



Land Rover
Range Rover

Workshop Bulletin

JUNE 1987

BULLETIN No. LSM180WB1

RANGE ROVER

LUCAS A127/65 AMP ALTERNATOR

CONTENTS

Section	Page
01 INTRODUCTION Introduction	1
04 GENERAL SPECIFICATION DATA Alternator	2
06 TORQUE WRENCH SETTINGS Alternator	2
86 ELECTRICAL Alternator Electric mirrors - circuit diagram Main circuit diagrams	3 7 8

INTRODUCTION **01**

RANGE ROVER

1987 MODEL YEAR IMPROVEMENTS

INTRODUCTION

As part of the 1987 model year programme Land Rover Ltd is continually looking at ways to improve the quality and characteristics of its products. This bulletin contains servicing details of the Lucas A127/65 alternator now fitted to Range Rover models.

The A127 alternator incorporates a combined regulator and brush box assembly readily detachable from the rear of the alternator body.

This bulletin also includes the latest main circuit diagrams for both left and right hand drive models plus a revised electric mirror circuit diagram.

04 GENERAL SPECIFICATION DATA

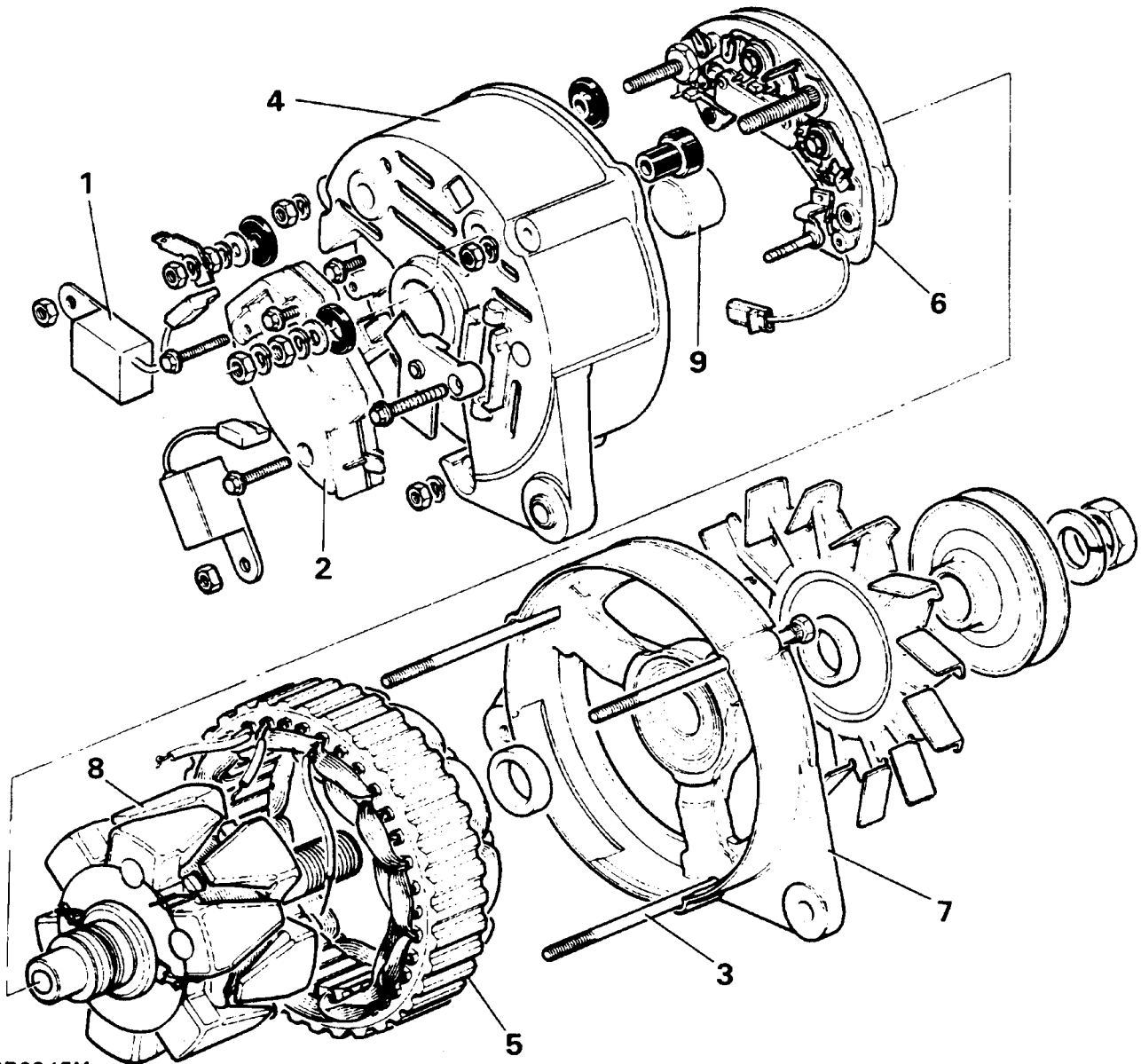
ALTERNATOR

Manufacturer	Lucas
Type	A127/65
Polarity	Negative earth
Maximum operating speed	15000 rev/min
Maximum DC output at 6000 rev/min	65 amp
Stator windings	3 phase
Stator winding resistance	0.15 ohm/phase
Regulator type	21TR
Regulator controlled voltage	13.6-14.4V
Field winding rotor poles	12
Rotor winding resistance	3.2 ohms
Brush length - new	17 mm(0.67 in))From
Renew regulator/brushbox assembly at	5 mm(0.20 in))moulding
Brush spring pressure	
- flush with brushbox moulding	1.3-2.7N(4.7-9.8oz)

06 TORQUE WRENCH SETTINGS

ALTERNATOR	Nm	lbf ft
Alternator shaft nut	50-70	37-52
Alternator through bolts	5.5	4.0
Alternator rectifier screws	3.5	2.5
Regulator/brushbox screws	2.5	2.0
Terminal nut - main output	4.0	3.0
Terminal nut - phase	4.0	3.0

ALTERNATOR - LUCAS - A127-65



RR2217M

Service parts

1. Suppression capacitors - 2 off
2. Regulator/Brushbox assembly
3. Through bolts
4. Slip ring end (SRE) bracket
5. Stator
6. Rectifier
7. Drive end bracket (DRE)/bearing assembly
8. Rotor
9. Slip ring end bearing

ALTERNATOR - LUCAS - A127-65**Description**

The model A127 alternator is a three phase, field sensed unit, the rotor and stator windings generate three phase alternating current (AC) which is rectified to direct current (DC). The electronic voltage regulator unit controls the alternator output voltage by high frequency switching of the rotor field circuit.

It is essential that good electrical connections are maintained at all times. Of particular importance are those in the charging circuit (including those at the battery) which should be occasionally inspected to see that they are clean and tight. In this way any significant increase in circuit resistance can be prevented.

Do not disconnect battery cables while the engine is running or damages to the semi-conductor devices may occur. It is also inadvisable to break or make any connections in the alternator charging and control circuits while the engine is running.

The Model 21TR electronic voltage regulator employs micro-circuit techniques resulting in improved performance under difficult service conditions. The whole assembly is encapsulated in silicone rubber and housed in an aluminium heat sink, ensuring complete protection against the adverse effects of temperature, dust, and moisture etc.

The brushbox assembly is incorporated in the regulator unit.

Surge protection is incorporated in the regulator unit.

The regulating voltage is set during manufacture to give the required regulating voltage range of 13.6 to 14.4 volts, and no adjustment is necessary. The only maintenance needed is the occasional check on terminal connections and wiping with a clean dry cloth.

The alternator system provides for direct connection of a charge (ignition) indicator warning light, and eliminates the need for a field switching relay or warning light control unit. As the warning lamp is connected in the charging circuit, lamp failure will cause loss of charge. Lamp should be checked regularly and a spare carried.

When using rapid charge equipment to re-charge the battery, the battery must be disconnected from the vehicle.

Dismantle, Overhaul, Test components

NOTE: Alternator charging circuit - The ignition warning light is connected in series with the alternator field circuit. Bulb failure would prevent the alternator charging, except at very high engine speed, therefore, the bulb should be checked before suspecting an alternator failure.

Precautions

Battery polarity is NEGATIVE EARTH, which must be maintained at all times.

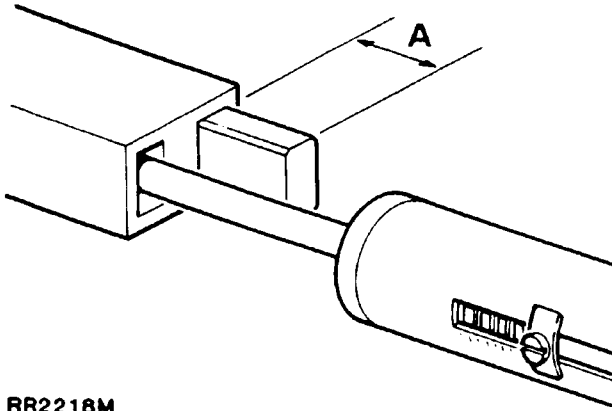
No separate control unit is fitted; instead a voltage regulator of micro-circuit construction is mounted on the slip ring end bracket.

Battery voltage is applied to the alternator output cable even when the ignition is switched off, the battery must be disconnected before commencing any work on the alternator. The battery must also be disconnected when repairs to the body structure are being done by arc welding.

Dismantle

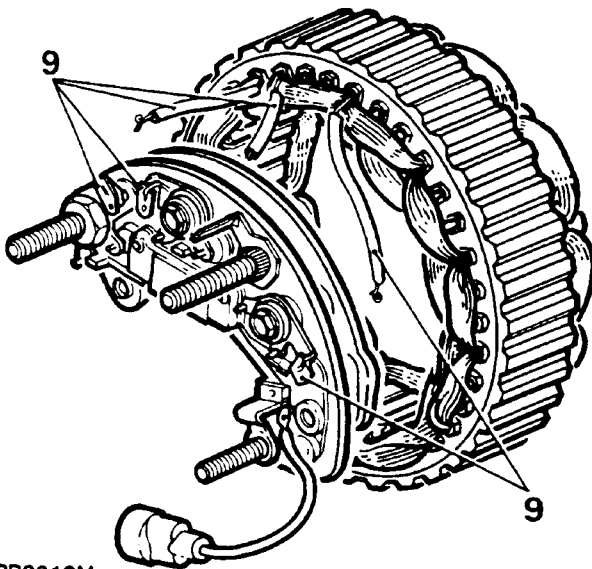
1. Withdraw the connectors from the alternator.
2. Remove the alternator
3. Remove the nuts from the through bolts, disconnect the connectors and remove two suppression capacitors.
4. Remove three screws, disconnect one lead and withdraw the regulator and brushbox assembly.

5. Check the brush lengths by measuring length of protrusion from moulding. If dimension A is 5mm (0.20in) or less, change the assembly.



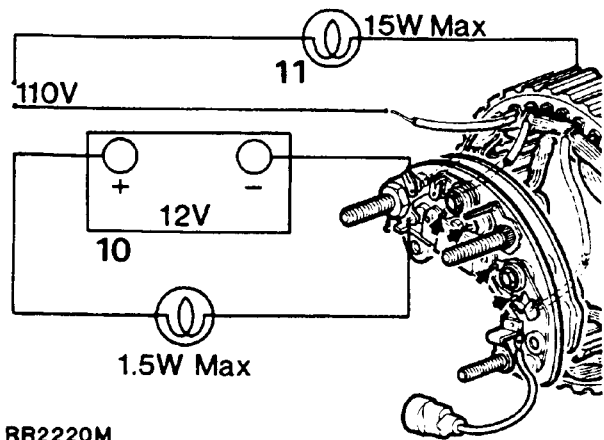
RR2218M

6. Check brush spring pressure using a push type spring gauge. Gauge should register 136 to 279 g (5 to 10 oz) when brush is pressed until face is flush with housing. If reading is outside these limits, renew assembly.
7. Mark the relative positions of the end brackets and stator. Remove through bolts and withdraw slip ring end bracket and stator assembly. Carefully tap the mounting lugs with a mallet if necessary.
8. Remove nuts, washers and insulators from stud terminals noting their position for reassembly. Remove two screws and insulation cover and withdraw rectifier and stator from slip ring end bracket.



RR2219M

9. Release the stator winding cable ends from the rectifier by applying a hot soldering iron to the terminal tags of the rectifier. Prise out the cable ends when the solder melts, and separate the rectifier and stator. Further dismantling of the rectifier is not required.
10. Check the diodes. Connect the test equipment as shown and test each diode in turn, note whether lamp lights, then reverse test lead connections. The lamp should light in one direction only. Renew the rectifier assembly if a faulty diode is diagnosed.

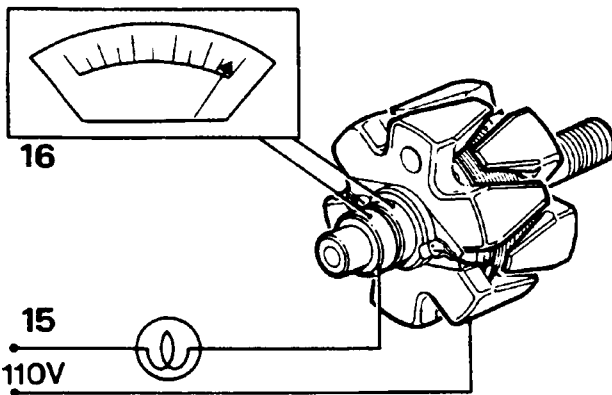


RR2220M

11. Visually inspect the stator windings for signs of damage or burning. Check the stator insulation using a suitable 110 volt test lamp. Connect the test leads to the laminated yoke and to each of the three leads in turn. If test lamp lights, fit a new stator.
12. Remove the fan and pulley assembly. Push out the rotor shaft from the bearing using a suitable press and remove the spacer from the shaft.

Continued

13. Clean surfaces of slip rings using a solvent moistened cloth.
14. Inspect slip ring surfaces for signs of burning, remove burn marks using extra fine glasspaper. On no account should emery cloth or similar abrasives be used, or any attempt made to machine the slip rings.
15. Check the insulation of the rotor field windings, using a suitable 110 volt test lamp connected between one of the slip rings and one of the rotor poles. If the test lamp lights, the rotor must be renewed.

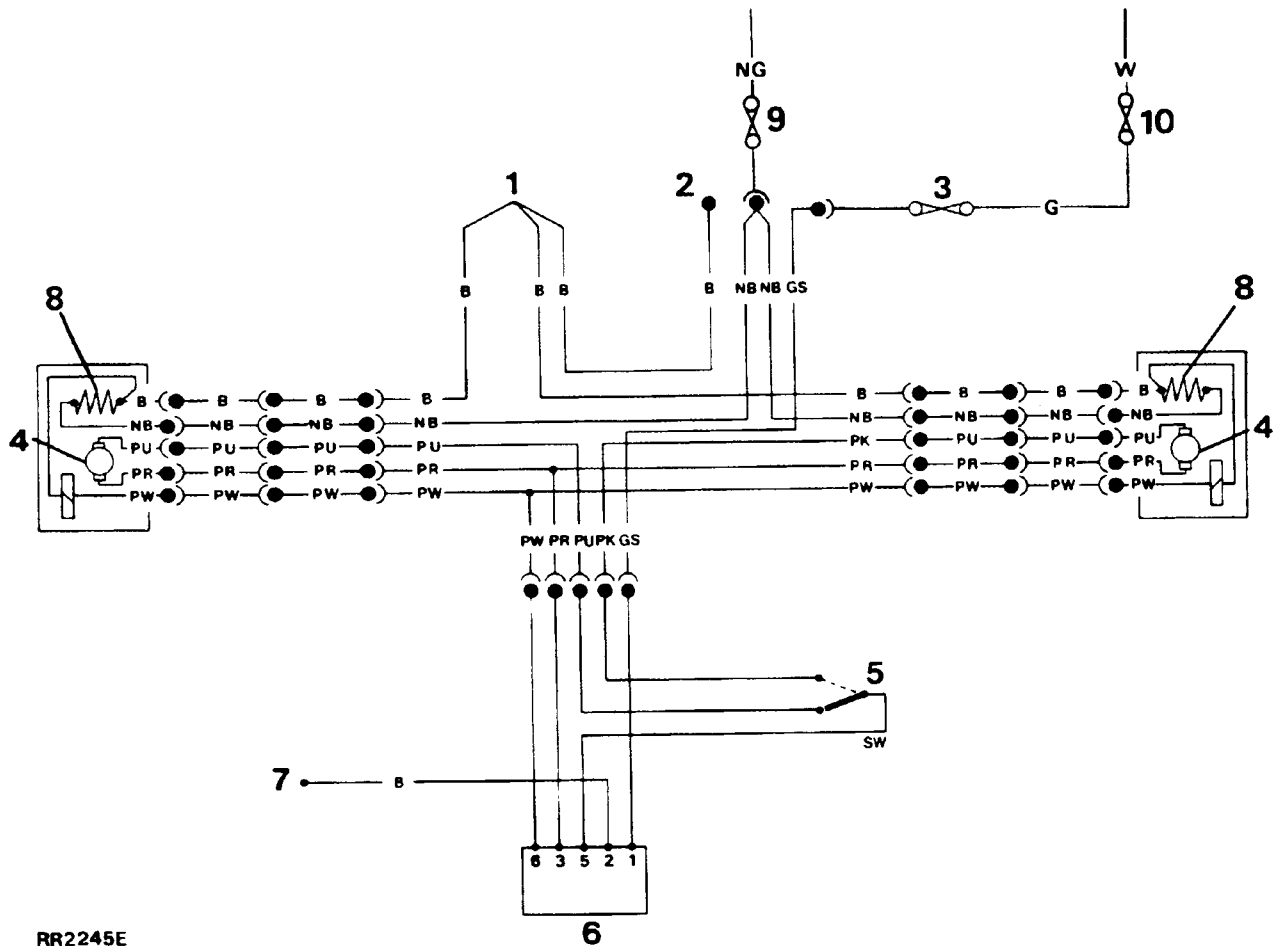


RR2221M

16. Check the resistance/continuity of the rotor field windings by connecting an ohmmeter to the slip rings as shown. A reading of 3.2 ohms should be obtained.
17. Check condition of bearings. If signs of rubbing between rotor poles and stator is evident, both bearings are excessively worn, and must be renewed.
18. Use a suitable press, applying pressure from the rear of the slip ring end bracket, to withdraw or refit the bearing. Note that the drive end bracket and bearing are only supplied as a unit.

Reassembling

19. Fit the spacer and press the rotor into the drive end bracket. Insert the through bolts. Fit the spacer, fan, pulley and spring washer to the shaft. Fit and tighten the pulley nut to the correct torque.
20. Fit the stator and rectifier assembly to the drive end bracket in the position previously marked.
21. Fit the slip ring end bracket in the position previously marked, locating the regulator lead through its aperture. Fit the insulation cover and tighten two rectifier securing screws.
22. Fit and tighten the through bolt nuts evenly and to the correct torque.
23. Connect the lead to the regulator, locate the brushes on the slip rings and secure the regulator/brushbox assembly, taking care not to damage the brushes.
24. Fit both suppression capacitors.
25. Refit the alternator.



RR2245E

ELECTRIC MIRRORS - Circuit diagram

- | | |
|---------------------------|---|
| 1. Clinch | 8. Mirror heating elements-active with heated rear screen |
| 2. Main cable connections | 9. Fuse 10-heating elements |
| 3. Fuse A5-mirror motors | 10. Fuse 13 |
| 4. Mirror motors | |
| 5. Change over switch | |
| 6. Mirror control switch | |
| 7. Earth-via main cable | |

CABLE COLOUR CODE

B	Black
U	Blue
N	Brown
G	Green
O	Orange
P	Purple
R	Red
S	Slate
W	White
Y	Yellow

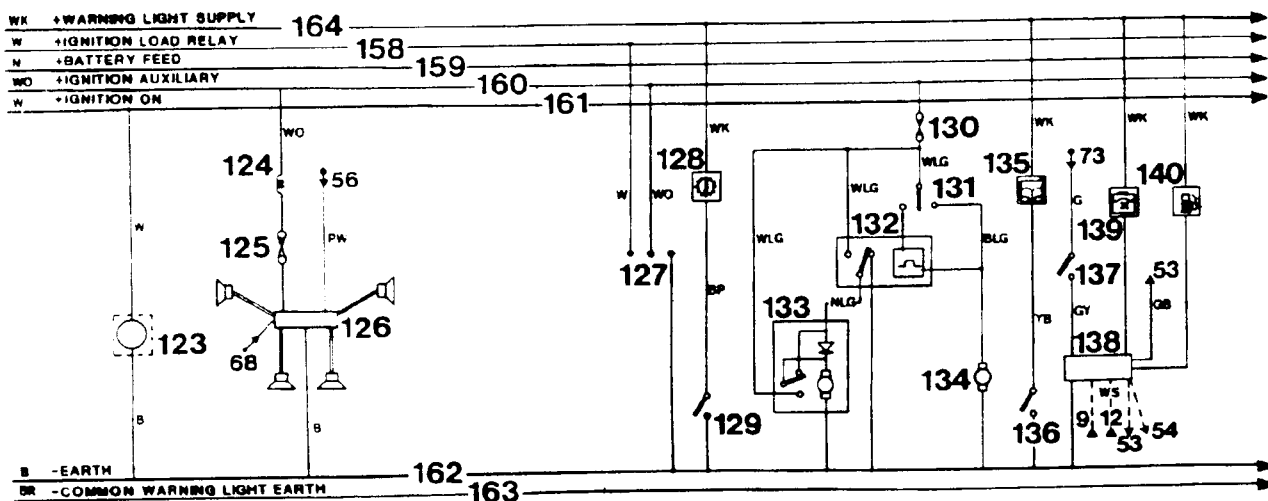
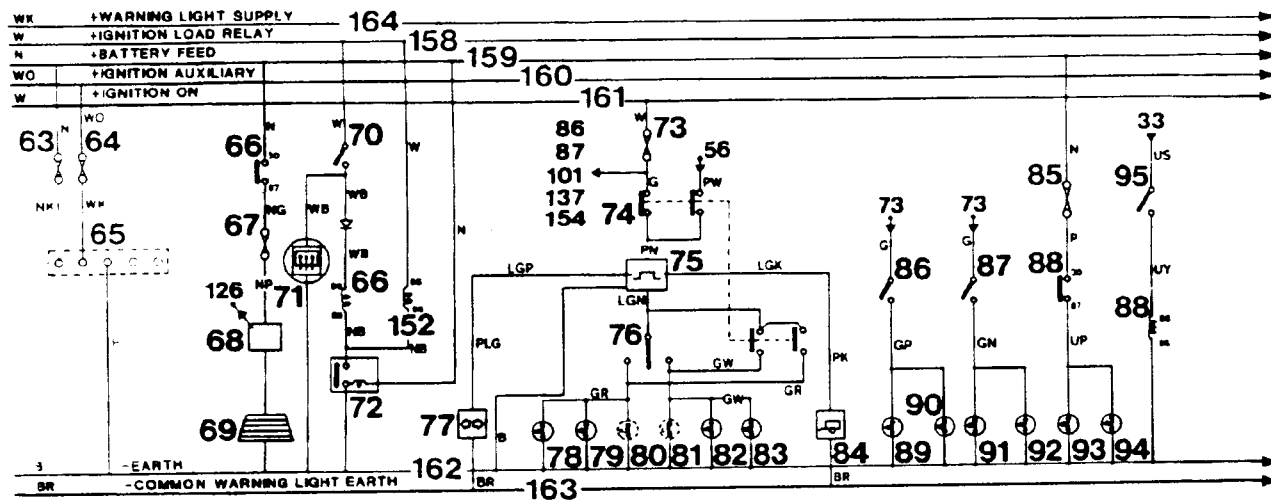
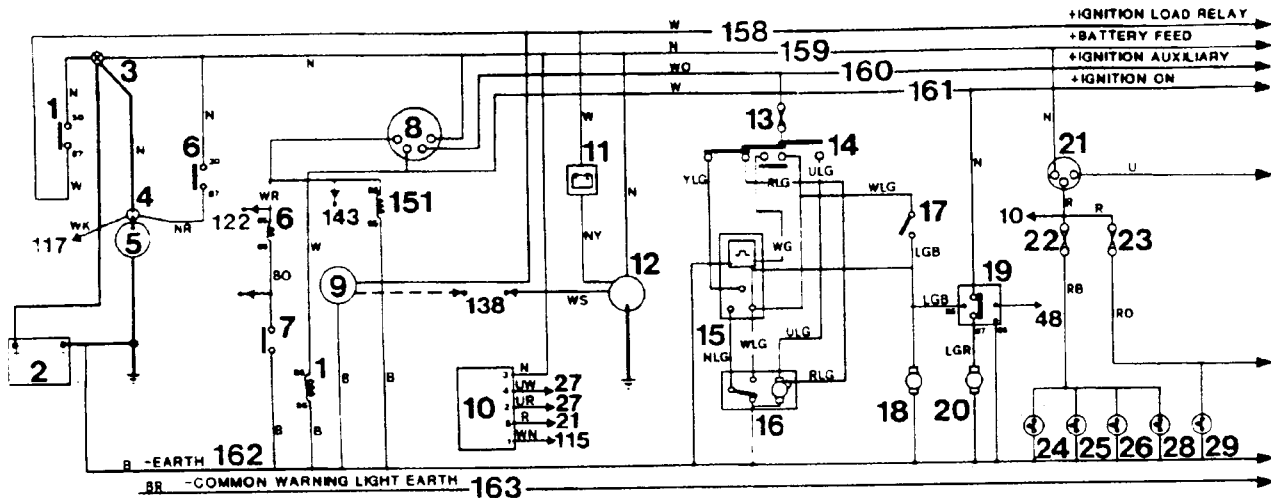
The last letter of a colour code denotes the tracer.

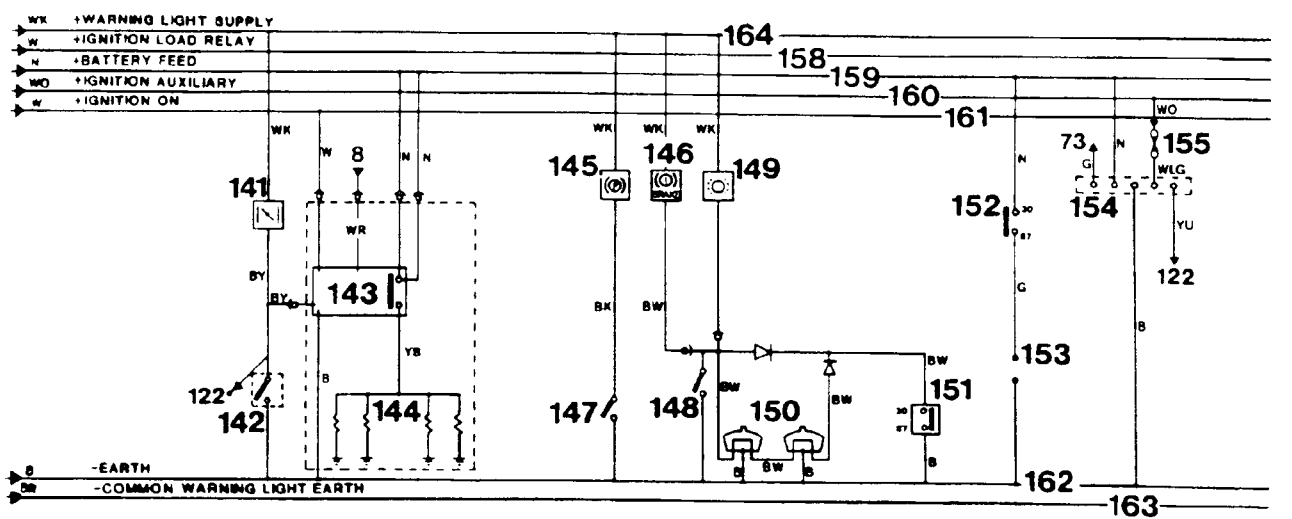
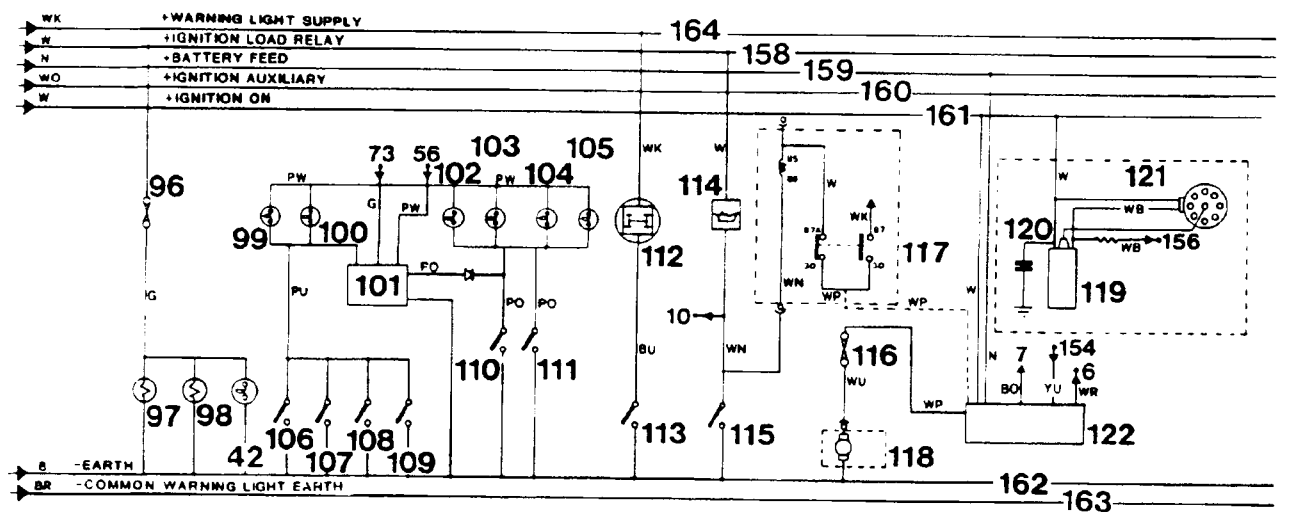
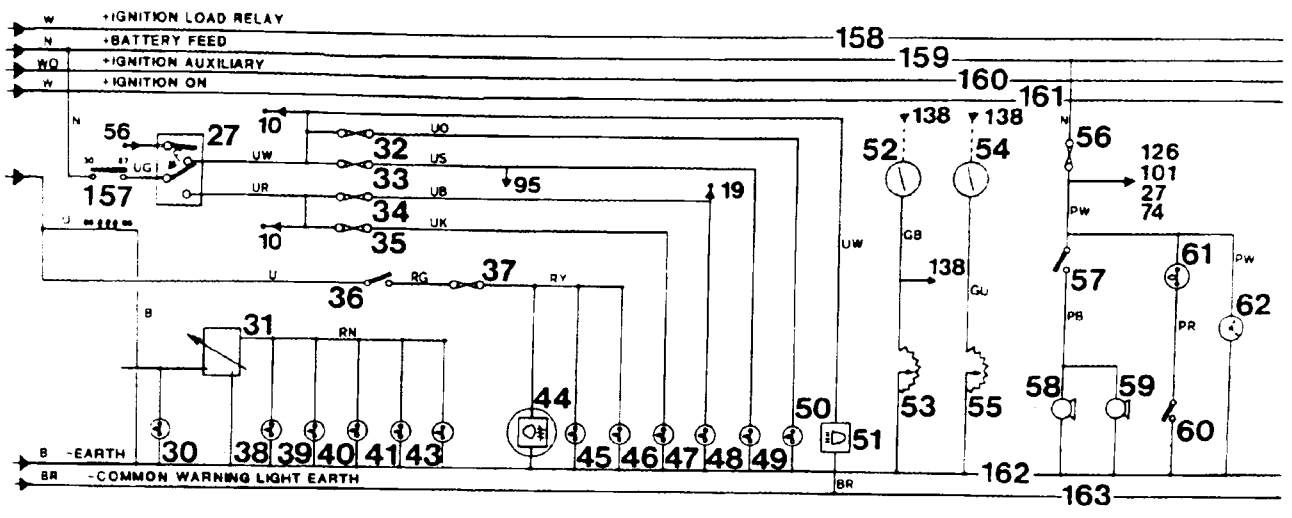
MAIN CIRCUIT DIAGRAM Right Hand Steering - RR2343M & RR2344M

- | | | | |
|-----|--|------|---|
| 1. | Ignition load relay | 91. | LH reverse lamp |
| 2. | Battery | 92. | RH reverse lamp |
| 3. | Terminal post | 93. | LH auxiliary lamp (option) |
| 4. | Starter solenoid | 94. | RH auxiliary lamp (option) |
| 5. | Starter motor | 95. | Auxiliary lamp switch (option) |
| 6. | Starter relay | 96. | Fuse 17 |
| 7. | Starter inhibit switch (Automatic) | 97. | Dash cigar lighter |
| 8. | Ignition switch | 98. | Cubby box cigar lighter |
| 9. | Tachometer | 99. | LH interior lamp |
| 10. | Voltage transformer (dip) | 100. | RH interior lamp |
| 11. | Ignition warning lamp | 101. | Interior lamp delay unit |
| 12. | Alternator | 102. | LH door edge lamp |
| 13. | Fuse 7 | 103. | RH door edge lamp |
| 14. | Front wiper/wash switch | 104. | LH puddle lamp |
| 15. | Front wiper delay unit | 105. | RH puddle lamp |
| 16. | Front wiper motor | 106. | Interior lamp switch |
| 17. | Front wash switch | 107. | LH rear door switch |
| 18. | Front wash pump | 108. | RH rear door switch |
| 19. | Headlamp wash timer unit (option) | 109. | Tailgate switch |
| 20. | Headlamp wash pump (option) | 110. | LH front door switch |
| 21. | Main lighting switch | 111. | RH front door switch |
| 22. | Fuse 6 | 112. | Differential lock warning lamp |
| 23. | Fuse 5 | 113. | Differential lock switch |
| 24. | LH side lamp | 114. | Oil pressure warning lamp |
| 25. | LH tail lamp | 115. | Oil pressure switch |
| 26. | Number plate lamp (2 off) | 116. | Fuse 18 |
| 27. | Main beam dip flash switch | 117. | Fuel cut off relay (carburettor models) |
| 28. | Radio illumination | 118. | Fuel pump (petrol models) |
| 29. | RH side lamp | 119. | Ignition coil |
| 30. | RH tail lamp | 120. | Capacitor |
| 31. | Rheostat | 121. | Distributor |
| 32. | Fuse 3 | 122. | EFI Harness plug |
| 33. | Fuse 4 | 123. | Fuel shut off solenoid (Diesel) |
| 34. | Fuse 1 | 124. | Radio choke |
| 35. | Fuse 2 | 125. | Radio fuse |
| 36. | Rear fog switch | 126. | Radio and four speakers |
| 37. | Fuse 12 | 127. | Ignition pick up points |
| 38. | Switch illumination (2 off) | 128. | Automatic transmission oil temperature warning lamp |
| 39. | Cigar lighter illumination (2 off) | 129. | Automatic transmission oil temperature switch |
| 40. | Heater illumination (4 off) | 130. | Fuse 16 |
| 41. | Clock illumination | 131. | Rear wash wiper switch |
| 42. | Automatic gear selector illumination (2 off) | 132. | Rear wiper delay unit |
| 43. | Instrument illumination (6 off) | 133. | Rear wiper motor |
| 44. | Rear fog warning lamp | 134. | Rear screen wash pump |
| 45. | LH rear fog | 135. | Low screen wash fluid level warning lamp |
| 46. | RH rear fog | 136. | Low screen wash switch |
| 47. | LH dip beam | 137. | Low coolant switch |
| 48. | RH dip beam | 138. | Multi-function unit in binnacle |
| 49. | LH main beam | 139. | Low coolant level warning lamp |
| 50. | RH main beam | 140. | Low fuel level warning lamp |
| 51. | Main beam warning lamp | 141. | Cold start/diesel glow plug warning lamp |
| 52. | Fuel gauge | 142. | Cold start switch - carburettor |
| 53. | Fuel gauge sender unit | 143. | Glow plug timer (diesel) |
| 54. | Water temperature gauge | 144. | Glow plugs (diesel) |
| 55. | Water temperature sender unit | 145. | Handbrake warning lamp |
| 56. | Fuse 11 | 146. | Brake fail warning lamp |
| 57. | Horn switch | 147. | Handbrake warning switch |
| 58. | RH horn | 148. | Brake fail warning switch |
| 59. | LH horn | 149. | Brake pad wear warning lamp |
| 60. | Under bonnet illumination switch | 150. | Brake pad wear sensors |
| 61. | Under bonnet light | 151. | Brake check relay |
| 62. | Clock | 152. | Split charge relay (option) |
| 63. | Fuse 19 | 153. | Split charge terminal post (option) |
| 64. | Fuse 20 | 154. | Heater/air conditioning connections |
| 65. | Pick-up point central locking/window lift (option) | 155. | Fuse 8 |
| 66. | Heated rear window relay | 156. | Coil negative (engine RPM input to ECU) |
| 67. | Fuse 9 | | |
| 68. | Radio aerial amplifier | | |
| 69. | Heated rear screen | | |
| 70. | Heated rear screen switch | | |
| 71. | Heated rear screen warning lamp | | |
| 72. | Voltage sensitive switch | | |
| 73. | Fuse 13 | | |
| 74. | Hazard switch | | |
| 75. | Flasher unit | | |
| 76. | Direction indicator switch | | |
| 77. | Hazard/indicator warning lamp | | |
| 78. | LH rear indicator lamp | | |
| 79. | LH front indicator lamp | | |
| 80. | LH side repeater lamp | | |
| 81. | RH side repeater lamp | | |
| 82. | RH front indicator lamp | | |
| 83. | RH rear indicator lamp | | |
| 84. | Trailer warning lamp | | |
| 85. | Fuse 15 | | |
| 86. | Stop lamp switch | | |
| 87. | Reverse lamp switch | | |
| 88. | Auxiliary lamp relay (option) | | |
| 89. | LH stop lamp | | |
| 90. | RH stop lamp | | |

CABLE COLOUR CODE

B	Black
U	Blue
N	Brown
G	Green
L	Light
O	Orange
K	Pink
P	Purple
R	Red
S	Slate
W	White
Y	Yellow





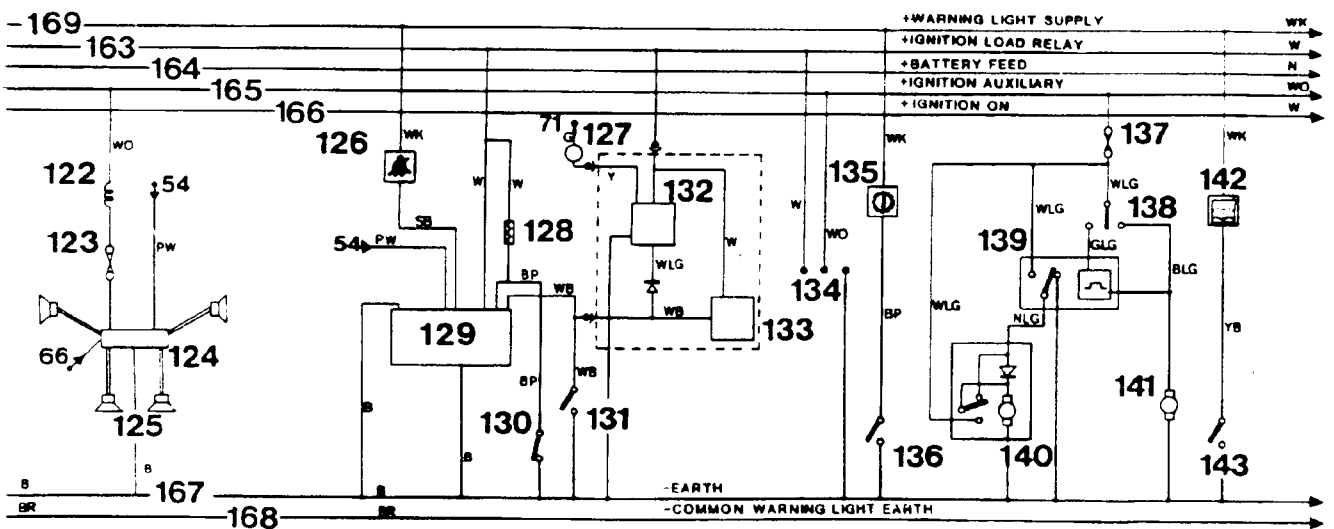
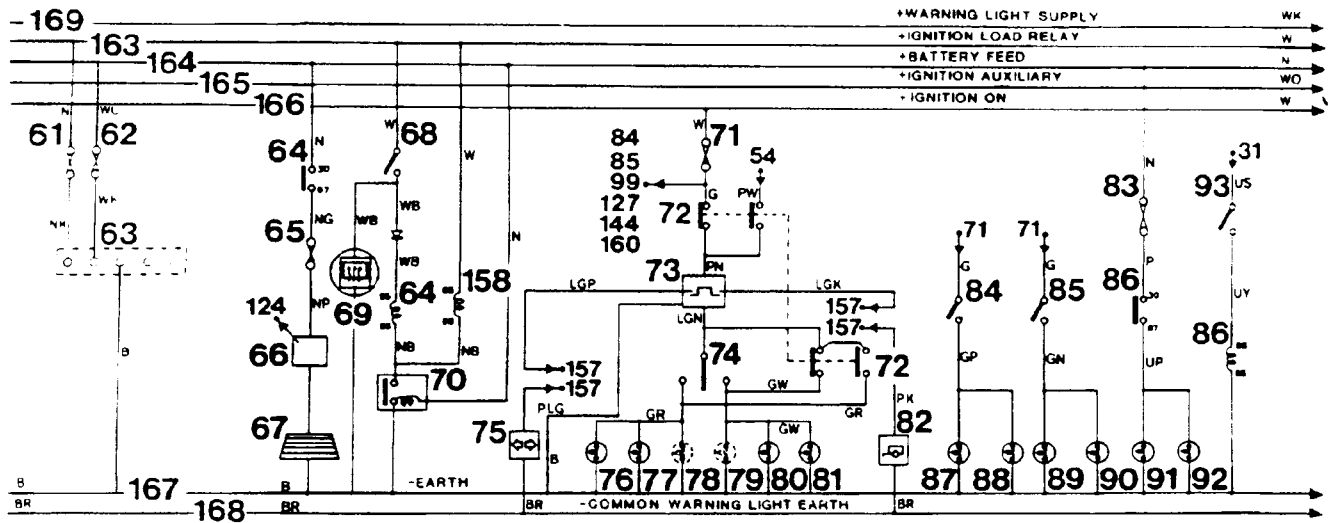
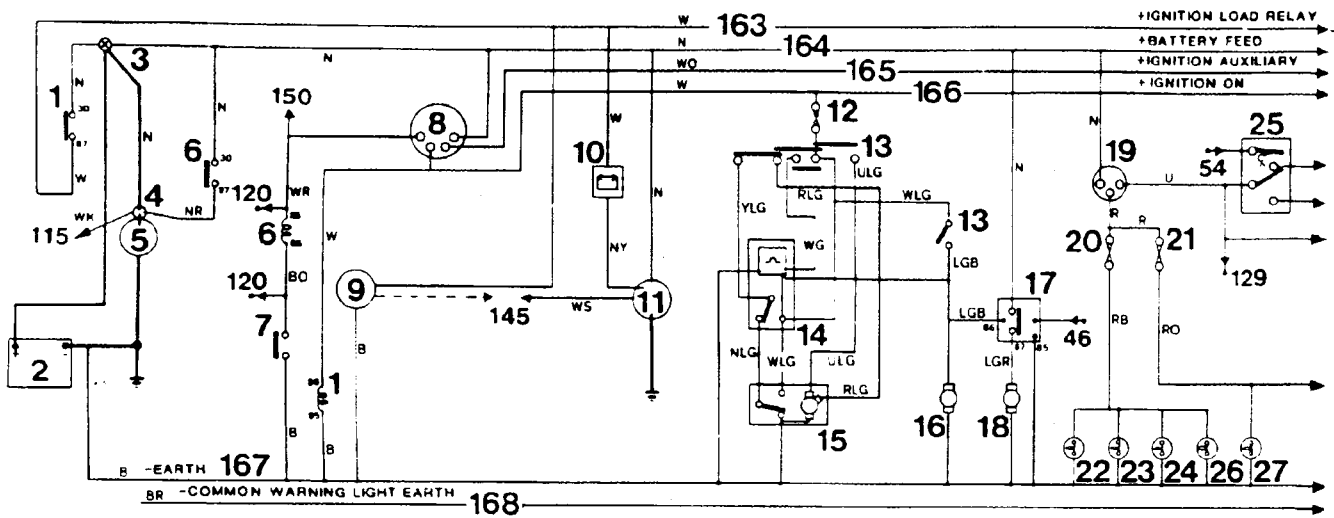
MAIN CIRCUIT DIAGRAM

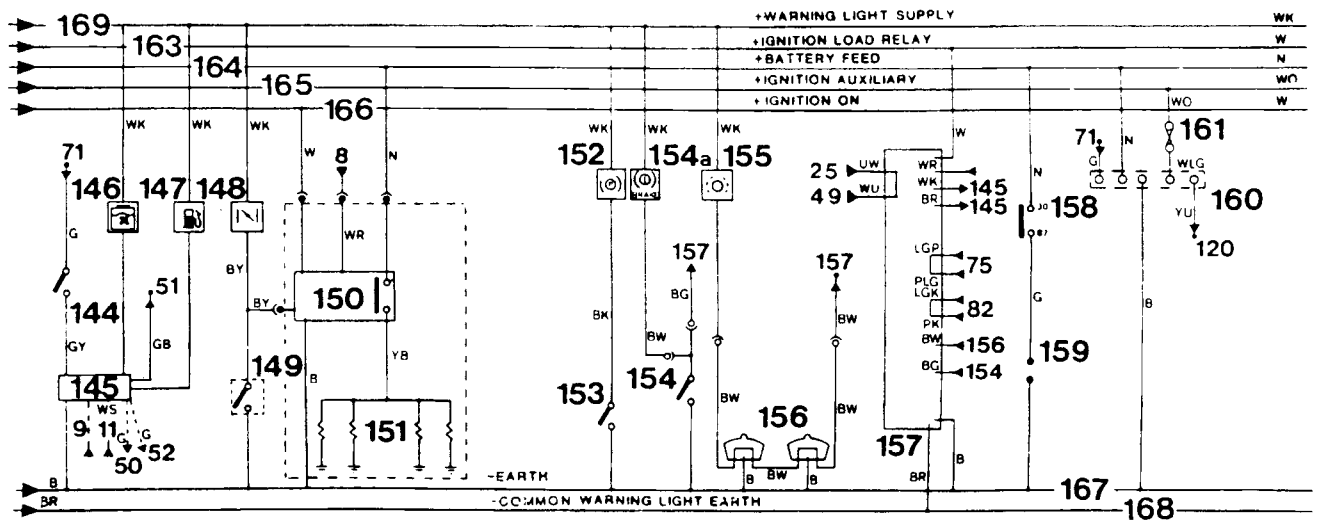
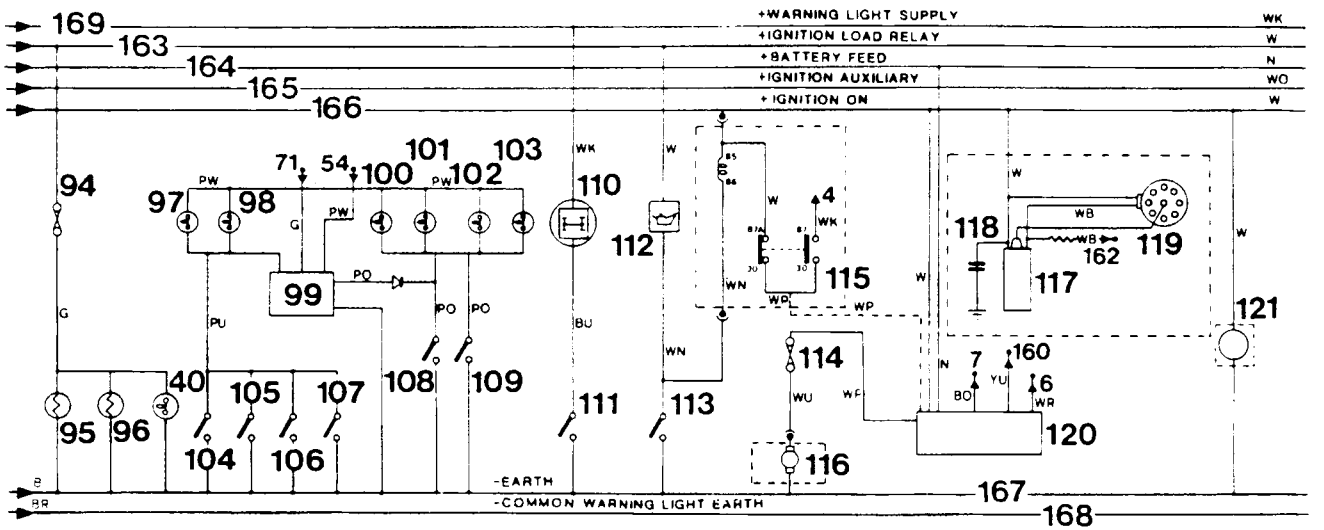
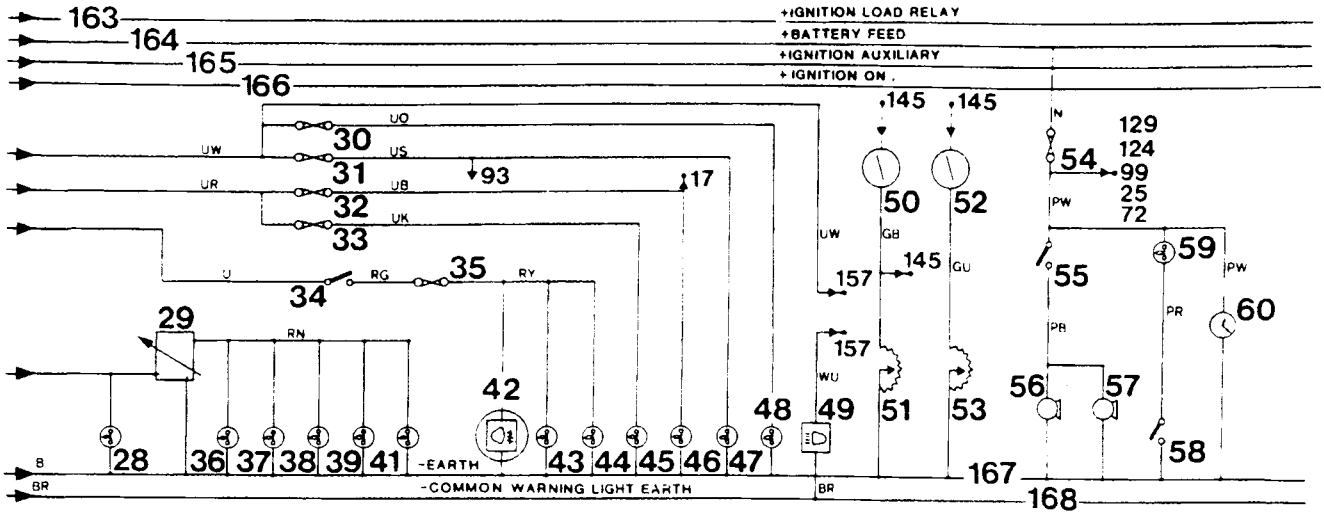
Left-hand Steering - RR2345M & RR2346M

1.	Ignition load relay
2.	Battery
3.	Terminal post
4.	Starter solenoid
5.	Starter motor
6.	Starter relay
7.	Starter inhibit switch (automatic)
8.	Ignition switch
9.	Tachometer
10.	Ignition warning lamp
11.	Alternator
12.	Fuse 7
13.	Front wiper/wash switch
14.	Front wiper delay unit
15.	Front wiper motor
16.	Front wash pump
17.	Headlamp wash timer unit (option)
18.	Headlamp wash pump (option)
19.	Main lighting switch
20.	Fuse 6
21.	Fuse 5
22.	LH side lamp
23.	LH tail lamp
24.	Number plate lamp (2 off)
25.	Main beam dip/flash switch
26.	Radio illumination
27.	RH side lamp
28.	RH tail lamp
29.	Rheostat
30.	Fuse 3
31.	Fuse 4
32.	Fuse 1
33.	Fuse 2
34.	Rear fog switch
35.	Fuse 12
36.	Switch illumination (2 off)
37.	Cigar lighter illumination (2 off)
38.	Heater illumination (4 off)
39.	Clock illumination
40.	Automatic gear selector illumination (2 off)
41.	Instrument illumination (6 off)
42.	Rear fog warning lamp
43.	LH rear fog
44.	RH rear fog
45.	LH dip beam
46.	RH dip beam
47.	LH main beam
48.	RH main beam
49.	Main beam warning lamp
50.	Fuel gauge
51.	Fuel gauge sender unit
52.	Water temperature gauge
53.	Water temperature sender unit
54.	Fuse 11
55.	Horn switch
56.	RH horn
57.	LH horn
58.	Under bonnet illumination switch
59.	Under bonnet light
60.	Clock
61.	Fuse 19
62.	Fuse 20
63.	Pick-up point central locking/window lift
64.	Heated rear window relay
65.	Fuse 9
66.	Radio aerial amplifier
67.	Heated rear screen
68.	Heated rear screen switch
69.	Heated rear screen warning lamp
70.	Voltage sensitive switch
71.	Fuse 13
72.	Hazard switch
73.	Flasher unit
74.	Direction indicator switch
75.	Hazard indicator warning lamp
76.	LH rear indicator lamp
77.	LH front indicator lamp
78.	LH side repeater lamp
79.	RH side repeater lamp
80.	RH front indicator lamp
81.	RH rear indicator lamp
82.	Trailer warning lamp
83.	Fuse 15
84.	Stop lamp switch
85.	Reverse lamp switch
86.	Auxiliary lamp relay
87.	LH stop lamp
88.	RH stop lamp
89.	LH reverse lamp
90.	RH reverse lamp
91.	LH auxiliary lamp (option)
92.	RH auxiliary lamp (option)
93.	Auxiliary lamp switch (option)
94.	Fuse 17
95.	Dash cigar lighter
96.	Cubby box cigar lighter
97.	LH interior lamp
98.	RH interior lamp
99.	Interior lamp delay unit
100.	LH door edge lamp
101.	RH door edge lamp
102.	LH puddle lamp
103.	RH puddle lamp
104.	Interior lamp switch
105.	LH rear door switch
106.	RH rear door switch
107.	Tailgate switch
108.	LH front door switch
109.	RH front door switch
110.	Differential lock warning lamp
111.	Differential lock switch
112.	Oil pressure warning lamp
113.	Oil pressure switch
114.	Fuse 1a
115.	Fuel shut-off relay - carburetter
116.	Fuel pump - petrol models
117.	Ignition coil
118.	Capacitor
119.	Distributor
120.	EFI Harness plug
121.	Fuel shut-off solenoid-Diesel
122.	Radio choke
123.	Radio fuse
124.	Radio
125.	Four speakers
126.	Seat belt warning lamp
127.	Speed transducer, Saudi only
128.	Resistor
129.	Audible warning unit
130.	Transfer box neutral switch
131.	Seat buckle switch
132.	Overspeed monitor (Saudi only)
133.	Overspeed buzzer (Saudi only)
134.	Ignition pick up points
135.	Automatic transmission oil temperature warning lamp
136.	Automatic transmission oil temperature switch
137.	Fuse 16
138.	Rear wash wiper switch
139.	Rear wiper delay unit
140.	Rear wiper motor
141.	Rear screen wash pump
142.	Low screen wash fluid level warning lamp
143.	Low screen wash switch
144.	Low coolant switch
145.	Multi-function unit in binnacle
146.	Low coolant level warning lamp
147.	Low fuel level warning lamp
148.	Cold start Diesel glow plug warning lamp
149.	Choke switch - carburetter
150.	Glowplug timer/Diesel
151.	Glowplugs Diesel
152.	Handbrake warning lamp
153.	Handbrake warning switch
154.	Brake tail warning switch
154a.	Brake tail warning lamp
155.	Brake pad wear warning lamp
156.	Brake pad wear sensors
157.	Brake check unit
158.	Split charge relay (option)
159.	Split charge terminal post
160.	Heater air conditioning connections
161.	Fuse 8
162.	Coil negative (engine RPM input to ECU)

CABLE COLOUR CODE

B	Black
U	Blue
N	Brown
G	Green
L	Light
O	Orange
K	Pink
P	Purple
R	Red
S	Slate
W	White
Y	Yellow





RR2346M

