulder of the needle with the top surface of the shaft, as illustrated.

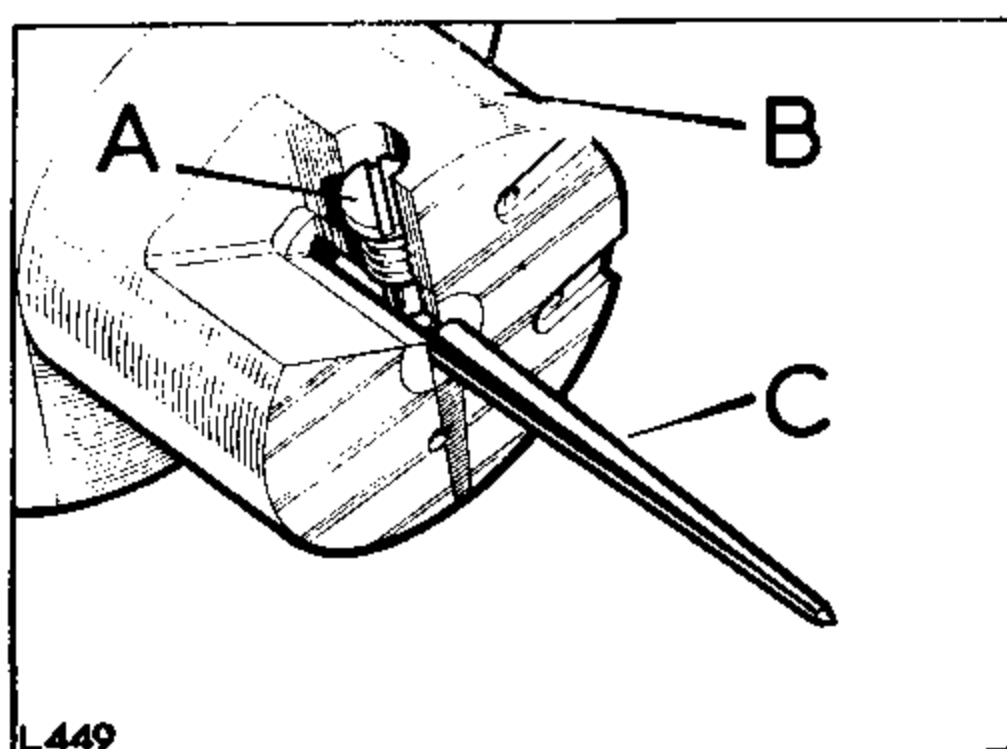


Fig. L1-32. Metering needle position

A—Retaining screw
B—Piston
C—Metering needle

Jet centralisation

Note: The efficient operation of the carburetter depends on the free movement of the air valve and needle in the jet orifice. In the Stromberg there is an annular clearance around the orifice bush which permits the lateral positioning of the bush and jet. Thus it may be clamped up in such a position that the metering needle moves freely in the orifice.

21. Very carefully insert needle into jet orifice and allow it to bottom, if any difficulty is encountered unclamp the jet assembly enough to allow the jet to bottom. In this position ensure that the locating tab on the diaphragm fits into the recess on the carburetter body.
22. Fit the air valve return spring and carburetter top cover, aligning the marks, then secure assembly.
23. Lift the air valve and tighten the jet assembly fully.
24. Slacken off the whole jet assembly approximately half a turn to release the orifice bush.
25. Allow the air valve to fall; the needle will then enter the orifice and thus automatically centralise it. If necessary, assist the air valve drop by inserting a pencil in the dashpot.
26. Slowly tighten the jet assembly, checking frequently that the needle remains free in the orifice. Check by raising the air valve approximately $\frac{1}{4}$ in. (6 mm) and allowing it to fall freely. The position should then stop firmly on the bridge.
27. Fill up the dashpot in the air valve to within a $\frac{1}{4}$ in. (6 mm) of the rod in which the damper operates with SAE 20 engine oil.
28. Fit in the damper assembly and fully secure.

Adjustments**Setting the idle**

Two adjustments are used when regulating the idle speed and mixture. The following procedure should be used in setting the throttle adjusting screw which controls the speed, and jet adjusting screw, which determines the mixture strength.

1. Remove the air cleaner.
2. Remove the damper assembly.
3. Hold the air valve down on the bridge in the throttle bore.
4. Screw up the jet adjustment screw until the jet is felt to come into contact with the underside of the air valve.
5. Turn down the jet adjusting screw three turns.
6. Run the engine till it is thoroughly warm.
7. Adjust the throttle adjusting screw to an idle speed of 500 rpm.

Note: The idle mixture will be correct when the engine speed is smooth and regular, and by careful and gradual adjustment of the jet adjustment screw, the correct adjustment will be determined.

To check

Lift the air valve $\frac{1}{32}$ in. (0,8 mm). If the engine speed rises the mixture is too rich, if the engine stops it is too weak. Correctly adjusted it will remain constant or fall slightly in speed. Turning the orifice adjusting screw into carburetter decreases the mixture strength; unscrewing will enrich.

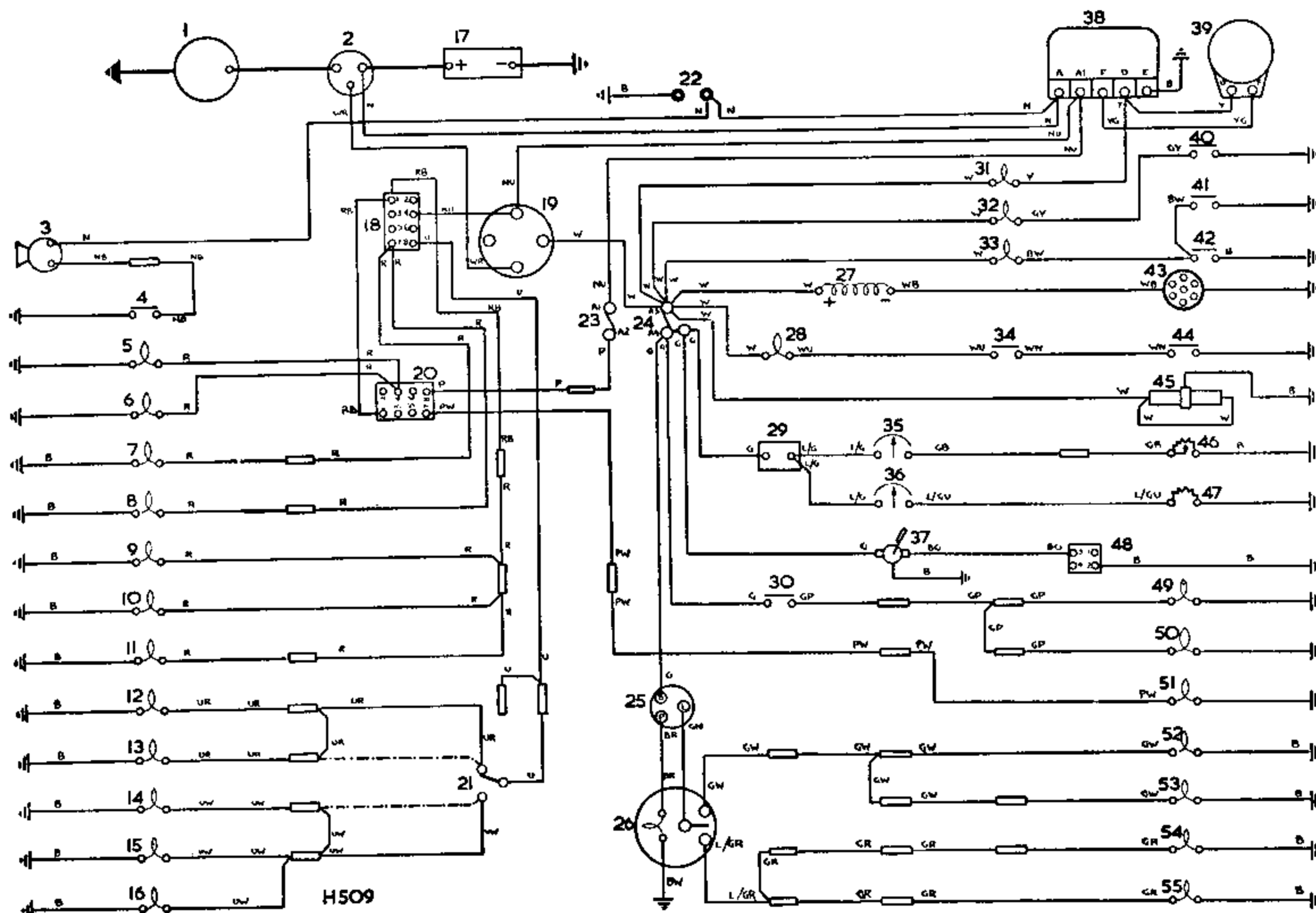


Fig. N1-10. Circuit diagram, 6 cylinder Forward Control, Petrol models, Series IIA, negative earth

- 1 Starter motor
- 2 Solenoid, starter motor
- 3 Horn
- 4 Horn push button
- 5 Panel light, speedometer
- 6 Panel light, instruments
- 7 Side lamp, LH
- 8 Side lamp, RH
- 9 Tail lamp, RH
- 10 Number plate lamp
- 11 Tail lamp, LH
- 12 Headlamp, RH, dipped beam
- 13 Headlamp, LH, dipped beam
- 14 Headlamp, LH, main beam
- 15 Headlamp, RH, main beam
- 16 Warning light, main beam
- 17 Battery, 12 volt
- 18 Switch, lights
- 19 Switch, ignition and starter
- 20 Switch, panel and interior light
- 21 Switch, headlamp dip
- 22 Inspection sockets
- 23 Fuse, A1-A2 (35 amp)
- 24 Fuse, A3-A4 (35 amp)
- 25 Flasher unit
- 26 Switch and warning light, flasher lamps
- 27 Ignition coil
- 28 Warning light, choke
- 29 Voltage stabiliser, fuel gauge and water temperature gauge
- 30 Switch, stop lamp

- 31 Warning lights, ignition
- 32 Warning light, oil pressure
- 33 Warning light, brake fluid reservoir
- 34 Switch, cold start on control
- 35 Fuel gauge
- 36 Temperature gauge
- 37 Wiper motor
- 38 Regulator box
- 39 Dynamo
- 40 Switch, oil pressure
- 41 Switch, brake fluid reservoir
- 42 Switch, brake servo
- 43 Distributor
- 44 Switch, cold start in cylinder head
- 45 Fuel pump
- 46 Fuel tank unit
- 47 Water temperature transmitter
- 48 Switch, wiper motor
- 49 Stop lamp, RH
- 50 Stop lamp, LH
- 51 Interior lamp
- 52 Flasher lamp, front RH
- 53 Flasher lamp, rear RH
- 54 Flasher lamp, rear LH
- 55 Flasher lamp, front LH

Dotted lines indicate circuit on LHS models

Snap and Lucar connections —□—

Earth connections —|||||—

Cable colour code

B—Black P—Purple W—White R—Red N—Brown Y—Yellow U—Blue G—Green L—Light

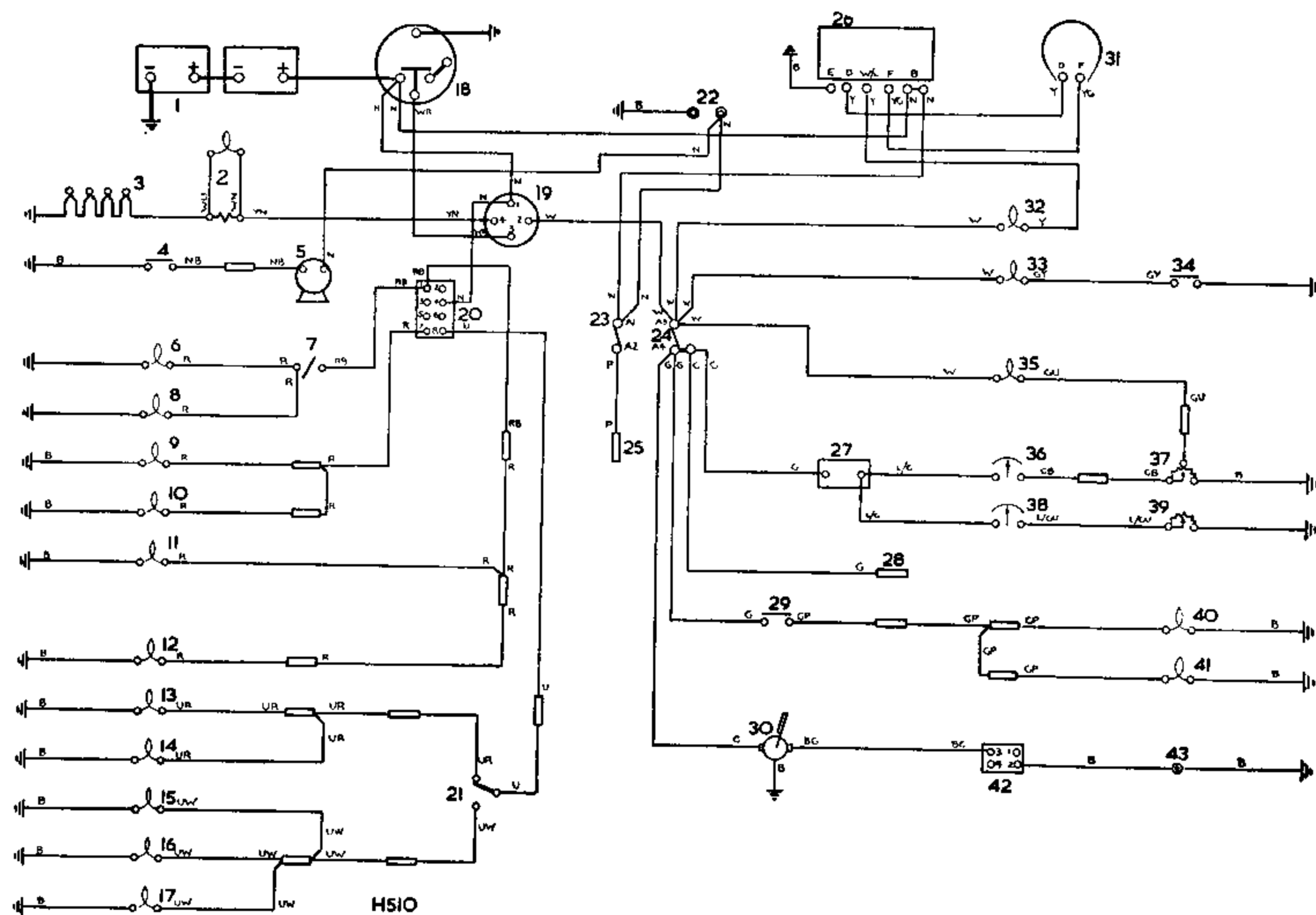
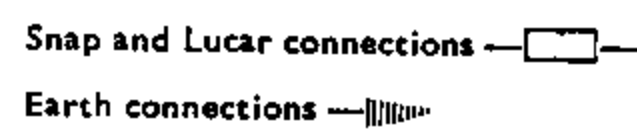


Fig. N1-11. Circuit diagram, 2½ litre 'Regular', 'Long' and Station Wagon, Diesel models, Series IIA, negative earth

- | | |
|--|---|
| 1 Batteries, two 6 volt | 25 Feed, interior light |
| 2 Warning light and resistor, heater plugs | 26 Regulator box |
| 3 Heater plugs | 27 Voltage stabiliser, fuel gauge and water temperature gauge |
| 4 Horn push button | 28 Feed, flasher lights |
| 5 Horn | 29 Switch, stop lamp |
| 6 Panel light, speedometer | 30 Wiper motor |
| 7 Switch, panel light | 31 Dynamo |
| 8 Panel light, instrument | 32 Warning light, dynamo |
| 9 Side lamp, RH | 33 Warning light, oil pressure |
| 10 Side lamp, LH | 34 Switch, oil pressure |
| 11 Tail lamp, RH | 35 Warning light, fuel level |
| 12 Tail lamp, LH | 36 Fuel gauge |
| 13 Headlamp, RH, dipped beam | 37 Fuel tank unit |
| 14 Headlamp, LH, dipped beam | 38 Temperature gauge |
| 15 Headlamp, LH, main beam | 39 Temperature transmitter unit |
| 16 Headlamp, RH, main beam | 40 Stop lamp, RH |
| 17 Warning light, headlamp main beam | 41 Stop lamp, LH |
| 18 Starter motor | 42 Switch, wiper motor |
| 19 Switch, starter-heater plugs | 43 Socket, wiper lead |
| 20 Switch, lights | |
| 21 Switch, headlamp dip | |
| 22 Inspection sockets | |
| 23 Fuse, A1-A2 (35 amp) | |
| 24 Fuse, A3-A4 (35 amp) | |



Cable colour code

- B—Black P—Purple W—White R—Red N—Brown Y—Yellow U—Blue G—Green L—Light

Key to illustration of starter motor, type M45G, 2½ litre Diesel models from engine suffix 'K' onwards

- | | | | | |
|----|--|----|--|---------------------------|
| 1 | Yoke | 13 | Pivot pin for starter motor | |
| 2 | Bracket, commutator end | 14 | Field coil for starter | |
| 3 | Bush, commutator end | 15 | Brushes for starter motor, set | |
| 4 | Spring set for brushes | 16 | Drive (roller clutch) for starter | |
| 5 | Cover for starter, commutator end | 17 | Bolt for starter motor | |
| 6 | Sealing ring for cover, commutator end | 18 | Solenoid for starter motor | |
| 7 | Intermediate bracket | 19 | Special nut for starter solenoid | |
| 8 | Bush for bracket | 20 | Bolt ($\frac{7}{16}$ in. UNC x $1\frac{1}{4}$ in. long) | } Fixing
starter motor |
| 9 | Sealing ring for intermediate bracket | 21 | Set bolt ($\frac{7}{16}$ in. UNF x 2 in. long) | |
| 10 | Armature | 22 | Spring washer | |
| 11 | Bracket for starter, drive end | 23 | Nut ($\frac{7}{16}$ in. UNF) | |
| 12 | Bush for bracket | | | |

Operation N1-21—continued

- The flexible connectors are soldered or crimped to terminal tags; two are connected to brush boxes, and two are connected to the free ends of the field coils. These flexible connectors must be removed by unsoldering, and the flexible connectors of the new brushes secured in their places by soldering.

The new brushes being pre-formed, 'bedding' to the commutator is unnecessary.

Commutator

- Clean the commutator with a petrol-moistened cloth. If necessary, rotate the armature and, using fine glass-cloth, remove pits and burned spots from commutator; remove abrasive dust with a dry air blast. If the commutator is badly worn, mount in a lathe, and, using a very sharp tool, take a light cut, taking care not to remove any more metal than necessary. The insulators between the commutator segments **must not be undercut**. Finally, polish with a very fine glass paper.

Armature

- If the armature is damaged, i.e. 'lifted' conductors, or distorted shaft, a new replacement must be fitted. Never attempt to machine the armature core, or true a distorted armature shaft.

Bearing bushes

If the bearing bushes are worn and allow excessive side play of the armature shaft, new replacements must be fitted.

- Commutator end bracket bush—Remove brake shoes, thrust washer and 'Tufnol' washer from the end bracket, as applicable. Screw in a $\frac{9}{16}$ in. tap and withdraw complete with bush.
- Drive end bracket bush and intermediate bracket bush can be pressed out.
- New bushes can be fitted using a shouldered mandrel of the same diameter as the shaft.

Note: Before fitting a new porous bronze bush, it should be completely immersed for 24 hours in clean SAE 30-40 engine oil. Porous bronze bushes must **not** be reamed after fitting.

Roller clutch

This should rotate freely in one direction and lock up in the other. If faulty, a new replacement must be fitted.

Insulation and continuity checks

If inspection of the armature and field coils of the starter motor do not reveal any faults, it is recommended that the following checks are carried out.

Armature insulation

- Attach an ohm meter or a 110 volt AC test lamp in series with a 12 volt battery.
- With two probes attached to the leads check the armature insulation by touching each commutator segment in turn with the other probe attached to the armature shaft.
- The test lamp should not light up, or if an ohm meter is used, a high reading should be recorded. Should this not be the case, the armature insulation is faulty and a new replacement armature should be fitted.

Armature continuity

- Indication of an open circuited armature winding will be given by burned commutator segments, this can be confirmed by substitution.

Field coil continuity

- Connect a battery and suitable bulb in series with two pointed probes.
- Place the probes on the field coil brush tappings.
- The test bulb should light, if not an open circuit is indicated and new replacement field coils should be fitted.
- If the test bulb does light, proceed with the field coil insulation test.

Field coil insulation

- Connect an ohm meter or a 110 volt AC test lamp between the terminal post and a clean part of the yoke.
- Lighting of the test lamp or a low ohmic reading indicates that the field coils are earthed to the yoke and new replacements must be fitted.

Radiator and grille panel assembly, remove and refit—Operation Q1-2

Workshop hand tools:

Spanner sizes: $\frac{7}{16}$ in. x $\frac{1}{2}$ in. AF open ended, 2 off, 2 BA open ended
Screwdriver (medium), Pliers

2½ litre Petrol and Diesel models:

Refer to Section A for additional detail information.

To remove

1. Remove bonnet. Operation Q1-1.
2. Disconnect battery leads.
3. Remove front apron panel.

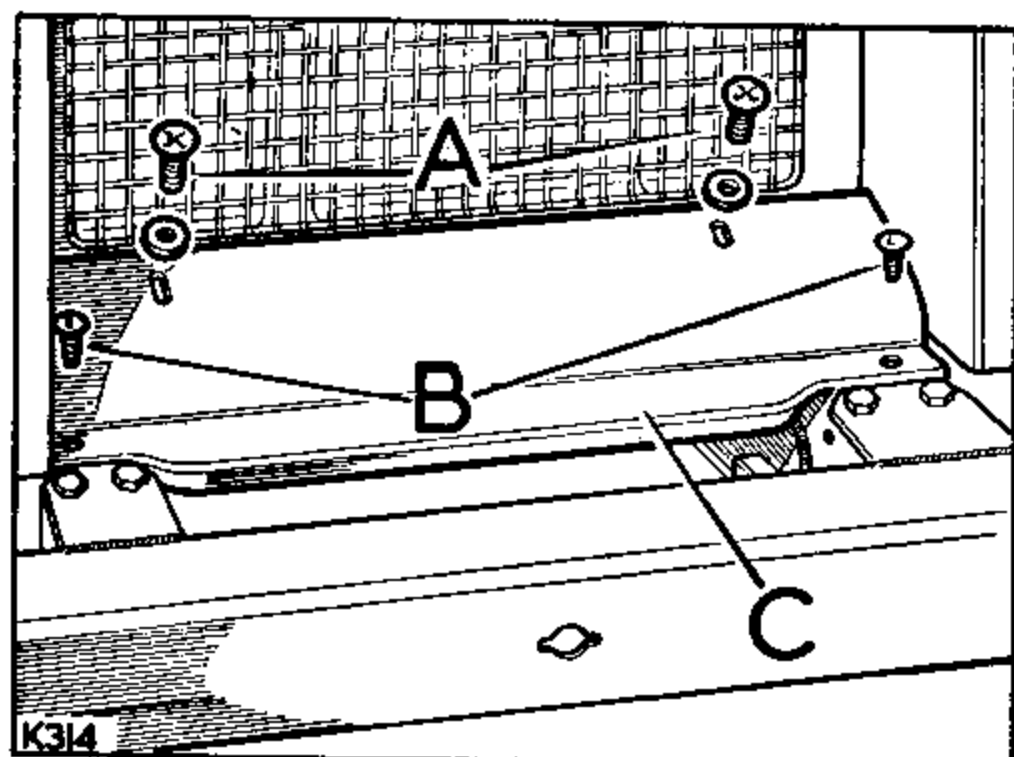


Fig. Q1-4. Apron panel fixings

A—Fixings at cross member brackets
B—Fixings at side members
C—Apron panel

4. Remove nameplate and radiator grille.

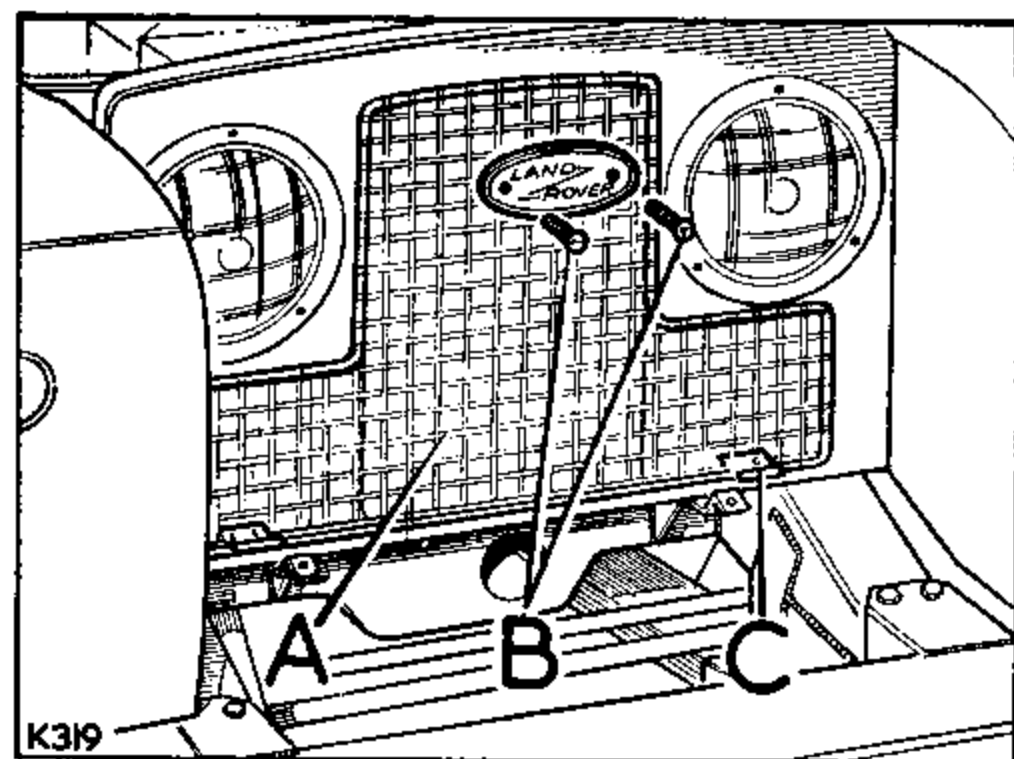


Fig. Q1-5. Radiator grille fixings

A—Radiator grille
B—Fixings for nameplate and grille
C—Support brackets

5. Remove radiator cap, drain off coolant.
6. Remove shroud from radiator fan cowl.
7. Slacken fixings and detach radiator coolant hoses.
8. Remove the fan blades fixings and lower the fan blades to rest on lower part of fan cowl. Remove the fan blades when access is obtained during grille panel removal.

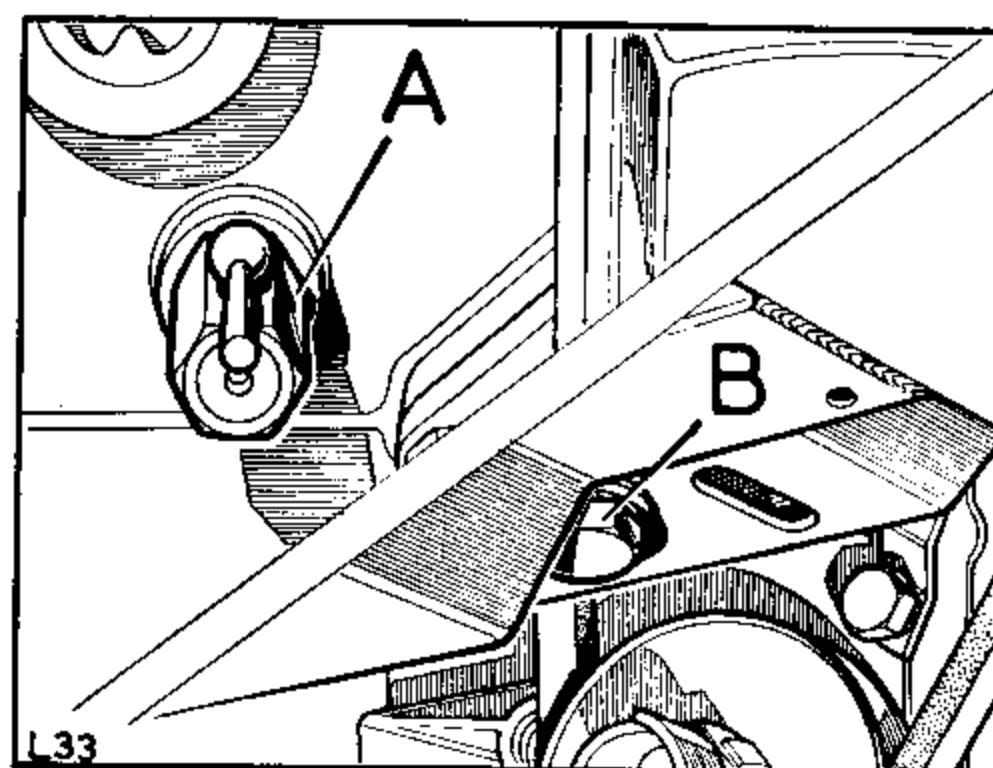


Fig. Q1-6. Coolant drain taps location

A—At engine block, RH side
B—At radiator

9. Disconnect the electrical leads for the front lamps at the snap connectors.
10. Remove the grille panel to front wings fixings, the securing nuts and washers are located in the respective wheelarches.
11. Remove the grille panel fixings at the brackets on the chassis cross member.
12. Carefully withdraw the assembly and the previously released fan blades from the engine compartment.

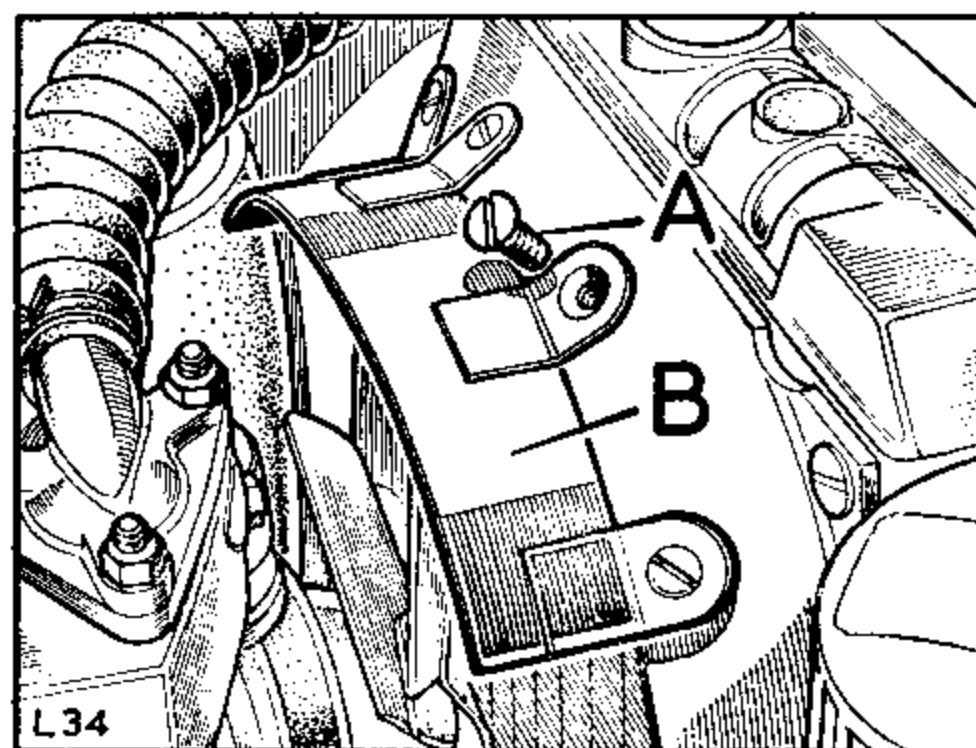


Fig. Q1-7. Fan shroud fixings

A—Fixings for fan shroud
B—Fan shroud

To refit

1. Refit the radiator grille and radiator complete on to the vehicle. Fit the fan blades to the fan pulley before engaging the grille panel fixings. See Figs. Q1-10 and Q1-9 for fixing details.

Operation Q1-2—continued

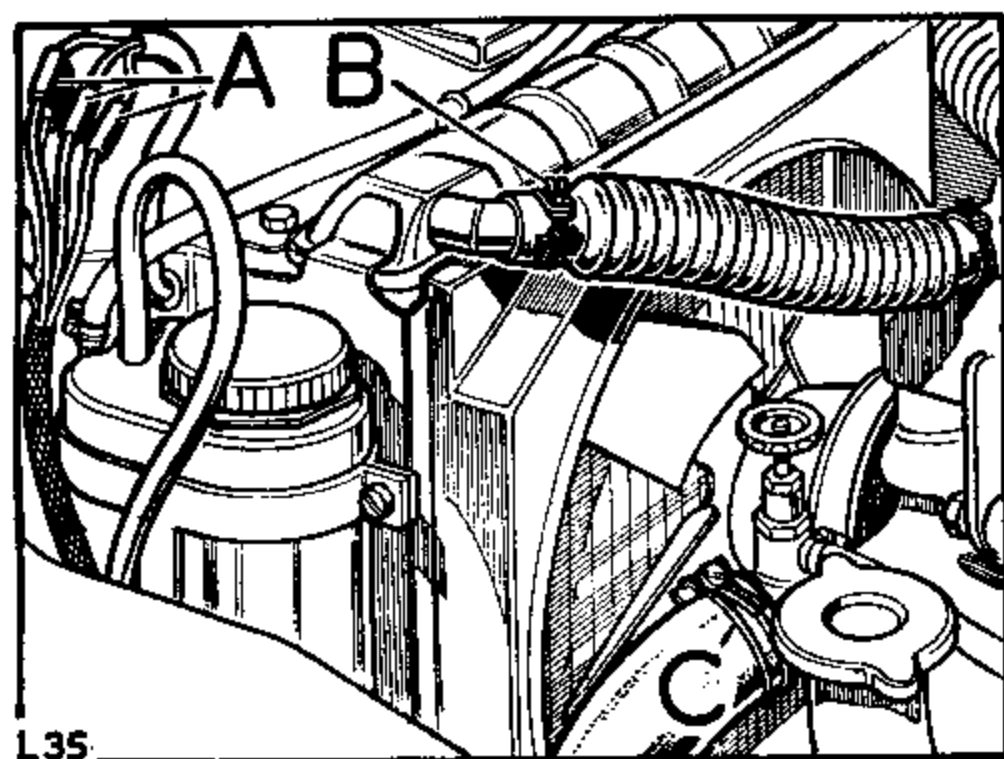


Fig. Q1-8. Coolant hose and lead connectors

- A—Snap connectors (3 off each side of vehicle)
- B—Fixings at top hose
- C—Fixings at bottom hose

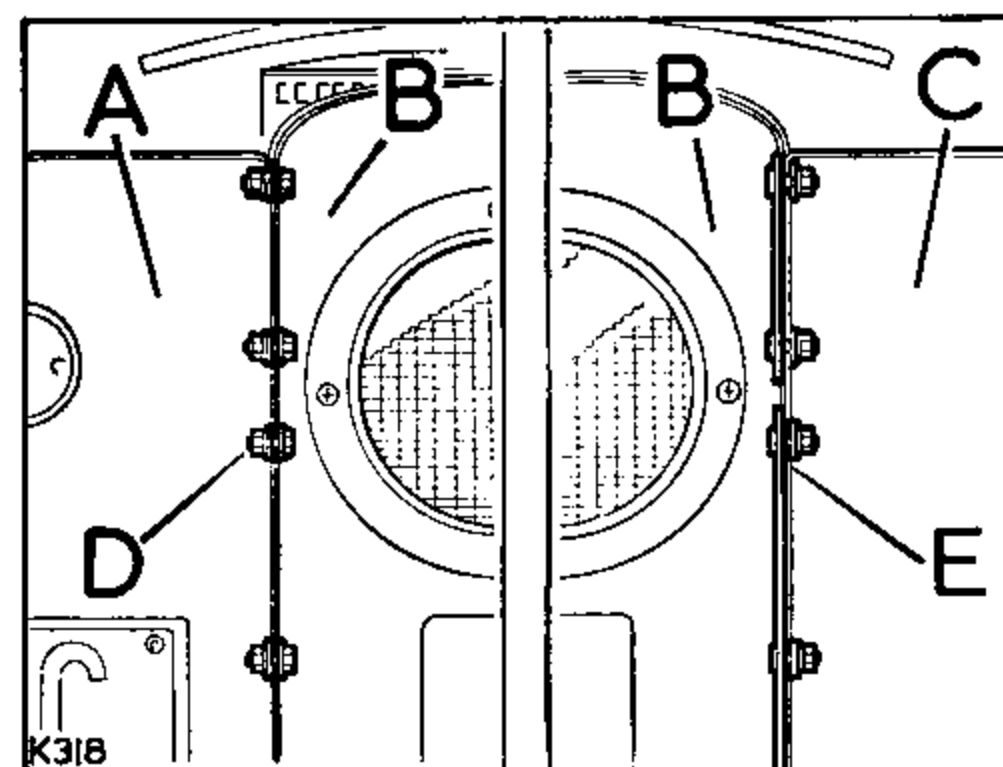


Fig. Q1-9. Radiator grille panel fixings

- A—Front wing, RH side
- B—Radiator grille panel
- C—Front wing, LH side
- D—Fixings at wheelarch, RH
- E—Fixings at wheelarch, LH

2. Make the electrical connections at the snap connectors, referring to Fig. Q1-8 and the appropriate circuit diagram, if necessary, in Section N.
3. Connect the coolant hoses and replenish the engine coolant system, allowing a free flow through the drain taps before closing them. Fig. Q1-8 refers.
4. Refit the front apron panel. Fig. Q1-4 refers.
5. Connect battery lead.
6. Refit the bonnet panel. Operation Q1-1.

Coolant System Capacity
Bonneted Control Models, 2½ litre Petrol and Diesel

Imperial Pints	U.S. Pints	Litres	Antifreeze	Frost Precaution
18	21½	10,25	33¼%	—32°C (—25°F)

Bonneted Control Model, 2.6 Litre Petrol

Imperial Pints	U.S. Pints	Litres	Antifreeze	Frost Precaution
24	29	13,5	33¼%	—32°C (—25°F)

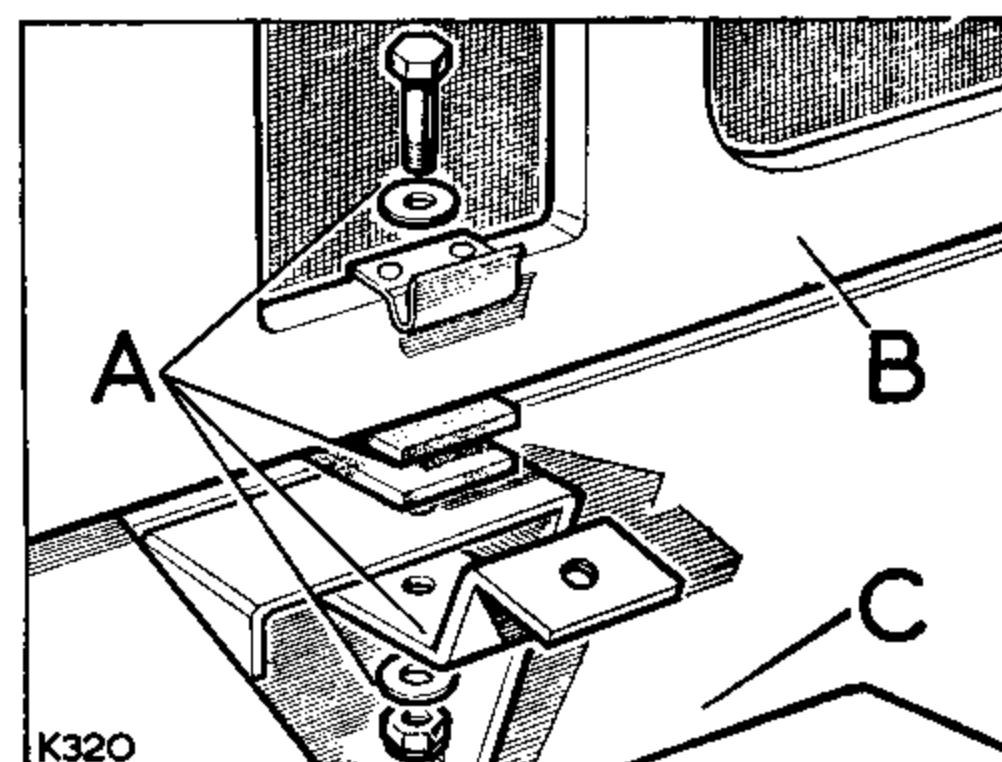


Fig. Q1-10. Fixings at chassis cross member

- A—Panel fixings
- B—Radiator grille panel
- C—Chassis cross member

Tyres, divided wheels (early vehicles), remove and refit—Operation R1-2

Workshop tools:
Wheelbrace, Valve core key, Suitable tyre levers, Tyre pressure gauge

To remove

Warning: Do not attempt to remove the outer ring of nuts on divided type wheels unless the wheel is removed and the tyre fully deflated, or severe personal injury may result.

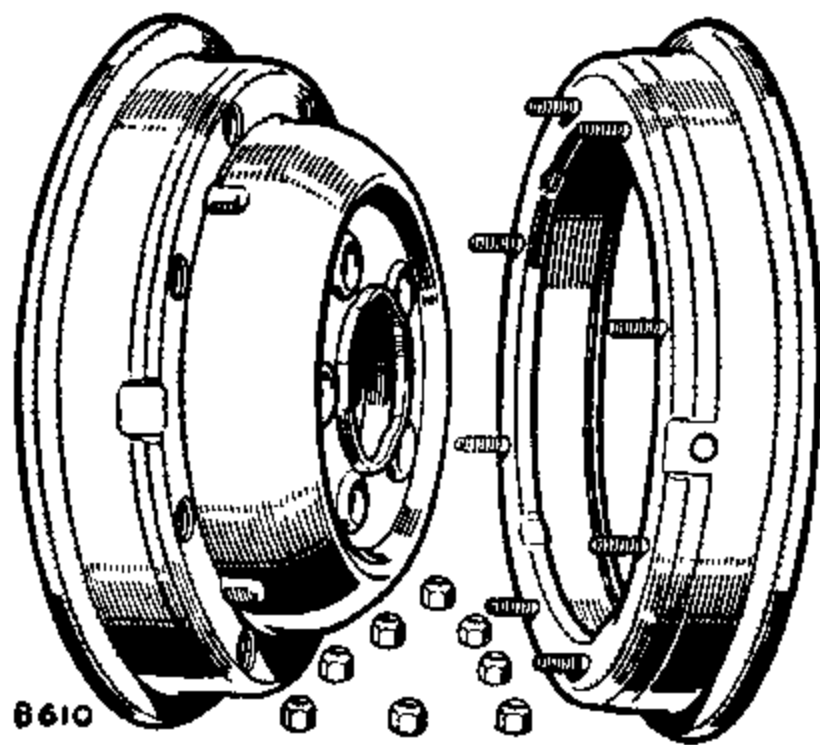


Fig. R1-2. Divided wheel

1. Remove the valve cap and core to deflate the tyre.
2. Press each bead in turn away from the flange, using levers and working round the tyre in small steps. Two or three circuits of the tyre may be necessary to free the beads completely.
3. Slacken and remove the clamping nuts. Remove the upper half of the wheel. Push the valve through the lower half of the wheel and remove the cover and tube.

To refit

1. Thoroughly examine the cover for nails, flints, etc., and ensure that no loose objects have been left inside. Clean the wheel rim flanges and seatings.
2. Inflate the inner tube until it is just rounded out, dust with French chalk and insert it in the cover with the white spots near the cover bead coinciding with the black spots on the tube.
3. Fit the protection flap, starting at the valve position. Make sure that the edges of the flap are not turned over inside the cover and that it lies centrally between the beads. See that the flap fits closely against the tube round the valve.
4. Lay the studded half of the wheel on the floor or bench with the studs pointing upwards. Fit the cover over the wheel and thread the valve through the hole, making sure that it points downwards.
5. Fit the other half of the wheel and tighten the clamping nuts lightly. Finally tighten the nuts using diagonal selection to ensure even tightening. Check that the valve is free and inflate the tyre to the recommended pressure.

Fault diagnosis—Wheels and tyres

Symptom	Possible cause	Investigation	Remedy
Excessive wear on front tyres	Incorrect tyre pressures	Check tyre pressures	Adjust as necessary
	Failure to rotate tyres		Change position of tyres including spare
	Incorrect toe-in of front wheels	Check wheel alignment, Operation G1-2	Adjust as necessary
	Harsh or unequal brakes	Check brake adjustment, Section H	Adjust as necessary
	Worn swivel pins	Jack up front of vehicle and check swivel pins	Overhaul swivel pin housings
	Incorrectly adjusted brakes	Check brake shoe adjustment, Section H	Adjust as necessary
	Eccentric wheels and tyres	Check tyre concentricity line. Check wheel pressings for damage or distortion	Rectify or renew
	Distorted brake drum	Remove brake drum and check concentricity	Recondition or fit new replacement
	Incorrect camber	Check for settled road springs, damage to front suspension and axle unit	Fit new parts as required
	Fast cornering and/or sustained high speed driving		In the hands of the operator
Excessive wear on rear tyres	Incorrect tyre pressures	Check tyre pressures	Adjust as necessary
	Rear wheel run-out or wobble	Check for loose wheel nuts, damaged wheel or incorrectly fitted tyres	Rectify as necessary
	Rear wheels out of alignment	Check that the rear spring centre dowel is not sheared. Check for a broken rear spring main leaf. Check for a damaged chassis	Rectify as necessary, see Sections E and J
	Harsh and unnecessary use of the brakes or high speed driving		In the hands of the operator
Rattle or noise from wheels	Loose wheel bearings	Check hub bearing adjustment. Sections E and F	Adjust as necessary
	Worn or damaged hub bearings	Remove hub and examine bearings	Fit new bearings
	Brake shoes or anchor plate loose	Remove brake drum and check shoes and anchor plate for security	Tighten fixings
Squeaks from wheels	Wheel stud nuts loose	Examine studs for damage	Tighten wheel nuts
	Lack of lubrication to wheel bearings		Lubricate as described in Sections E and F
	Wheel bearings adjusted too tightly	Check hub bearing adjustments Sections E and F	Adjust as necessary
	Worn or damaged hub bearings	Remove hubs and examine bearings	Fit new bearings

Fault diagnosis—Wheels and tyres—*continued*

Symptom	Possible cause	Investigation	Remedy
Squeaks from wheels—cont.	Interference of brake drum with brake shoes	Check the brake drum for distortion and scoring. Check the brake shoes for damage or warping	Rectify or fit new parts as required
Other noises from wheels	Incorrect tyre pressures	Check tyre pressures	Adjust as necessary
	Foreign body embedded in tyre	Examine all tyres	Extract the embedded matter and repair or renew the tyre as necessary
	Variation in tread surface due to patch or damage	Examine all tyres	Fit new tyres as necessary
	Type or condition of tyre tread giving sound similar to gear noise	Ensure that tyres are of the recommended type and fitted correctly. Check tyre wear condition	Fit new tyres of the recommended type as necessary
	Wear in swivel pin housings		See Section E
	Wear in axle half shafts	}	} See Sections E and F
	Wear in differential		
Overheating of wheel bearings	Lack of lubrication to wheel bearings		Lubricate as described in Sections E and F
	Use of a poor quality or incorrect grade of lubricant	See Section X for recommended lubricants	Replenish with correct lubricants
	Wheel bearings adjusted too tightly	Check hub bearing adjustment, Sections E and F	Adjust as necessary
	Worn or damaged wheel bearings	Remove hubs and examine bearings	Fit new bearings as required
	Heat transfer from brake drums due to dragging brakes	Check brake shoe adjustment, Section H	Adjust as necessary
	Excessive use of brakes		In the hands of the operator
	Foreign matter in bearings	Remove hubs and examine bearings	Fit new parts as required

DETAILED INDEX**FOR INDEX OF SECTIONS A TO C, PART ONE REFERS**

	Description	Operation Number	
		Remove/Refit	Check/Overhaul
G	Glass, cab	Q1-11	—
	Glass, rear door	Q1-15	Q1-11
	Glass, side door	Q1-5	Q1-11
	Glass, side, hard top	Q1-12	Q1-11
	Glass, side, Station Wagon	Q1-14	Q1-11
	Glass, windscreen	Q1-4	—
	Grille, radiator	Q1-2	—
H	Hand brake lever	H1-13	H1-13
	Hand brake, transmission	C1-4	H1-11
	Hand control, engine speed, Diesel	P1-3	—
	Headlamps	N1-2	N1-2
	Heater plugs, Diesel	N1-14	N1-14
	Heater plug and starter switch, Diesel	N1-8	—
	Horn	N1-18	N1-18
	Horn button	N1-17; G1-3	—
	Housing, swivel pin	F1-9	F1-10
	Hub, front	F1-4	F1-5
	Hub, rear	E1-5	E1-6
	I	Injector, fuel, Diesel	A2-6
Inner tube		R1-1	—
Instruments		P1-1; P1-1A	—
L	Lamp, head	N1-2	—
	Lamp, number plate	N1-6	—
	Lamp, rear	N1-4	—
	Lamp, side	N1-3	—
	Lamp, stop	N1-4	—
	Level unit, fuel tank, side mounted	L1-10	—
	Level unit, fuel tank, rear mounted	L1-11	—
	Lever, hand brake	H1-13	H1-13
	Lever, hand speed control, Diesel	P1-3	—
	Lever, steering	F1-10	—
	Lever, steering relay	G1-9	—
	Light, warning, instrument panel	P1-1; P1-1A	—
	Link, drag	G1-4	—
	Lock, door	Q1-5	—
	Longitudinal tube, steering	G1-5	—
	Lubrication	Section X	—

DETAILED INDEX**FOR INDEX OF SECTIONS A TO C, PART ONE REFERS**

Description	Operation Number	
	Remove/Refit	Check/Overhaul
M Master cylinder, 'CV' type	H1-5	H1-6
Master cylinder, 'CB' type	H1-7	H1-8
Master cylinder, 'CV' type, with servo	H1-5A	H1-6A
Mixture control, Petrol	P1-4	—
N Nozzle, fuel injector, Diesel	A2-6	L1-16
Number plate lamp	N1-6	—
O Oil pressure warning light	P1-1; P1-1A	—
P Pedal, accelerator	P1-3	—
Pedal, brake	H1-4	H1-4
Pedal, brake, with mechanical servo	H1-4A	H1-4A
Petrol pump, mechanical, 2¼ litre	A1-13	L1-5
Petrol pump, electric, 2.6 litre	L1-6	L1-7
Petrol sediment bowl	L1-12	—
Petrol tank, side mounted	L1-8	—
Petrol tank, rear mounted	L1-9	—
Petrol tank level unit, side tank	L1-10	—
Petrol tank level unit, rear tank	L1-11	—
Pipe, brake	H1-9	—
Plug, heater, 2¼ litre Diesel	N1-14	N1-14
Priming fuel system, Diesel	—	L1-14
Propeller shaft, front	D1-2	D1-3
Propeller shaft, rear	D1-2	D1-3
R Rear axle	E1-16	—
Rear axle casing	E1-15	—
Rear axle shaft	E1-2; E1-3A	E1-3; E1-3A
Rear body	Q1-13	—
Rear door	Q1-15	—
Rear side doors	Q1-5	—
Relay unit, steering	G1-9	G1-10
Road spring, front	F1-12	F1-13
Road spring, rear	E1-9	E1-10
Road wheel	R1-1; R1-2	—
Rod, track	G1-4	—
Roof, cab	Q1-11	—
Roof, hard top	Q1-12	—
Roof, Station Wagon	Q1-14	—

DETAILED INDEX**FOR INDEX OF SECTIONS A TO C, PART ONE REFERS**

Description	Operation Number	
	Remove/Refit	Check/Overhaul
S Seat base	Q1-10	—
Sediment bowl, Petrol	L1-12	—
Sedimenter, Diesel	L1-15	—
Servo unit, hydraulic, brakes	H1-14	H1-15
Servo unit, mechanical, brakes	H1-14A	H1-15A
Shackle pin	E1-9; F1-12	E1-10; F1-13
Shaft, front axle	F1-6	F1-7
Shaft, rear axle	E1-2; E1-3A	E1-3; E1-3A
Shaft, propeller, front	D1-2	D1-3
Shaft, propeller, rear	D1-2	D1-3
Shock absorber	E1-7	E1-7
Shoe, 10 in. brakes, front and rear	H1-10	H1-12
Shoe, 11 in. brakes, front	H1-10A	H1-12
Shoe, 11 in. brakes, rear, Series II	H1-10B	H1-12
Shoe, 11 in. brakes, rear, Series IIA	H1-10C	H1-12
Shoe, transmission brake	H1-11	H1-12
Side lamp	N1-3	—
Side screen	Q1-5	—
Silencer, exhaust, 2¼ litre	M1-1	—
Silencer, exhaust, 2.6 litre	M1-2	—
Solenoid, starter, 2¼ litre Diesel	N1-21	N1-21
Speedometer	P1-1; P1-1A	—
Speedometer cable	P1-2	—
Spring, road, front	F1-12	F1-13
Spring, road, rear	E1-9	E1-10
Starter motor, Petrol models	A1-9; A3-9	N1-20
Starter motor, 2¼ litre Diesel	A2-9	N1-21
Steering ball joints	—	G1-6
Steering box	G1-7	G1-8
Steering box adjustment	—	G1-8
Steering column	G1-7	G1-8
Steering drag link	G1-4	—
Steering longitudinal arm	G1-5	—
Steering relay	G1-9	G1-10
Steering track rod	G1-4	—
Steering wheel	G1-3	—
Stop lamp	N1-4	—
Stop lever, Diesel	P1-5	—
Stub axle, front	F1-4	F1-5
Stub axle, rear	E1-5	E1-6
Supply tank, brake and clutch	H1-3	—
Switch, lamps	P1-1; P1-1A	—
Switch, panel lights	P1-1; P1-1A	—
Switch, starter, Petrol	N1-8	—
Switch, starter and heater plug, Diesel	N1-8	—

DETAILED INDEX

FOR INDEX OF SECTIONS A TO C, PART ONE REFERS

Description	Operation Number	
	Remove/Refit	Check/Overhaul
S Switch, stop lamp	N1-7	—
Swivel pins	F1-9	F1-10
T Tailboard	Q1-12	—
Tail lamp	N1-4	—
Tank, brake and clutch supply	H1-3	—
Tank, fuel, side mounted	L1-8	—
Tank, fuel, rear mounted	L1-9	—
Toe-in, front wheels	—	G1-2
Tools	Section Z	—
Track rod	G1-4	—
Transmission brake	C1-4	H1-11
Tyre, road wheel	R1-1; R1-2	—
U Universal joints, front axle	F1-6	F1-7
Universal joint, propeller shafts	D1-2	D1-3
V Ventilator, windscreen	Q1-9	—
Voltage control box	N1-16	—
W Warning light, fuel, Diesel	P1-1; P1-1A	—
Water pump, 2¼ litre Petrol	A1-11	K1-2
Water pump, 2.6 litre Petrol	A3-11	K1-2
Water pump, 2¼ litre Diesel	A2-11	K1-2
Water temperature gauge	P1-1; P1-1A	—
Wheel alignment, front	—	G1-2
Wheel cylinder, 10 in. brakes, front and rear	H1-10	H1-10
Wheel cylinder, 11 in. brakes, front	H1-10A	H1-10A
Wheel cylinder, 11 in. brakes, rear, Series II	H1-10B	H1-10B
Wheel cylinder, 11 in. brakes, rear, Series IIA	H1-10C	H1-10C
Wheel, road	R1-1; R1-2	—
Wheel, steering	G1-3	—
Windscreen	Q1-4	—
Windscreen fastener	Q1-4	—
Windscreen wiper	N1-19	—
Windscreen ventilator	Q1-9	—
Wing, front	Q1-3	—

