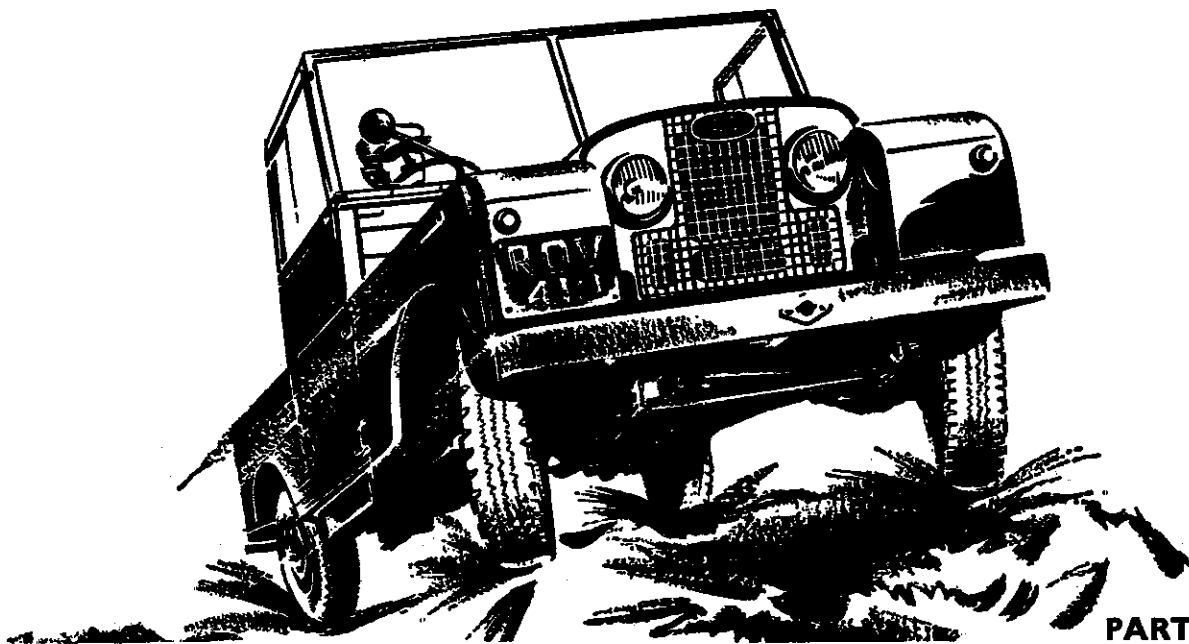


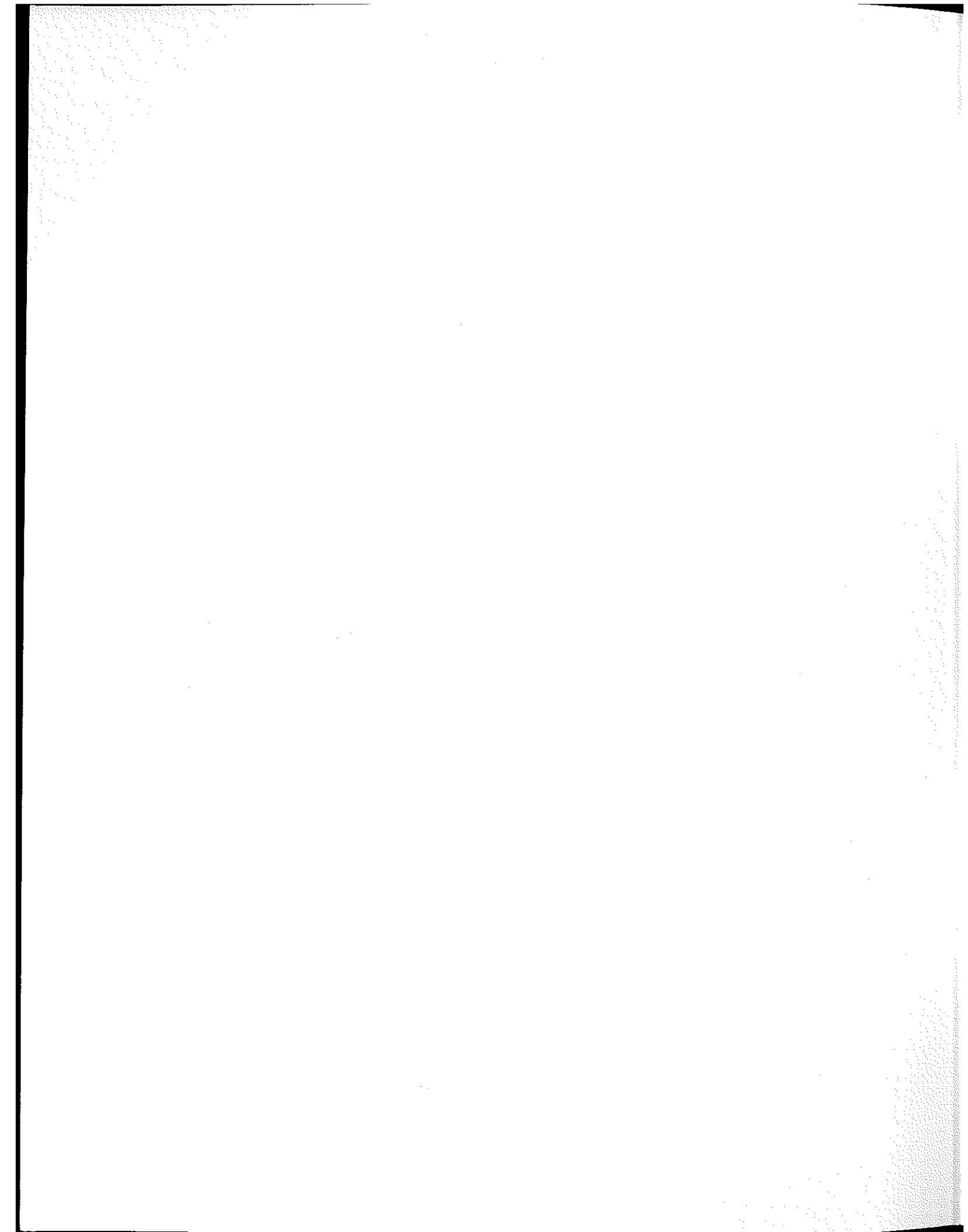
# INSTRUCTION MANUAL



PART No. 4277

**LAND-  
-ROVER**

*1948-58  
SERIES I*



# Instruction Manual

FOR THE



REGISTERED TRADE MARK

## 1948-58 SERIES I MODELS

80 models, 1948-53

86 and 107 models, 1954-55

88 and 109 models, 1956-58

### The Rover Company Ltd.

**SOLIHULL, WARWICKSHIRE**

Telephone : SHEldon 4242

Telegrams : Rovrepair, Solihull  
Telex : 33-156

*By Appointment  
to Her Majesty  
Queen Elizabeth II*



*Manufacturers  
of Motor Cars and  
Land-Rovers*

*The Rover Company Ltd.*

*Service Dept. :*

**SOLIHULL, WARWICKSHIRE**

Telephone :  
SHEldon 4242

Telegrams :  
Rovrepair, Solihull

*London Service Station :*

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LONDON, S. W. 6**

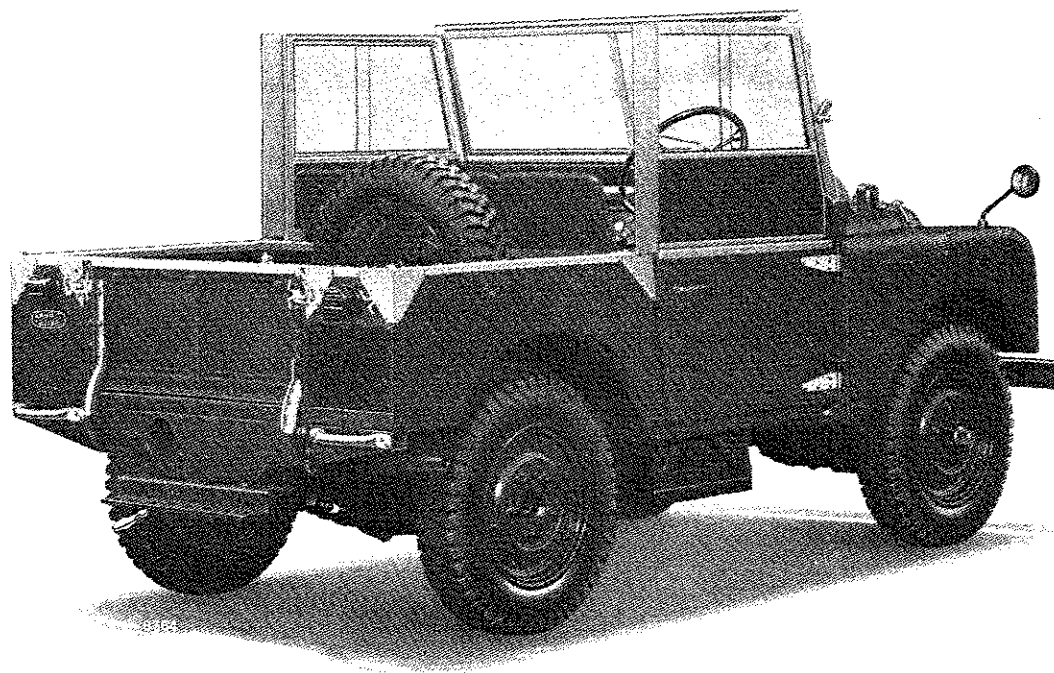
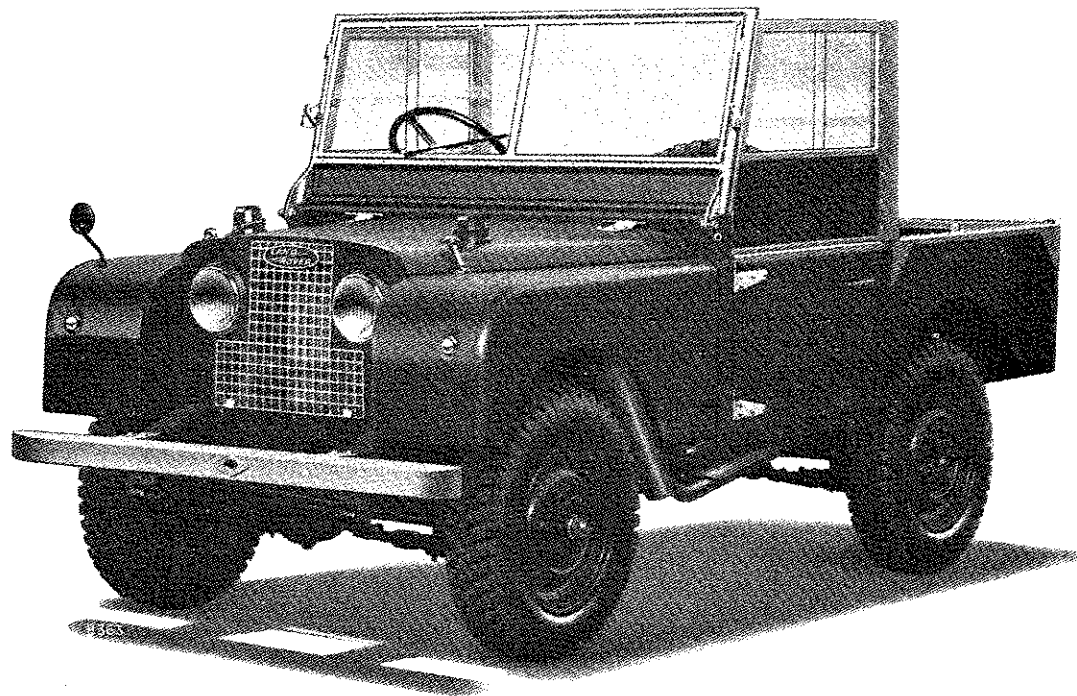
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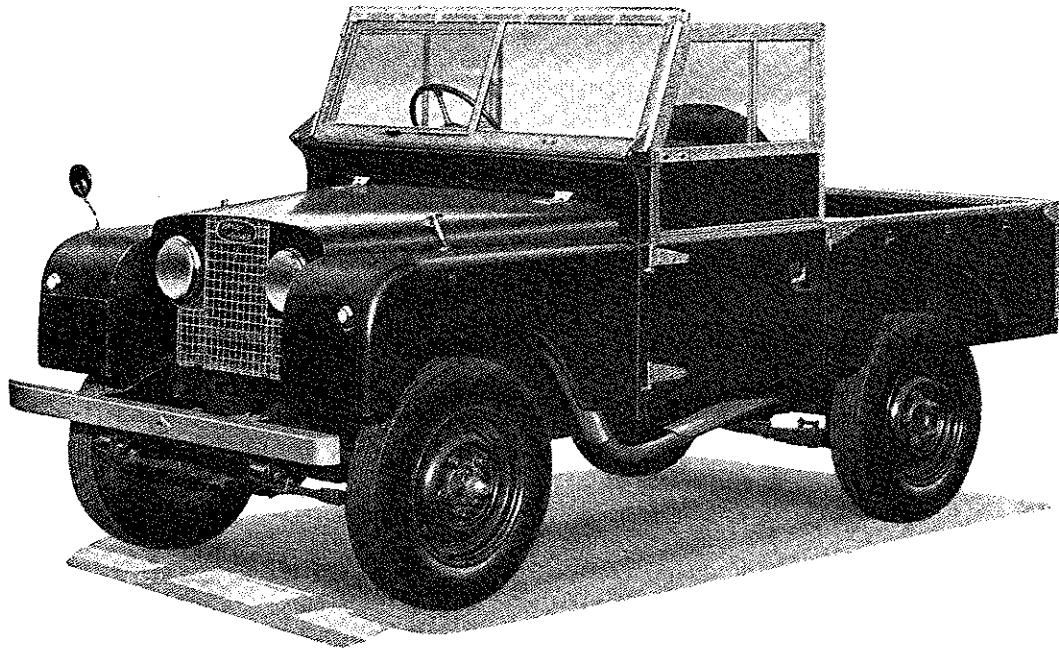
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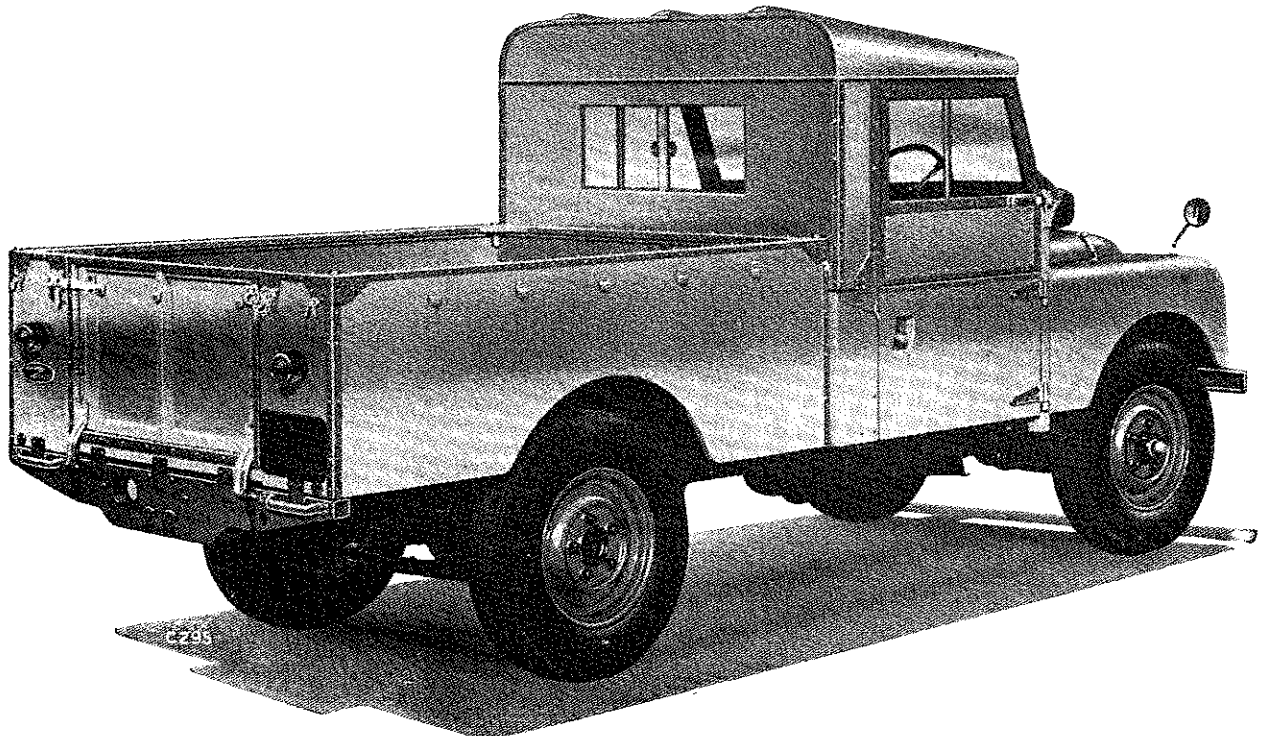
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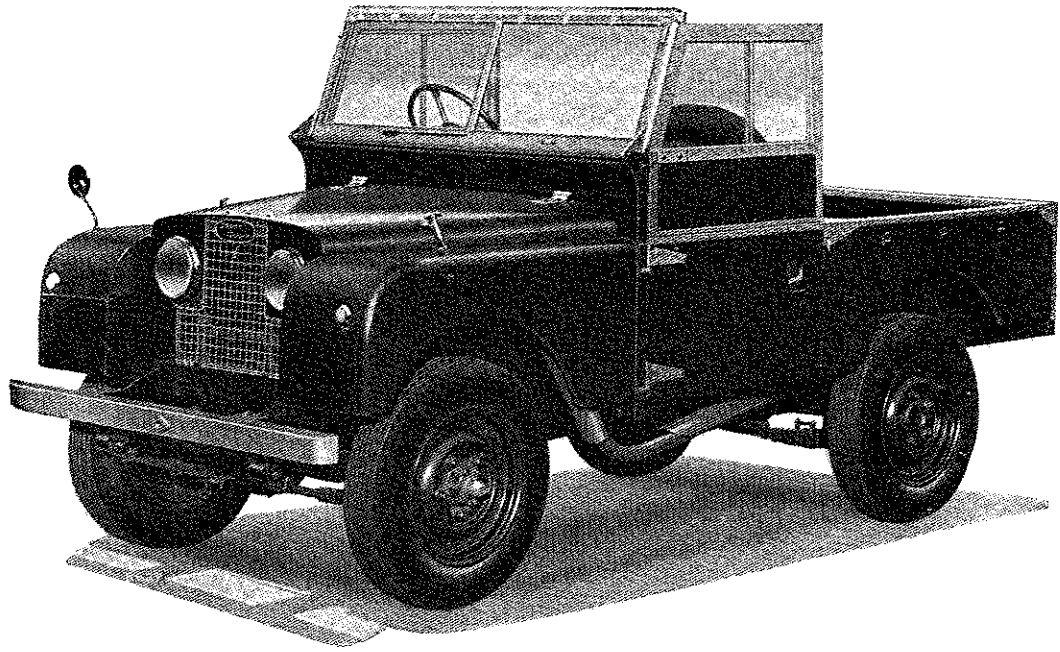
LAND-ROVER 1948-53



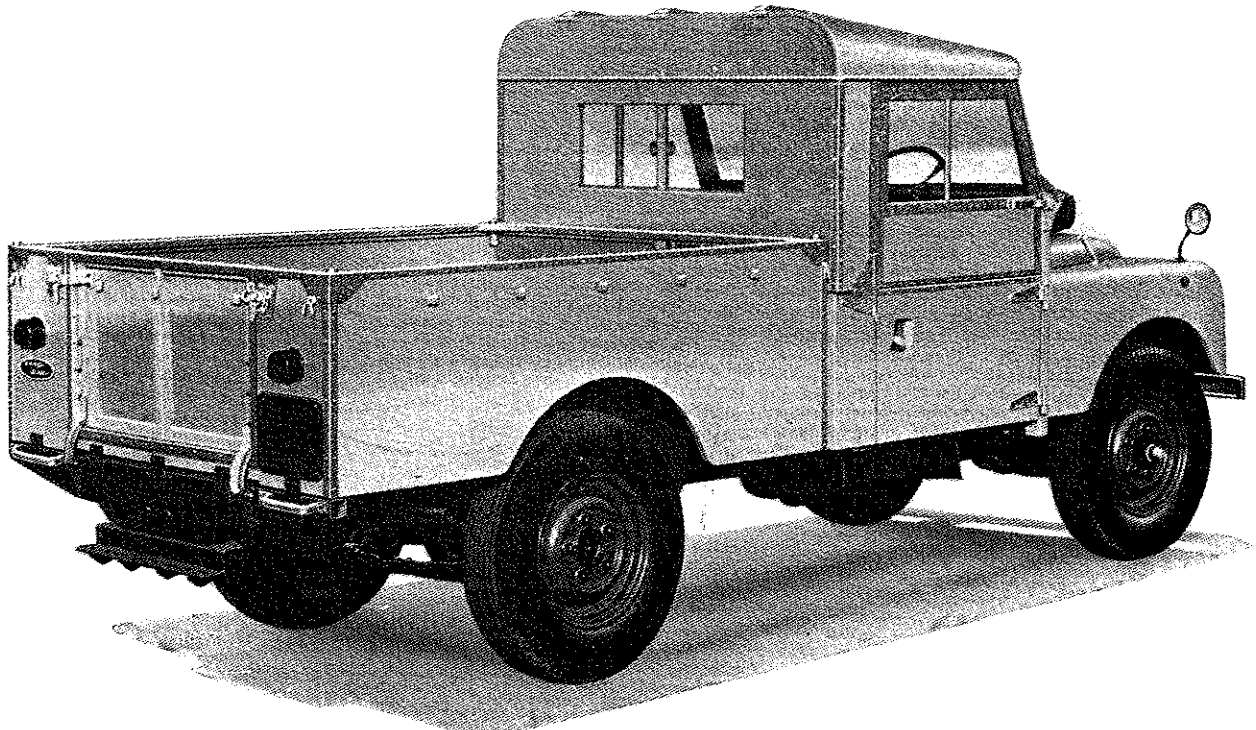
LAND-ROVER 86 and 88



LAND-ROVER 107 and 109



LAND-ROVER 86 1954



LAND-ROVER 107 1954

# Introduction

Every effort has been made in the design of the Land-Rover to reduce the amount of attention which the owner must devote to upkeep; this manual provides all the information necessary for periodic maintenance attention. All models are very similar in design, differences being noted at appropriate points in the text.

For ease of reference, the manual is divided into three distinct sections:—

Section A describes the driving controls and includes general information to assist in operating the vehicle to the best advantage.

Section B deals with all the maintenance items.

Section C gives details of the facilities offered by our Service Department.

Although the instructions have been made as simple and clear as possible, there may be occasions when the owner finds himself in some difficulty, in which case reference should be made either to a Rover distributor or dealer or direct to our Service Department (see Section C).

It is well to read this book carefully on receipt of the vehicle, particular attention being paid to the running-in instructions on Page E-18.

## VEHICLE SERIAL NUMBERS.

The vehicle serial number, comprising eight or nine digits, will be found on the transfer box instruction plate on the dash panel over the gearbox cover. It is the same as the chassis number, which is stamped on the left-hand rear spring shackle bracket.

The full vehicle serial number must be quoted in all correspondence; the registration number of the vehicle is of no use whatever to us.

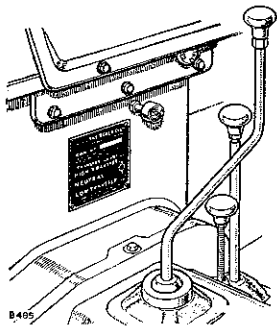


Fig. 1.  
Vehicle serial number.

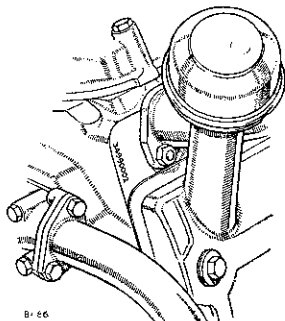


Fig. 2  
Engine serial number.

The engine serial number, which need not be quoted in correspondence unless specifically asked for, is stamped on the left-hand side of the cylinder block at the front.

Other units bear serial numbers as detailed below, but they should not be quoted unless specifically requested:—

Gearbox number: Right-hand side of gearbox casing at rear.

Rear axle: On top of axle casing on left-hand side.

Front axle: On top of axle casing on left-hand side.

## NOMENCLATURE.

To cater for both right- and left-hand drive models, reference is made throughout the text to the "left-hand" and "right-hand" 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 drive" models are those having the driving controls on the left-hand side, again when the vehicle is viewed from the rear.

In some instances the abbreviation "L.H.D." is used to denote left-hand drive and "R.H.D." for right-hand drive.

Horse-power figures are quoted in British units.

## SPECIFICATION.

It will be realised that from time to time alterations in design and in the make of various accessories occur and this instruction manual, while being kept up-to-date as far as possible, is not to be taken as a standard specification. The specification may be altered at any time, without incurring any obligation to incorporate such alteration in vehicles already delivered.

## GENUINE ROVER PARTS.

All Rover owners should recognize the importance which attaches to the use of only GENUINE ROVER PARTS or ROVER APPROVED PARTS when repair or maintenance work is being carried out on their cars.

Rover parts are produced to the same high standard as those parts built into the car in its original production, and for this and other reasons it is in their interests that Rover owners should insist that only GENUINE ROVER PARTS or ROVER APPROVED PARTS are fitted to their cars.

THE ROVER CO. LTD.,  
SOLIHULL, WARWICKSHIRE,  
ENGLAND.

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## GENERAL DATA

### ENGINE 1948-51

Bore	69,5 mm (2.73 in.)
Stroke	105 mm (4.133 in.)
Number of cylinders	4
Cylinder capacity	1,595 cc. (97.34 cu. in.)
Compression ratio	6.8-1
R.A.C. rating	11.98 h.p.
B.H.P.	50-55 at 4,000 r.p.m.
Maximum torque	80 lb/ft. (11 mkg) at 2,000 r.p.m.
Firing order	1-3-4-2
Sparkling plugs	Lodge HLNR
Sparkling plug point gap	.023 in.-.026 in. (0,6-0,65 mm)
Distributor contact breaker gap	.012 in. (0,30 mm)
Ignition timing (static—full retard)	15° B.T.D.C.
Valve timing (No. 1 exhaust valve peak)	114° B.T.D.C.
Tappet clearance:	
Inlet	.010 in. (0.25 mm) } Engine cold or at
Exhaust	.012 in. (0.30 mm) } running temperature
Vibration damper	Integral with fan driving pulley
Valve gear—inlet	Overhead operated by followers and push rods
"    "—exhaust	Side operated by direct rockers
Oil pressure	40 lb/sq.in. (2,8 kg/cm <sup>2</sup> ) at 30 m.p.h. (50 km/h) in top gear with engine warm
Lubrication	Full pressure
Oil filter—internal	Gauze pump intake filter in sump
"    "—external	By-pass pressure filter A.C. Type ZS1
Mountings	Four-point rubber

### ENGINE 1952-54

Bore	77,8 mm (3.063 in.)
Stroke	105 mm (4.133 in.)
Number of cylinders	4
Cylinder capacity	1,997 cc. (121.9 cu.in.)
Compression ratio	6.8-1
R.A.C. rating	15 h.p.
B.H.P.	52 at 4,000 r.p.m.
Maximum torque	101 lbs/ft. (14 mkg) at 1,500 r.p.m.
Firing order	1-3-4-2
Sparkling plugs	Lodge CLN
Sparkling plug point gap	.023 in.-.026 in. (0,60-0,65 mm)
Distributor contact breaker gap	.015 in. (0,38 mm)
Ignition timing (static—full retard)	1952-53: 8° B.T.D.C.    1954: 10° B.T.D.C.
Valve timing (No. 1 exhaust valve peak)	114° B.T.D.C.
Tappet clearance:	
Inlet	.010 in. (0,25 mm) } Engine cold or at
Exhaust	.012 in. (0,30 mm) } running temperature
Vibration damper	Integral with fan driving pulley
Valve gear—inlet	Overhead operated by followers and push rods
"    "—exhaust	Side operated by direct rockers
Oil pressure	35-45 lb/sq.in. (2,5-3,2 kg/cm <sup>2</sup> ) at 30 m.p.h. (50 km/h) in top gear with engine warm
Lubrication	Full pressure
Oil filter—internal	Gauze pump intake filter in sump
"    "—external	By-pass pressure filter A.C. type ZS1
Mountings	Four-point rubber

### ENGINE 1955-58

Bore	77,8 mm. (3.063 in.)
Stroke	105 mm (4.134 in.)
Number of cylinders	4
Cylinder capacity	1997 c.c. (121.8 cu.in.)
Compression ratio	6.7-1. Copper and asbestos gasket 6.9-1. Corrugated steel gasket

R.A.C. rating	15 H.P.
B.H.P.	52 at 4,000 R.P.M.
Maximum torque	101 lb./ft. (14 mKg.) at 1,500 R.P.M.
Firing order	1, 3, 4, 2
Sparking plugs	14 mm. with suppressors
Sparking plug point gap	.029 to .032 in. (0,75 to 0,80 mm.)
Distributor contact breaker gap	.014 to .016 in. (0,35 to 0,40 mm)
Ignition timing (static—full retard)	10° B.T.D.C.
Tappet clearance—inlet	.010 in. (0,25 mm.)
"    "    —exhaust	.012 in. (0,30 mm.)
Valve timing (No. 1 exhaust valve peak)	114° B.T.D.C.
Number of crankshaft bearings	3
"    "    camshaft bearings	4
Vibration damper	Integral with fan driving pulley
Valve gear—inlet	Overhead operated by followers and push rods
"    "    —exhaust	Side operated by direct rockers
Oil pressure	55 to 65 lb./sq.in. (3,8 to 4,6 kg./cm. <sup>2</sup> ) at 30 m.p.h. (50 k.p.h.) in top gear with engine warm
Lubrication	Full pressure
Oil filter—internal	Gauze pump intake filter in sump
"    "    —external	Full-flow filter
Mountings	Four-point rubber

### CLUTCH

Type	Single dry plate 9 in. (230 mm.) diameter
Adjustment	$\frac{3}{8}$ in. (20 mm.) free movement at pedal pad

### MAIN GEARBOX

Type	Single helical constant mesh with synchro-mesh on top and third speeds
------	--

### TRANSFER BOX

Type	Two speed reduction on main gearbox output
Front wheel drive	Two/four wheel drive control on transfer box output

1948-51

Front wheel drive lock	On vehicles numbered up to: 16100602, 16131572, 16160908, 16200000, 16230080, 16260020, 16300002, 16330001, 16360006, 16630024 and 16660786 Front wheel drive incorporating over-run freewheel unit
------------------------	---

1952-54

Front wheel drive lock	From vehicles numbered: 16100603, 16131573, 16160909, 16200001, 16230081, 16260021, 16300003, 16330002, 16360007, 16630025 and 16660787 onwards Front wheel drive incorporating dog clutch
------------------------	--

### PROPELLER SHAFTS

Type	Open type to both axles
------	-------------------------

### REAR AXLE

86 and 88

Type	Spiral bevel; semi-floating shafts. Fully floating shafts optional extra on 1955-58 models
Ratio	4.7-1 (4.88-1 for axles numbered up to 861371)

109 vehicles up to 121704769

107 Station Wagon vehicles up to 131701305

Type	Spiral bevel; semi-floating shafts
Ratio	4.7-1

109 vehicles 121704770 onwards

107 Station Wagon vehicles 131701306 onwards

Type	Spiral bevel; fully floating shafts
Ratio	4.7-1

### FRONT AXLE

Differential	Spiral bevel
Front wheel drive	Enclosed universal joints (Tracta joints on 1948-53 models)
Ratio	4.7-1 (4.88-1 for axles numbered up to 861371)

## GEAR RATIOS

Main gearbox:	Top	Direct
	Third, Gearboxes numbered prior to 06106001	1.490-1
	Third, Gearboxes numbered 06106001 onwards	1.377-1
	Second	2.043-1
	First	2.996-1
	Reverse	2.547-1

Transfer gearbox:	High transfer	1.148-1
	Low transfer	2.888-1

Overall ratio (final drive) 1948-54	In High Transfer		In Low Transfer	
	Rear axles numbered 860001 to 861319	Rear axles numbered 861320 onwards	Rear axles numbered 860001 to 861319	Rear axles numbered 861320 onwards
Top gear	5.612	5.396	14.122	13.578
Third (gearboxes numbered prior to 06106001)	8.362	8.039	21.042	20.229
Third (gearboxes numbered 06106001 onwards)	—	7.435	—	18.707
Second	11.466	11.026	28.852	27.742
First	16.814	16.171	42.310	40.688
Reverse	14.295	13.745	35.970	34.585

Overall ratio (final drive) 1955-58		
	In High Transfer	In Low Transfer
	Top	5.396-1
Third	7.435-1	18.707-1
Second	11.026-1	27.742-1
First	16.171-1	40.688-1
Reverse	13.745-1	34.585-1

## FUEL SYSTEM

Petrol pump	Electric
Carburettor	Down-draught type
Air cleaner	Oil bath type with integral centrifugal pre-cleaner
Filter	Sediment bowl type

## COOLING SYSTEM

Type	Pump, fan and thermostat ; pressurised
------	--

## ELECTRICAL SYSTEM

Type	Positive earth
Voltage	12
Battery capacity	51 A.H.
Ignition system	Coil
Charging circuit	Compensated voltage control

## SUSPENSION

Road springs	Semi-elliptic leaf
Hydraulic dampers	Telescopic ; non-adjustable

## BRAKES

Foot brake—Land-Rover 80, 86 and 88 Hydraulic, 10 in. brake drums  
 " " —Land-Rover 107 and 109 Hydraulic, 11 in. brake drums  
 Hand brake Mechanical on transfer box output shaft

## STEERING

80, 86 and 107 type Worm and nut Ratio: 15-1  
 88 and 109 type Recirculating ball Ratio: straight ahead 15 6-1  
 full lock 23 8-1  
 Front wheel toe-in  $\frac{3}{8}$  to  $\frac{3}{16}$  in. (1,2 to 2,4 mm)  
 Camber angle  $1\frac{1}{2}^\circ$   
 Caster angle  $3^\circ$   
 Swivel pin inclination  $7^\circ$

## WHEELS

Type 16 in. well-base or divided

## TYRES

Size 6.00-16, 6.50-16 or 7.00-16 (see Page E-35)  
 Pressures See Page E-36

CAPACITIES	1948-51			1952-53			1954-58		
	Imperial Unit	U.S. Unit	Litres	Imperial Unit	U.S. Unit	Litres	Imperial Unit	U.S. Unit	Litres
Engine sump oil	10 pints	12 pints	5,5	10 pints	12 pints	5,5	10 pints	12 pints	5,5
Extra when refilling after fitting new filter	—	—	—	—	—	—	1 pint	1 2 pints	0,5
Air cleaner oil	2 pints	2 4 pints	1	2 pints	2 4 pints	1	1 5 pints	2 pints	0,85
Main gear box oil	4 pints	4 8 pints	2,25	2 5 pints	3 pints	1,5	2 5 pints	3 pints	1,5
Transfer box oil	6 pints	7 pints	3,5	4 5 pints	5 5 pints	2,5	4 5 pints	5 5 pints	2,5
Rear differential	3 pints	3 5 pints	1,75	3 pints	3 5 pints	1,75	3 pints	3 5 pints	1,75
Front differential	3 pints	3 5 pints	1,75	3 pints	3 5 pints	1,75	3 pints	3 5 pints	1,75
Swivel pin housing (each)	1 pint	1 2 pints	0,5	1 pint	1 2 pints	0,5	1 pint	1 2 pints	0,5
Fuel tank	10 gallons	12 gallons	45,0	10 gallons	12 gallons	45,0	10 gallons	12 gallons	45,0
Cooling system	17 pints	20 5 pints	9,75	17 pints	20 5 pints	9,75	17 pints	20 5 pints	9,75

DIMENSIONS	1948-51		1952-53		1954 88"		1954 107"	
	British	Metric	British	Metric	British	Metric	British	Metric
Overall length	132 in.	3,35 m	132 in.	3,35 m	141 in.	3,56 m	173 $\frac{1}{2}$ in.	4,41 m
Overall width	61 in.	1,55 m	61 in.	1,55 m	62 $\frac{9}{16}$ in.	1,59 m	62 $\frac{9}{16}$ in.	1,59 m
Overall unladen height, hood up	73 $\frac{1}{2}$ in.	1,92 m	73 $\frac{1}{2}$ in.	1,92 m	76 in.	1,93 m	83 $\frac{1}{2}$ in.	2,12 m
Overall unladen height, hood down, screen up	67 in.	1,70 m	67 in.	1,70 m	68 in.	1,73 m	—	—
Overall unladen height, hood down, screen down	56 in.	1,42 m	56 in.	1,42 m	57 $\frac{1}{2}$ in.	1,46 m	—	—
Overall unladen height, with truck cab or hard top	72 $\frac{1}{2}$ in.	1,89 m	72 $\frac{1}{2}$ in.	1,89 m	75 in.	1,91 m	78 in.	1,98 m
Wheelbase	80 in.	2,03 m	80 in.	2,03 m	86 in.	2,18 m	107 in.	2,72 m
Track	50 in.	1,27 m	50 in.	1,27 m	50 in.	1,27 m	50 in.	1,27 m
Turning circle (6.00-16 tyres)	35 ft.	10,5 m	35 ft.	10,5 m	37 ft.	11,3 m	—	—
Turning circle (7.00-16 tyres)	40 ft.	12,2 m	40 ft.	12,2 m	41 $\frac{1}{2}$ ft.	12,7 m	48-49 ft.	14,6-14,9 m

<i>DIMENSIONS cont.</i>	1948-51		1952-53		1954 88"		1954 107"	
	British	Metric	British	Metric	British	Metric	British	Metric
Unladen ground clearance, under differentials (6.00-16 tyres)	8½ in.	216 mm	8½ in.	216 mm	8 in.	203 mm	-	-
Unladen ground clearance, under differentials (7.00-16 tyres)	9¼ in.	235 mm	9¼ in.	235 mm	8¾ in.	222 mm	8¾ in.	222 mm
Weight (less water and petrol)	2302 lbs.	1043 kg.	2302 lbs.	1043 kg.	2707 lbs.	1226 kg.	3088 lbs.	1401 kg.
Weight (running, with water, oil, 5 gallons petrol)	2604 lbs.	1182 kg.	2604 lbs.	1182 kg.	3009 lbs.	1365 kg.	3248 lbs.	1473 kg.
Weight (maximum approved gross load, normal roads)	4032 lbs.	1829 kg.	4032 lbs.	1829 kg.	4152 lbs.	1897 kg.	4688 lbs.	2126 kg.
Weight (maximum approved gross load, cross country)	-	-	-	-	3990 lbs.	1810 kg.	4885 lbs.	2227 kg.
Maximum approved payload (normal loads)	1000 lbs.	450 kg.	1000 lbs.	450 kg.	Driver, two passengers and 1000 lbs. 450 kg.		Driver, two passengers and 1500 lbs. 678 kg.	
Maximum approved payload (cross country)	-	-	-	-	Driver, two passengers and 800 lbs. 363 kg.		Driver, two passengers and 1200 lbs. 544 kg.	
Maximum drawbar pull (dependent upon surface conditions)	1200-2000 lbs.	550-900 kg.	1200-2000 lbs.	550-900 kg.	1200-2000 lbs.	550-900 kg.	1200-2000 lbs.	550-900 kg.
Internal body dimensions—length	37½ in.	952 mm	37½ in.	952 mm	45¾ in.	1,16 m	72¾ in.	1,85 m.
Internal body dimensions—width	56½ in.	143 mm	56½ in.	143 mm	57 in.	1,45 m	57 in.	1,45 m
Internal body dimensions—depth	14½ in.	368 mm	14½ in.	368 mm	14¼ in.	3,62 m	20½ in.	5,20 m
Internal body dimensions—height of wheelarch	8¾ in.	222 mm	9 in.	229 mm	8¾ in.	2,22 m	8¾ in.	2,22 m
Internal body dimensions—width of wheelarch	11 in.	279 mm	12½ in.	318 mm	12 in.	3,05 m	12 in.	3,05 m
Internal body dimensions—height, floor to roof	45 in.	1,14 m	45 in.	1,14 m	-	-	-	-

<i>DIMENSIONS</i>	1955-58 86 and 88 Basic		1955-58 107 and 109 Basic		1955-58 86 and 88 Station Wagon		1955-58 107 Station Wagon	
	British	Metric	British	Metric	British	Metric	British	Metric
Overall length	140¾ in.	3,58 m.	173½ in.	4,41 m.	140¾ in.	3,58 m.	173½ in.	4,41 m.
Overall width	62⅞ in.	1,59 m.	62⅞ in.	1,59 m.	62⅞ in.	1,59 m.	62⅞ in.	1,59 m.
Overall unladen height, hood up	76 in.	1,93 m.	83½ in.	2,12 m.	-	-	-	-
Overall unladen height, hood down, screen up	68 in.	1,73 m.	-	-	-	-	-	-
Overall unladen height, hood down, screen down	57½ in.	1,46 m.	-	-	-	-	-	-
Overall unladen height, with truck cab or hard top	77 in.	1,96 m.	78 in.	1,98 m.	77 in.	1,96 m.	78 in.	1,98 m.

DIMENSIONS cont.—	1955-58 86 and 88 Basic		1955-58 107 and 109 Basic		1955-58 86 and 88 Station Wagon		1955-58 107 Station Wagon	
	British	Metric	British	Metric	British	Metric	British	Metric
Wheelbase, 86 and 107 models	86 in.	2,18 m.	107 in.	2,72 m.	86 in.	2,18 m.	107 in.	2,72 m.
Wheelbase, 88 and 109 models	88 in.	2,23 m.	109 in.	2,77 m.	88 in.	2,23 m.	109 in.	2,77 m.
Track	50 in.	1,27 m.	50 in.	1,27 m.	50 in.	1,27 m.	50 in.	1,27 m.
Turning circle (6.00-16 tyres), 86 models	37 ft.	11,3 m.	—	—	37 ft.	11,3 m.	—	—
Turning circle (6.00-16 tyres), 88 models	41 ft.	12,5 m.	—	—	41 ft.	12,5 m.	—	—
Turning circle (7.00-16 tyres), 86 and 107 models	40 ft.	12,2 m.	48-49 ft.	14,63-14,92 m.	40 ft.	12,2 m.	48-49 ft.	14,63-14,92 m.
Turning circle (7.00-16 tyres), 88 and 109 models	43 ft.	13,1 m.	50 ft.	15,25 m.	43 ft.	13,1 m.	—	—
Unladen ground clearance, under differentials (6.00-16 tyres)	8 in.	203 mm.	—	—	8 in.	203 mm.	—	—
Unladen ground clearance, under differentials (7.00-16 tyres)	8 $\frac{3}{4}$ in.	222 mm.	8 $\frac{3}{4}$ in.	222 mm.	8 $\frac{3}{4}$ in.	222 mm.	8 $\frac{3}{4}$ in.	222 mm.
Weight (less water and petrol)	2,678 lbs.	1,215 kg.	3,018 lbs.	1,369 kg.	2,906 lbs.	1,318 kg.	3,398 lbs.	1,541 kg.
Weight (running, with water, oil, 5 gallons petrol)	2,740 lbs.	1,243 kg.	3,080 lbs.	1,397 kg.	2,968 lbs.	1,346 kg.	3,460 lbs.	1,569 kg.
Weight (maximum approved gross load, normal roads)	*4,290 lbs.	*1,945 kg.	5,185 lbs.	2,352 kg.	*4,218 lbs.	*1,913 kg.	4,960 lbs.	2,250 kg.
Weight (maximum approved gross load, cross country)	4,090 lbs.	1,855 kg.	4,885 lbs.	2,216 kg.	4,018 lbs.	1,822 kg.	4,660 lbs.	2,114 kg.
Maximum approved payload (normal roads)	*Driver, two passengers and 1,000 lbs. 450 kg.		Driver, two passengers and 1,500 lbs. 678 kg.		*7 persons and 200 lbs. 91 kg.		10 persons, or 6 persons and 600 lbs. 272 kg.	
Maximum approved payload, cross country	Driver, two passengers and 800 lbs. 363 kg.		Driver, two passengers and 1,200 lbs. 544 kg.		7 persons		8 persons, or 6 persons and 300 lbs. 136 kg.	
Maximum drawbar pull (dependent upon surface conditions)	1,200 to 2,000 lbs.	550 to 900 kg.	1,200 to 2,000 lbs.	550 to 900 kg.	1,200 to 2,000 lbs.	550 to 900 kg.	—	—
Internal body dimensions—length	45 $\frac{3}{4}$ in.	1,16 m.	72 $\frac{3}{4}$ in.	1,85 m.	45 $\frac{3}{4}$ in.	1,16 m.	76 in.	1,93 m.
Internal body dimensions—width	57 in.	1,45 m.	57 in.	1,45 m.	57 in.	1,45 m.	57 in.	1,45 m.
Internal body dimensions—depth	14 $\frac{1}{4}$ in.	362 mm.	20 $\frac{1}{2}$ in.	520 mm.	—	—	—	—
Internal body dimensions—height of wheelarch	8 $\frac{11}{16}$ in.	221 mm.	8 $\frac{11}{16}$ in.	221 mm.	8 $\frac{11}{16}$ in.	221 mm.	8 $\frac{11}{16}$ in.	221 mm.
Internal body dimensions—width of wheelarch	12 in.	305 mm.	12 in.	305 mm.	12 in.	305 mm.	12 in.	305 mm.
Internal body dimensions—height floor to roof...	—	—	—	—	48 $\frac{1}{4}$ in.	1,2 m.	47 $\frac{1}{2}$ in.	1,21 m.

\* Maximum loads for cross country when heavy duty springs are fitted.

# SECTION A

## DESCRIPTION *and* DRIVING INSTRUCTIONS

### CONTROLS AND INSTRUMENTS

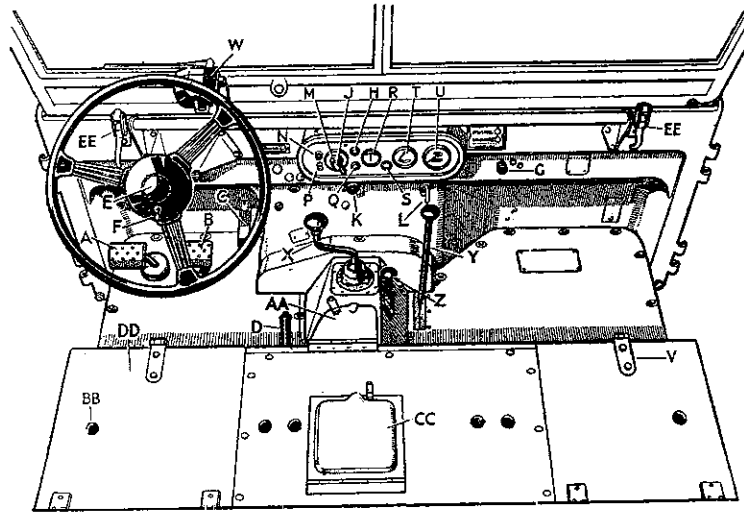


Fig. 3. Controls and instruments—1948-53.

- |                                  |                                     |                                     |
|----------------------------------|-------------------------------------|-------------------------------------|
| A—Clutch pedal                   | L—Slow-running control.             | W—Windscreen wiper.                 |
| B—Brake pedal                    | M—Lamp switch.                      | X—Main gear change lever.           |
| C—Accelerator pedal              | N—Instrument panel light switch.    | Y—Transfer box change lever.        |
| D—Hand brake.                    | P—Lead lamp socket.                 | Z—Front wheel drive lock.           |
| E—Horn button                    | Q—Charging warning light            | AA—Access cover for gearbox filler. |
| F—Headlamp dipper switch         | R—Ammeter.                          | BB—Location hole for seat           |
| G—Mixture control.               | S—Oil pressure warning light        | CC—Access cover for power take-off  |
| H—Mixture control warning light. | T—Petrol level gauge.               | control.                            |
| J—Ignition switch.               | U—Speedometer.                      | DD—Tool-box.                        |
| K—Starter switch.                | V—Access to petrol filler and brake | EE—Windscreen clamp.                |
|                                  | fluid reservoir.                    |                                     |

The controls and instruments are illustrated at Figs. 3 and 3A; the layout is similar to that on a normal car, with the addition of transfer box and front wheel drive controls.

#### FOOT PEDALS.

Normal in position and operation.

#### IGNITION SWITCH AND KEY.

Integral with the lamp switch in the centre of the instrument panel; turn the key clockwise for "on".

The key is detachable.

With the ignition "off", only the following electrical equipment can be used:—

Driving lights (head, side and tail lamps), instrument panel lights, lead lamp socket and horn.

#### IGNITION WARNING LIGHT.

The red warning light at the top centre of the panel appears when the dynamo fails to charge or the dynamo charging rate is low. It will glow when the ignition is switched on and the engine is stationary or running slowly and will go out when the engine speed rises

#### STARTER SWITCH.

On the dash panel below the instrument panel; to operate, press and release as soon as the engine fires.

#### MIXTURE CONTROL.

Marked "Cold Start" and mounted on the dash panel below the speedometer. See Page E-16 for operation.

#### MIXTURE CONTROL WARNING LIGHT.

Action of the amber warning light at the bottom right-hand corner of the panel is described on Page E-16.

#### OIL PRESSURE WARNING LIGHT.

The green warning light at the bottom left-hand corner of the panel glows when the engine oil pressure drops below a safe figure. It will light up when the engine is stationary and fade out when the engine starts and the oil pressure builds up to normal. See Page E-22 for further details.



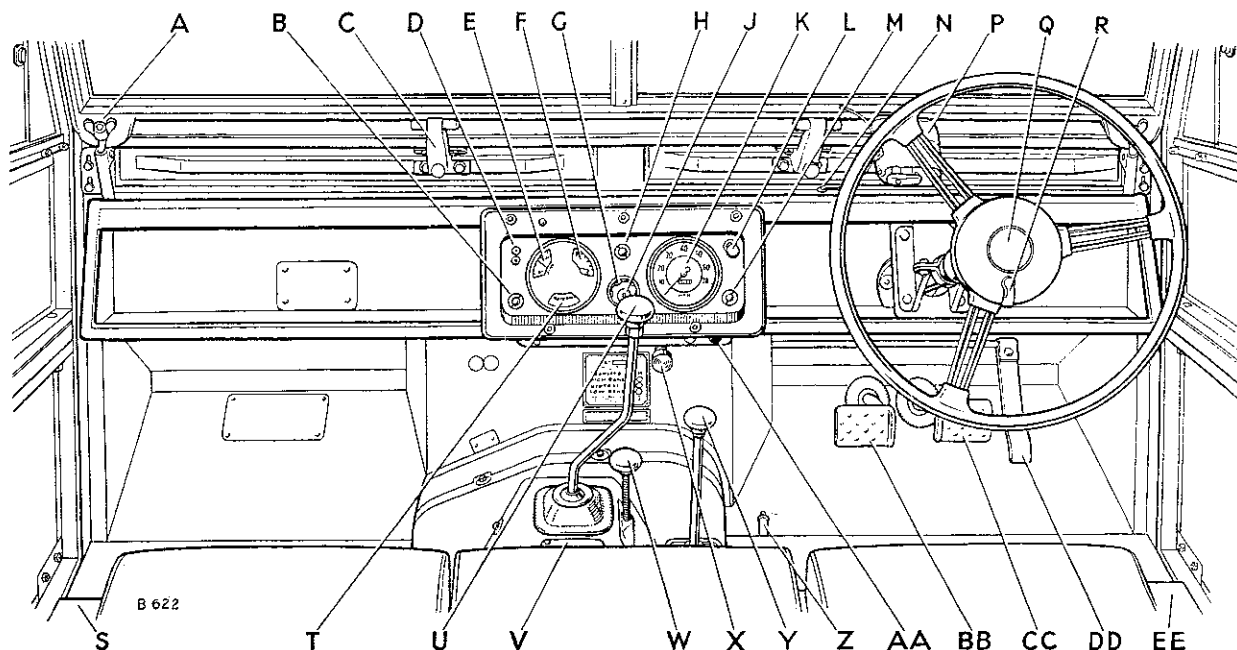


Fig. 3A Layout of controls and instruments—1954-58

- |                                |  |  |
|--------------------------------|--|--|
| A—Wingnuts securing windscreen | L—Instrument panel light switch        | W—Front wheel drive control                            |
| B—Oil pressure warning light   | M—Mixture control warning light        | X—Starter switch.                                      |
| C—Windscreen ventilators.      | N—Wiper lead plug.                     | Y—Transfer box lever.                                  |
| D—Lead lamp socket.            | P—Windscreen wiper.                    | Z—Hand brake.  |
| E—Ammeter.                     | Q—Horn button (86 and 107).            | AA—Mixture control.                                    |
| F—Petrol level gauge.          | R—Headlamp dipper switch (86 and 107). | BB—Clutch pedal.                                       |
| G—Lamp switch.                 | S—Access to tool locker.               | CC—Brake pedal.  |
| H—Ignition warning light.      | T—Headlamp warning light               | DD—Accelerator pedal.                                  |
| J—Ignition switch              | U—Main gear change lever.              | EE—Access to petrol tank and brake<br>fluid reservoir. |
| K—Speedometer.                 | V—Access to gearbox oil filler.        |  |

#### *SLOW-RUNNING CONTROL—1948-53*

Situated to the right of the starter switch is a slow-running control ; by pulling out this control, the engine idling speed may be increased when desired for stationary work. Prior to road usage, the idling speed should always be returned to normal to facilitate gear changing.

#### *HAND BRAKE.*

Protrudes through the front of the seat box. To release the brake, pull upwards slightly, depress the button in the top of the hand grip and push down as far as possible ; to apply the brakes, pull the lever upwards.

#### *HORN.*

86 and 107

Operated by the push button in the centre of the steering wheel.

88 and 109

The horn push button is housed on an extension arm attached to the steering column.

#### *AMMETER.*

The ammeter, in the multiple gauge, indicates the charging or discharging rate of the battery ; usually a charge reading of three or four amperes will be shown.

When starting from cold, the charge reading will rise to a steady maximum, remain constant for a short while and then fall to a steady charge most suitable for the particular state of charge of the battery.

#### *PETROL LEVEL GAUGE.*

The petrol level gauge, in the multiple panel, only operates with the ignition "on". This gauge is not a precision instrument and cannot be used to derive petrol consumption figures ; such tests must be made with an auxiliary tank of known size.

#### *INSTRUMENT PANEL LIGHT SWITCH.*

The push-pull switch controlling the panel lights, in the top right-hand corner of the panel, is only operative with the lamp switch at S or H.

### *WINDSCREEN WIPER SWITCH.*

To set the wiper in operation, pull out the blade lever, turn it to clear the switch lever and turn the latter through 90°. To park the blade, reverse these operations.

### *LAMP SWITCH.*

Turn the rotary lamp switch to the required position: OFF, S (side, tail and rear number plate lamps) or H (as S plus headlamps).

*NOTE.*—On North American vehicles, the side lamps are extinguished when the switch is moved to H and vice versa.

### *HEADLAMP DIPPER SWITCH.*

*86 and 107*

Operation of the dipper switch, on the steering wheel boss, replaces the primary filaments in both headlamps by secondary "out-of-focus" filaments directed towards the near-side of the road.

*88 and 109*

Fitted with a foot operated switch to the left of the clutch pedal.

### *HEADLAMP WARNING LIGHT.*

The small red warning light at the bottom centre of the multiple gauge glows when the primary headlamp beams are in use; its purpose is to remind the driver to switch off or dip the headlamps on entering a brightly-lit area.

### *LEAD LAMP SOCKET.*

In the top left-hand corner of the instrument panel are a pair of sockets which can be used either for a lead lamp or trickle battery charger; the red socket is earthed.

### *MAIN GEAR CHANGE LEVER.*

See Page E-17 for gear changing instructions.

### *TRANSFER BOX LEVER.*

The lever controlling the two-speed transfer box is situated to the right of the gearbox cover; it must be pushed right forward for normal high ratio work. See Page E-17 for instructions on use of the transfer box.

### *FRONT WHEEL DRIVE CONTROL.*

Operation of the yellow knob, protruding from the gearbox cover, controlling the front wheel drive is described on Page E-17.

## STANDARD BODY FITTINGS

The main characteristics of the Land-Rover models are brought out at Figs. 4, 5 and 6, but the following points may require explanation to ensure maximum utility from the vehicle.

### LOCKING THE VEHICLE.

To protect the vehicle against theft, the ignition key should always be removed when parking. As an additional precaution, the distributor rotor may be removed (see Page E-39) or the petrol tap on the sediment bowl turned "off" (see Page E-31).

When private locks and window catches are fitted, these should be secured when the vehicle is left unattended.

### BONNET.

The bonnet top panel is secured by a spring fastener on each side. To open, release the fasteners and raise the panel until the jointed prop rod can be pulled slightly forward at the joint.

The panel can be removed from the vehicle by withdrawing one of the split pins securing the prop rod and sliding off its hinges on the dash.

### FRONT BUMPER AND REAR DRAWBAR.

Attached by bolts and readily detachable for attention to accidental damage.

**NOTE.** The rear drawbar is an Extra for late models.

### TOWING ATTACHMENTS.

#### Early models.

Two forms of towing attachment are supplied as standard equipment. The towing plate can be

fixed to the rear drawbar, by means of the bolts provided, at any point along its length. As it is cranked and distance pieces are provided with the bolts, judicious assembly enables the towing hole to be arranged at varying heights from the ground, to suit a variety of appliances.

The towing jaw can be bolted to the centre of the rear chassis cross-member, using the bolts provided, and can be used for towing a trailer or other equipment.

#### Late models.

An attachment bracket and towing jaw are supplied as standard equipment.

The towing jaw can be bolted directly to the centre of the rear chassis cross-member and can be used for towing a trailer or other equipment.

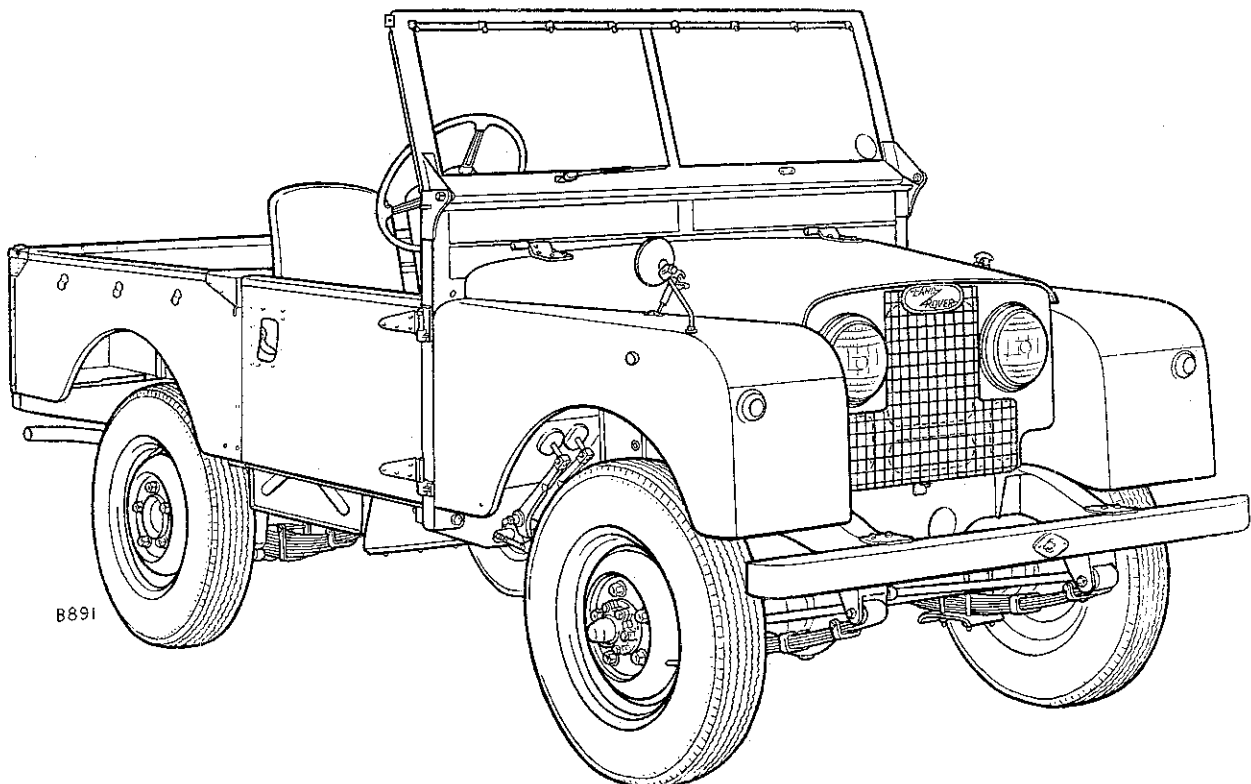
An alternative lower position is provided by fixing the attachment bracket to the centre of the rear chassis cross-member. The towing jaw can then be bolted to the two lower holes in the attachment bracket.

Alternative towing attachments and a trailer lamp lead are also available.

### SEATS.

Each seat cushion is detachable by releasing the securing strap at the front and withdrawing the retaining tongues from the slots in the back-rest panel.

Except on the de-luxe Land-Rover 107 and 109, the seat backs are secured in the upright position to the backrest panel by straps; if the vehicle is parked in inclement weather without a covering, they may be folded down on to the seat cushions.



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Fig. 4. Front view—Land-Rover 86 and 88.

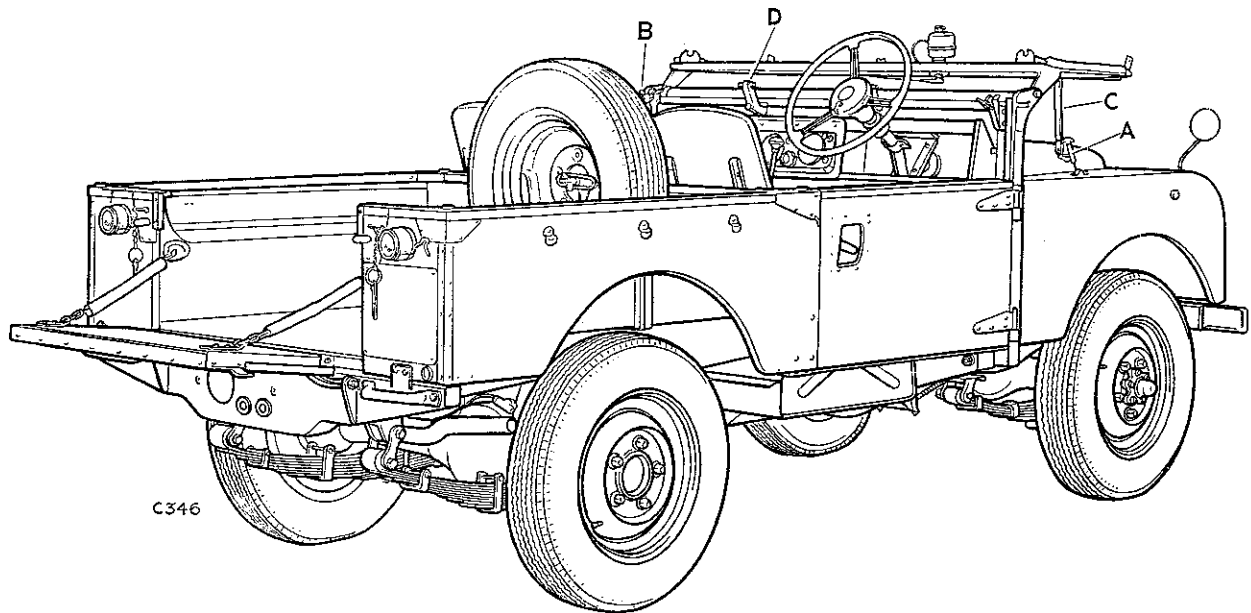


Fig. 5. Rear view—Land-Rover 86 and 88.

A—Bonnet fastener.      B—Windscreen-securing wingnut.      C—Windscreen stay.      D—Ventilator fastener.

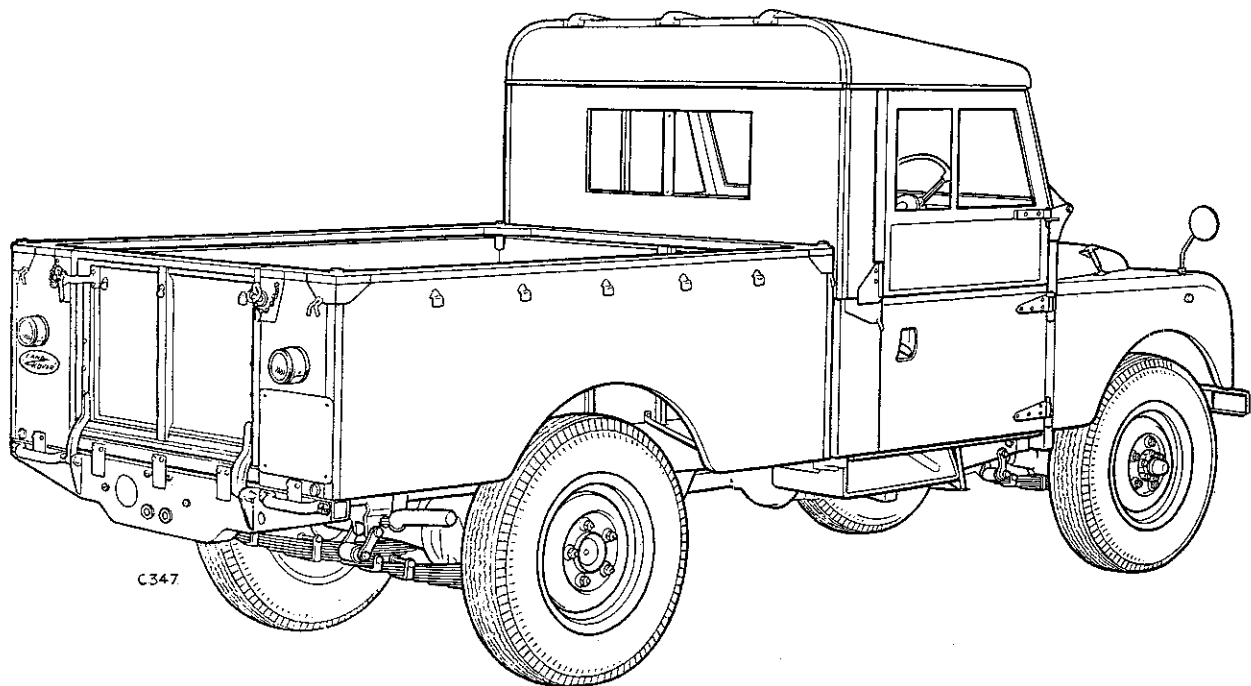


Fig. 6. Rear view—Land-Rover 107 and 109.

### LOCKER LIDS.

The right-hand locker lid, under the seat cushion, encloses the petrol tank and filler and the brake fluid reservoir (see Page E-29); a similar locker on the left-hand side is used as a tool box.

### TOOL STOWAGE.

Small tools are carried in the left-hand locker, under the seat cushion. Except on some special vehicles, the starting handle and lifting jack handle extension are secured in clips on the seat back-rest panel and are accessible with the seat backs lowered.

### WINDSCREEN.

On canvas covered vehicles only, provision is made for folding the windscreen down on to the bonnet as follows:—

Remove the hood then disconnect the windscreen wiper lead at the plug adjacent to the wiper motor and release the bonnet fasteners. Slacken the wing-nuts at the bottom corners of the windscreen. Lower the windscreen, slacken the support stays (at the top of the windscreen frame) and rest them on the bonnet staples; secure the windscreen and bonnet with the bonnet fasteners.

### WINDSCREEN VENTILATORS.

The two ventilators in the windscreen frame may be opened independently by pulling down each fastener; to close, pull the fastener up and "over centre" as far as possible. The knurled screw on each fastener rigidly controls the degree of opening with the fastener pulled right down; to increase the opening, turn the screw anti-clockwise and vice-versa. Use of the ventilators will be found advantageous when traversing dusty roads, as they greatly reduce the amount of dust blown into the vehicle from the rear.

### TAILBOARD.

In the horizontal position, the tailboard is retained by two chains. To remove the tailboard completely, remove the split pin and plain washer from one of the hinges, unhook the chains and slide it off its hinges.

### SIDESCREENS.

The sidescreens are readily detachable after removing the securing nuts and washers.

### DOORS.

To remove the doors (disconnect check straps if fitted) swing them fully open and lift complete assembly clear of hinge pivots.

### PETROL FILLER.

The petrol filler cap is located beneath the locker lid on the right-hand side of the seat box, accessible after the right-hand seat cushion is removed. When the cap is removed a telescopic tube may be drawn out of the tank neck and locked by a slight anti-clockwise movement, to facilitate filling. The tank capacity is 10 Imperial gallons (45 litres).

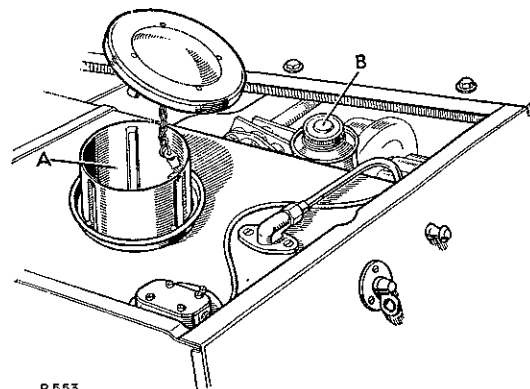


Fig. 7. Petrol filler and brake fluid tank

A—Petrol filler.

B—Brake fluid supply tank.

Any good brand of petrol of approximately 80 octane rating is suitable for this vehicle. If it is desired to run the vehicle on a fuel having an octane rating of substantially less than 80, the ignition may require slightly retarding to avoid pinking (see Page E-24—Ignition timing).

### RADIATOR FILLER.

Access to the radiator filler is gained by lifting the bonnet panel.

The cooling system is pressurised and great care must be taken when removing the radiator filler cap, especially when the engine is hot, to avoid steam which may be blown out with considerable force.

When removing the filler cap, first turn it anti-clockwise to the stop and allow all pressure to escape, before pressing it down and turning further in the same direction to lift it off.

The correct water level is to the bottom of the filler neck; the total capacity of the system is 17 Imperial pints (9,75 litres).

**NOTE.** Use soft water wherever possible; if the local water supply is hard, rain or distilled water should be used.

## STARTING PROCEDURE

Before attempting to start the engine, read the following notes concerning the mixture control and accelerator.

### MIXTURE CONTROL

The mixture control has three positions and there is no graduation between them. The mixture is normal with the control pushed right in; the warming-up position can be located by pulling out the control about half-way until a light click is felt, and the rich or starting position is with the control pulled right out.

On no account must the control be set in any position between these three settings. When the engine has started, the control must be returned to the normal position as soon as possible, consistent with even running.

### ACCELERATOR.

The carburettor is fitted with an accelerator pump, so that when the accelerator is fully depressed, an extra rich mixture is provided to assist acceleration. As this is not required when starting the engine, except under abnormal starting conditions, the accelerator must not be touched when starting with a cold engine.

It may assist starting a hot engine if the accelerator is depressed half-way and then released as soon as the engine fires.

Never pump the accelerator pedal under any circumstances.

### STARTING THE ENGINE.

1. Ensure that the main gear lever is in the neutral position.
2. Ensure that the transfer box lever is in high ratio position, i.e., right forward.
3. Start the engine as follows :—
  - A. Engine cold.
    - (i) Pull the mixture control right out.
    - (ii) Keep the foot clear of the accelerator.
    - (iii) Switch on the ignition, check that the green oil pressure and red ignition warning lights appear.
    - (iv) Press the starter button, when the engine should start after a turn or two.

### B. Engine warm or hot.

- (i) Set the mixture control in the mid-way position if the engine is warm or right in if the engine is hot.
- (ii) Depress the accelerator half-way.
- (iii) Switch on the ignition, check that the green oil pressure and red ignition warning lights appear.
- (iv) Press the starter button.
- (v) Remove the foot from the accelerator as soon as the engine fires.

*NOTE.* If the engine makes a false start, allow the starter to come to rest before pressing the starter button again. Should the engine fail to start after two or three attempts, investigate and correct the cause before the battery is run down needlessly.

### WHEN THE ENGINE STARTS.

Except under conditions of extreme cold, push in the mixture control from the rich to the warm-up (mid-way) position within a few seconds of the engine starting. This period may have to be extended if conditions are severe, but should never exceed a minute or so.

Do not race the engine; drive away at moderate speed immediately after starting, so stimulating lubrication of the cylinder walls as the engine warms up. Continue with the control in the mid-way position until the engine temperature has risen sufficiently to allow the knob to be pushed right in to the normal position.

The appearance of the AMBER WARNING LIGHT on the instrument panel will indicate that the control has been left out inadvertently and must be pushed in at once.

### WARNING LIGHTS.

Like all mechanical devices, the mixture control warning system is not completely fool-proof and the responsibility for pushing in the mixture control rests with the driver, especially as the warning light may never appear owing to bulb failure. Suspected bulb failure may be confirmed by pulling out the mixture control momentarily when the engine is hot, when the bulb should be illuminated.

To guard against bulb failure in the oil pressure and ignition warning lights, a check should be made that the bulbs glow each time the ignition is switched on.

## GEAR CHANGING INSTRUCTIONS

### MAIN GEAR LEVER

The positions of the main gear change lever are marked on the lever knob. It should be noted that the only reverse stop is a spring in the selector mechanism which tends to hold the lever away from the reverse selector shaft.

### GEAR CHANGING

Gear changing on the main gearbox is carried out in the normal manner. Synchro-mesh gears are provided for changing from second to third, third to top and top to third and in these cases single de-clutching may be used; for all other changes, it is advisable to use the double de-clutch method.

Until experience is gained under differing operating conditions, the following speeds may be used as a guide when changing gear:—

	High ratio	Low ratio
First to second	5-8 m.p.h. (8-15 k.p.h.)	Within two or three vehicle lengths of starting.
Second to third	15 m.p.h. (25 k.p.h.)	6 m.p.h. (10 k.p.h.)
Third to top	20-25 m.p.h. (35-40 k.p.h.)	10 m.p.h. (15 k.p.h.)

### TRANSFER BOX LEVER

The transfer box gives two ratios in the output from the main gearbox, termed "high" and "low", thus giving a total of eight forward and two reverse speeds in all. It is controlled by the lever to the right of the gearbox cover; this has three positions—right forward for high ratio, mid-way for neutral and right back for low ratio.

For normal usage and road work the lever should be in the high position. Low ratio is used when the vehicle is to be operated on heavy ground and for heavy pulling.

The neutral position mid-way between "high" and "low" is quite definite and is used with the power take-off for stationary work; the vehicle cannot be driven with the lever in neutral.

### TRANSFER GEAR CHANGING

Changing from HIGH to LOW transfer ratio should only be attempted when the vehicle is stationary. The engine may be left running, but the main gear lever must be in the neutral position. Depress the clutch pedal and pull the transfer box lever right back; release the clutch. Should there be any hesitation in the gear engaging, do not force the lever. With the engine running, engage a gear in the main gearbox and let in the clutch momentarily; then return the main gear lever to neutral and try the transfer control again.

Changing from LOW to HIGH transfer ratio may be accomplished at any time, regardless of vehicle speed. Release the accelerator pedal, depress the clutch pedal and push the transfer box lever right forward, pausing slightly in the neutral position; let in the clutch.

### FRONT WHEEL DRIVE LOCK—

1948-51 mid-season

Four-wheel drive is fitted as standard on the Land-Rover. The drive to the front wheels incorporates an over-run freewheel unit which eliminates any undue tyre wear on the front wheels or excessive strain on the transmission when travelling on hard surfaces.

The inclusion of this freewheel means that all four wheels are driving only when the engine is pulling and the vehicle is travelling in a forward direction. When reversing or the engine is coasting with the vehicle travelling forward, the drive is to the rear wheels only. There may be occasions when four-wheel traction is necessary in reverse while operating on soft surfaces or in a forward gear when descending a steep, muddy gradient and provision has therefore been made to "lock" the freewheel unit and so obtain four-wheel drive under such conditions.

The control for this operation (known as the "FRONT WHEEL DRIVE LOCK") takes the form of a knob on the gearbox cover. It is so arranged that the freewheel can only be locked by pressing this knob downwards, when the transfer lever is in LOW ratio; the unit is automatically returned to its normal free condition when the transfer lever is returned to the HIGH position on resuming hard surface travelling.

The control must only be operated when the vehicle is stationary.

NOTE: On approximately the first 14,000 vehicles, the control takes the form of a key ring in the right-hand floor board, instead of the knob. Its operation is identical with the later version, except that the ring must be pulled upward about  $\frac{1}{4}$  in. (7 mm) to lock the freewheel unit.

### FRONT WHEEL DRIVE CONTROL—

1951 mid-season onwards

The vehicle may be operated in two-wheel or four-wheel drive as required; the drive to the front wheels is through a dog-clutch in the casing on the front of the transfer box, controlled by the yellow knob on the gearbox cover.

When operating the vehicle in HIGH transfer ratio, the drive is normally to the rear wheels only; should conditions call for drive on all four wheels, i.e., when traversing soft country or descending a steep, muddy gradient, the front wheel drive should be engaged by pressing down the knob on the gearbox cover. In order to regain two-wheel drive, on resuming hard surface travelling, stop the vehicle, engage LOW transfer ratio and return to HIGH transfer ratio, when the dog-clutch is automatically disengaged and the control knob returns to the "up" position.

When operating the vehicle in LOW transfer ratio, four-wheel drive is automatically engaged at the same time as LOW ratio is selected; the front wheel drive is automatically disengaged on regaining HIGH transfer ratio.

## RUNNING-IN THE NEW VEHICLE

### *RUNNING-IN PERIOD.*

Progressive running-in of a new vehicle is of the utmost importance and has a direct bearing on durability and smooth running throughout its life.

The running-in period is 500 miles (750 km.), during which time 35-40 m.p.h. (55-65 k.p.h.) in high transfer ratio top gear should not be exceeded. The engine must not be allowed to labour at any time and full use should be made of the indirect gears to ensure that full throttle is not used even to achieve 40 m.p.h. (65 k.p.h.). If the vehicle is used in low transfer ratio when new, 15 m.p.h. (25 k.p.h.) should not be exceeded in top gear. Corresponding maximum speeds should be used in the lower gears.

Thereafter, maximum speeds may be increased gradually, but the vehicle should not be driven at prolonged high speeds until it has done 1,000 miles (1,500 km.).

Never race the engine when cold at any time during the life of the vehicle.

### UPPER CYLINDER LUBRICATION.

The use of an upper cylinder lubricant is advisable during the running-in period; recommended lubricants appear on Page E-51.

It should be added to the tank before filling with petrol to ensure thorough mixing, in the proportion of one fluid ounce to four gallons of petrol (three centilitres to twenty litres).

The addition of upper cylinder lubricant is not recommended after the engine has been run in, as it tends to increase combustion chamber deposits.

### LUBRICATION AND FREE SERVICE.

Except under tropical or extreme winter conditions, it is recommended that the oil placed in the engine, gearbox and axles on initial assembly be used for the first 750 miles (1,000 km.), when it should be changed in accordance with the first service inspection detailed on the Free Service Card supplied with the vehicle.

Under the exceptional conditions stated, the oils should be changed on receipt of the vehicle to the correct grade and again at the free service stage.

A second service inspection is carried out by the dealer at 1,500 miles (2,500 km.).

### SPARE WHEEL.

On the Land-Rover 86 and 88, the spare wheel is carried behind the seat backrest and secured by a clamp and wing nut, it can also be fitted to the bonnet panel as an optional extra.

On the 107 and 109, fittings to secure the spare wheel, either on the front panel of the rear body or on the bonnet, are supplied as standard equipment.

## WHEEL CHANGING

1. Slacken the double-ended wheel securing nuts.
2. Jack up the corner of the vehicle, fitting the jack under the road spring below the axle casing.
3. Remove the nuts and withdraw the wheel over the studs.
4. If available, place a drop of oil on the stud threads, to assist in subsequent removal.
5. Fit the new wheel, with the "V" tread directed to the front at the top; tighten the nuts securely and lower the vehicle to the ground.

**WARNING.** Do not touch 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.

### FREE SERVICE INSPECTIONS.

Rover Distributors/Dealers will give your Land-Rover two Free Service inspections, any oil used being charged for. This Service is provided on new Land-Rovers sold direct by Distributor/Dealer to the user, on completion of the first 750 miles (1,000 km.) and again after the first 1,500 miles (2,500 km.).

With the literature supplied with each new vehicle there is included a "Free Service Card" which details the items to be covered by each Service and two detachable Vouchers should be taken to the Distributor/Dealer as each Service becomes due.

The importance of regular and systematic maintenance cannot be too highly stressed and we strongly advise the Land-Rover owner to take advantage of these free service facilities which are offered by the Rover Organisation.

In the event of an owner residing some distance from the Rover Distributor/Dealer from whom the vehicle was purchased, it may be more convenient for him to have the two Free Service Inspections carried out elsewhere. Agreement can usually be reached with the "Vendors" of the vehicle to accept an Inter-Dealer charge at our agreed rates from another repairer for carrying out these services on their behalf, but the owner should confirm this arrangement with the "Vendors" of the car beforehand.

In the case of vehicles sold in the British Isles against a Home Delivery Order (for eventual export), it becomes necessary for the owner concerned to obtain the two Free Services from one of our Home Distributors or Dealers. The owner can obtain these facilities from any Rover Distributor or Dealer in the British Isles on presentation of the Service Vouchers. In these circumstances the Rover Company will accept responsibility for the Labour charges involved at our agreed Inter-Dealer Rates on receipt of any invoice from the Distributor/Dealer. The oil used will be charged to the owner.



# SECTION B

## ROUTINE MAINTENANCE *and* REPAIR WORK

### SUMMARY OF POINTS REQUIRING MAINTENANCE ATTENTION

All items of regular or occasional maintenance are listed below in terms of mileage and operation hours which would apply in a temperate climate under clean working conditions. Climatic and operating conditions affect maintenance intervals to a large extent ; in many cases, therefore, the determination of such intervals must be left to the good judgment of the operator, but the recommendations will serve as a firm basis for maintenance work.

If the vehicle is used almost exclusively in low transfer ratio or for stationary work, mileage is of no use whatever in deciding maintenance intervals; lubrication attention must then be based on operation hours.

To ensure that the correct procedure is followed as each item is dealt with, it is most important that attention be transferred in turn to the appropriate page as indicated. In addition, these notes concerning more frequent attention to certain important lubrication points should be read carefully to ensure long and efficient service from the vehicle.

**Engine.** Under severe conditions of mud or dust, the first and subsequent oil changes must be more frequent, even to the extent of a daily change. Under deep wading conditions through water carrying mud and grit, a daily oil change is essential.

**Air cleaner.** When the vehicle is used for dusty road or field work, attention must be more frequent and may involve a daily oil change; under extremely bad conditions, cleaning twice daily may be called for.

**Gearbox, transfer box, differentials and swivel pin housings.** It is essential to change oil much more frequently than indicated if the vehicle is operated under bad conditions, especially if deep wading is carried out.

**Propeller shafts.** Under tropical or severe conditions, particularly where sand is encountered, the sliding joints must be lubricated very frequently to prevent ingress of abrasive material.

USE ONLY THE RECOMMENDED LUBRICANTS LISTED ON PAGE E-51.

#### POINTS REQUIRING REGULAR ATTENTION

##### DAILY:

Before starting the engine, check:—

1. Level of oil in the engine sump.
2. Level of water in radiator.

##### WEEKLY—1948-53 models:

1. **TYRES.** Check pressure and inflate if necessary. Examine tyres for cuts and damage and remove any embedded flints, etc.

##### MONTHLY—1954-58 models:

1. **TYRES.** Check tyre pressures. Inspect tyre treads (Page E-36).

##### EVERY 250 MILES (500 Km.) OR 10 OPERATION HOURS.

1. **ENGINE.** Replenish oil level in sump as necessary

##### EVERY 1,000 MILES (1,500 Km.) OR 40 OPERATION HOURS.

1. **GEARBOX.** Remove the drain plug from the bell housing and allow any oil to drain away (Page E-26)

##### EVERY 3,000 MILES (5,000 Km.) OR 120 OPERATION HOURS.

1. **ENGINE.** Drain the sump and refill with fresh oil (Page E-22). Clean the breather filters (Page E-22).
2. **ENGINE.** Clean sparking plugs and reset gaps (Page E-24).
3. **GEARBOX.** Replenish oil level as necessary (Page E-25).
4. **TRANSFER BOX.** Replenish oil level as necessary (Page E-26).
5. **FRONT AND REAR DIFFERENTIALS.** Replenish oil levels as necessary (Page E-27).
6. **SWIVEL PIN HOUSINGS.** Replenish oil levels as necessary (Page E-27).
7. **STEERING BOX.** Replenish oil level as necessary (Page E-28).
8. **STEERING BALL JOINTS.** Check that the rubber boots on the steering ball joints have not become dislodged or the joint damaged (see Page E-29).
9. **PROPELLER SHAFTS.** Lubricate the sliding joints and journals (Page E-26).
10. **FOOT PEDALS.** Lubricate (Page E-29).
11. **DISTRIBUTOR.** Lubricate (Page E-39).
12. **FUEL SYSTEM.** Empty, clean and refill the air cleaner (Page E-31).
13. **WHEELS.** Change round all wheels (Page E-35).
14. **BATTERY.** Check acid level (Page E-38).

**EVERY 6,000 MILES (10,000 Km.) OR  
240 OPERATION HOURS.**

1. **ENGINE.** Renew the external oil filter element (Page E-22).
2. **ENGINE.** Clean the oil pump intake filter (Page E-22).
3. **DISTRIBUTOR.** Clean and check contact points (Page E-40).

**EVERY 9,000 MILES (15,000 Km.) OR  
360 OPERATION HOURS.**

1. **GEARBOX.** Drain and refill with fresh oil (Page E-26).
2. **TRANSFER BOX.** Drain and refill with fresh oil (Page E-26).
3. **FRONT AND REAR DIFFERENTIALS.** Drain and refill with fresh oil (Page E-27).
4. **SWIVEL PIN HOUSINGS.** Drain and refill with fresh oil (Page E-28).

**EVERY 12,000 MILES (20,000 Km.) OR  
480 OPERATION HOURS.**

1. **FRONT AND REAR AXLES.** Check tightness of U bolts and spring clips (Page E-29).
2. **PROPELLER SHAFTS.** Check tightness of securing bolts (Page E-26).
3. **BODY.** Check tightness of body securing bolts, wing bolts, etc.
4. **DYNAMO.** Lubricate (Page E-39).

**EXTRA EQUIPMENT REQUIRING REGULAR ATTENTION**

Certain items of extra equipment require regular maintenance attention as follows:—

**EVERY 40 OPERATION HOURS.**

1. **REAR POWER TAKE-OFF.** Replenish oil level as necessary.
2. **REAR PULLEY.** Replenish oil level as necessary.
3. **ENGINE GOVERNOR.** Replenish oil level as necessary.
4. **CAPSIAN WINCH.** Replenish oil level as necessary. Lubricate at nipples.

**POINTS REQUIRING OCCASIONAL  
ATTENTION AS FOUND NECESSARY**

1. **COOLING SYSTEM.** Replenish water level (Pages E-15 and E-34). Adjust fan belt tension (Page E-34).
2. **BRAKES.** Replenish fluid level in supply tank (Page E-29).
3. **GENERAL.** Apply a few spots of oil to all exposed joints such as throttle joints, clutch linkage, door locks and hinges, bonnet prop, etc. Inspect wiring and pipes for signs of chafing which might cause "shorts" or leaks.
4. **CLUTCH.** Adjust free pedal movement (Page E-25).
5. **FUEL SYSTEM.** Clean sediment bowl (Page E-31). Clean pump and carburettor filters (Pages E-31 and E-34).
6. **ENGINE.** Adjust tappet clearances (Page E-24).

**DECARBONISING**

It is not possible to lay down a hard and fast rule concerning the mileage intervals at which the engine should be decarbonised and the valves ground in, for it is not actually necessary to carry out the operation until there is a "fall-off" in performance.

The point at which this condition is reached will vary under different conditions of service and some difficulty may be experienced in detecting it. Should this be the case, it is better either to depend upon mileage as a guide and decarbonise the engine at every 9,000-10,000 miles (15,000-16,500 km.) or 360 operation hours, or to seek advice from the nearest Rover distributor or dealer.

**EVERY 1,000 MILES (1,500 Km.).**

1. **TRAILER.** Lubricate at nipples.

**EVERY SIX MONTHS.**

1. **REAR POWER TAKE-OFF.** Drain and refill with fresh oil.
2. **REAR PULLEY.** Drain and refill with fresh oil.
3. **POWER TAKE-OFF PROPELLER SHAFT.** Lubricate.
4. **CAPSIAN WINCH.** Drain and refill with fresh oil.

# LUBRICATION AND MAINTENANCE

## GENERAL INSTRUCTIONS.

One of the most important factors in the performance and durability of any vehicle is its lubrication. The responsibility for correct lubrication attention rests mainly on the driver; for this reason, the relative instructions set out in this section of the manual should be followed carefully.

The instructions are complete and any part of the vehicle not specifically mentioned does not require routine attention in this respect.

The recommended lubricants are detailed on Page E-51; as a result of exhaustive tests, they have been found pre-eminently suitable for Land-Rovers and should be used whenever possible. In the interests of smooth and economic running, heavier grade oil should not be used; when ordering oil, the correct grade, as well as the make, should be clearly stated.

## OIL ADDITIVES.

No responsibility can be taken for damage arising from the use of any additive to the recommended lubricants.

The oils selected are complete in themselves and afford every protection. A warning is necessary against the addition of any oils or other products, as these may materially impair the character of the lubricant in use.

## ENGINE

### ENGINE OIL CONSUMPTION.

The Rover Company feels that there are many owners who may not be fully aware of certain changes which have come about in engine design and manufacturing technique, and the characteristics of modern engine lubricants.

The Rover Company, in common with other manufacturers, expects from a new engine a definite consumption of engine oil.

It is usually a characteristic that in the early life of an engine the consumption of oil will be higher than subsequently, and it is quite normal for consumption figures to improve up to and even beyond 6,000 miles (9,600 km.).

The reason for the heavier consumption when new is that as the piston rings bed in so is the consumption reduced. This consumption of oil in the early stages of the engine's life is a desirable characteristic, aiding as it does the effective running in of pistons, rings and cylinder bores, resulting in subsequent longevity.

It should also be realised that with the trend towards modern thinner lubricants, which is in itself a highly desirable feature, there may be some tendency for the consumption also to be slightly increased.

Owners when checking oil consumption should make quite sure that the check is made with the engine cold and the vehicle standing on level ground, otherwise a false reading may result.

Over-filling an engine with lubricating oil has no advantages and can quite easily result in a loss of lubricant, giving a completely misleading impression.

It is also unnecessary to top-up oil in the sump for every half-pint (0,25 litre) that may be consumed, but topping-up should not be delayed after the oil level has, or is likely to reach in the course of current running, the low mark on the dipstick.

## ENGINE LUBRICATION

### OIL LEVEL.

Since a certain amount of oil is used up in proper operation of the engine, the oil supply must be replenished at intervals, in addition to periodic oil changes.

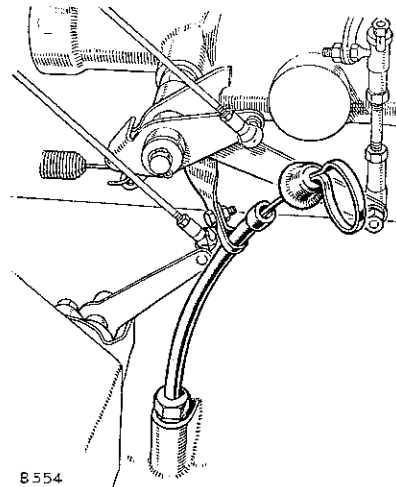


Fig. 8. Engine dipstick.

The oil level dipstick on the right-hand side of the engine, accessible when the bonnet panel is raised, carries two marks, H (High) and L (Low). The oil level must be maintained as near the H mark as possible and must never fall below the L mark. The oil filler is at the left-hand front corner of the engine. (See Fig. 11, Page E-23)

To check the oil level, proceed as follows:—

Stand the vehicle on level ground and allow a few minutes for the oil to drain back into the sump from the valve gear, etc. Withdraw the dipstick upwards, wipe it clean, re-insert to its full depth and remove a second time to take the reading. Add oil as necessary; never fill above the H mark, as the engine may then require more frequent decarbonisation.

## OIL PRESSURE

The oil pressure warning light on the instrument panel will glow when, for any reason, the pressure drops below 10 to 12 lb./sq.in. (0,7 to 0,8 kg./cm.<sup>2</sup>). It will light up when the engine is stationary and will go out when the engine has started and the oil pressure has built up to exceed this figure.

**NOTE.** The light may flicker when the engine is running at idling speed, but providing it fades out immediately the engine is speeded up, the oil pressure can be considered satisfactory.

Should the warning light appear at any time when the engine is running above idling speed, stop the engine immediately and investigate the cause; usually it will be due to low oil level in the sump, or occasionally, to a choked oil pump intake filter.

## ENGINE OIL CHANGES.

When the vehicle leaves the factory, engine oil of a grade suitable for a temperate climate is in use.

Except under tropical or extreme winter conditions, the first engine oil change should be made at 750 miles (1.000 km.) or 30 hours; under such conditions the oil should be changed to the appropriate grade immediately upon receipt of the vehicle and then changed again at 750 miles (1.000 km.) or 30 hours.

Thereafter the oil must be changed at regular intervals (see Page E-19).

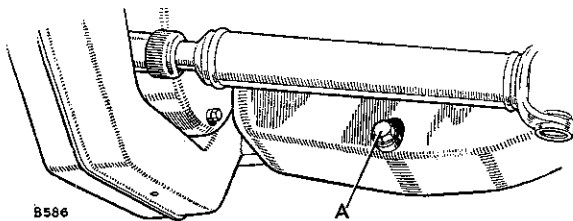


Fig. 9. Engine sump drain plug.  
A—Drain plug.

To change the engine oil, proceed as follows:—

Run the engine to warm up the oil, switch off the ignition and remove the drain plug in the right-hand side of the sump. Allow time for the oil to drain away completely and replace the plug.

Refill with oil of the correct grade through the filler at the left-hand front of the engine; the capacity is 10 Imperial pints (5,5 litres).

When the vehicle is used primarily for industrial or dusty FIELD work, the oil should be changed at each 75 hours, provided that the EXTERNAL OIL FILTER is changed at every 300 hours.

It cannot be too strongly emphasised that, should the oil filter not be replaced at these intervals, the engine oil must be changed more frequently.

## OIL FILTERS.

In addition to the gauze pump intake filter in the sump, the oil is cleaned by means of a full-flow pressure filter mounted externally on the engine.

The gauze filter on the pump must be cleaned and the element of the full-flow filter renewed at regular intervals (see Page E-20). Both filters can conveniently receive this attention at a routine oil change.

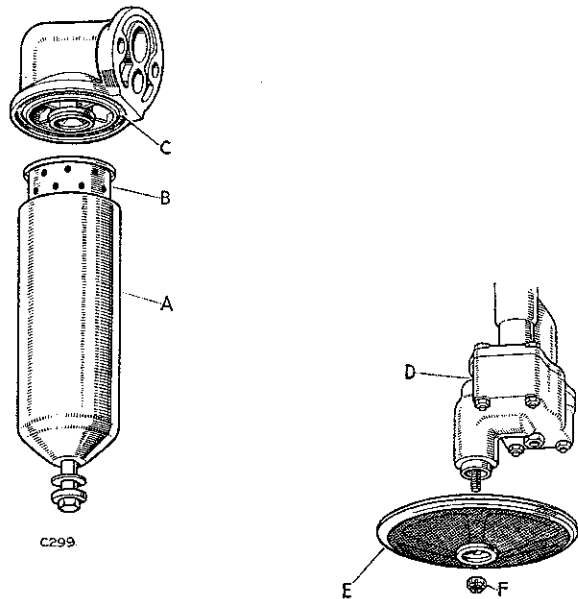


Fig. 10. Engine oil filters.

- |              |                 |
|--------------|-----------------|
| A—Container. | D—Oil pump.     |
| B—Element.   | E—Filter gauze. |
| C—Gasket.    |                 |

To clean gauze filter remove the sump and dismantle filter from pump. Wash filter in petrol and clean with a stiff brush then refit to pump.

Clean sump with petrol and replace.

Unscrew the bolt in the bottom of the filter container and remove the container complete with the filter element. Remove and discard the used filter element and large rubber washer. Wash the container in petrol. Place the new filter element in the container and reassemble the unit using the new large rubber washer supplied with the element. Ensure that all the sealing washers are in position and intact and that the container is correctly located in the top cover.

Refill with correct grade of engine oil and run engine for five minutes, then check for leaks. Check oil level and replenish if necessary.

## ENGINE BREATHER FILTERS.

The oil-wetted gauze filters fitted to the top rocker cover breather and oil filler pipe should be cleaned at regular intervals (see Page E-19) in the following manner:—

Remove the filters and wash the gauze thoroughly by swilling the units in a dish of petrol. Re-wet the gauzes by dipping in clean engine oil and shake off the surplus; replace the top filter with the slot facing forward and the bottom filter with the slot facing the rear of the vehicle.

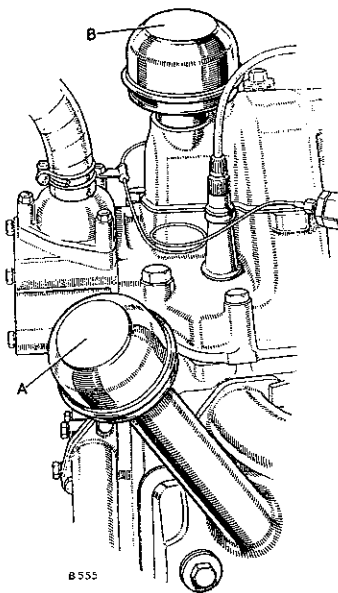


Fig. 11.  
Engine breather filters.

A—Oil filler filter.  
B—Top rocker cover filter.

### ENGINE TIMING.

#### FLYWHEEL MARKINGS—1948-53

Ignition and valve timing is based on markings on the engine flywheel which are visible, adjacent to a pointer, under the inspection cover on the right-hand side of the flywheel housing.

The markings and their meanings are as follows:—

1. The line against which the letters T.D.C. are stamped, when brought opposite the pointer, indicates that No. 1 (front) piston is at top dead centre, i.e., at the top of its stroke.
2. The line against which the letters F.A. are stamped, when set opposite the pointer, indicates the firing point of No. 1 cylinder when the octane selector is set in the standard position on the sliding scale (i.e., the point at which the distributor points should be just opening, with the rotor in the firing position for No. 1 or No. 4 cylinder).

Use the line marked F.A. 15° for 1948-51 models (4 flywheel teeth before T.D.C.) and that marked F.A. 8° for 1952-53 models (2 flywheel teeth before T.D.C.)

3. The line against which the letters E.P. are stamped, when set opposite the pointer, indicates the point at which No. 1 exhaust valve should be at the peak of its lift (fully open). It is 114° before T.D.C. (31 flywheel teeth).

#### FLYWHEEL MARKINGS—1954-58

Ignition and valve timing is based on markings on the engine flywheel which are visible, adjacent to a pointer, under the inspection cover on the right-hand side of the flywheel housing.

The markings and their meanings are as follows:—

1. The line against which the letters T.D.C. are stamped, when brought opposite the pointer, indicates that No. 1 (front) piston is at top dead centre, i.e., at the top of its stroke.

2. The line against which the letters F.A. 10° are stamped, (2½ flywheel teeth before T.D.C.) when set opposite the pointer, indicates the firing-point of No. 1 cylinder, i.e., the position at which the distributor points should be just opening, with the rotor in the firing position for No. 1 or No. 4 cylinder.
3. The line against which the letters E.P. are stamped, when set opposite the pointer, indicates the point at which No. 1 exhaust valve should be at the peak of its lift (fully open). It is 114° before T.D.C. (31 flywheel teeth).

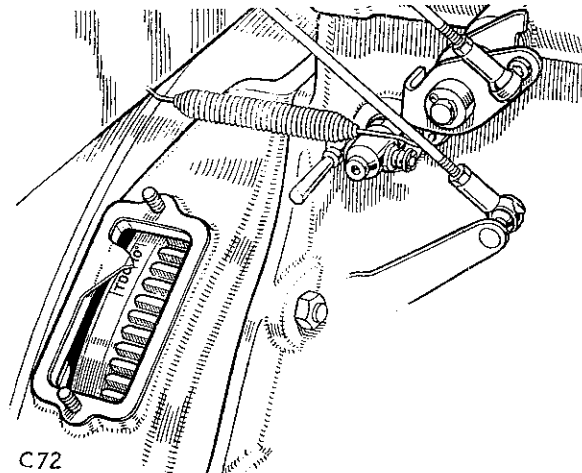


Fig. 12. Flywheel markings.

### VALVE TIMING.

If the timing chain should have been removed, the procedure to re-time the engine is as follows.

1. Set No. 1 exhaust tappet to the correct clearance and slacken all the remaining adjusting screws as far as possible.
2. Rotate the camshaft in the running direction until No. 1 exhaust valve is fully open.

The use of a dial indicator is the only reliable method of determining this point. It should be mounted on a stud adjacent to No. 1 exhaust rocker and with its aid the possibility of an error in determining the exhaust peak is eliminated. It is possible to do the job correctly without a dial indicator, but much time is wasted and the possibilities of an error very much magnified.

3. Rotate the engine in the running direction until the E.P. mark on the flywheel is in line with the pointer.
4. Fit the timing chain, ensuring that there is no slack on the driving side (G).
5. Hold the ratchet pawl (E) clear and lift the jockey pulley arm (H) as far up as possible, ensuring that the ball end of the tensioner cylinder (D) is engaged in its seating. Replace the jockey pulley (C) on its shaft, meshing the pulley with the chain.
6. Check the timing and correct if necessary. The camshaft chainwheel (A) is made with three irregularly spaced keyways, so that if the timing will not come correct in the first position tried, alternatives are provided.

7. Fit the flat washer and circlip, retaining the jockey pulley on its arm. Engage the ratchet (E, F).
8. Set the inlet tappets to the correct clearance.

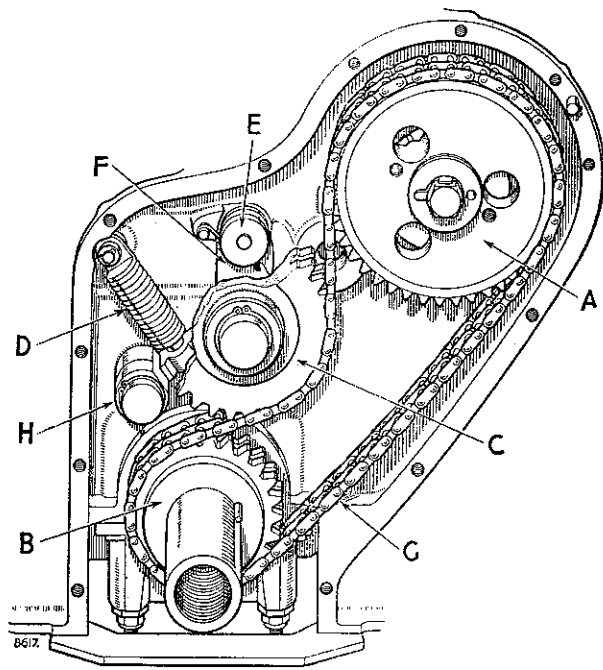


Fig. 13 Timing chain

- |                          |                               |
|--------------------------|-------------------------------|
| A—Camshaft chainwheel.   | E—Pawl.                       |
| B—Crankshaft chainwheel. | F—Ratchet.                    |
| C—Jockey pulley.         | G—Timing chain (driving side) |
| D—Hydraulic tensioner.   | H—Jockey pulley arm.          |

### IGNITION TIMING

In addition to automatic timing advance mechanism, the distributor incorporates a hand setting control, known as the octane selector. This is a vernier adjustment attached to the distributor, fitted with a sliding portion controlled by an adjusting screw and a calibrated scale marked R (retard) and A (advance) with a number of divisions between. The standard setting for the ignition is with the long line of the scale on the sliding portion against the mark on the selector body, thus leaving one division further possible advance and four divisions retard. See Fig. 42, Page E-39.

This setting is correct for 80 octane fuel and with a clean engine, but should pinking develop as a result of the need for decarbonising, the control can be retarded a little by turning the screw in an anti-clockwise direction. Do not forget to return it to the original position after decarbonising.

In certain countries very low grade fuel is supplied, in which case it may be necessary to adjust the octane selector to avoid pinking, even with a clean engine.

Should the distributor have been disturbed, the ignition timing must be reset as follows:—

1. Set the contact breaker point gap to .014 to .016 in. (0,35 to 0,40 mm.) with the points fully open. Use the combined feeler gauge and screwdriver supplied in the tool kit.
2. Rotate the engine in the running direction until the F.A. 10° mark on the flywheel is in line with the pointer, with both valves on No. 1 cylinder closed.

3. The distributor rotor will now correspond with No. 1 cylinder high tension lead terminal.
4. Set the octane selector so that the fourth line from the left-hand side of the calibrated slide is against the face of the distributor body casting.
5. Slacken the pinch bolt at the base of the distributor head; rotate the distributor bodily in the opposite direction to the arrow on the rotor arm until the contact breaker points are just opening with the fibre cam follower on the leading side of the cam; re-tighten the pinch bolt.

### TAPPET ADJUSTMENT

It is most important that tappet clearances be maintained at the correct figure and adjustment is therefore provided on each valve rocker. If anything less than the correct clearance is used, a fall in power output will follow, while greater clearance will mean noisy tappets.

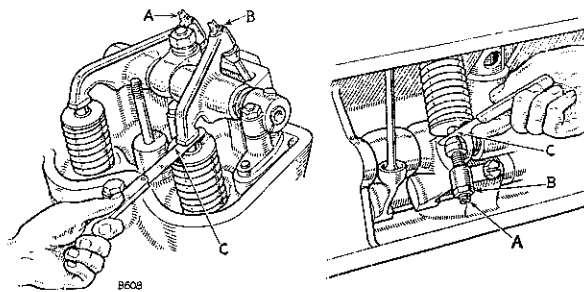


Fig. 14. Tappet adjustment

- |                           |            |
|---------------------------|------------|
| A—Tappet adjusting screw. | B—Locknut. |
| C—Feeler gauge.           |            |

The correct clearance is .010 in. (0,25 mm.) on the inlet valves and .012 in. (0,30 mm.) on the exhaust valves, with the engine either cold or at running temperature. The cylinder firing order is 1, 3, 4, 2.

To carry out tappet adjustment, proceed as follows:—

1. Rotate the engine in the running direction until the valve receiving attention is fully open and then move the engine one complete turn, to bring the tappet on to the back of the cam.
2. Check the tappet clearance with a feeler gauge. If adjustment is required, slacken the locknut and rotate the tappet adjusting screw until the clearance is correct; re-tighten the locknut, taking care to ensure that this operation does not upset the clearance.
3. Repeat for the other valves in turn.

### SPARKING PLUGS

The sparking plugs are fitted with plastic covers retained in the cylinder head by rubber rings. To gain access to the plugs for cleaning and gap-setting, pull up the plug covers, without detaching them from the high tension leads.

At regular intervals (see Page E-19) remove the plugs, clean and re-set the electrode gaps to .029 to .032 in. (0,75 to 0,80 mm.) if necessary.

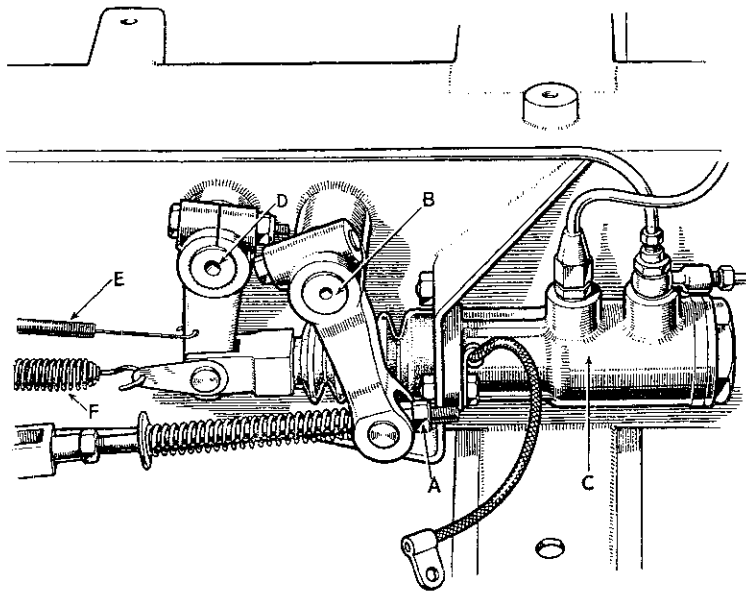


Fig. 15 Clutch adjustment—1948-53.

- A—Clutch adjustment nut.
- B—Clutch pedal shaft
- C—Brake master cylinder.
- D—Brake pedal shaft.
- E—Stop light actuating spring
- F—Brake pull-off spring

## CLUTCH

The clutch must only be used when starting the vehicle from rest or when changing gear; at all other times, the foot should be kept clear of the clutch pedal, to avoid unnecessary lining wear.

### CLUTCH ADJUSTMENT—1948-53

The clutch pedal adjustment is correct when there is  $\frac{3}{4}$  in. (20 mm.) free movement measured at the pedal pad and the linkage should be re-set when the movement falls below this figure. Adjustment is provided by a nut on the end of the rod connecting the pedal to the clutch operating lever on the bell-housing; this nut is machined so that it locks itself at every half-turn against the joint-pin in the pedal lever. To increase the free pedal travel, turn the nut in an anti-clockwise direction half a turn at a time and make sure that the nut is against the pin, before checking the pedal movement. (Fig 15.)

### CLUTCH ADJUSTMENT—1954-58

To ensure efficient operation of the clutch unit, there must be free movement in the linkage, to the extent of  $\frac{3}{4}$  in. (20 mm.) measured at the pedal pad.

This point must be checked from time to time. If there is more than the required free movement, slacken the locknut and screw out the stop bolt (A) until the movement is correct; secure with the locknut. This action will alter the position of the pedal pad, which can be re-set by means of the adjustment provided on the clutch linkage. Slacken the outer locknuts (B) and rotate the inner adjusting nuts (C), both in the same direction, until the pedal is set in a convenient position. Tighten the adjusting nuts and distance pieces against the joint pin and secure with the locknuts.

## MAIN GEARBOX

### MAIN GEARBOX LUBRICATION.

The main gearbox and clutch withdrawal mechanism are lubricated as one unit

### OIL LEVEL.

The main gearbox oil level must be checked periodically (see Page E-19) and replenished as necessary to the H mark on the dipstick. Both the dipstick and filler plug are accessible through the swinging cover plate on the gearbox cover.

### BELL HOUSING DRAIN PLUG.

The gearbox bell housing is completely sealed to exclude dust and mud under severe wading conditions. Because of this, a drain plug is provided in the bottom of the housing, so that any oil accumulating from the rear main bearing or gearbox can be drained away before it affects the clutch.

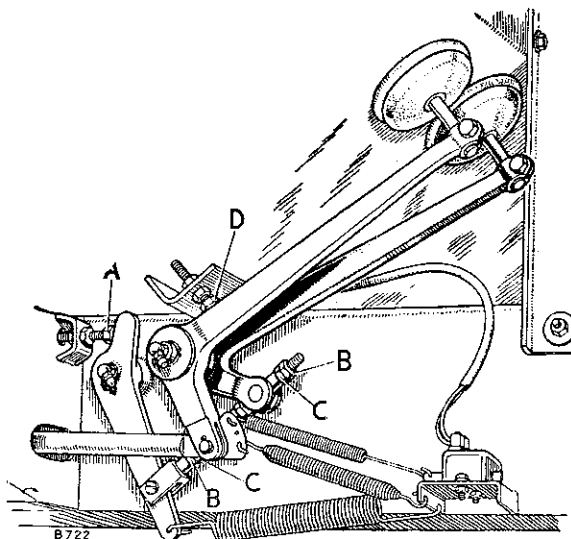


Fig. 15A. Clutch adjustment—1954-58.

- A—Stop bolt
- B—Locknuts.
- C—Adjusting nuts

This plug must be removed periodically (see Page E-19) and all oil allowed to drain off before the plug is replaced.

**NOTE.** If the vehicle is not expected to do wading or very muddy work, the plug can be left out at the operator's discretion, provided the plug is replaced if it later becomes necessary to undertake wading work.

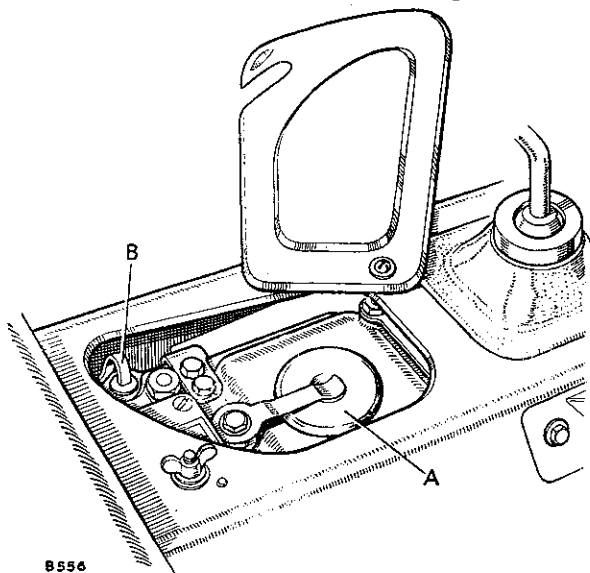


Fig. 16. Gearbox oil filler.  
A—Filler cap. B—Dipstick.

### GEARBOX OIL CHANGES

Except under extreme winter conditions, the first gearbox oil change should be made at 750 miles (1,000 km.) or 30 hours; under such conditions the oil should be changed to the appropriate grade immediately upon receipt of the vehicle and then changed again at 750 miles (1,000 km.) or 30 hours.

Thereafter the oil must be changed periodically (see Page E-20).

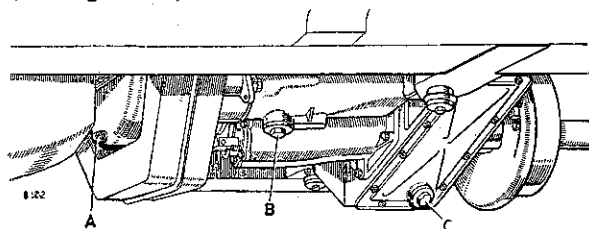


Fig. 17. Gearbox drain plugs.  
A—Bell housing plug. B—Gearbox plug  
C—Transfer box plug.

To change the oil, remove the drain plug from the bottom of the main gearbox casing, immediately after a run when the oil is warm; allow the oil to drain away completely and replace the plug. Refill with oil of the correct grade; the capacity is approximately 2½ Imperial pints (1,5 litres).

### TRANSFER BOX

#### TRANSFER BOX LUBRICATION.

The transfer box and front wheel drive housing are lubricated as one unit.

### OIL LEVEL.

The transfer box oil level must be checked periodically (see Page E-19) and replenished as necessary to the bottom of the level plug hole. The level plug is in the rear face of the transfer box and the filler plug on the cover plate on top of the box on the right-hand side; both are accessible when the seat box centre panel is removed.

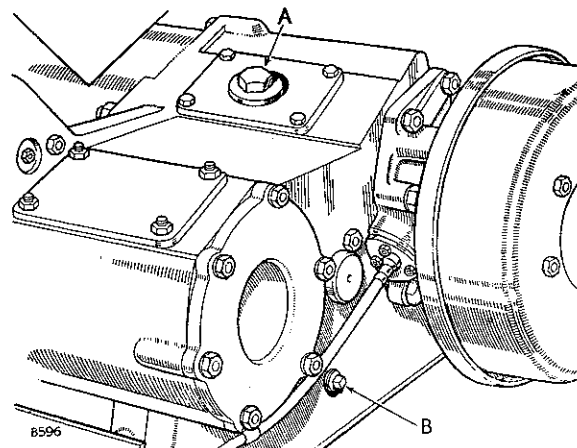


Fig. 18. Transfer box lubrication.  
A—Filler plug B—Level plug.

### TRANSFER BOX OIL CHANGES.

Except under extreme winter conditions, the first transfer box oil change should be made at 750 miles (1,000 km.) or 30 hours; under such conditions the oil should be changed to the appropriate grade immediately upon receipt of the vehicle and then changed again at 750 miles (1,000 km.) or 30 hours.

Thereafter the oil must be changed periodically (see Page E-20).

To change the oil, remove the drain plug (see Fig. 17) from the bottom of the transfer box immediately after a run when the oil is warm; allow the oil to drain away completely and replace the plug. Refill with oil of the correct grade; the capacity is 4½ Imperial pints (2,5 litres).

### PROPELLER SHAFTS

#### PROPELLER SHAFT LUBRICATION.

At regular intervals (see Page E-19), apply one of the recommended oils, using the oil gun provided in the tool kit, at the lubrication nipple on the sliding portion of the front and rear propeller shafts.

At the same time, apply the correct grade of oil at the lubrication nipples fitted to the four universal joints. It is preferable to use the oil gun provided, but if high pressure equipment is used, care must be taken not to damage the seals in the joints.

#### PROPELLER SHAFT BOLTS.

Periodically check the security of the propeller shaft securing bolts and rectify as necessary (see Page E-20).



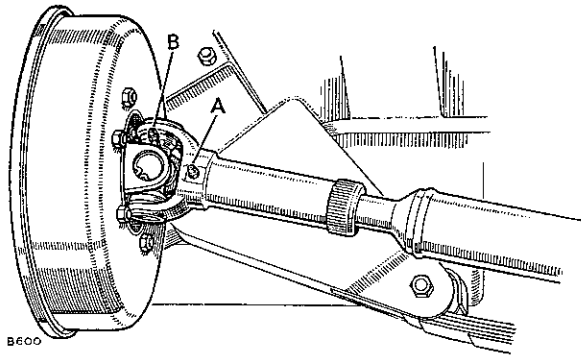


Fig. 19. Propeller shaft lubrication.  
A—Sliding sleeve nipple. B—Universal joint nipple.

## FRONT AND REAR DIFFERENTIALS

### FRONT AND REAR DIFFERENTIAL LUBRICATION.

#### OIL LEVEL.

The differential oil levels must be checked periodically (see Page E-19), immediately after a run when the oil is warm, and replenished as necessary to the bottom of the filler plug hole. The rear axle level/filler plug is on the right-hand side of the differential casing and the front axle plug is at the front of the axle casing.

**NOTE.** A second plug fitted at the rear of the front axle casing can be disregarded.

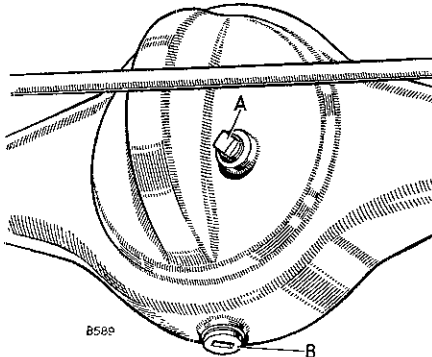


Fig. 20. Front differential lubrication.  
A—Filler/level plug. B—Drain plug.

#### FULLY FLOATING REAR AXLE.

The oil filler plug located in the driving member is for initial filling only. During normal running the oil level is maintained from the differential and the hub requires no further attention in this respect.

*Special Note.*—If the hub is replaced or has been stripped down for any purpose, it must be filled on assembly with one-third pint of the same grade of oil as used in the differential.

#### DIFFERENTIAL OIL CHANGES.

Except under extreme winter conditions, the first differential oil change should be made at 750 miles (1,000 km.) or 30 hours; under such conditions, the oil should be changed to the appropriate grade immediately upon receipt of the vehicle and then changed again at 750 miles (1,000 km.) or 30 hours.

Thereafter the oil must be changed periodically (see Page E-20) in the following manner:—

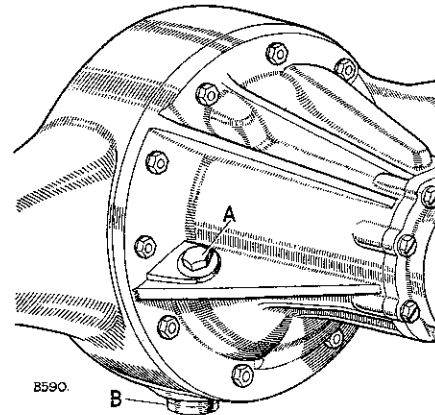


Fig. 21. Rear differential lubrication.  
A—Filler/level plug. B—Drain plug.

Immediately after a run, when the oil is warm, drain off the oil by removing the drain plugs in the bottom of the axle casings. Replace the drain plugs and refill with oil of the correct grade; the capacity of each differential is approximately 3 Imperial pints (1,75 litres).

The drain plugs have slotted heads and can be removed with the aid of the handle of the single-ended spanner in the tool kit. (See special note under fully floating rear axle (see above).)

## SWIVEL PIN HOUSINGS

### SWIVEL PIN HOUSING LUBRICATION

The front wheel drive universal joints, swivel pins and front hubs receive their lubrication from the swivel pin housings.

#### OIL LEVEL.

The swivel pin housing oil levels must be checked periodically (see Page E-19) and replenished as necessary to the bottom of the filler/level plug holes at the rear of the housings.

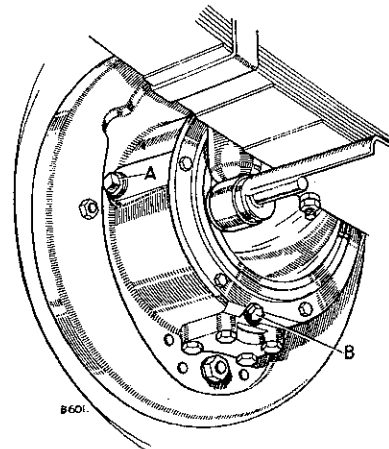


Fig. 22  
Swivel pin housing  
lubrication  
A—Filler/level plug  
B—Drain plug.

## SWIVEL PIN HOUSING OIL CHANGES.

Except under extreme winter conditions, the first oil change should be made at 750 miles (1 000 km.) or 30 hours ; under such conditions, the oil should be changed to the appropriate grade immediately upon receipt of the vehicle and then changed again at 750 miles (1.000 km.) or 30 hours.

Thereafter the oil must be changed periodically (see Page E-20).

To change the oil, remove the drain plug from the bottom of each housing, immediately after a run when the oil is warm ; allow the oil to drain away completely and replace the plugs. Refill with oil of the correct grade through the filler/level plug holes ; the capacity of each housing is approximately 1 Imperial pint (0,5 litre).

## STEERING

### WORM AND NUT TYPE (86 and 107) STEERING BOX LUBRICATION

The steering box oil level must be checked periodically (see Page E-19) and replenished as follows:—

Remove the filler plug on top of the column and the air release plug on the steering box. If oil runs from the release plug hole, replace it; if not, pour oil through the filler until it runs from the release plug hole and replace the release plug. Then pour as much oil as possible through the filler before replacing the plug

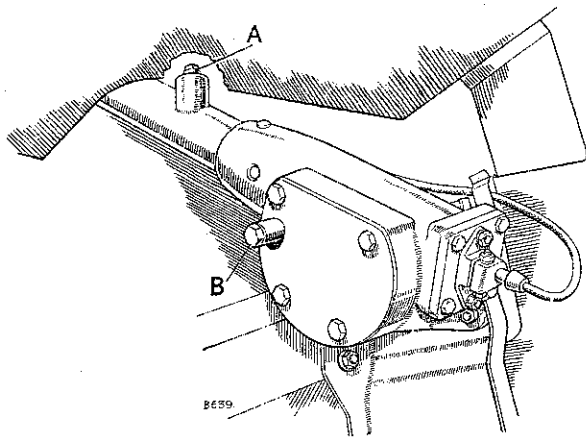


Fig. 23 Steering box lubrication.  
A—Oil filler plug. B—Air release plug

Access to the filler plug is gained by lifting the bonnet panel and to the release plug from beneath the front wing

### STEERING COLUMN ADJUSTMENT.

End thrust in the steering column is taken on an adjustable bearing at the top of the column. Wear or end-play in the steering unit can therefore be taken up when necessary in the following manner:—

1. Remove the steering wheel, dust shield and spring.

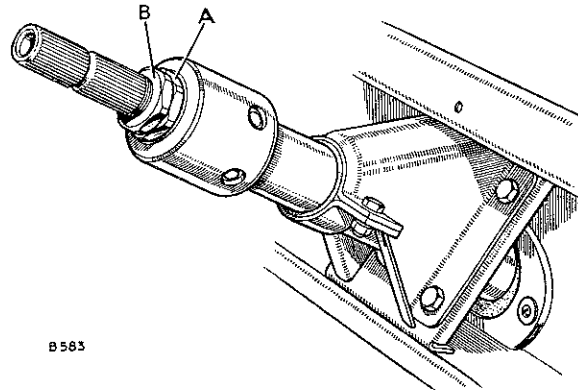


Fig. 24 Steering column adjustment.  
A—Adjusting nut B—Locknut

2. Slacken the bearing locknut now exposed (upper nut) and tighten the lower nut until the end-play in the column just disappears. This condition is most readily determined if the steering wheel is replaced temporarily, when any play in the column can be detected if the wheel is gently pulled up and down.
3. When the setting is correct, re-tighten the locknut securely and replace the spring, dust shield and steering wheel.

### RECIRCULATING BALL TYPE (88 and 109) STEERING BOX LUBRICATION.

The steering box oil level must be checked periodically (see Page E-19) and replenished as necessary to the bottom of the filler plug hole on the top of the cover plate. Access to the plug is gained by lifting the bonnet panel.

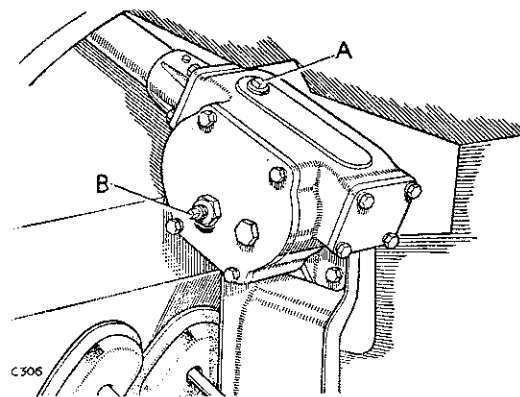


Fig. 25 Recirculating steering box lubrication  
A—Filler plug. B—Adjuster screw.

### ROCKER SHAFT ADJUSTMENT.

End play in the rocker shaft may be taken up by means of the adjuster (see Fig. 25) in the side cover plate. Need for attention at this point will be indicated by a slight rattle from the steering column.

The adjustment should be carried out after the first 750 miles (1.000 km.), but thereafter will only be required at long intervals.

Proceed as follows:—

With the road wheels set straight ahead, slacken the locknut and screw the adjuster down by hand until it contacts the top of the rocker shaft; tighten a further one-tenth of a turn and secure with the locknut.

### STEERING COLUMN ADJUSTMENT

End thrust in the steering column is taken up by removing shims and joint washers under the bottom cover of the steering box.

1. This adjustment will be made more accessible by the removal of the off-side front wheel.
2. Remove bottom cover of steering box which is retained by four bolts.
3. Withdraw bottom cover and remove all shims and joint washers.
4. Replace bottom cover only and tighten up until no end-float is experienced on rotating the steering wheel.

Measure with a feeler gauge the gap between the bottom cover and the body of the box that has been caused by the removal of shims and joint washers.

5. Remove bottom plate and insert required number of shims and alternate joint washers as ascertained above, checking on assembly that no end thrust is apparent.
6. Lower vehicle and top-up steering box with correct grade of oil.

### STEERING BALL JOINTS.

Steering joints on the Land-Rover have been designed in such a way as to retain the initial filling of grease for the normal life of the ball joints, however this applies only if the rubber boot remains in position on the ball joint. The rubber boots should be checked periodically (see Page E-19) to ensure that they have not become dislodged or the joint be damaged. Should any of the rubber boots be pushed out of position proceed as follows:—

- (a) Remove ball end from lever.
- (b) Remove rubber boot.
- (c) Thoroughly clean all parts.
- (d) Apply grease (Castrolase Heavy, Energrease C3 or Mobilgrease No. 4) round taper of ball joint and also fill the boot.
- (e) Re-assemble all parts using new rubber boot and springs as required.

## SUSPENSION

### HYDRAULIC DAMPERS.

The telescopic hydraulic dampers on both front and rear springs require no maintenance attention; should they be damaged, replacement units must be fitted.

### FRONT WHEEL ALIGNMENT.

As an aid to maximum tyre life and comfortable steering, the front wheel alignment should be checked by a Rover dealer at regular intervals.

## ROAD SPRINGS.

At regular intervals (see Page E-20), check the security of the road spring leaf clips and the nuts on the U bolts securing the axles to the springs; rectify as necessary.

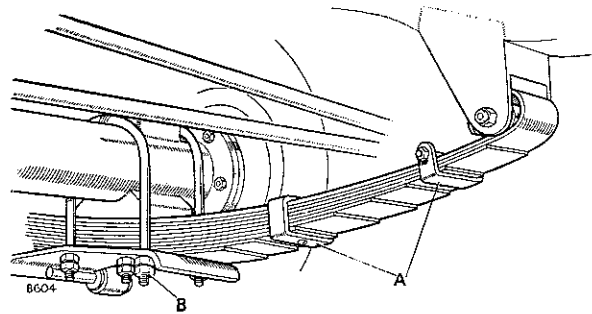


Fig 26 Leaf clips and U bolts  
A—Leaf clips. B—U bolt nuts.

## CHASSIS

### FOOT PEDAL LUBRICATION

Periodically (see Page E-19), apply one of the recommended oils at the lubrication nipples on the pedal shafts.

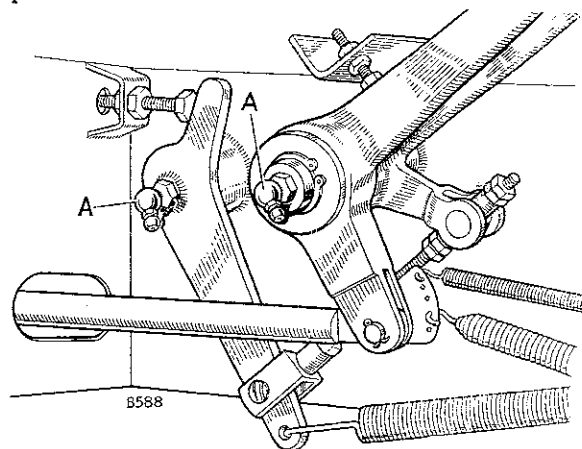


Fig. 27. Pedal shaft lubrication.  
A—Lubrication nipples.

## BRAKE SYSTEM

The wheel brakes, operated by the foot pedal, are of the hydraulic type, while the hand-brake operates a mechanical brake unit mounted on the output shaft from the transfer box.

### BRAKE FLUID RESERVOIR.

The fluid reservoir for the hydraulic brake system is fitted under the seat box on the right-hand side and is accessible when the locker lid is raised. See Fig 7, Page E-15.

The correct fluid level is with the reservoir three-quarters full; periodically, remove the filler cap and replenish as necessary, using only Girling Crimson Brake Fluid (obtainable from any Rover dealer).

It is advisable to check this point regularly, as shortage of fluid will result in gradual deterioration of the brakes which may not be noticed by the driver.

## WHEEL BRAKE ADJUSTMENT.

When lining wear has reached the point where the pedal travel becomes excessive, it is necessary to adjust the brake shoes in closer relation to the drum.

Proceed as follows:—

*All 86, 88 and 107 models with 10" brakes.*

Jack up each wheel in turn. On the back face of the brake anchor plate, will be found a hexagon adjustment bolt (A), which operates a snail cam bearing on the leading shoe. Only one of these is fitted to each wheel brake unit, thereby providing single-point adjustment. Spin the wheel and rotate the adjuster bolt until the brake shoe contacts the drum, then ease the adjuster until the wheel again rotates freely. Repeat for the other three wheels.

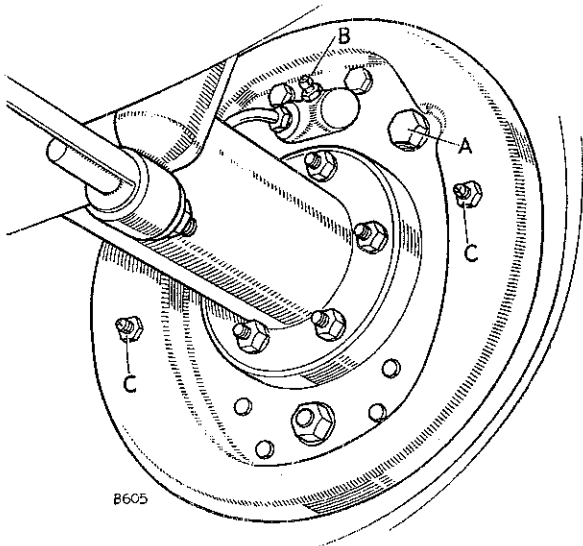


Fig 28 Wheel brake adjustment.

Front and rear 10 in. brakes.  
Front only 11 in. brakes.

A—Adjustment bolt. B—Bleed nipple.  
C—Shoe steady posts.

*107 and 109 with 11" brakes.*

### Front

Each shoe is independently set by means of an adjuster operating through a serrated snail cam.

1. With the vehicle jacked up, ensure that the wheels rotate freely; slacken off the adjusters if necessary by turning anti-clockwise.
2. Turn the adjuster for each shoe clockwise until the shoe just brushes the brake drum, then slacken off two serrations.

### Rear

The rear brake shoes are adjusted by means of a single adjuster assembly fitted at the lower side of the brake anchor plate which allows the shoes to expand or contract equally.

1. With the rear wheels jacked up ensure that they rotate freely; slacken the adjuster if necessary, by turning anti-clockwise.

2. Apply the foot brake to ensure that the shoes are bedded in and turn the adjuster clockwise until the linings brush the brake drum then slacken adjuster off (anti-clockwise) two clicks.

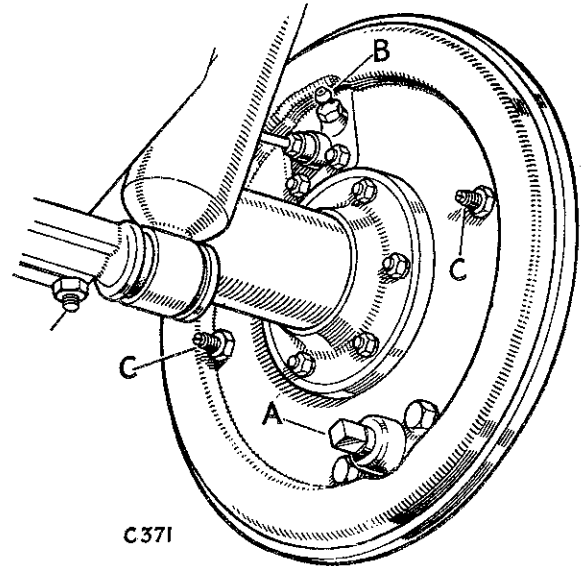


Fig 28A. Wheel brake adjustment—Rear only 11 in. brakes

A—Adjuster spindle. B—Bleed nipple.  
C—Shoe steady.

## TRANSMISSION BRAKE ADJUSTMENT.

Periodic adjustment of the transmission brake unit will be required; proceed as follows:—

Release the hand-brake. Adjustment is made by means of the adjuster wedge spindle (A) protruding from the front of the brake back-plate, accessible from beneath the vehicle or after removing the centre seat box panel; during rotation of the adjuster a click will be felt and heard at each quarter revolution. Rotate the spindle as far as possible in a clockwise direction, i.e., until the brake shoes contact the drum. Then unscrew the adjuster two clicks and give the brake a firm application to centralise the shoes; the brake drum should now be quite free to rotate. No other adjustment to the hand-brake system is necessary to compensate for lining wear.

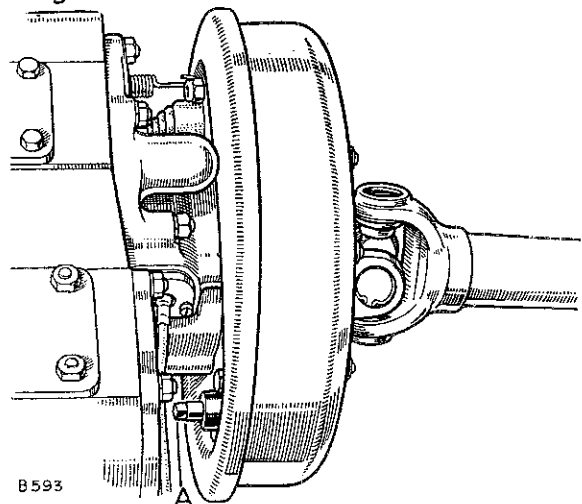


Fig 29. Transmission brake adjustment.

A—Adjuster.

## BLEEDING THE BRAKE SYSTEM

If the level of fluid in the reservoir is allowed to fall too low, or if any section of the brake pipe system is disconnected, the brakes will feel "spongy", due to air having been absorbed into the system. This air lock must be removed by bleeding the hydraulic system at the wheel cylinders; bleeding must always be carried out at all wheels, irrespective of which portion of the pipe-line is affected :-

1. Slacken the shoe adjustment bolts right off.
2. Attach a length of rubber tubing to the bleed nipple on the wheel unit farthest from the brake pedal and place the lower end of the tube in a glass jar.
3. Slacken the bleed screw behind the nipple and pump the brake pedal sharply two or three times and then more slowly, pausing at each end of each stroke, until the fluid issuing from the tube shows no signs of air bubbles when the tube is held below the surface of the fluid in the jar.
4. Hold the tube under the fluid surface and tighten the bleed screw.
5. Repeat for the other three wheels in turn, finishing at the one nearest the brake pedal.
6. Re-adjust the brakes.

The fluid in the reservoir should be replenished throughout the operation, to prevent another air-lock being formed.

## FUEL SYSTEM

The fuel system comprises the tank, pipe lines, sediment bowl, pump, carburetter and air cleaner.

It is most important that the entire system be kept clean and free from leaks.

### DRAINING THE FUEL SYSTEM.

If the vehicle is to be stored for an extended period, the fuel system should be completely drained to prevent the formation of gum in the pump and carburetter. Remove the drain plug from the bottom of the petrol tank and replace when the tank is empty; then run the engine until the petrol in the pipe-line is exhausted.

### SEDIMENT BOWL.

The sediment bowl, inserted in the pipe from the tank to the pump and mounted on the engine side of the dash, serves as the main filter in the fuel system. Should the filter become choked or if an appreciable amount of foreign matter has collected in the bowl, the unit should be cleaned as follows :-

Remove the glass bowl by slackening the thumbscrew and swinging the wire holder aside. Remove the gauze filter from the body of the unit and wash it and the bowl in petrol. Replace the gauze correctly over the square inlet nozzle, ensure that the sealing washer is in good condition and replace the bowl.

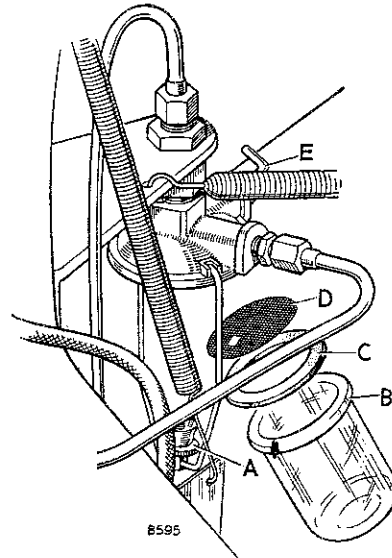


Fig 30. Sediment bowl.

A—Thumbscrew. D—Filter gauze.  
B—Bowl. E—Shut-off tap.  
C—Joint washer.

The screw-in petrol shut-off tap protruding from the body of the unit should normally be left open. If desired, when parking the vehicle for a lengthy period, it can be closed to serve as a precaution against theft.

### PETROL PUMP.

The petrol pump, mounted on the engine side of the dash, is wired through the ignition; it will operate immediately the ignition is switched on, so filling the carburetter float chamber and ensuring easy starting.

### CLEANING PETROL PUMP FILTER.

Should the pump filter become choked, it can be withdrawn by unscrewing the hexagon brass plug in the bottom of the pump body. Clean thoroughly in petrol, using a stiff brush; never use rag for cleaning this type of filter.

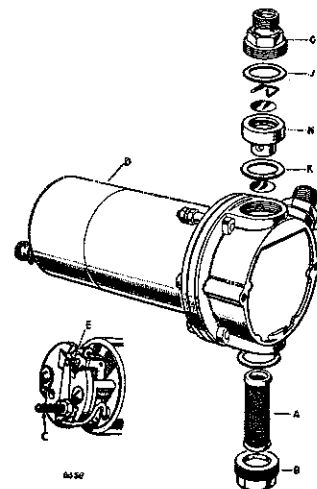


Fig 31. Petrol pump

A—Gauze filter F—Inlet union.  
B—Filter plug. G—Outlet union.  
C—Feed terminal H—Valve cage.  
D—Bakelite cover. J—Thick fibre washer.  
E—Contact points K—Thin fibre washer.

## PETROL PUMP FAULT LOCATION

If petrol pump trouble is suspected :—

1. Disconnect the pump end of the pipe to the carburetter (upper pipe at pump) and switch on the ignition :—
  - A. If the pump then operates satisfactorily, the trouble is due to either :—
    - (i) Blockage of the pipe to the carburetter, which can be cleared by blowing down it with a tyre pump
    - Or (ii) Sticking carburetter float needle. To remedy, clean the float chamber and needle valve.
  - B. If the pump still does not operate correctly, the trouble may be due to either :—
    - (i) Blockage of the pump filter, which should be cleaned.
    - (ii) Blockage of the sediment bowl which can be cured by cleaning.
    - (iii) Blockage of the pipe to the sediment bowl or that from the bowl to the tank, which can be cleared by blowing down it with a tyre pump.
    - (iv) Poor connection in the pump wiring. Disconnect the lead from the feed terminal (C) and strike it against a metallic

part of the dash ; the appearance of sparks will indicate that the current supply is in order.

**NOTE.** Care should be taken during this test, as loose petrol or vapour may cause a fire.

- Or (v) Dirty pump contact points. Remove the cover (D) and touch the terminal (C) with the lead. If the pump does not operate when the points (E) are in contact and a spark cannot be struck off the terminal, then the points must be cleaned by sliding a piece of card between them.

Failure to locate and rectify the fault in this manner will indicate that the pump itself is at fault and the local Rover dealer should be consulted.

If the pump becomes noisy in operation, allow it to deliver directly into a can ; if the delivery pipe is submerged in the petrol and bubbles appear, an air leak on the suction side of the pump is indicated, which must be found and cured.

If the pump becomes hot in operation or keeps on beating without delivering petrol, a choked filter or dirt in the pump valves is indicated. To locate and remove the obstruction in the valve, unscrew the top union (G) from the pump and lift out the valve cage (H). When replacing the cage, ensure that the thin hard fibre washer (K) is below the cage and the thick one (J) above.

## AIR CLEANER 1948-53

A small centrifugal pre-cleaner separates out the coarser particles of foreign matter before the air passes into the top of the main cleaner body. The air is diverted down a large diameter tube in the centre of the cleaner, at the bottom of which a sharp reversal of direction takes place, thus depositing the majority of the dust into the oil reservoir in the detachable tray forming the bottom of the cleaner. It then passes up through the woven steel packing which fills the annular chamber surrounding the central tube, where the remaining particles are extracted and the clean air travels through the outlet elbow to the carburetter intake. (Fig. 32.)

The complete cleaner may be removed from the vehicle by undoing the three large clips securing it to the support on the battery box. It is also necessary to disconnect the outlet elbow from the carburetter duct, by rotating a cam ring on the duct to release two clips.

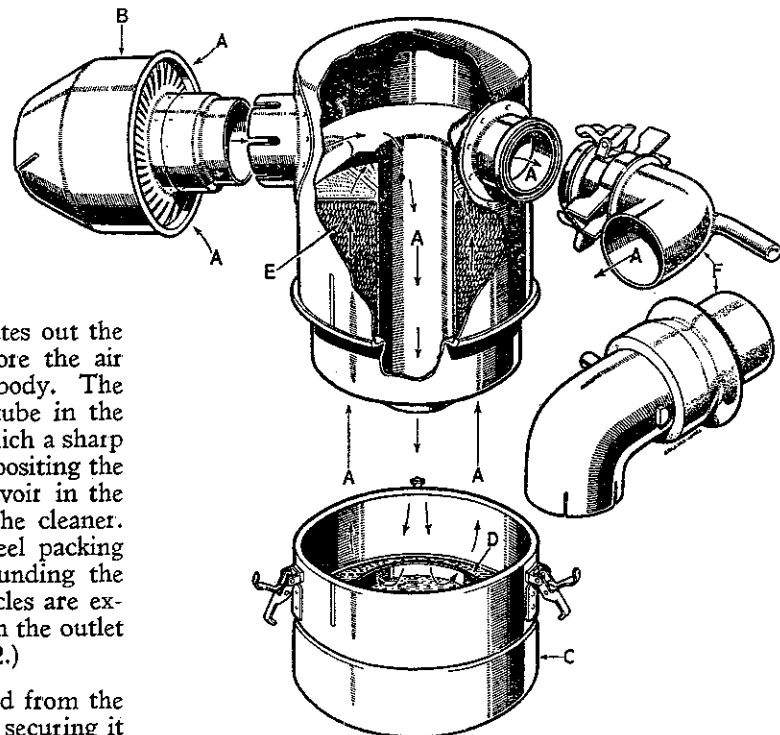


Fig. 32. Air cleaner

- |                            |                          |
|----------------------------|--------------------------|
| A—Path of air shown → → →  | D—Oil level.             |
| B—Centrifugal pre-cleaner. | E—Woven steel packing.   |
| C—Oil bath.                | F—Outlet to carburetter. |

The oil bowl forming the bottom of the cleaner is secured to the body by means of three further (small) clips; when replacing the bowl, align the white marks on the cleaner body and bowl to ensure correct location of the clips. The correct oil level in the bowl is indicated by a ring formed in the pressing; the capacity is approximately 2 pints (1 litre).

Two engine breather pipes from the crankcase and top rocker cover are led into the carburetter duct.

Attention to the air cleaner is extremely important, especially under dusty conditions, as it plays a very important part in preventing engine wear generally and cylinder bore wear in particular. If the vehicle is used mainly for road work, the oil bowl should be emptied, cleaned and refilled to the level mark with engine oil at each engine oil change; at the same time clean the filter gauze by swilling the cleaner body in petrol. When the vehicle is used for field work, clean and change the oil in the cleaner much more frequently; under extremely dusty conditions, such as harrowing or scuffling, daily oil changes may be required.

#### AIR CLEANER—1954-58

Attention to the air cleaner is extremely important, especially under dusty conditions, as engine wear generally will be seriously affected if the vehicle is run with an excessive amount of sludge in the cleaner oil bath.

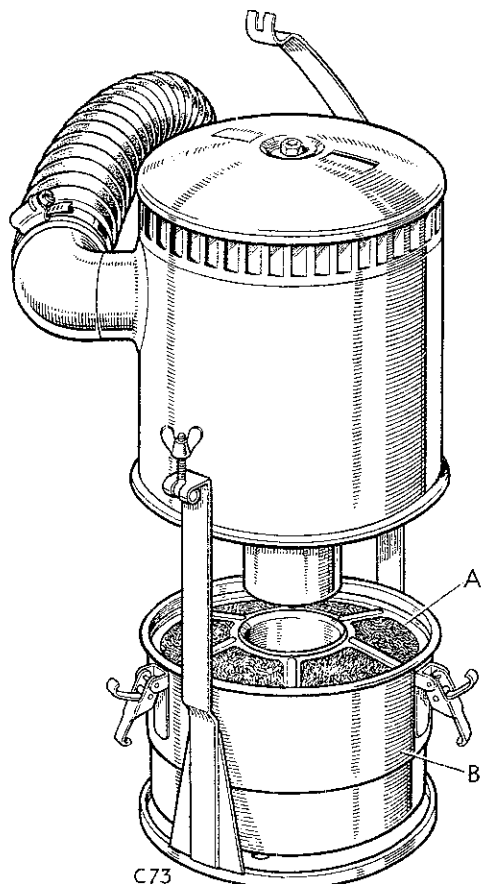


Fig. 32A. Air cleaner.

A—Oil bowl. B—Oil level mark.

Under clean road or stationary conditions, the cleaner oil bath should be cleaned and refilled at each engine oil change. In cases where the vehicle is operated under dusty road or field conditions, attention must be more frequent, even to the extent of a daily oil change; under extremely bad conditions, cleaning twice daily may be called for.

Proceed as follows:—

1. Release the clamping strap securing the complete air cleaner to the battery box support, disconnect the outlet elbow from the carburetter intake pipe by slackening the clip and remove the cleaner from the vehicle.
2. Remove the oil bowl from the bottom of the cleaner by releasing the three securing clips.
3. Clean all dirty oil and sludge from the bowl and refill with fresh engine oil to the level indicated by a ring formed in the pressing; the capacity is approximately 1½ Imperial pints (0,85 litre).
4. Clean the filter in the cleaner body by swilling the complete body in petrol or paraffin and shake off the surplus.
5. Replace the bowl.
6. Refit the complete unit in the vehicle.

#### CARBURETTER.

The carburetter is adjusted on assembly and, apart from occasional cleaning of the filter, should require no further attention. The only normal adjustment provided is that to obtain smooth engine idling.

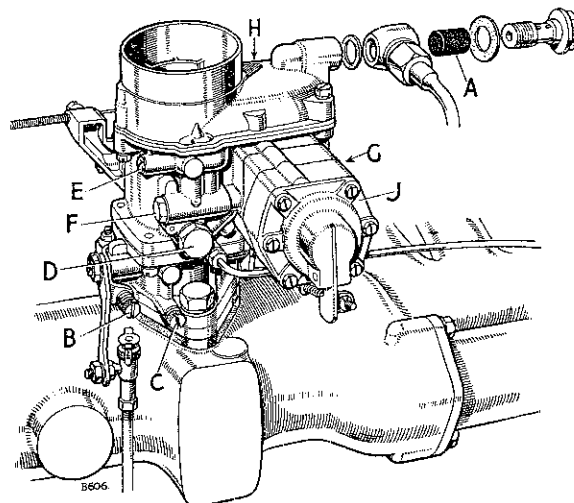


Fig. 33 Carburetter.

- |                       |                       |
|-----------------------|-----------------------|
| A—Filter.             | F—Pump jet            |
| B—Slow-running screw. | G—Economy jet.        |
| C—Volume screw.       | H—Starter petrol jet. |
| D—Main jet            | J—Accelerator pump    |
| E—Pilot jet           |                       |

For a temperate climate and altitudes up to 3,000 ft. (1,000 m.), i.e., as the vehicle is tested initially, the standard carburetter setting is:—

Choke: 25; main jet: 115; correction jet: 240; pilot jet: 55; pump jet: 75; economy jet: 50; air bleed: 1.5; starter air jet: 5.5; starter petrol jet: 135; petrol level: 16 mm. below float chamber joint face.

When operating under other conditions, the carburetter setting may need adjusting to suit; as a general guide, the following settings may be used as a basis to determine such adjustment:—

Tropical conditions. As standard, except main jet: 110.

Altitude setting. As standard, except:—

3,000 to 6,000 ft. (1,000 m. to 2,000 m.)

Main jet: 110; air bleed: 2.0.

6,000 to 10,000 ft. (2,000 m. to 3,000 m.)

Main jet: 107.5; air bleed: 2.0.

10,000 to 14,000 ft. (3,000 m. to 4,000 m.)

Choke: 26; main jet: 107.5; correction jet: 260; air bleed: 2.0.

#### CLEANING CARBURETTER FILTER.

When necessary, disconnect the petrol pipe from the carburetter and withdraw the gauze filter from the float chamber cover. Clean the filter in petrol, using a stiff brush.

#### CARBURETTER SLOW-RUNNING ADJUSTMENT.

It may occasionally become necessary to adjust the slow-running qualities of the carburetter, in which case proceed as follows:—

1. Run the engine until it is hot—never set the idling with a cold engine.
2. Set the slow-running screw until the idling speed is rather high.
3. Slacken the volume screw until the engine begins to hunt.
4. Screw it in very gradually until the hunting just disappears.
5. If the engine speed is too high, reset the slow-running screw to slow it down to an idling speed of about 500 r.p.m.
6. This may cause a resumption of slight hunting. If so, turn the volume control screw gently in a clockwise direction until the idling is once more satisfactory.

#### CLEANING CARBURETTER JETS.

Reference is made in the "IN CASE OF TROUBLE" section on Page E-44 to carburetter jet cleaning.

It is most unlikely that trouble will be experienced with blocked jets, but the following notes will assist in location of jets which may need cleaning:—

1. Main petrol jet; the jet proper is screwed in to the inner end of the carrier, which must be removed to gain access to the jet.
2. Pilot jet has a screwdriver slot in the hexagon head.
3. Accelerator pump jet is located between the main and pilot jets.
4. Economy jet is located at the side of the accelerator pump housing, opposite the pump jet.
5. Starter petrol jet is a plain hexagon-headed unit at the rear of the carburetter.

## COOLING SYSTEM

### COOLING SYSTEM MAINTENANCE.

It is a good plan to inspect the cooling system at the same time as the engine oil level is checked; such care would largely prevent the possibility of a sudden and costly delay due to coolant loss and consequent engine damage. Attention should be paid to the following points:—

1. Water level in radiator—to the bottom of the filler neck.
2. Condition of all hoses—freedom from cracks and hose clips tight.
3. Any other water leaks.
4. Check that the drain taps are fully closed.

### FAN BELT ADJUSTMENT.

As the fan belt is of the "V" type, the drive is on the sides of the belt and it is not therefore necessary to adjust it tightly and so put an excessive load on the water pump and dynamo bearings; the tension is correct when the belt can be depressed  $\frac{1}{2}$  to  $\frac{3}{4}$  in. (12 to 19 mm.) by thumb pressure between the fan and crankshaft pulleys. The procedure for adjustment is as follows:—

Slacken the three dynamo pivot bolts and the bolt securing the dynamo to the adjusting link. Move the dynamo outwards until the tension is correct and re-tighten the bolts.

### DRAINING THE COOLING SYSTEM

As a precaution against corrosion, the cooling system should be drained and flushed out at least twice each year in the following manner:—

1. Remove the radiator filler cap (see Page E-15).
2. Open the water drain taps at the bottom of the radiator and on the right-hand side of the cylinder block at the rear.

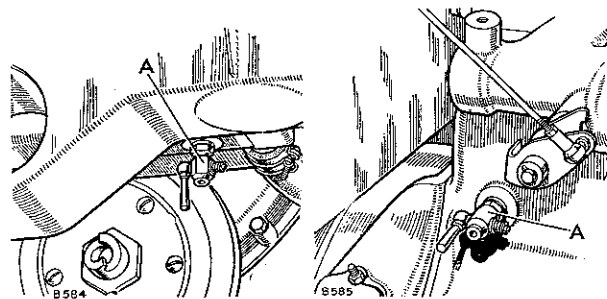


Fig. 34 Drain taps.

A—Drain tap.

3. When the water flow has ceased, insert a piece of wire in each tap, to make sure that a blockage has not been caused by rust or scale.
4. Place a hose in the radiator filler neck and adjust the flow of water to equal that draining from the taps.
5. Run the engine for a short time to ensure thorough cleaning of the whole system.



- Switch off the engine, remove the hose and close the taps. Refill the system with clean water to the bottom of the filler neck and replace the filler cap. The total capacity is 17 Imperial pints (9,5 litres).

**NOTE.** Use soft water wherever possible; if the local water supply is hard, rain or distilled water should be used.

- Run the engine until working temperature is reached and top up the water level as necessary.

### CLEANING RADIATOR.

In the event of the cooling gills of the radiator becoming blocked with dirt, straw, etc., they should be cleaned by means of compressed air or water pressure applied from the rear, so forcing the foreign matter out through the front of the radiator. Never use a metal implement for this purpose or serious damage may result to the radiator core.

### FROST PRECAUTIONS

In cold weather, when the temperature may drop to or below freezing point, precautions must be taken to prevent freezing of the water in the cooling system.

As a thermostat is fitted in the system, it is possible for the radiator block to freeze in cold weather even though the engine running temperature is quite high; for this reason, the use of an anti-freezing mixture is essential.

Only high quality inhibited glycol-base solutions should be used.

When the temperature is between 32° F and 14° F (0° C and minus 10° C) use 1 part of anti-freeze to 4 parts of water. If the temperature is between 5° F and 14° F (minus 10° C and minus 15° C) use 1 part of anti-freeze to 3 parts of water.

Proceed as follows:—

- Ensure that the cooling system is leak-proof; anti-freezing solutions are far more "searching" at joints than water.
- Drain and flush the system as described on this page.
- Mix the solution to the required strength in a separate container and refill the system.
- Run the engine to ensure good circulation of the mixture.

When the winter is over, as a precaution against corrosion, the anti-freezing solution should be drained off and the system flushed thoroughly again.

If the vehicle is to be stored in cold weather, unless it is kept in a well-heated garage or anti-freeze solution has been used, the cooling system must be completely drained. After the water has drained out, it is well to run the engine at a fast idling speed for not more than half a minute, so as to dry out any water that may have been retained in the bottom of the jacketing.

**NOTE.** During the winter months, in Britain, vehicles leaving the Rover Factory have the cooling system filled with 25% of Anti-freeze mixture. This gives protection against frost down to 0° F (minus 17° C). Vehicles so filled can be identified by the Yellow label affixed to the right-hand side of the windscreen and a Yellow label tied to the engine.

If the prevailing weather makes the use of anti-freeze mixture unnecessary when the vehicle is received, the cooling system must be drained, flushed and refilled as a precaution against corrosion. The Yellow labels should be removed from the windscreen and engine when this has been carried out.

### WHEELS AND TYRES

The standard tyre equipment for the Land-Rover 80, 86 and 88 is the 6.00-16 size; this is a dual-purpose tyre. It is suitable for general cross-country work including towing and is serviceable both on and off the road.

Alternatively, 6.50-16 tyres may be fitted as original equipment on the Land-Rover 86 and 88; they are also dual-purpose tyres, but provide rather better traction off the road than the 6.00-16 tyre.

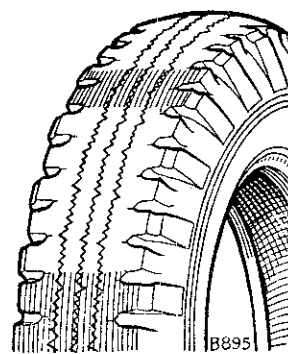


Fig. 35

Typical standard tyre,  
6.00-16 and 7.00-16

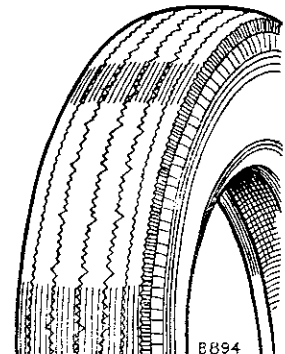


Fig. 36.

Typical tyre, 7.00-16  
for road work only

7.00-16 tyres are fitted as standard on the Land-Rover 107 and 109.

For certain special conditions, alternative tyres are recommended.

1. **SOFT MUDLAND AND PLOUGHLAND**, etc., especially when towing on such surfaces. Under such conditions, greater wheel grip and maximum power are required and can be obtained from the 7.00-16 Tractor pattern tyres. Their special tread design with deep, widely-spaced bars is ideal, but they are noisy and will wear rapidly if used extensively on hard dry surfaces and on the road. They must be regarded, therefore, as special purpose tyres.

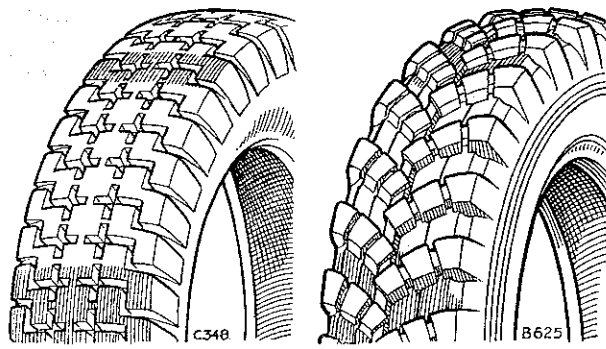


Fig. 37.  
Typical sand tyre 7.00-16

Fig. 38  
Typical 6.50-16 tyre

2. **ROAD USE.** Where exceptional conditions cause the majority of service to be on road and the vehicle will not be expected to operate on soft ground, best service will be obtained by fitting 6.00-16 or 7.00-16 car type tyres.

3. **SURFACES WHERE MINIMUM CONTACT PRESSURES ARE REQUIRED, e.g., SANDY DESERT.** Under such conditions 7.00-16 sand type tyres are recommended

**TYRE PRESSURES—1948-51**

For normal road and cross-country work, tyre pressures must be maintained at:—

<b>Front</b>	<b>Rear</b>
20 lb. per sq.in. (1,4 kg/cm <sup>2</sup> )	26 lb. per sq.in. (1,8 kg/cm <sup>2</sup> )

When loads in excess of 550 lb. (250 kg.) are carried in the rear of the vehicle, pressures in the rear tyres only must be raised to 30 lb. per sq.in. (2,1 kg/cm<sup>2</sup>).

Should it be desired to traverse exceptionally soft ground, the tyre pressures may be reduced to

<b>Front</b>	
6.00 x 16: 15 lb. per sq.in. (1,05 kg./cm <sup>2</sup> )	7.00 x 16: 13 lb. per sq.in. (0,9 kg./cm <sup>2</sup> )
<b>Rear</b>	
6.00 x 16: 20 lb. per sq.in. (1,4 kg./cm <sup>2</sup> )	7.00 x 16: 18 lb. per sq.in. (1,25 kg./cm <sup>2</sup> )

These reduced pressures must only be employed when absolutely essential and the pressures must be returned to normal immediately after the soft ground has been negotiated.

1. For normal road and cross-country work, tyre pressures must be maintained at:—

<b>Front and Rear</b>	
25 lb. per sq.in. (1,75 kg./cm <sup>2</sup> )	

When loads in excess of 550 lb. (250 kg.) are carried in the rear of the vehicle, pressures in the rear tyres only must be raised to 30 lb. per sq.in. (2,1 kg/cm<sup>2</sup>).

2. Should it be desired to traverse exceptionally soft ground, the tyre pressures may be reduced to

**Front and Rear**

- 6.00 x 16 tyres: 15 lb. per sq.in. (1,05 kg./cm<sup>2</sup>)
- 7.00 x 16 tyres: 13 lb. per sq.in. (0,9 kg./cm<sup>2</sup>)

When loads in excess of 550 lb. (250kg) are carried in the rear of the vehicle, pressures in the rear tyres only must be raised to:—

- 6.00 x 16 tyres: 20 lb. per sq.in. (1,4 kg./cm<sup>2</sup>)
- 7.00 x 16 tyres: 18 lb. per sq.in. (1,25 kg./cm<sup>2</sup>)

**TYRE PRESSURES—1954-58**

Careful attention must be given to the question of correct tyre pressures if maximum tyre life and performance are to be obtained.

1. For normal road and cross-country work, tyre pressures must be maintained at:—

<b>Land Rover. All models</b>	
<b>Front and Rear:</b>	
25 lb. per sq. in. (1,75 kg./cm <sup>2</sup> )	

When loads in excess of 550 lb. (250 kg.) are carried in the rear of the vehicle, pressures in the rear tyres only must be raised to:

- Land-Rover 86 and 88:**  
30 lb. per sq. in. (2,1 kg./cm<sup>2</sup>).
- Land-Rover 107 and 109:**  
32 lb. per sq. in. (2,25 kg./cm<sup>2</sup>)

2. Should it be desired to traverse exceptionally soft ground, the tyre pressures may be reduced to:—

<b>Land-Rover 86 and 88</b>	
<b>Front and Rear:</b>	

- 6.00-16 tyres: 15 lb. per sq. in. (1,05 kg./cm<sup>2</sup>).
- 6.50-16 tyres: 15 lb. per sq. in. (1,05 kg./cm<sup>2</sup>).
- 7.00-16 tyres: 13 lb. per sq. in. (0,9 kg./cm<sup>2</sup>).

When loads in excess of 550 lb. (250 kg.) are carried in the rear of the vehicle, pressures in the rear tyres only must be raised to:—

- 6.00-16 tyres: 20 lb. per sq. in. (1,4 kg./cm<sup>2</sup>).
- 6.50-16 tyres: 20 lb. per sq. in. (1,4 kg./cm<sup>2</sup>).
- 7.00-16 tyres: 18 lb. per sq. in. (1,25 kg./cm<sup>2</sup>).

**Land-Rover 107 and 109**

<b>Unladen</b>	<b>Front and Rear:</b>	
	16 lb. per sq. in. (1,15 kg./cm <sup>2</sup> ).	
<b>Laden</b>	<b>Front:</b>	18 lb. per sq. in. (1,25 kg./cm <sup>2</sup> ).
	<b>Rear:</b>	24 lb. per sq. in. (1,7 kg./cm <sup>2</sup> ).

*Reduced pressures must only be employed when absolutely essential and the pressures must be returned to normal immediately after the soft ground has been negotiated.*

Pressures should be checked and adjusted—weekly 1948-53 models, monthly 1954-58 models, paying attention to the following points:—

1. Whenever possible, check with the tyres cold, as the pressure is about 2 lb. (0,1 kg.) higher at running temperature.
2. Always replace the valve caps, as they form a positive seal on the valves.

3. Any unusual pressure loss (in excess of 1 to 3 lb. (0,05 to 0,20 kg) per month) should be investigated and corrected.
4. Always check the spare wheel, so that it is ready for use at any time.
5. At the same time, remove embedded flints, etc., from the tyre treads with the aid of a penknife or similar tool. Clean off any oil or grease on the tyres, using petrol sparingly.

### TYRE TREADS

The tread form of the special purpose tyres makes them uni-directional. They must be fitted with the V or arrow in the tread pattern pointing forwards at the top of the wheel, to ensure maximum grip and efficient tread cleaning when operating on soft ground. For this reason, it may be necessary to reverse the spare tyre on its wheel (depending on which side of the vehicle it is to be fitted) when putting it into service.

### CHANGING TYRE POSITIONS

In the interests of tyre mileage and even wear, it is desirable to change the position of the tyres on the vehicle (including the spare) at intervals of 3,000 miles (5 000 km.). The front and rear wheels should be interchanged on each side of the vehicle; at the same time, the spare wheel should be fitted to give it a spell of duty and one of the other wheels removed to become the spare.

### FACTORS AFFECTING TYRE LIFE.

The most important factors, among many which have an adverse effect on tyre life, are:—

1. Incorrect tyre pressures.
2. High average speeds.
3. Harsh acceleration.
4. Frequent hard braking.
5. Warm, dry climatic conditions.
6. Poor road surfaces.
7. Impact fractures caused by striking a kerb or loose brick, etc.
8. Incorrect front wheel alignment. Alignment should be checked periodically by a Rover dealer and adjusted as necessary.

### WHEELS.

As standard equipment, well-base wheels are fitted, but divided type wheels, identified by the ring of bolts securing the two halves together, are available as original equipment as an optional extra.

Either pattern wheel may be used with 6.00-16 or 7.00-16 tyres, although 7.00-16 Tractor type tyres are more readily fitted to the divided type. Rubber protection flaps must be fitted when divided wheels are used.

**NOTE: DIVIDED WHEELS.** Under no circumstances must the clamping nuts, which hold the two halves of the wheel together, be slackened unless the tyre is fully deflated. Failure to observe this rule may result in damage to the equipment and will certainly involve the risk of personal injury.

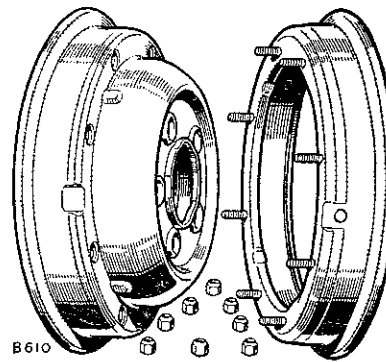


Fig. 39.  
Divided wheel

### TYRE REMOVAL—WELL-BASE WHEELS.

As inextensible wires are incorporated in the beads of the outer cover, the beads must not be stretched over the wheel rim. The operation will be more easily carried out if the cover beads are lubricated liberally with water, preferably with a little soap added. Tyre levers should be dipped before each insertion. The correct method of tyre removal is as follows:—

1. Remove the valve cap and core (using the extractor provided in the tool kit) and deflate the tyre.
2. Press each bead in turn off its seating. Insert a lever at the valve position and, while pulling on this lever, press the bead into the well diametrically opposite the valve.
3. Insert a second lever close to the first and prise the bead over the wheel rim. Continue round the bead in small steps until it is completely off the rim.
4. Remove the inner tube and pull the second bead over the rim.

Minor tyre injuries, such as from nails, require no attention other than removal of the object, but more severe tread or wall cuts require vulcanised repairs.

Avoid the use of gaiters or liners except as a temporary expedient.

“Butyl” synthetic inner tubes are fitted and all repairs must be vulcanised.

### TYRE REPLACEMENT—WELL-BASE WHEELS.

Outer covers and tubes marked with balance spots should be fitted so that the white spots near the cover bead coincide with the black spots across the base of the tube. This achieves a high degree of tyre balance.

1. Place the cover over the wheel and press the lower bead over the rim edge into the well.
2. Inflate the inner tube until it is just rounded out and insert it in the cover.
3. Press the upper bead into the well diametrically opposite the valve and lever the bead over the rim edge.

4. Push the valve inwards to ensure that the tube is not trapped under the bead, pull it back and inflate the tyre.
5. Check the concentricity of the fitting line on the cover and the top of the wheel flange. Deflate the tube completely and re-inflate to the correct pressure, to relieve any strains in the tube.

#### TYRE REMOVAL—DIVIDED WHEELS.

Do not touch the nuts securing the two halves of the wheel together before the tyre is deflated or serious personal injury may result

Remove the tyre as follows:—

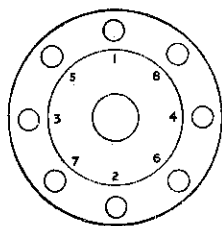
1. Remove the valve cap and core to deflate the tyre.
2. Press each bead in turn away from the flange, using levers and working round the tyre in small steps. Two or three circuits of the tyre may be necessary to free the beads completely.
3. Slacken and remove the clamping nuts. Remove the upper half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

Minor tyre injuries, such as from nails, require no attention other than removal of the object, but more severe tread or wall cuts require vulcanised repairs. Avoid the use of gaiters or liners except as a temporary expedient

“Butyl” synthetic inner tubes are fitted and all repairs must be vulcanised.

#### TYRE REPLACEMENT—DIVIDED WHEELS.

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 in the sequence illustrated. Check that the valve is free and inflate the tyre to the recommended pressure.



#### WHEEL AND TYRE BALANCE.

Wheel and tyre units are accurately balanced on initial assembly with the aid of small weights secured to the inner side of the wheel slot flanges by means of set bolts. In the interests of smooth riding and even tyre wear, it is advantageous for a Rover dealer to check the balance whenever a tyre is refitted.

### ELECTRICAL EQUIPMENT

#### BATTERY.

The positive earth 12-volt battery is carried under the bonnet on the right-hand side.

At regular intervals (see Page E-19), check the battery level as follows:—

1. Wipe all dirt and moisture from the battery top.
2. Remove the filler plug from each cell in turn. If necessary add sufficient distilled water to raise the level to the top of the separators. Replace the filler plug. Avoid the use of a naked light when examining the cells.

In hot climates it will be necessary to top-up the battery at more frequent intervals.

In very cold weather it is essential that the vehicle be used immediately after topping-up, to ensure that the distilled water is thoroughly mixed with the electrolyte. Neglect of this precaution may result in the distilled water freezing and causing damage to the battery.

Occasionally check the condition of the battery by measuring the specific gravity of the electrolyte in each cell, using a hydrometer. Specific gravity readings and their indications are as follows:—

1.280 to 1.300 (32° to 34° Baumé)

Battery fully charged.

About 1.210 (25° Baumé)

Battery about half discharged.

Below 1.150 (19° Baumé) Battery fully discharged.

These figures assume an electrolyte temperature of 60° F. (15.5° C.). If one cell gives a reading very different from the rest, it may be that acid has leaked from that particular cell, or there may be a short circuit between the plates, in which case the battery should be inspected at a service depot.

Never leave the battery in a discharged condition for any length of time; it should be given a short refreshing charge every fortnight, to prevent permanent sulphation of the plates.

**NOTE.** If the vehicle is to be left in the open in very cold weather, care must be taken to ensure that the battery is in a good state of charge, otherwise there is danger of the electrolyte freezing and consequent damage to the battery.

If the battery lugs have been removed for any reason they must always be refitted as follows:—

1. Clean terminal post and inside of the battery lug.
2. Fit lug to terminal post and lightly tap on to the taper of the post.

3. Smear vaseline or anti-corrosion grease in the hole for the retaining screw.
4. Replace screw taking care not to overtighten. On no account must the screw be used for pulling down the lug.

### DYNAMO

Periodically (see Page E-20), the dynamo must be lubricated at the commutator end bearing by inserting the nozzle of a pump type oil can in the small central hole and injecting just sufficient engine oil to moisten the lubricating pad.

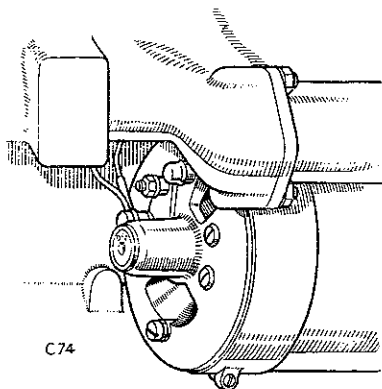


Fig. 40. Dynamo lubrication.

### VOLTAGE CONTROL BOX.

This unit is mounted on the engine side of the dash and houses the cut-out and dynamo voltage regulator, which are accurately set before leaving the works and should not normally require any further attention.

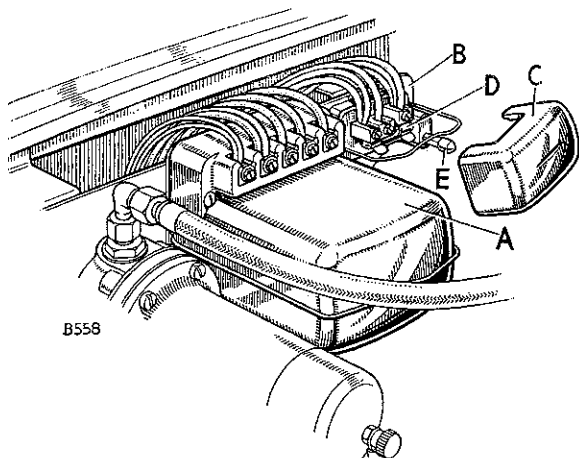


Fig. 41. Voltage control and fuse boxes.

A—Voltage control box. B—Fuse box. C—Fuse box cover.  
D—Fuse (35 amp.). E—Spare fuse.

### FUSE.

The single fuse is housed under a separate cover alongside the voltage control box; it protects the horn, windscreen wiper, fuel tank level unit and the stop lights.

All other electrical components are not fused.

A blown fuse is indicated by the failure of all the units protected by it and is confirmed by examination of the fuse. Before replacing a blown fuse, locate and remedy the fault in the wiring of the units which have failed. If the cause of the trouble cannot be found and a new fuse blows immediately, the vehicle should be examined at a service depot.

A spare fuse is carried in the fuse box; only 35 amp. cartridge type fuses must be used.

### STARTER.

In the event of the starter pinion becoming jammed in mesh with the flywheel, it can usually be freed by withdrawing the dust cap and turning the starter armature by means of a spanner applied to the shaft extension at the commutator end.

### DISTRIBUTOR.

#### DISTRIBUTOR MAINTENANCE.

At regular intervals (see Page E-19), remove the distributor cap and lubricate as follows:—

1. Lightly smear the cam with clean engine oil.
2. Lift off the rotor and add a few drops of thin machine oil to lubricate the cam bearing and distributor shaft; push the rotor on the shaft as far as possible.
3. Place a drop of clean engine oil on the contact breaker lever pivot, taking care not to oil the contacts.
4. Add a few drops of thin machine oil through the hole marked "OIL HERE" in the contact breaker base plate, to lubricate the automatic timing control.

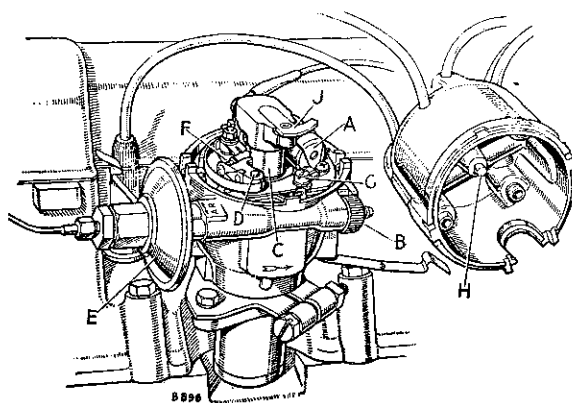


Fig. 42. Distributor.

A—Condenser. F—Contact points.  
B—Octane selector. G—Screws securing movable contact.  
C—Cam. H—Carbon brush.  
D—Contact breaker pivot. J—Rotor arm.  
E—Vacuum unit.

Periodically (see Page E-19), clean the distributor as follows:—

1. Wipe the inside and outside of the cap with a soft, dry cloth; ensure that the small carbon brush works freely in its holder.

2. Slacken the nuts on the terminal block and lift off the spring and moving contact. Ensure that the contacts are free from grease or oil; if they are burned or blackened, clean with a fine carborundum stone or very fine emery cloth and wipe with a petrol-moistened cloth. Replace the moving contact.
3. Check and adjust the contact breaker clearance as follows :—
  - (i) Remove the distributor cap and turn over the engine by hand until the contacts are fully open.
  - (ii) The clearance should be .014 to .016 in. (0,35 to 0,40 mm.) i.e., the feeler gauge supplied in the tool kit should be a sliding fit between the contacts.
  - (iii) If necessary, slacken the two screws which secure the adjustable contact and move the plate until the clearance is correct; re-tighten the screws.
  - (iv) Replace the distributor cap.

#### HIGH TENSION CABLES.

7 mm. rubber covered ignition cable must be used for replacement purposes when the original cable is cracked or perished. Connections are made as follows :—

1. To coil. Pass the moulded nut over the cable, bare the end of the cable, thread the wire through the washer from the original cable and bend back the wire strands.
2. To distributor. Unscrew the pointed fixing screws on the inside of the distributor cap and push the cables, which should not be bared but cut off flush to the required length, well home into their respective terminals and tighten the fixing screws. The screw securing the centre cable is accessible when the carbon brush is removed.

#### HORN.

86 and 107.

The horn is adjusted on initial assembly and should not require attention for a considerable time. Adjustment merely takes up wear of moving parts and does not alter the pitch of the note; proceed as follows :—

1. Ascertain that the horn failure or faulty note is not due to some outside source, such as a discharged battery, loose connection, loose part adjacent to the horn, etc.
2. Operate the horn push and turn the adjustment screw anti-clockwise until the horn just fails to sound.

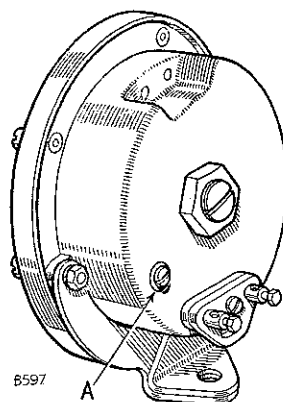


Fig. 43.  
Horn adjustment.  
A—Adjusting screw.

3. Release the horn push and turn the screw clockwise for six "clicks" (one quarter turn) when the original performance should be restored.
4. If the note is still unsatisfactory, the horn should be examined at a service depot.

88 and 109.

The horn is adjusted on initial assembly and should not require attention for a considerable time. Adjustment merely takes up wear of moving parts and does not alter the pitch of the note; proceed as follows :—

1. Ascertain that the horn failure or faulty note is not due to some outside source, such as a discharged battery, loose connection, loose part adjacent to the horn, etc.

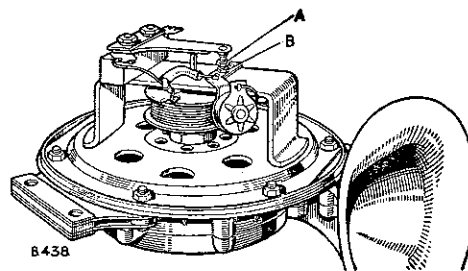


Fig. 44. Horn adjustment.  
A—Adjustable contact. B—Locknut.

2. Disconnect the supply lead from the horn, taking care that the end does not contact any metal part of the vehicle.
3. Remove the horn cover. Slacken the locknut on the fixed contact and rotate the adjusting nut until the contacts are just separated (indicated by the horn failing to sound, when the horn button is momentarily depressed).
4. Turn the nut half a revolution in the opposite direction and tighten the locknut.
5. Replace the cover.
6. If the note is still unsatisfactory, the horn should be examined at a Service Depot.

REPLACEMENT BULBS 1948-53

Position	Lucas	Voltage	Wattage	
Headlamp R.H. (Home models)	No. 162	12	36 Single filament	} Vertical fluted glass in
Headlamp L.H. (Home models)	No. 300	12	36/36 Double filament (dip to left)	
Headlamps (R.H.D. Export models)	No. 300	12	36/36 Double filament (dip to left)	} light unit
Headlamps (L.H.D. Export models except North American vehicles)	No. 301	12	36/36 Double filament (dip to right)	
Headlamps (R.H.D. models)	No. 354	12	42/36 Double filament (dip to left)	} Block glass in
Headlamps (L.H.D. models except Europe)	No. 355	12	42/36 Double filament (dip to right)	
Headlamps (Europe except France)	No. 360	12	45/35 Double filament (Duplo)	} light unit
Sidelamps (dash fixing)	No. 207	12	6 Single pole	
Sidelamps (wing fixing)	No. 989	12	6 Single pole	
Stop/tail lamps (except North American vehicles)	No. 207	12	6 Single pole	
Stop/tail lamps (North American vehicles)	No. 361	12	18/6 Double filament	
Instrument panel lights	No. 207	12	6 Single pole	
Ignition and mixture control warning lights	No. 970	2.5	5 M.E.S.	} Alternatives, check before ordering
	No. 987	12	2.2 M.E.S.	
Oil pressure and headlamp warning lights	No. 987	12	2.2 M.E.S.	
Rear number plate lamp	No. 989	12	6 Single pole	

REPLACEMENT BULBS 1954

Position	Make and Type	Voltage	Wattage
Headlamps (R.H.D. models)	Lucas No. 354	12	42/36 Double filament (dip to left)
Headlamps (L.H.D. models except North America and Europe)	Lucas No. 301	12	36/36 Double filament (dip to right)
Headlamps (Europe except France)	Lucas No. 360	12	45/35 Double filament (Duplo) (vertical dip)
Headlamps (France and North America)	Special	12	—
Sidelamps	Lucas No. 222	12	4
Stop/tail lamps (except North American vehicles)	Lucas No. 207	12	6
Stop/tail lamps (North American vehicles)	Lucas No. 361	12	18/6 Double filament
Rear number plate lamp	Lucas No. 222	12	4
Instrument panel lights	Lucas No. 987	12	2.2 M.E.S.
Warning lights	Lucas No. 987	12	2.2 M.E.S.

REPLACEMENT BULBS 1955-58

Position	Make and Type	Voltage	Wattage
Headlamps (R.H.D. models)	Lucas No. 354	12	42/36 Double filament (dip to left)
Headlamps (L.H.D. models except North America and Europe)	Lucas No. 355	12	42/36 Double filament (dip to right)
Headlamps (Europe except France)	Lucas No. 370	12	45/40 Double filament (Duplo) (vertical dip)
Headlamps (France and North America)	Special	12	—
Sidelamps	Lucas No. 222	12	4
Stop, tail lamps	Lucas No. 380	12	21/6 Double filament
Rear number plate lamps (North American vehicles)	Lucas No. 222	12	4
Instrument panel lights	Lucas No. 987	12	2.2 M.E.S.
Warning lights	Lucas No. 987	12	2.2 M.E.S.

## HEADLAMP BULB REPLACEMENT.

Slacken the clamping bolt at the bottom of the headlamp rim and lift off the rim and dust-excluding rubber. Press in the light unit against the tension of the springs on the three adjustment screws, turn it anti-clockwise and withdraw. Twist the back shell in an anti-clockwise direction and pull it off the light unit; the bulb can then be replaced and the unit reassembled.

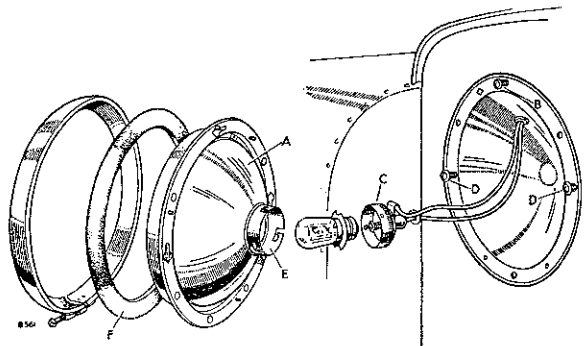


Fig. 45. Headlamp.

A—Light unit.  
B—Bulb setting screw  
C—Back shell.

D—Horizontal setting screws  
E—Bulb holder.  
F—Dust excluder.

## HEADLAMP SETTING.

The headlamps should be set so that the main driving beams are parallel with the road surface. If adjustment is required, remove the rim as described above. The vertical setting can then be made by turning the screw at the top of the lamp and horizontal adjustment by means of the screws at the side of the unit.

In order to adjust headlamps, using a beam setting board, proceed as follows:—

1. Mark on the board the dimensions given in Fig. 46 and position the vehicle, unladen, on level ground.

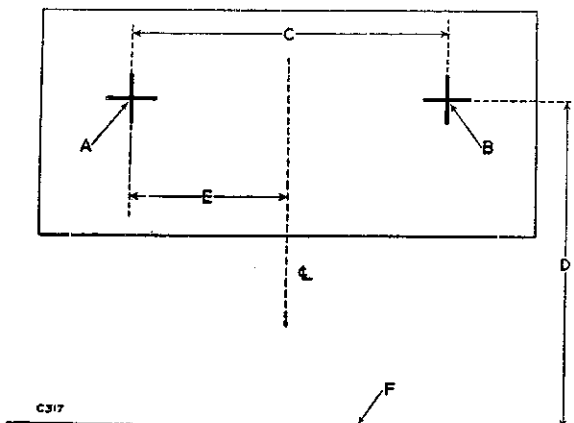


Fig. 46 Headlamp setting board dimensions.

A—Concentrated area of light—L. H. headlamp.  
B—Concentrated area of light—R. H. headlamp.  
C—20 in. (508 mm.).  
D—35½ in. (901,7 mm.)—86 and 88 models.  
37½ in. (952,5 mm.)—107 and 109 models.  
E—10 in. (254 mm.).  
F—Ground level.

2. Place the board 12 ft. (365,8 cm.) in front of the headlamps ensuring that it is at right angles to the vehicle centre line and that the centre line on the board is in the same plane as the vehicle centre line.
3. Adjust the beam by turning the screws indicated in Fig. 45 until the area of concentrated light corresponds with the marks on the beam setting board.

## SIDE LAMP BULB REPLACEMENT.

Lever the rubber bead away from the lamp and remove the rim and glass from the bottom first. Renew the bulb, move the rubber bead aside, locate the rim at the top of the lamp and press it into position; finally position the bead so that it fits snugly round the rim.

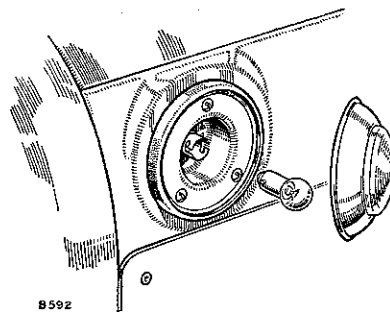


Fig. 47.  
Side lamp.

## STOP, TAIL LAMP BULB REPLACEMENT. (Metal body type lamp)

Turn the bulb cover and glass complete, to the left approx. 50° and withdraw from bulb holder assembly. The double filament bulb is fitted with securing pegs arranged to ensure that bulb replacement is only possible with the stop lamp filament upward.

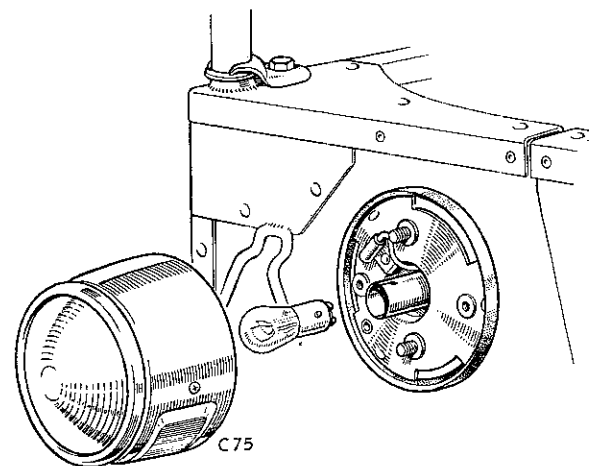


Fig. 48 Stop, tail lamp (metal body type.)

## STOP, TAIL LAMP BULB REPLACEMENT. (Plastic body type lamp)

Remove screws and plastic dome, the bulb can then be withdrawn.

The double filament bulb is fitted with the securing pegs arranged to ensure that bulb replacement is only possible with the stop lamp filament upward.



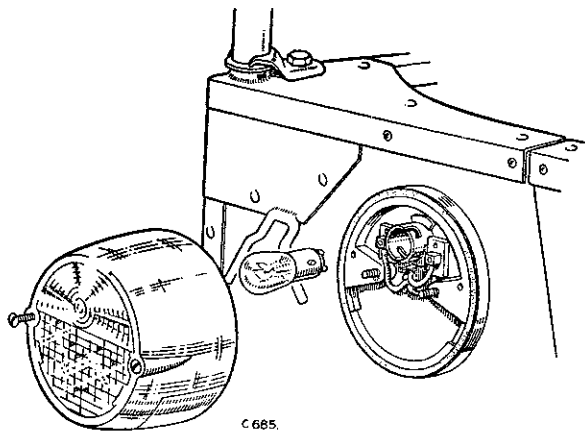


Fig. 48A Stop, tail lamp (plastic body type)

#### REAR NUMBER PLATE LAMP BULB REPLACEMENT (North American vehicles).

Slacken the securing screw and swing open the cover; the bulb is then accessible in the lamp body.

#### INSTRUMENT PANEL AND WARNING LIGHT BULB REPLACEMENT.

Should a warning light bulb burn out, operation of the corresponding component will not be affected, but it should be replaced at the earliest opportunity to safeguard that particular item of equipment.

The ignition, mixture control and oil pressure warning light bulbs can be renewed after unscrewing the respective bezels from the front of the instrument panel. Access to the instrument panel illumination and headlamp warning light bulbs is gained by with-

drawing the instrument panel facia; this is effected by removing the five screws, washers and nuts securing the panel. See Fig. 3, Page E-10.

#### WINDSCREEN WIPER.

#### WINDSCREEN WIPER ARM AND BLADE REPLACEMENT

Slacken the fixing nut and tap sharply to release the collet which clamps the arm on to the spindle; then remove the complete assembly.

When fitting the replacement arm and blade, slacken the securing nut and push the arm boss over the end of the spindle as far as it will go. Secure by tightening the nut.

#### WINDSCREEN WIPER BLADE REPLACEMENT

Remove the rubber bush securing the old blade to the arm; insert the tongue on the replacement blade through the slot in the arm and secure it by fitting the rubber bush through the hole in the tongue.

### BODYWORK

#### CLEANING BODY.

It is always preferable to clean the bodywork with water and sponge, using plenty of water; wherever possible the surface should be freely hosed. Dry with a chamois leather.

It is well periodically to wash the underside of the vehicle, to prevent the formation of mud pockets

## IN CASE OF TROUBLE: LOCATION AND REMEDY OF FAULTS

Although every precaution is taken to eliminate all possible causes of trouble, failure may occasionally develop through lack of attention to the equipment, or damage to the wiring. The following pages set out the recommended procedure for a systematic examination to locate and remedy the causes of some of the more probable faults which may occur during the life of the vehicle.

All the checks listed can be readily carried out without special equipment; if the fault is not located in this way, consult the local Rover distributor or dealer, who will be able to investigate the defect more closely.

### ENGINE FAILS TO START

1. Check that the ignition is switched ON
2. Check that there is sufficient petrol in the tank.
3. Check that the cold start control is set correctly for starting (see Page E-16).
4. Check that the engine is being turned at an adequate speed by the starter motor; this speed will be recognised after some experience with the vehicle.  
If the cranking speed is too low :—
  - (i) Check the battery connections for tightness and cleanliness.
  - (ii) Check the state of charge of the battery by switching on the headlamps and pressing the starter button; if the headlamps go out or very dim when the starter is operated, the battery requires recharging from an independent electrical supply.

It should be possible to start the engine by cranking with the starting handle.

5. Remove the cable from each sparking plug terminal in turn and hold it so that the end is about  $\frac{1}{4}$  in. (7 mm.) away from some metal part of the chassis, while the engine is turned over; if sparks jump the gap regularly, the coil and distributor are functioning correctly.
  - (i) If the sparks are strong and regular, remove and clean the sparking plugs and reset the electrode gaps to .029 to .032 in. (0,75 to 0,80 mm).
  - (ii) If the sparks are NOT regular :—
    - (a) Check that the distributor rotor is in position
    - (b) Check that the L. I. connections on the coil and distributor are clean and tight.
    - (c) Check that the distributor points are :—
      1. Clean.
      2. Opening and closing correctly.
      3. Correctly set when open—gap .014 to .016 in. (0,35 to 0,40 mm).
    - (d) Check that current is present at the SW terminal on the coil, by disconnecting the wire at the coil end and touching it against the SW terminal, with the ignition switch ON and the distributor contact-breaker points closed. If sparks occur, low tension current is flowing through the coil correctly; if there is NO spark, either the coil or the low tension wiring is defective and your dealer should be consulted.
  - (iii) If the sparks are weak and in addition there is a flashing at the distributor contact breaker points, a faulty distributor condenser is indicated.
  - (iv) If the sparks are present on some leads, but not on others, check the distributor cap for cracks and the plug leads for faulty insulation.

6. Disconnect the petrol pipe from the carburetter and check that petrol is delivered to the carburetter when the ignition is switched on. If petrol is not delivered from the pipe :—
  - (i) Check that the pump "ticks" when the ignition is on, with the pipe still disconnected. If not, the fault is probably in the pump wiring.
  - (ii) Check that the petrol pipes and filters are clear (see Page E-31).
  - (iii) Check that there are no air leaks in the suction line to the petrol pump (see Page E-32).

### ENGINE STARTS BUT SOON STOPS

1. Check that the controls are set correctly (see Page E-16)
2. Check the petrol feed to the carburetter by disconnecting the pipe from the carburetter and noting the petrol flow with the ignition switched on.  
If there is little or no flow :—
  - (i) Check the petrol level in the tank.
  - (ii) Check that the air vent in the filler neck is clear
  - (iii) Check the petrol pump for correct operation (see Page E-31).
  - (iv) Check that the petrol filters are clear (see Pages E-31 and E-34)
  - (v) Check that the petrol pipes are clear (see Page E-31).
3. Check that the carburetter jets are clear, in the following order (Page E-34) :—
  - (i) Starter petrol jet
  - (ii) Main jet.
  - (iii) Pilot jet
4. Check for a fault in the ignition circuit by connecting a wire between the "A" connection on the voltage control box and the "SW" connection on the coil, thus by-passing the ignition switch. At the same time, the wire from the ignition switch must be disconnected from the coil.
5. Remove the carburetter top cover and check that there is no water in the float chamber.

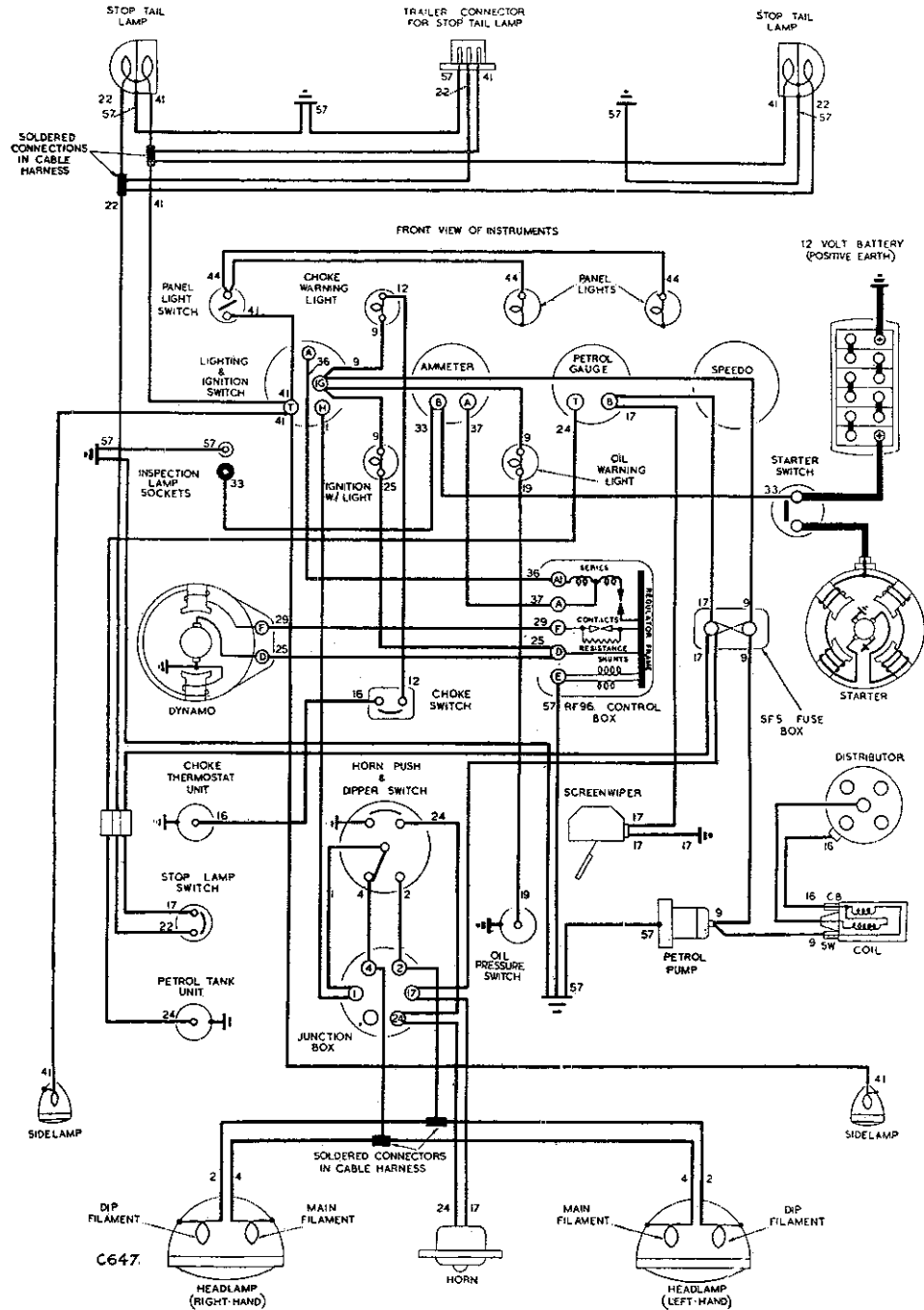
### ENGINE MISFIRES

Engine running on less than four cylinders, either intermittently or continually

1. Stop the engine and endeavour to re-start with the starter motor to check the state of the battery and connections. If the battery is in a low state of charge, it will need recharging from an independent electrical supply, and the charging circuit should be checked as directed under CHARGING CIRCUIT below
2. Remove the lead from each sparking plug in turn and check :—
  - (i) By holding the end of the lead about  $\frac{1}{4}$  in. (7 mm.) away from a metal part of the engine with the engine running. Sparks should jump the gap regularly.  
If NO SPARK is present on one or more cylinders :—
    - (a) Check for moisture on the H. I. leads or distributor.
    - (b) Check, clean and reset the distributor contact-breaker points to .014 to .016 in. (0,35 to 0,40 mm) as necessary.
    - (c) Check the distributor cap for cracks and the plug leads for faulty insulation.

(Continued on Page E-52)

# WIRING DIAGRAM, 1948-50 MODELS

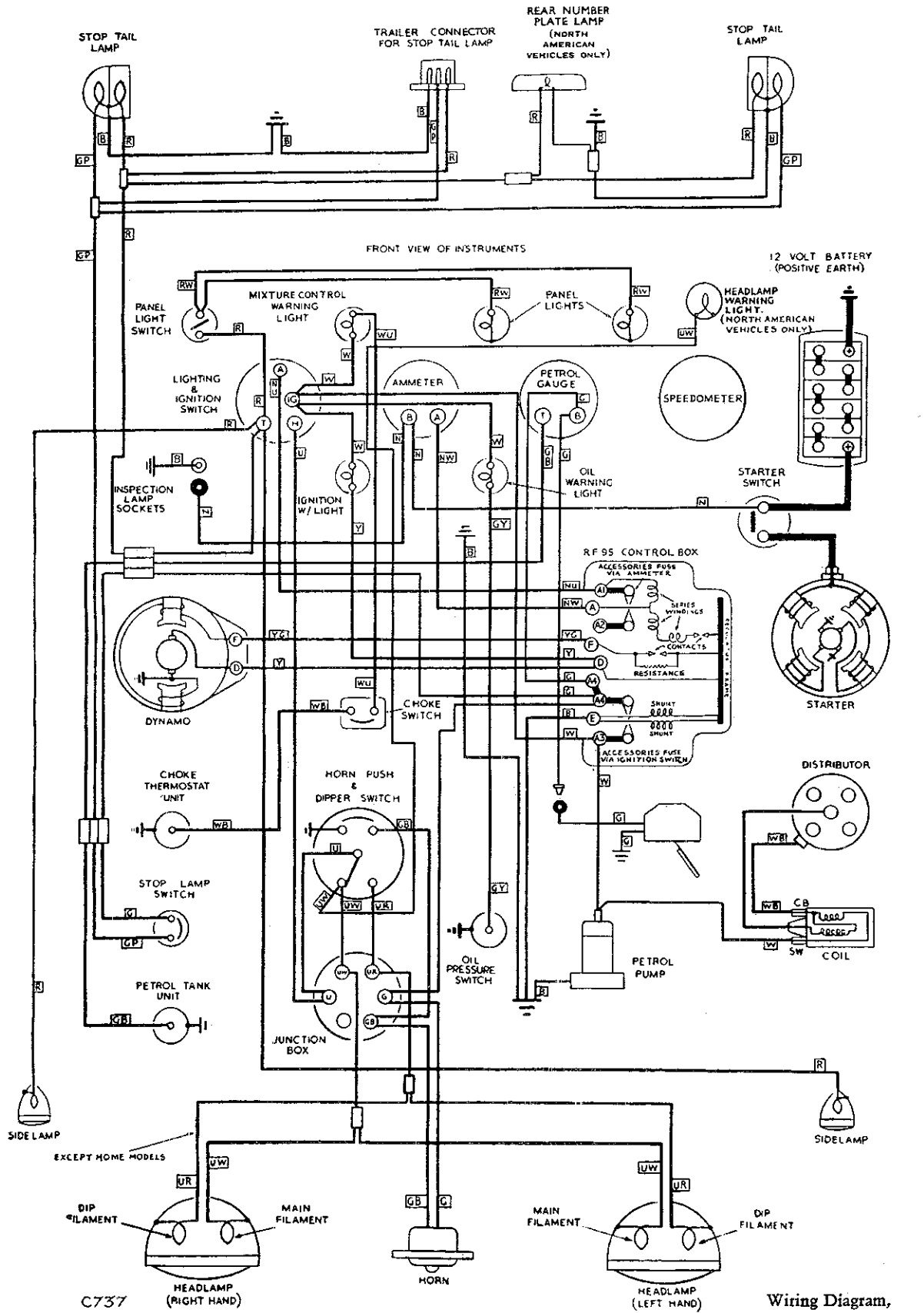


Wiring Diagram, 1948-50 models

## KEY TO CABLE COLOURS

- |                      |                       |                      |                       |
|----------------------|-----------------------|----------------------|-----------------------|
| 1 BLUE               | 17 GREEN              | 33 BROWN             | 49 PURPLE             |
| 2 BLUE with RED      | 18 GREEN with RED     | 34 BROWN with RED    | 50 PURPLE with RED    |
| 3 BLUE with YELLOW   | 19 GREEN with YELLOW  | 35 BROWN with YELLOW | 51 PURPLE with YELLOW |
| 4 BLUE with WHITE    | 20 GREEN with BLUE    | 36 BROWN with BLUE   | 52 PURPLE with BLUE   |
| 5 BLUE with GREEN    | 21 GREEN with WHITE   | 37 BROWN with WHITE  | 53 PURPLE with WHITE  |
| 6 BLUE with PURPLE   | 22 GREEN with PURPLE  | 38 BROWN with GREEN  | 54 PURPLE with GREEN  |
| 7 BLUE with BROWN    | 23 GREEN with BROWN   | 39 BROWN with PURPLE | 55 PURPLE with BROWN  |
| 8 BLUE with BLACK    | 24 GREEN with BLACK   | 40 BROWN with BLACK  | 56 PURPLE with BLACK  |
| 9 WHITE              | 25 YELLOW             | 41 RED               | 57 BLACK              |
| 10 WHITE with RED    | 26 YELLOW with RED    | 42 RED with YELLOW   | 58 BLACK with RED     |
| 11 WHITE with YELLOW | 27 YELLOW with BLUE   | 43 RED with BLUE     | 59 BLACK with YELLOW  |
| 12 WHITE with BLUE   | 28 YELLOW with WHITE  | 44 RED with WHITE    | 60 BLACK with BLUE    |
| 13 WHITE with GREEN  | 29 YELLOW with GREEN  | 45 RED with GREEN    | 61 BLACK with WHITE   |
| 14 WHITE with PURPLE | 30 YELLOW with PURPLE | 46 RED with PURPLE   | 62 BLACK with GREEN   |
| 15 WHITE with BROWN  | 31 YELLOW with BROWN  | 47 RED with BROWN    | 63 BLACK with PURPLE  |
| 16 WHITE with BLACK  | 32 YELLOW with BLACK  | 48 RED with BLACK    | 64 BLACK with BROWN   |

# WIRING DIAGRAM, MAJORITY OF 1951 MODELS

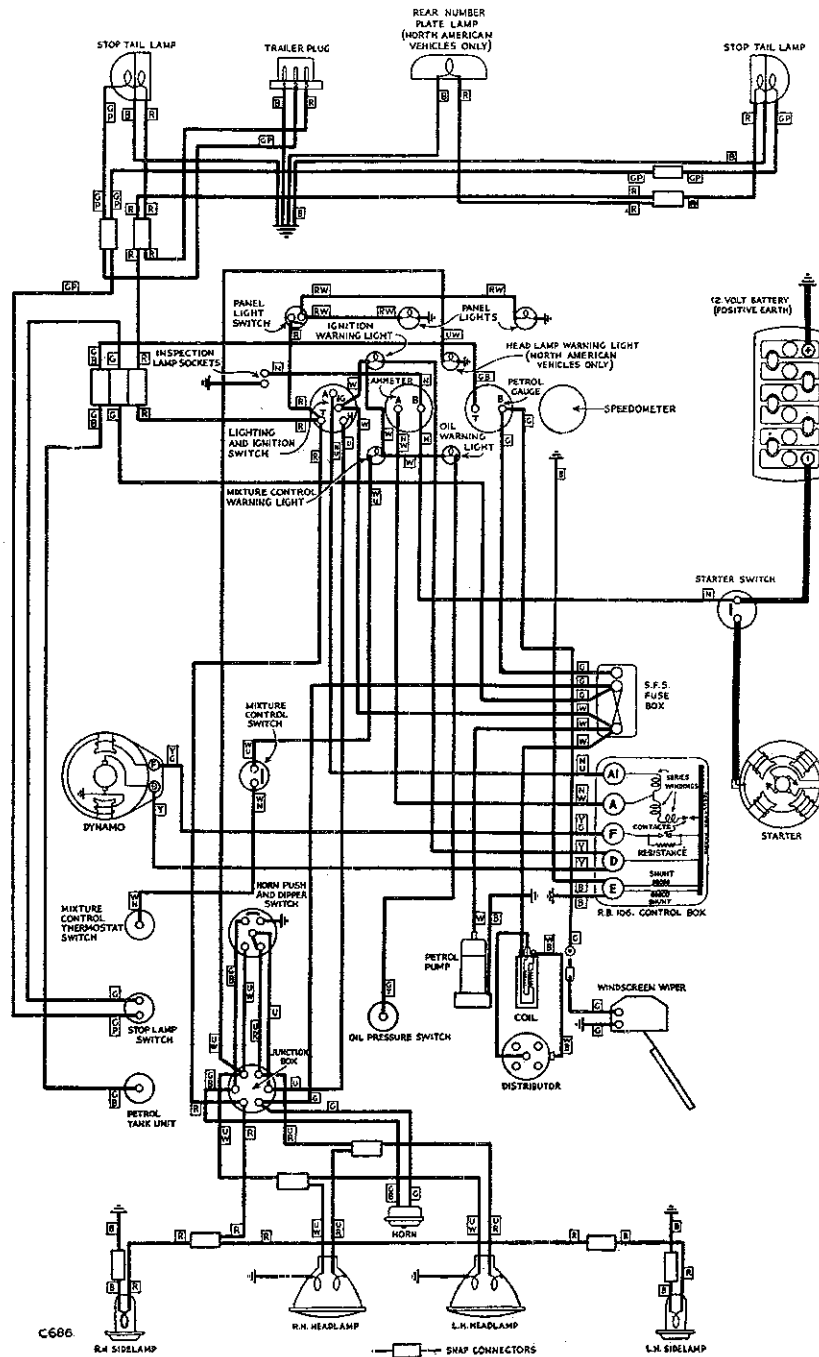


Wiring Diagram,  
majority of 1951 models.

## KEY TO CABLE COLOURS

B-BLACK      G-GREEN      N-BROWN      P-PURPLE      R-RED      U-BLUE  
 W-WHITE      Y-YELLOW      NU-BROWN WITH BLUE AND SO ON

# WIRING DIAGRAM, LATE 1951, 1952 AND 1953 MODELS



Wiring Diagram, late 1951, 1952 and 1953 models

### KEY TO CABLE COLOURS

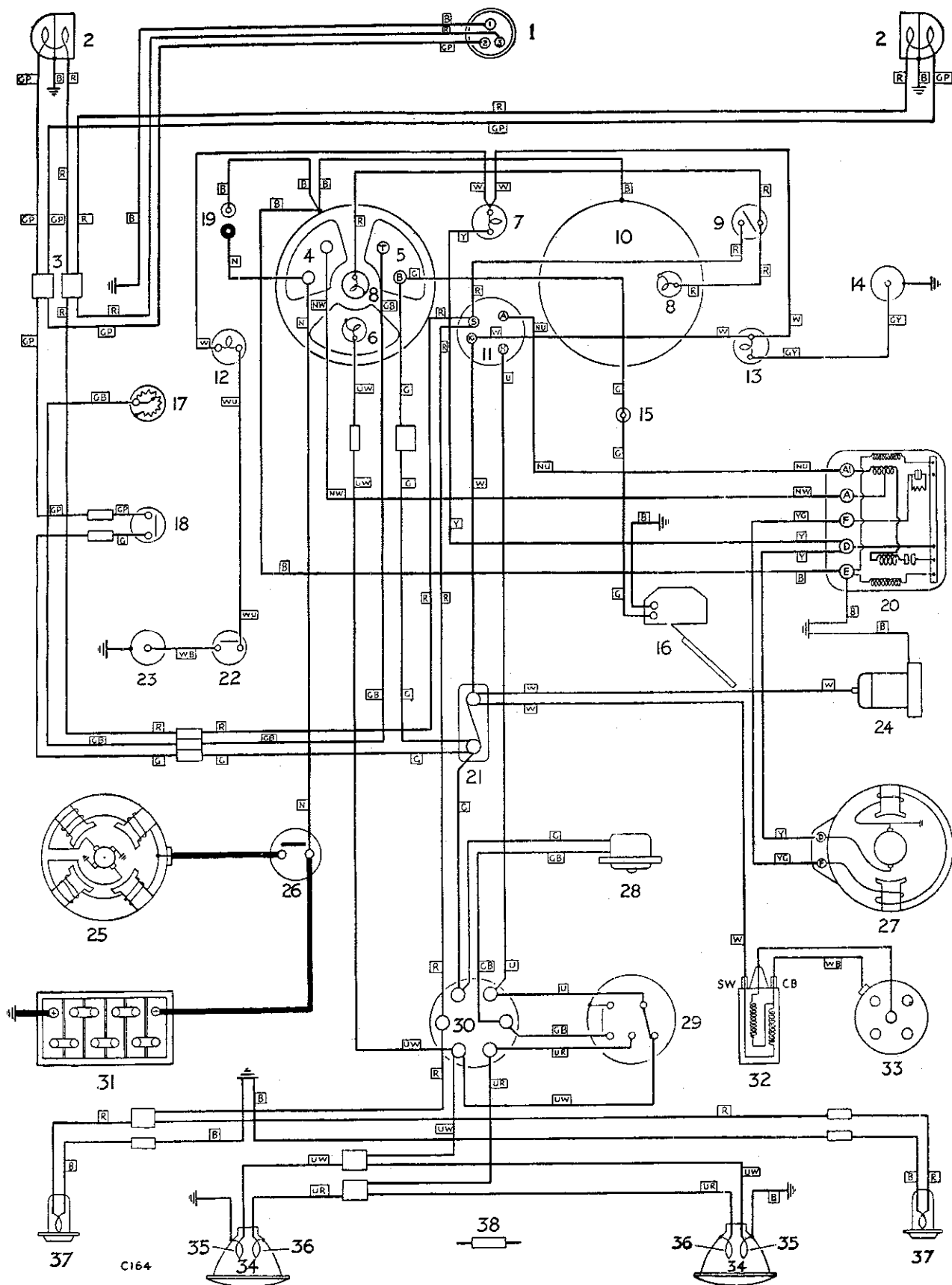
B—BLACK  
G—GREEN

N—BROWN  
P—PURPLE  
NU—BROWN WITH BLUE AND SO ON

R—RED  
U—BLUE

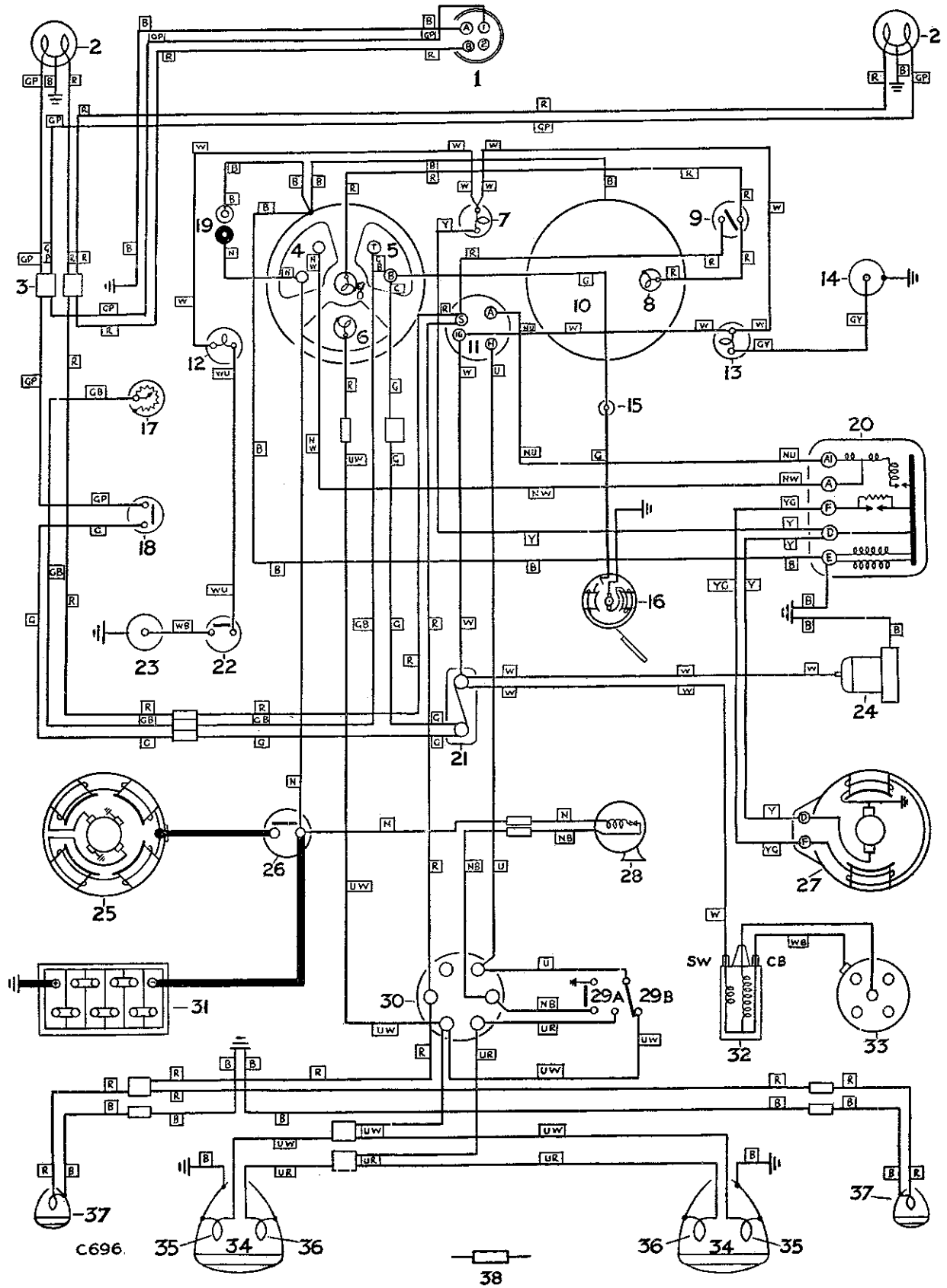
W—WHITE  
Y—YELLOW

WIRING DIAGRAM 86 and 107—1956-58 MODELS



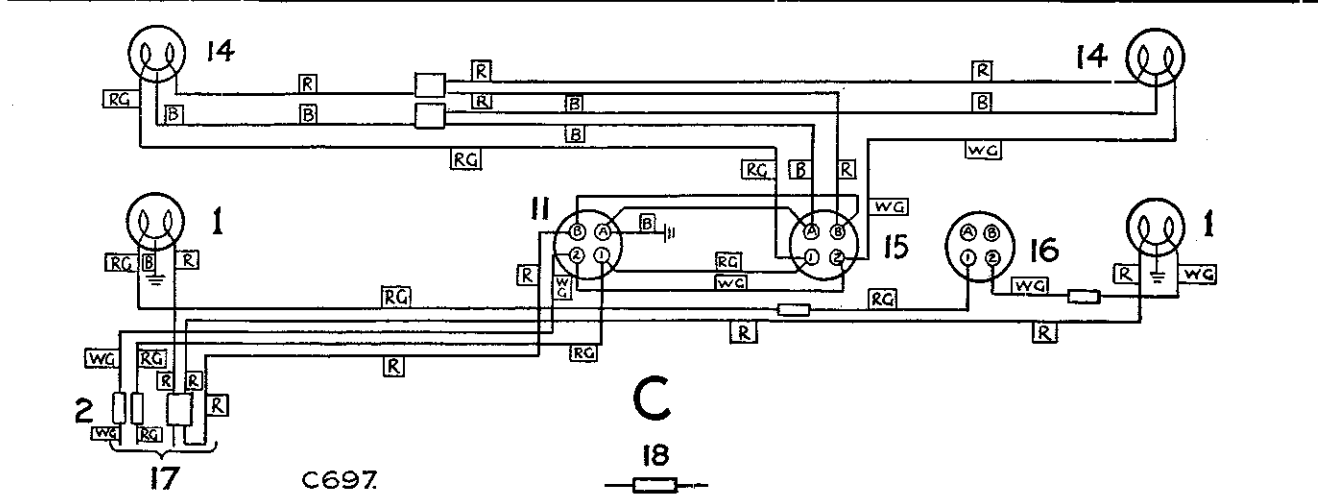
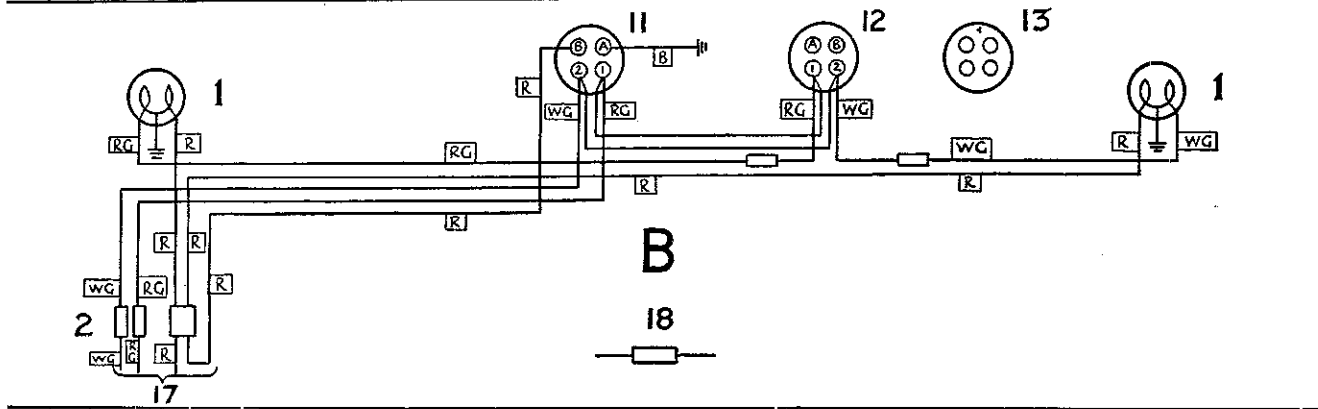
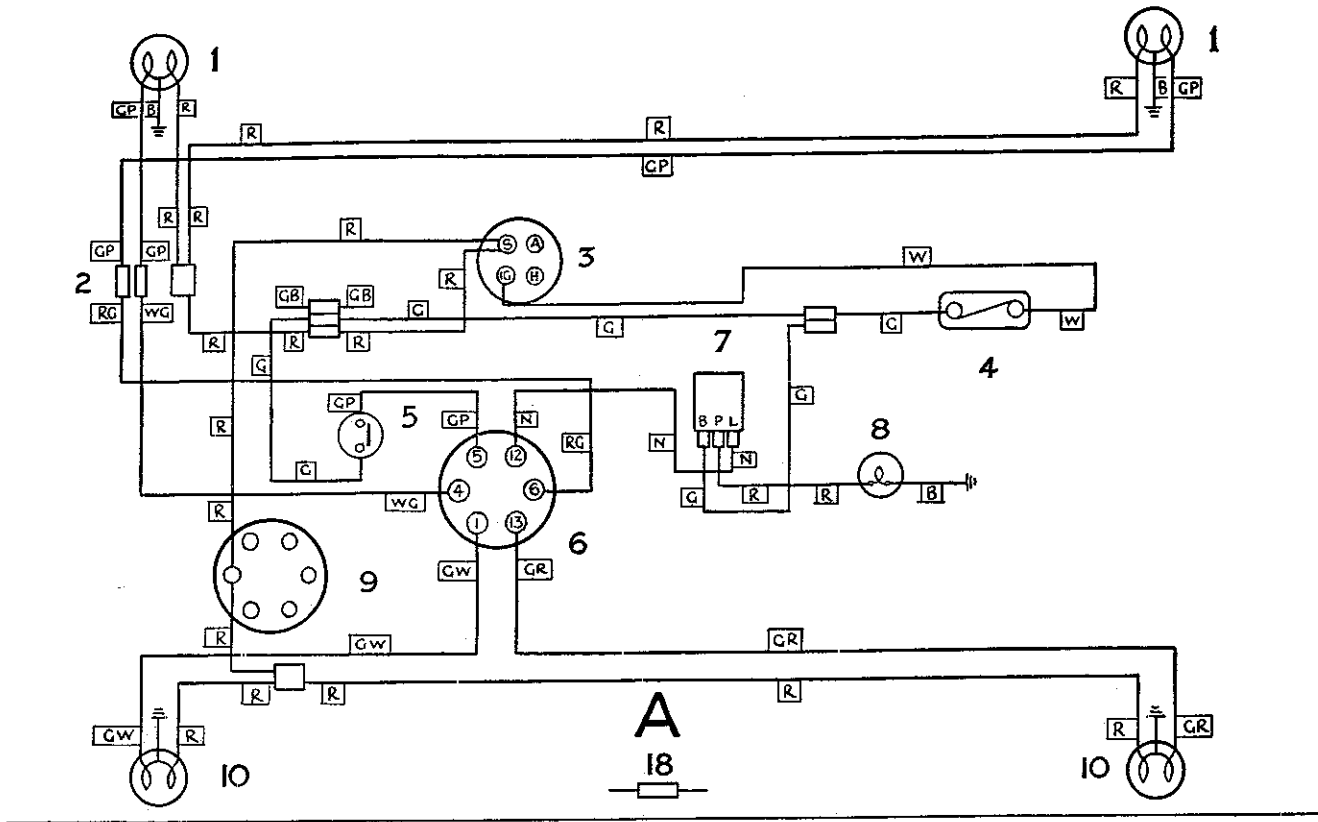
See Page E-51 for key to wiring diagram.

# WIRING DIAGRAM 88 and 109—1954-58 MODELS



See Page E-51 for key to wiring diagram.

FLASHER WIRING DIAGRAM—1954-58 MODELS



C697

See Page E-51 for key to wiring diagram



## KEY TO MAIN WIRING DIAGRAMS

- |  |   |  |
|--|---|--|
| 1. Trailer light socket (extra equipment)<br>2. Stop, tail lamps<br>3. Snap connectors for trailer light<br>4. Ammeter<br>5. Petrol level gauge<br>6. Headlamp main beam warning light<br>7. Ignition warning light<br>8. Panel lights<br>9. Panel light switch<br>10. Speedometer<br>11. Ignition and lighting switch<br>12. Mixture control warning light<br>13. Oil pressure warning light<br>14. Oil pressure switch | 15. Windscreen wiper plug and socket<br>16. Windscreen wiper<br>17. Petrol tank level unit<br>18. Stop lamp switch<br>19. Inspection lamp sockets<br>20. R.E.106 voltage control box<br>21. S.F.5 fuse box (35 amp. fuse)<br>22. Mixture control switch (at control)<br>23. Mixture control thermostat switch (at cylinder head)<br>24. Petrol pump<br>25. Starter<br>26. Starter solenoid switch<br>27. Dynamo | 28. Horn<br>29. Horn push and headlamp dipper switch, 86 and 107<br>29A. Horn push<br>29B. Headlamp dipper switch<br>30. Junction box<br>31. 12 volt battery (positive earth)<br>32. Ignition coil<br>33. Distributor<br>34. Headlamps<br>35. Main beam<br>36. Dip beam<br>37. Side lamps<br>38. Snap connectors shown thus —  — |
|--|---|--|

NOTE: On vehicles to the North American specification, the connections at the ignition and lighting switch are such that the sidelamps are extinguished when the headlamps are in use

## KEY TO FLASHER WIRING DIAGRAM

To be used in conjunction with main wiring diagrams on Pages E-48 and E-49.

A—Wiring diagram for flashers only.

B—Wiring diagram using flashers and trailer socket. In this diagram the rear flashers are shown connected via the trailer socket and vehicle flasher plug; the plug must be in this position when trailer is not in use.

C—Wiring diagram using flashers and trailer. In this diagram vehicle flashers are disconnected and trailer plug in use, giving flashers on trailer.

- |   |   |  |
|---|---|--|
| 1. Stop, tail lamp<br>2. Snap connectors<br>3. Ignition and light switch<br>4. Fuse box<br>5. Stop lamp switch<br>6. Flasher switch | 7. Flasher unit<br>8. Flasher warning light<br>9. Junction box<br>10. Front flasher and side lamp<br>11. Trailer socket<br>12. Vehicle flasher plug | 13. Dummy trailer socket<br>14. Trailer stop, tail lamp<br>15. Trailer plug<br>16. Vehicle flasher plug in dummy trailer socket<br>17. Wiring as diagram 'A' from this point.<br>18. Snap connectors shown thus —  — |
|---|---|--|

### KEY TO CABLE COLOURS

B—BLACK  
G—GREEN

N—BROWN  
P—PURPLE  
RN—RED WITH BROWN, AND SO ON

R—RED  
U—BLUE

W—WHITE  
Y—YELLOW

## RECOMMENDED LUBRICANTS

These recommendations apply to temperate climates where operational temperatures may vary between approximately 10°F (-12°C) and 90°F (32°C).

Information on oil recommendations for use under extreme winter or tropical conditions can be obtained from your local Rover Distributor or The Rover Co. Ltd., Technical Service Department.

COMPONENTS	S.A.E.	B.P.	CASTROL	DUCKHAM'S	ESSO	MOBIL	REGENT Texacol/ Caltex	SHELL
ENGINE, AIR CLEANER AND GOVERNOR	20W	Energol SAE 20W	Castrolite	Duckham's NOL Twenty	Esso Extra Motor Oil 20W/30	Mobiloil Arctic	Advanced Havoline 20/20W	Shell X100 SAE 20W
GEARBOX AND TRANSFER BOX DIFFERENTIALS AND SWIVEL PIN HOUSINGS STEERING BOX STEERING RELAY UNIT REAR POWER TAKE-OFF, PULLEY UNIT AND CAPSTAN WINCH HYDRAULIC WINCH GEARBOX	90EP	Energol EP SAE 90	Castrol Hypoy	Duckham's Hypoid 90	Esso Gear Oil GP 90	Mobilube GX 90	Universal Thuban 90	Spirax 90 EP
HYDRAULIC WINCH SUPPLY TANK	—	Energol HL65	Hyspin 70 or Castrolite	—	Teresso 43 or Essofleet HD10W	DIE Light	Advanced Havoline 20/20W	Shell X100 SAE 20/20W
LUBRICATION NIPPLES	—	Energlease L2	Castrollease LM	Duckham's LB10 Grease	Esso Multi-purpose Grease H	Mobilgrease MP	Marfak Multi-purpose 2	Retinax A

NO lubricants of other MAKES, GRADES OR TYPES are currently recommended.

Multigrade oils are only recommended for engines and other units in good mechanical condition.

If the SPARK is IRREGULAR on all cylinders:—

- (a) Check for moisture as in (i) (a).
  - (b) Check the distributor points as in (i) (b).
  - (c) Check the cap and leads as in (i) (c).
  - (d) Check the L. I. connections for tightness and cleanliness.
  - (e) Check for flashing or "blueing" of the contact-breaker points. If present, the distributor condenser should be renewed.
  - (f) Check for a fault in the ignition circuit by connecting a wire between the "A" connection on the voltage regulator box and the "SW" connection on the coil, thus by-passing the ignition switch. At the same time, the wire from the ignition switch must be disconnected from the coil.
- (ii) For any audible alteration in the running of the engine, as each lead is removed. No alteration will indicate that the sparking plug in question is at fault:—
- (a) Remove and clean the plug; reset the gap to .029 to .032 in. (0,75 to 0,80 mm.) as necessary.
  - (b) If still faulty, fit a new sparking plug.
3. If the "missing" is accompanied by "spitting back" through the carburetter, a valve may be sticking. This can often be cured by slowly dropping oil or upper cylinder lubricant into the carburetter intake, while the engine is running.

#### LACK OF ENGINE POWER

1. Check that the carburetter throttle is opening fully.
2. Check that the brakes are not binding and that the tyre pressures are correct.
3. Check that the carburetter jets are not blocked (in the following order). See Page E-34:—
  - (i) Main jet.
  - (ii) Pump jet.
  - (iii) Economy jet.
4. Check the ignition timing.
5. Check the tappet adjustment.
6. If items 1—5 are satisfactory, it is probable that the engine needs decarbonising, and your Rover distributor or dealer should be consulted.

#### CHARGING CIRCUIT

1. Battery in low state of charge.
  - (a) This state will be shown by lack of power when starting, poor light from the lamps and hydrometer readings below 1.200, and may be due to the dynamo either not charging or giving low or intermittent output. Check the ammeter reading when the vehicle is running steadily in top gear with no lights in use; a definite steady charge should be indicated. The ignition warning light will not go out if the dynamo fails to charge, or will flicker on and off in the event of intermittent output.
  - (b) Examine the charging and field circuit wiring, tightening any loose connections, or replacing broken cables.

Pay particular attention to the battery connections.
  - (c) Examine the fan and dynamo driving belt; take up any undue slackness by turning the dynamo on its mounting (see Page E-34).
  - (d) If the cause of the trouble is not apparent, have the equipment examined at a service depot.

#### 2. Battery overcharged.

This will be indicated by burnt-out bulbs, very frequent need for topping-up of battery and high hydrometer readings. Check the ammeter reading when the car is running steadily—with a fully charged battery and no lights or accessories in use, the charge reading should be of the order of only 3—4 amperes. If the ammeter reading is in excess of this value, it is advisable to have the regulator setting tested and adjusted if necessary at a service depot.

#### STARTER MOTOR

##### 1. Starter motor lacks power or fails to turn engine.

- (a) See if the engine can be turned over by hand. If not, the cause of the stiffness of the engine must be located and remedied.
- (b) If the engine can be turned by hand, check that the trouble is not due to a discharged battery.
- (c) Examine the connections to battery, starter and starter switch, making sure that they are tight and that the cables connecting these units are not damaged.
- (d) It is also possible that the starter pinion may have jammed in mesh with the flywheel, although this is by no means a common occurrence. To disengage the pinion, pull off the dust cap and rotate the squared end of the starter shaft by means of a spanner.

##### 2. Starter operates, but does not crank engine.

This fault will occur if the pinion of the starter drive is not allowed to move along the screwed sleeve into engagement with the flywheel, due to dirt having collected on the screwed sleeve. Clean the sleeve carefully with paraffin.

##### 3. Starter pinion will not disengage from flywheel when engine is running.

Stop the engine and ascertain if the starter pinion is jammed in mesh with the flywheel. Release it, if necessary, by withdrawing the dust cap and rotating the squared end of the starter shaft in the opposite direction to normal rotation. If the pinion persists in sticking in mesh, have the equipment examined at a service depot. Serious damage may result to the starter if it is driven by the flywheel.

#### LIGHTING CIRCUITS

##### 1. Lamps give insufficient illumination.

- (a) Test the state of charge of the battery, recharging it if necessary either by a long period of day-time running or from an independent electrical supply.
- (b) Check the setting of the headlamps (see Page E-42).
- (c) If the bulbs are discoloured as a result of long service, they should be renewed. On lamps in which the reflector surface is accessible, see that it is clean.

##### 2. Lamps light when switched on, but gradually fade out.

As para. 1 (a).

##### 3. Brilliance varies with speed of vehicle.

- (a) As para. 1 (a).
- (b) Examine the battery connections, making sure that they are tight; replace faulty cables.

##### 4. Lights flicker.

Examine the circuits of the lamps for loose connections.

##### 5. Failure of lights.

- (a) As para. 1 (a).
- (b) Examine the wiring for a loose or broken connection and remedy.

# SECTION C

## ROVER SERVICE ORGANISATION

Instructions are given in this book for items of routine maintenance to which due attention should be paid if smooth and efficient running is to be ensured.

In addition, however, there may be times when additional information is desired, either on repair work beyond the scope of this manual or when some difficulty is experienced.

We are always pleased to give such cases our special attention and to reply as fully as possible to any queries you may raise by letter or when you visit either of our Service Depots at Solihull and London.

Complete instructions can be supplied for any operation which you may desire to carry out on your Land-Rover; alternatively, a complete Workshop Manual is available, from any Rover distributor or dealer.

In the event of replacement parts being required, they should be obtained through the nearest Rover Distributor or Dealer.

Please address enquiries under all these headings to:—

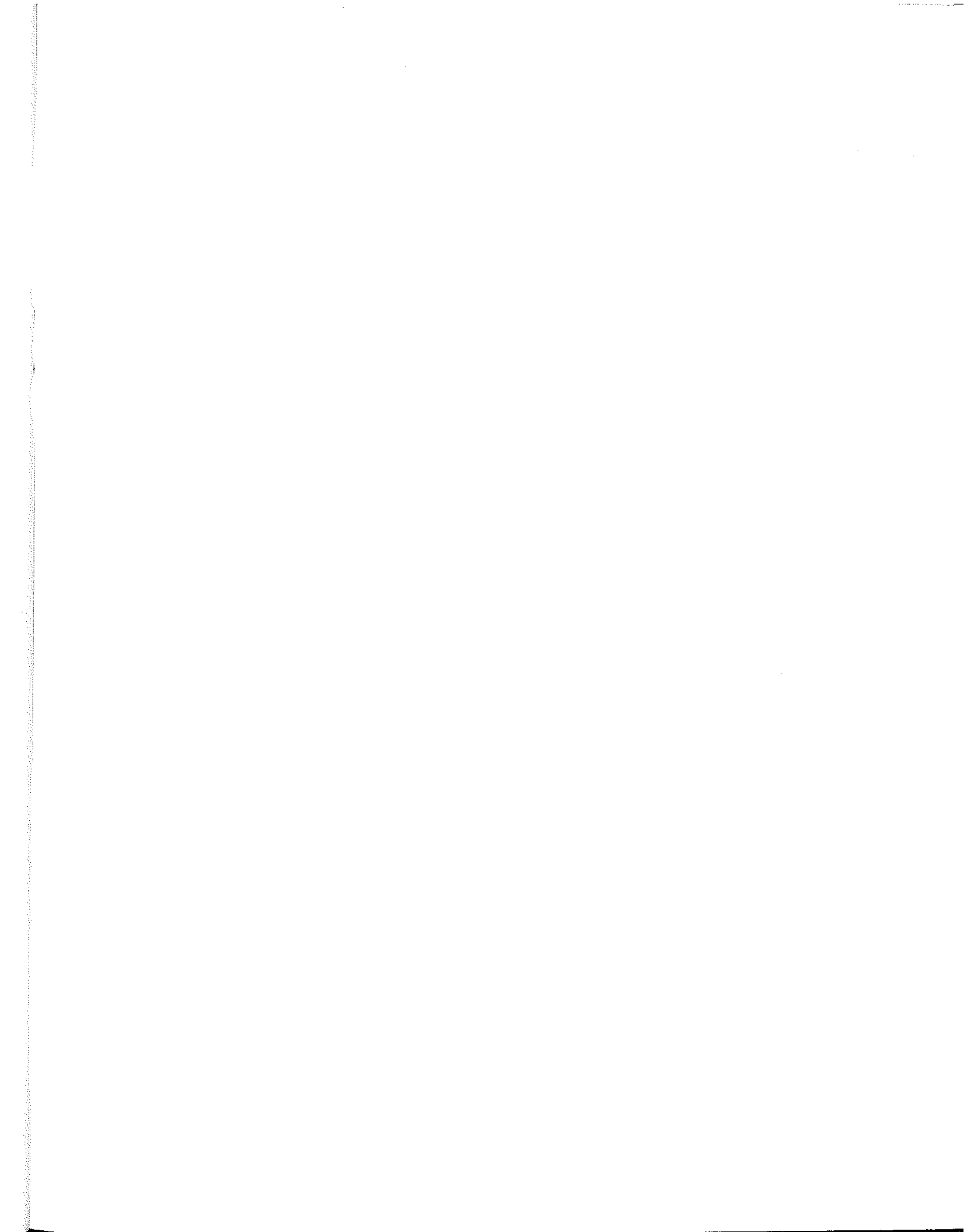
The Rover Co., Ltd.,  
Service Department,  
Solihull,  
Warwickshire.

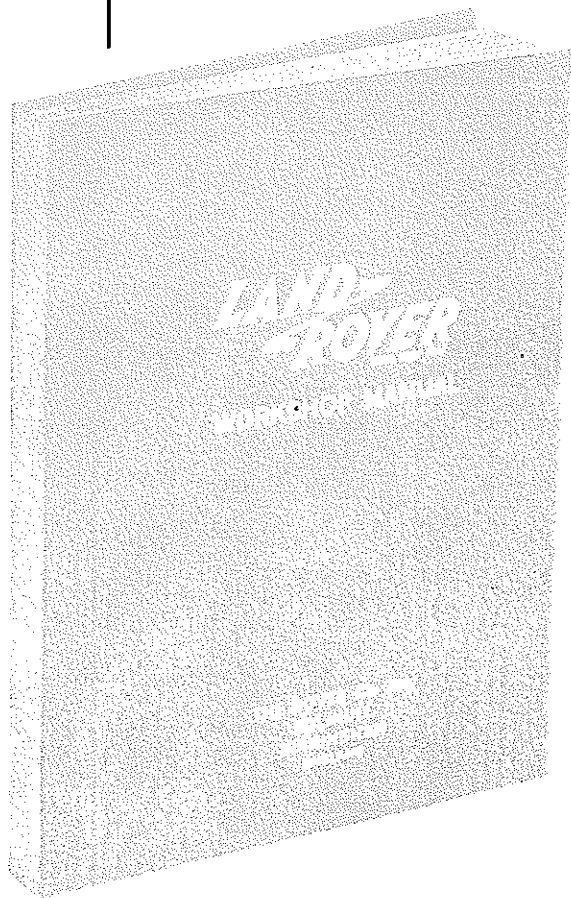
*Telephone:* SHEldon 4242.

*Telegrams:* Rovrepair, Solihull

*Telex:* 33-156







The  
**LAND-ROVER**  
WORKSHOP  
MANUAL

Containing practical information of the greatest value to everybody concerned with the maintenance and overhaul of the LAND-ROVER.

Copies can be obtained from all Rover Distributors and Dealers.

