



Ministry
of Defence

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Our Reference:
FOI2022/00738
Date:
1 February 2022

Dear xxxx,

I am writing about your email of 19 December 2021, requesting the following information:

'Chapter 13 covers the electrical system for the TUL/TUM GS (13.1)/FFR (13.2) Winterised/Waterproof (13.4), Winterised (13.5) as well the the Battle Field Ambulance (13.3 and 13.6). You disclosed 13.1 which covers the vast majority of vehicles. I do not see why not at least 13.2, 13.4 and 13.5 shouldn't be disclosed as well, as they just only describe the difference (of the FFR, Winterised/Waterproof and Winterised versions) compared to chapter to 13.1. Those differences are few, but in terms of understanding the vehicles' complete electrical system they are essential to know. Aside GS TULS/TUMs, their cousins (FFR, Winterised/Waterproof and Winterised TULs/TUMs) have been released to the civilian market as well. This might apply to the Ambulances as well.'

Your request has been handled in accordance with the Freedom of Information (FOI) Act 2000.

A search for the information has now been completed within the Ministry of Defence, and I can confirm that all the information in scope of your request is held.

The information you have requested is enclosed, as follows:

- Annex A – Chapter 13.2
- Annex B – Chapter 13.4
- Annex C – Chapter 13.5

If you have any queries regarding the content of this letter, please contact this office in the first instance. If you wish to complain about the handling of your request, or the content of this response, you can request an independent internal review by contacting the Information Rights Compliance team, Ground Floor, MOD Main Building, Whitehall, SW1A 2HB (e-mail CIO-FOI-IR@mod.gov.uk). Please note that any request for an internal review should be made within 40 working days of the date of this response.

If you remain dissatisfied following an internal review, you may raise your complaint directly to the Information Commissioner under the provisions of Section 50 of the Freedom of Information Act. Please note that the Information Commissioner will not normally investigate your case until the MOD internal review process has been completed. The Information Commissioner can be contacted at: Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire, SK9 5AF.

Defence Equipment & Support

Further details of the role and powers of the Information Commissioner can be found on the Commissioner's website at <https://ico.org.uk/>.

Yours sincerely,

DE&S Secretariat

CHAPTER 13-2

FITTED FOR RADIO (FFR)

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INTRODUCTION

1 This chapter gives the Technical Description for the 24 volt split charging system as fitted to Truck Utility Light (TUL) HS, and Truck Utility Medium (TUM) HS vehicles. The information given is applicable to both LH and RH drive vehicles.

24 VOLT SPLIT CHARGING SYSTEMS**Description**

2 The 24 volt split charging system fitted to FFR vehicles consists of two linked 50 amp alternators, an Electronic Control Unit, a twin alternator relay and an ammeter. Subject to battery status the circuit allows each alternator to provide supplementary current to either the vehicle batteries 'BB' or the radio batteries 'AB' (Fig 1) if the battery load of 'BB' or 'AB' is exceeding it's respective alternator supply, (i.e. 50 amps).

Operation

3 Under normal running conditions the vehicle batteries are supplied charging current by the lower mounted alternator whilst the radio batteries are supplied by the upper mounted alternator. Provided the charged status of both sets of batteries remains good, the two circuits will remain totally separate.

3.1 The Electronic Control Unit monitors the voltage of both the vehicle and radio batteries. Should the voltage of either sets of batteries drop below 23 volts the ECU detects the differential and activates the twin alternator relay to switch in the link to the required alternator for supplementary charging current.

Example

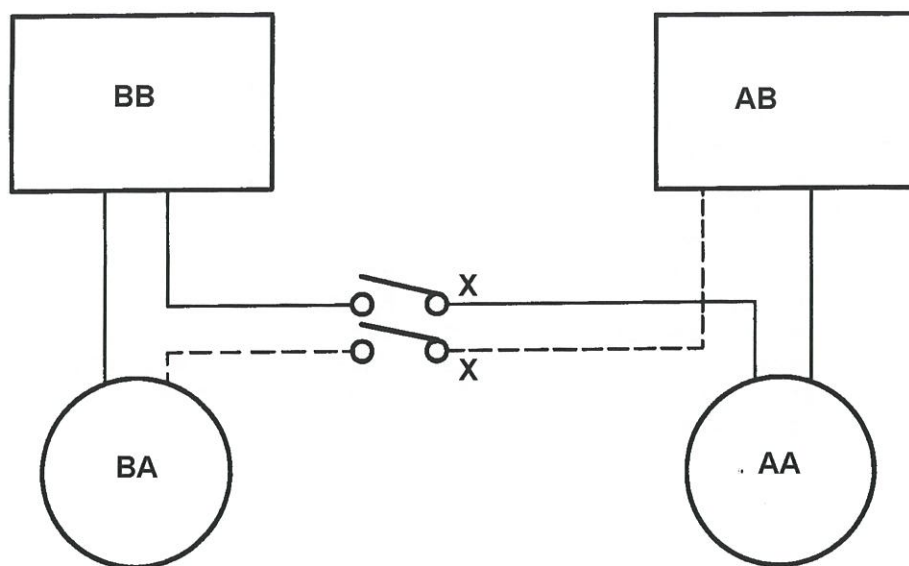
4 The following list refers to Fig 1 and assumes:

4.1 Good = load below 50 amps.

4.2 Bad = load over 50 amps.

TABLE 1 SPLIT CHARGE SYSTEM

Serial No (1)	Batteries (2)	Alternator (3)
1 AB	Good BB Good	No X link
2 AB	Bad BB Bad	No X link
3 AB	Good BB Bad	X link active to AA Alternator AA supplements batteries BB (provided that battery load BB exceeds alternator BA supply, i.e. 50 amps)
4 AB	Bad BB Good	X link active to BA Alternator BA supplements batteries AB.



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Fig 1 24v split charging system

KEY TO FIG 2

1	Alternator connections	13	Reverse switch
2	Oil pressure switch connection	14	Fast fuse connections
3	Water temperature sensor connection	15	Earth bonding leads, radio table
4	Fuel shut off connection	16	Terminal box connections
5	Twin alternator connections	17	Batteries terminal box connections
6	Twin alternator inter link connection	18	Radio batteries
7	Alternator ECU feed connection	19	FFR charging ECU
8	Main harness connection	20	Radio antenna leads
9	Starter solenoid main harness connection	21	Interlink charging harness
10	Ammeter connections	22	Differential lock switch connections
11	Charging relay connection	23	FFR Engine harness
12	Starter solenoid connections		

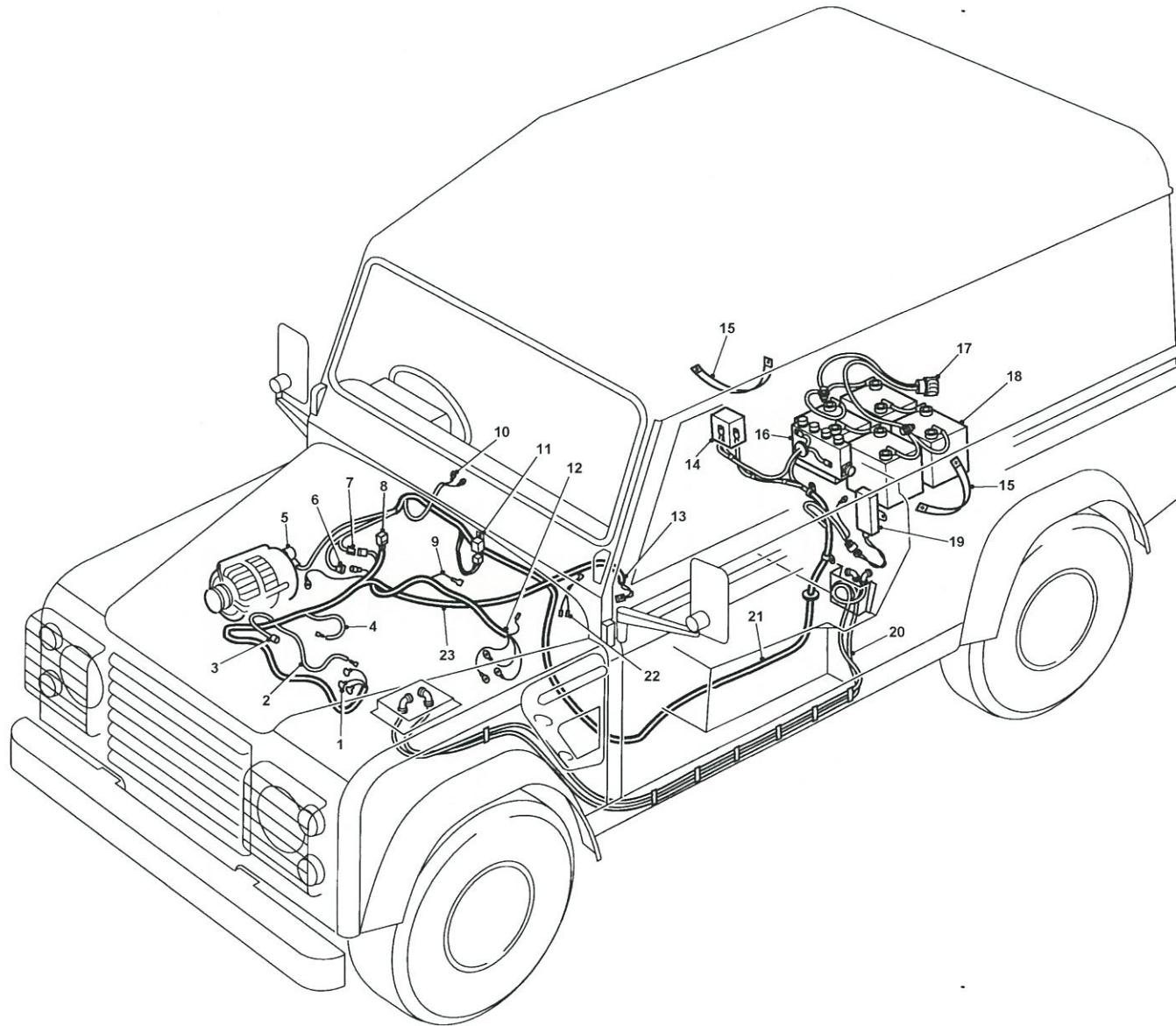


Fig 2 FFR harness assembly layout

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HOW TO USE THE CIRCUIT DIAGRAMS

5 The circuit diagrams are presented with Power and Earth distribution first, followed by individual circuits for each electrical system on the vehicle.

Power distribution

6 The power distribution diagram shows the connections from the battery to the engine and fuse boxes. It also shows the internal circuitry of the fuse boxes.

- 6.1 The fuse box details are followed by the earth distribution diagram.
- 6.2 The Header joints, Splices and centre taps sections follow on outlining the way in which internal harness splices and header joints distribute power in the harness.
- 6.3 This information should be used during diagnosis of electrical faults to check symptoms in associated circuits and narrow down the search area.

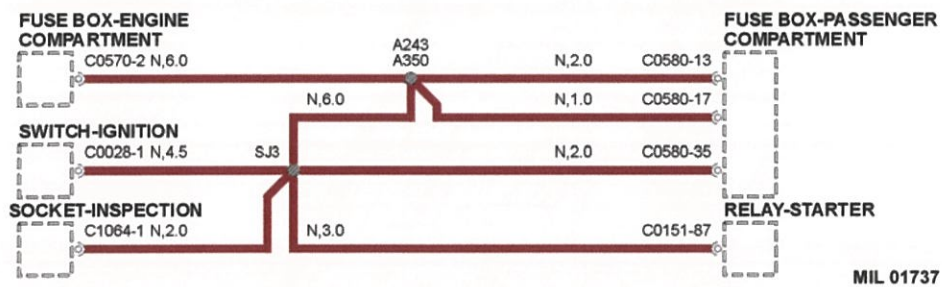


Fig 3 Power distribution

Headers, splices and centre taps

7 Header and splice circuits present the joint(s) and wiring up to the first component. Splices are identified by a number with an alphabetical prefix and wire colour.

Wire attributes

8 Additional information separated by a “,” is shown along side the wire colour.

- 8.1 Wire gauge is the cross sectional area of the wire in square millimetres. This is included to help in selecting the correct wire during harness repair.
- 8.2 Wire length (Power and Earth distribution only) is the length of wire in millimetres. This can be used to locate internal harness splices; look for the shortest wire between the joint and connector. For example, it can be seen that C0570-2 is 730 mm from joint A350 (refer to Fig 3).

Connectors

9 Header joints are identified by their corresponding connector number with a numbered suffix to indicate the pin-out detail of wire, i.e. C0580-4 identifies connector 0580, pin number 4 (refer to Fig 4). Wire insulation colour is identified in the normal way. Where wires have a predominant colour with a secondary colour stripe, the main colour is identified first, i.e. LGS – Light Green with a Slate stripe.

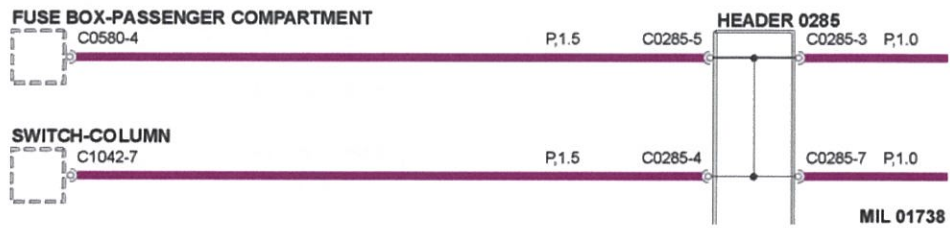


Fig 4 Connectors

Earth distribution

10 The ground distribution section comprises a number of Headers, Splices and centre taps circuits. These are used in a similar manner to those in Power distribution; to narrow the search area by checking for fault symptoms in associated circuits.

Line types

11 Fig 5 means that the wire connects to another circuit.

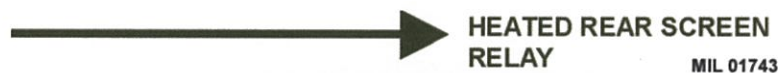


Fig 5 Line types I

12 The “cup and ball” symbol indicates the male and female halves of the connector (refer to Fig 6).

- 12.1 Plug on lead, fly lead (Fig 6 (A)), wired directly to the component.
- 12.2 Connector plugs directly into circuit (Fig 6 (B)).

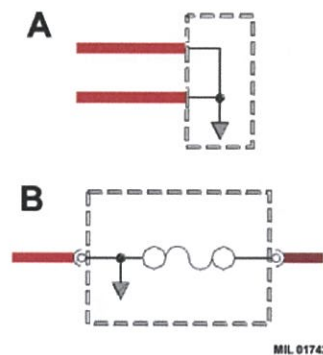


Fig 6 Line types II

Components

13 The name, or description of the component is shown. A dotted outline indicates that the component is not shown in its entirety.

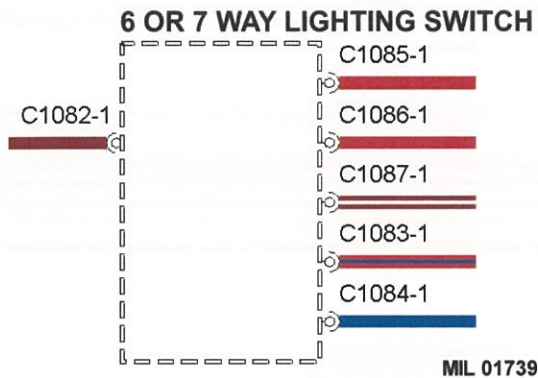


Fig 7 Components

Earth points

14 Earth points are identified with an eyelet symbol and a connector number, except where components are grounded through their fixings, when only the eyelet is shown.

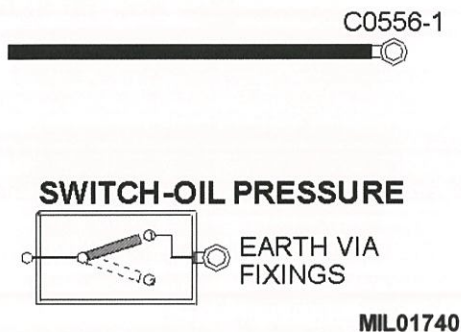


Fig 8 Earth points

Fuses and diodes

15 Fusible links (refer to Fig 9 (A)) and current fuses (B), are identified as shown. The direction of the arrow in a diode symbol (C) indicates the direction of flow. The Zener diode (D) prevents current flow until a precise voltage is reached.

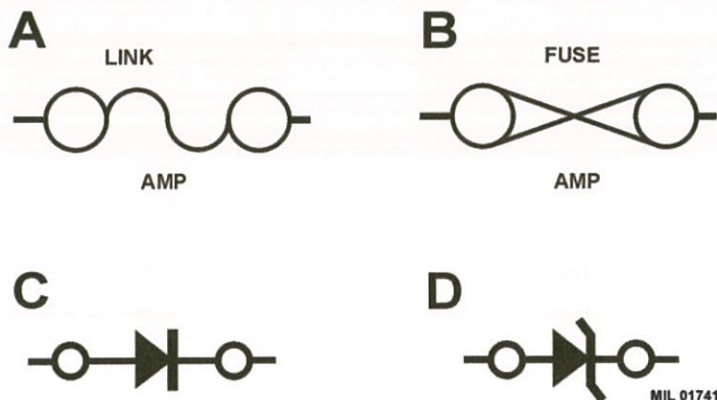


Fig 9 Fuses and diodes

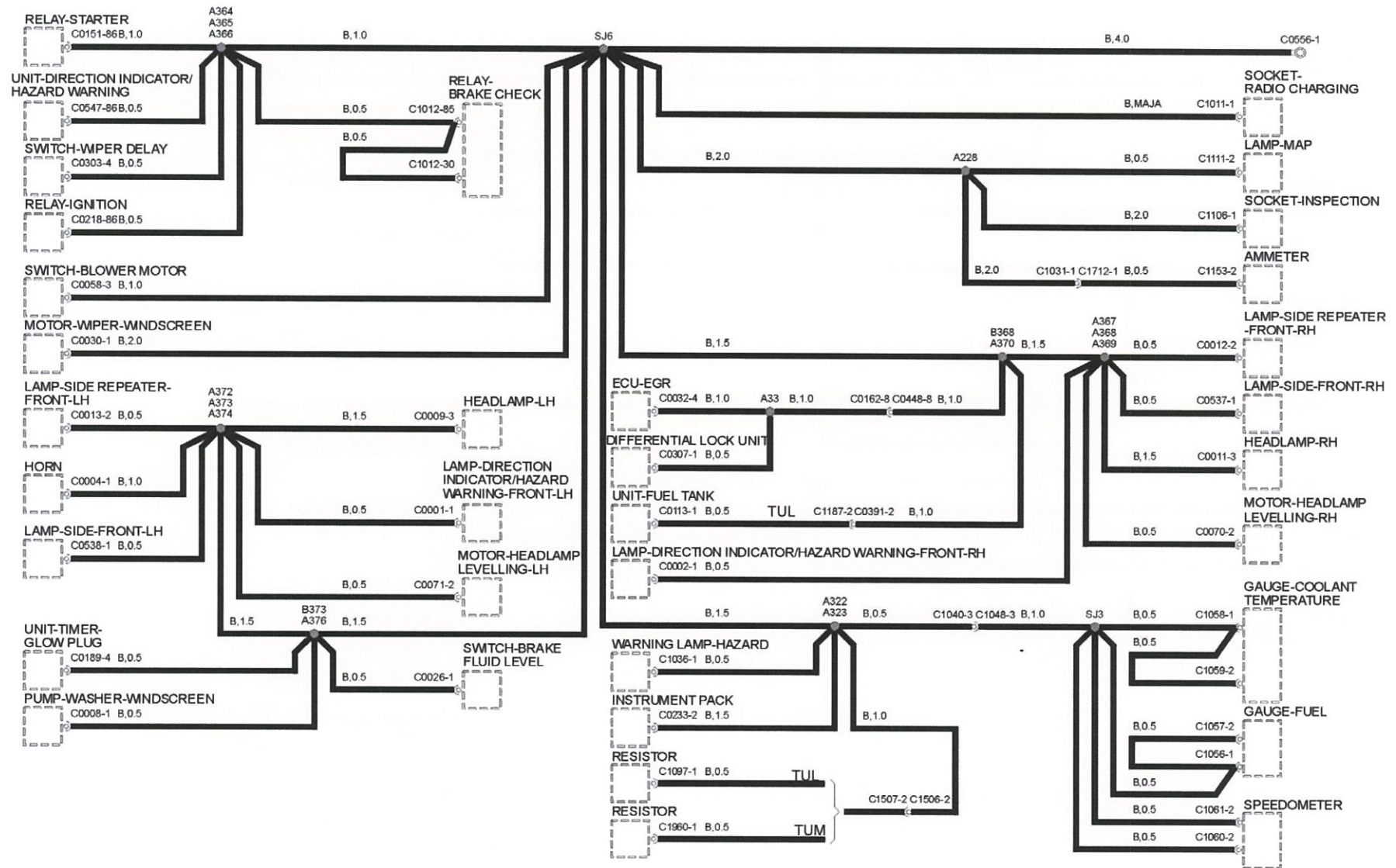


Fig 10 Earth Distribution I

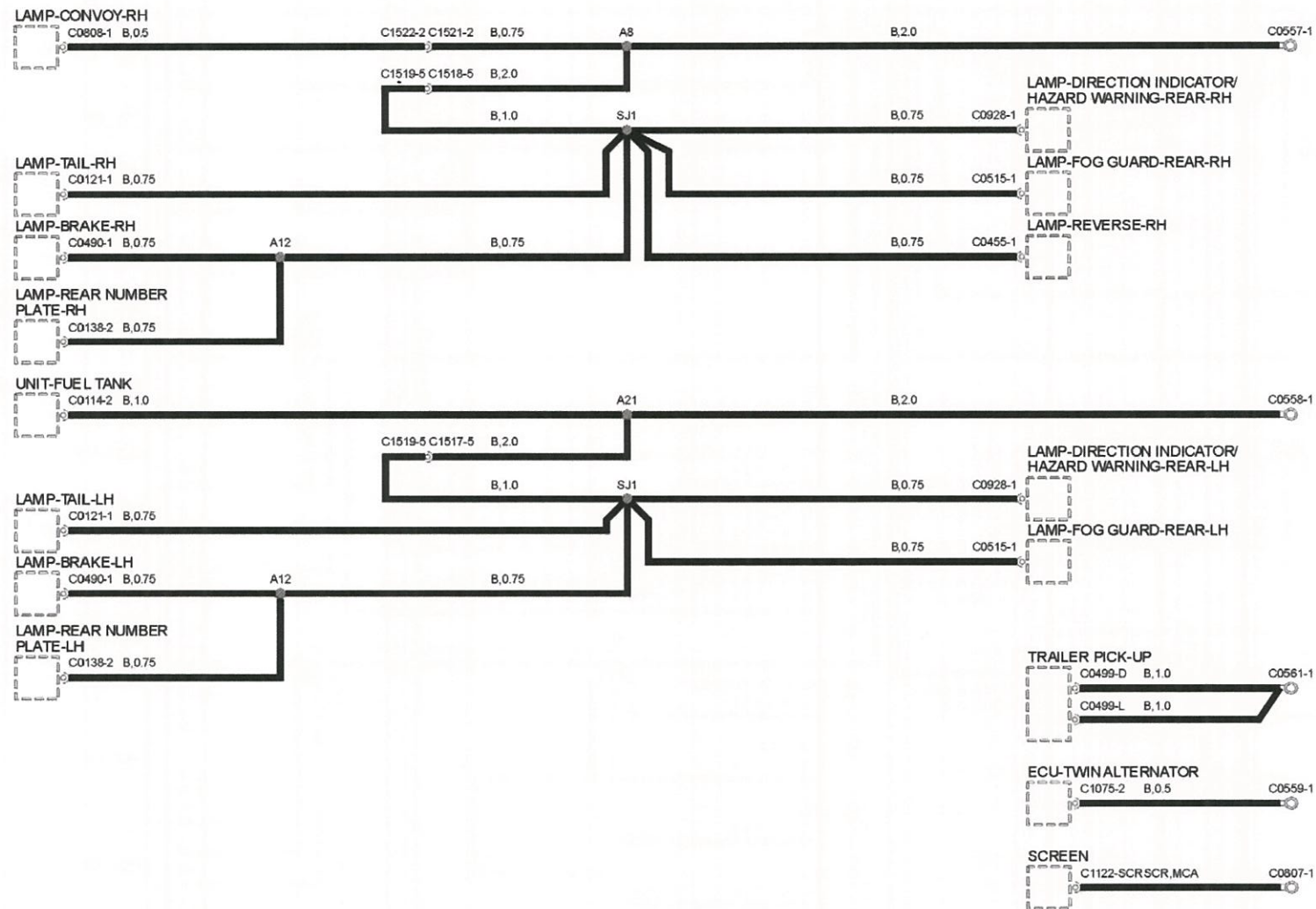


Fig 11 Earth distribution II

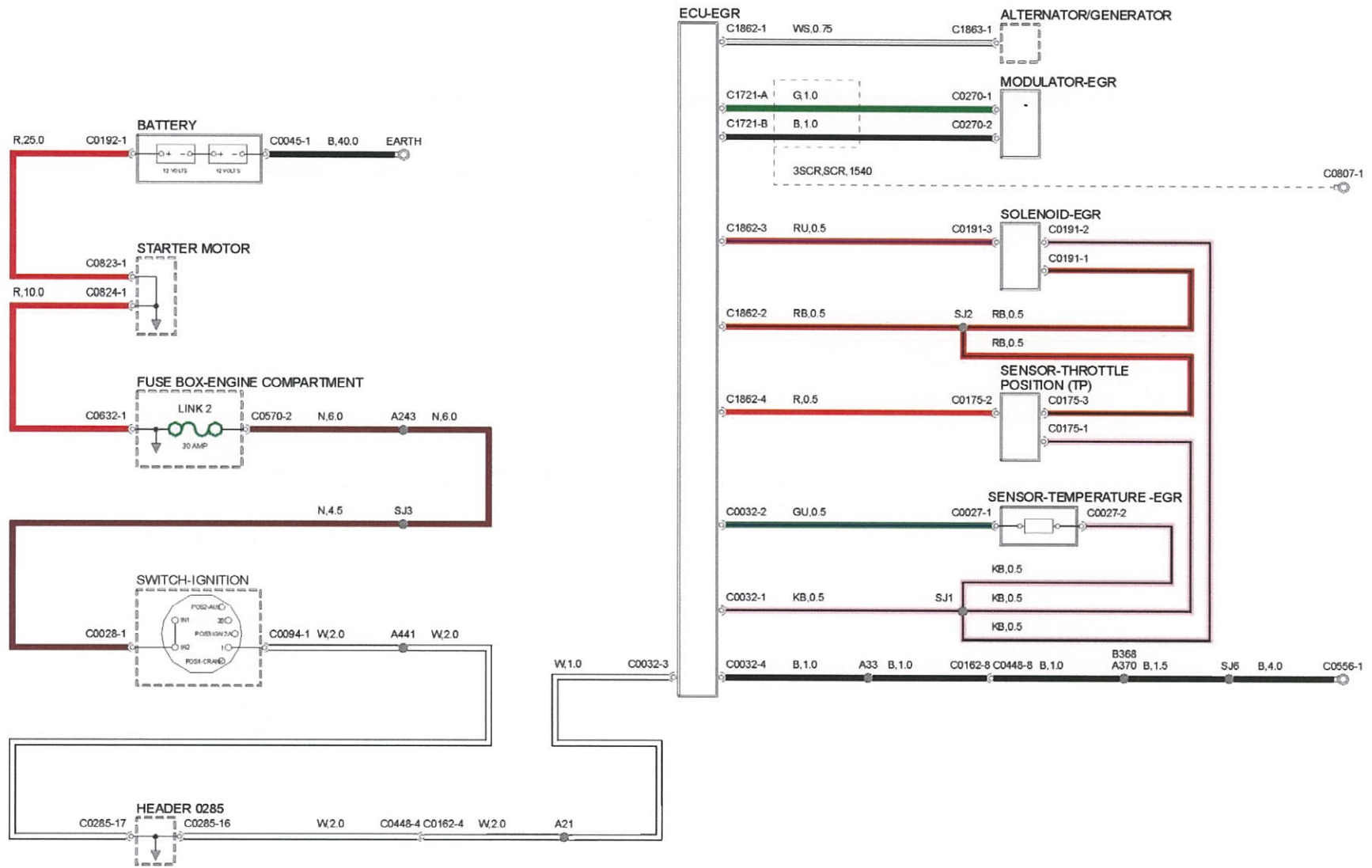


Fig 12 EEGR

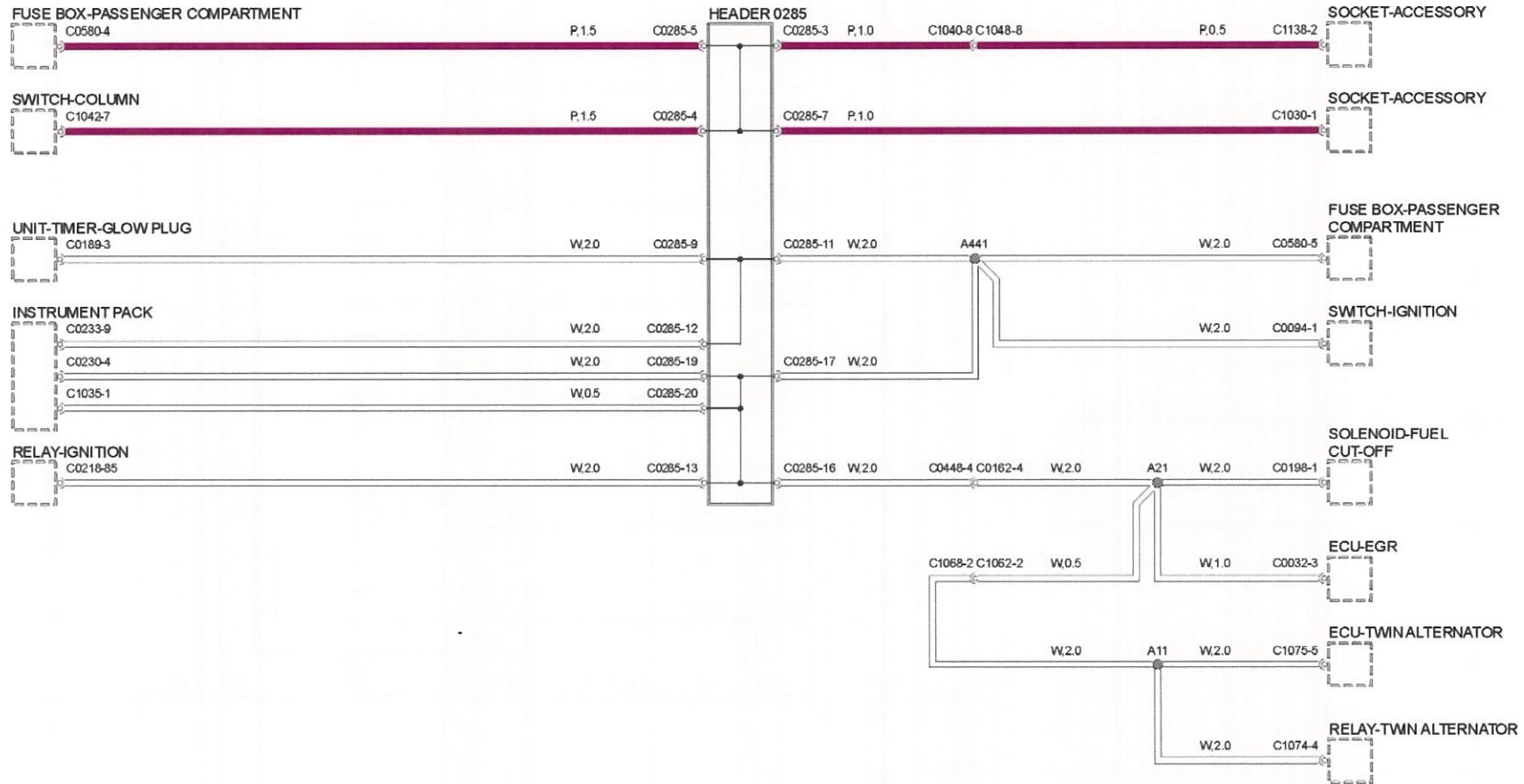


Fig 13 Header joints

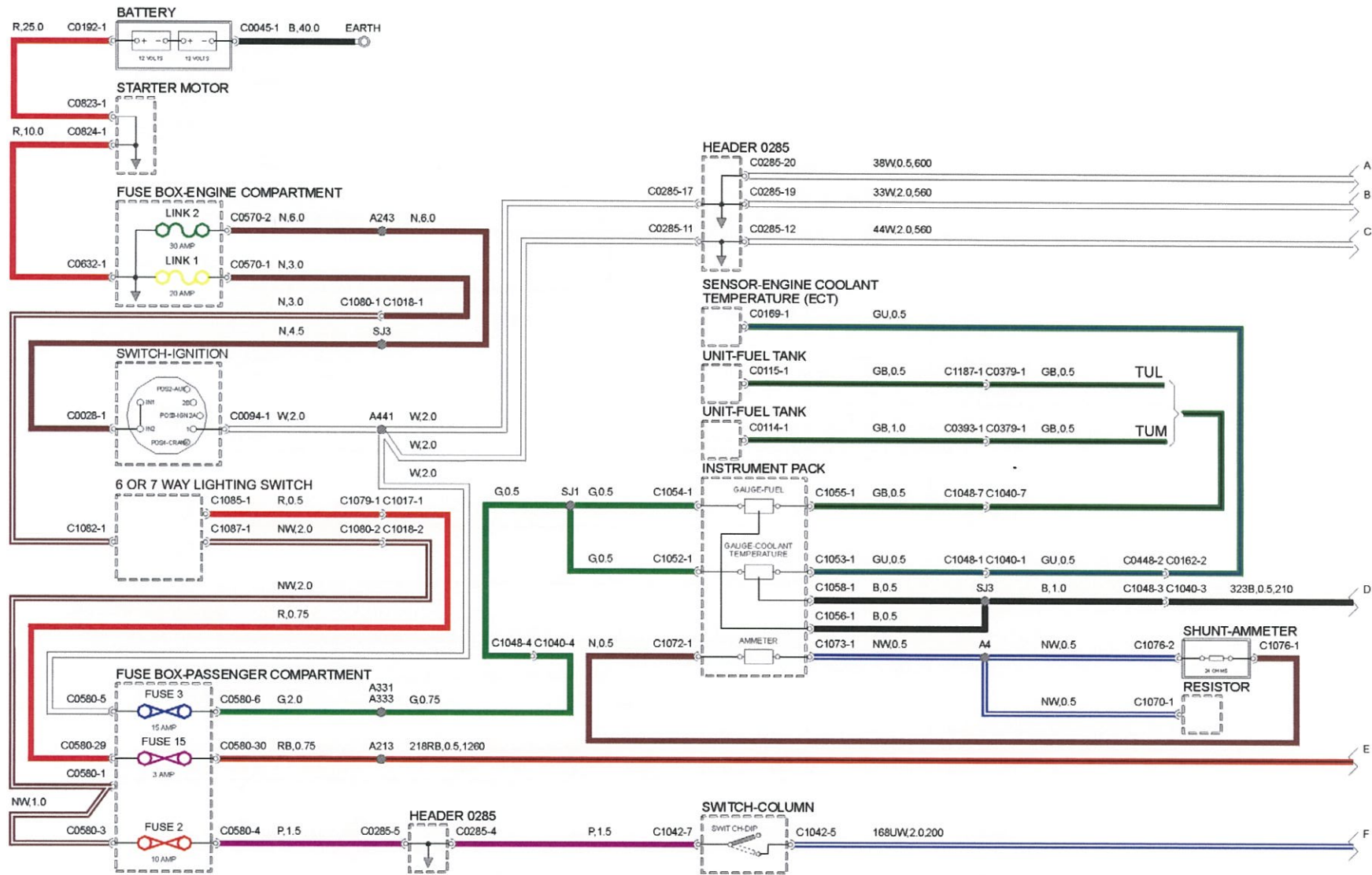


Fig 14 Instruments I

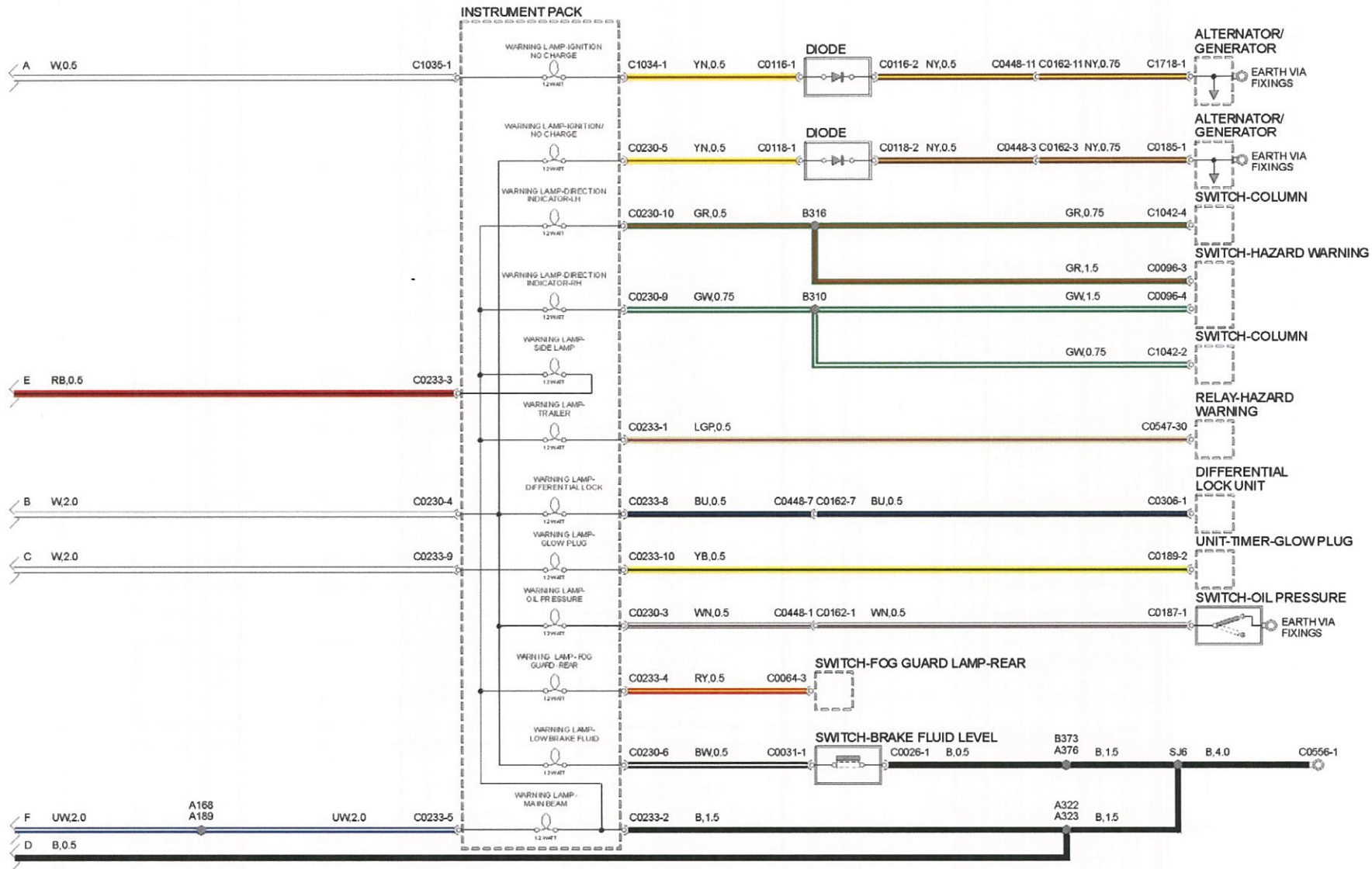


Fig 15 Instruments II

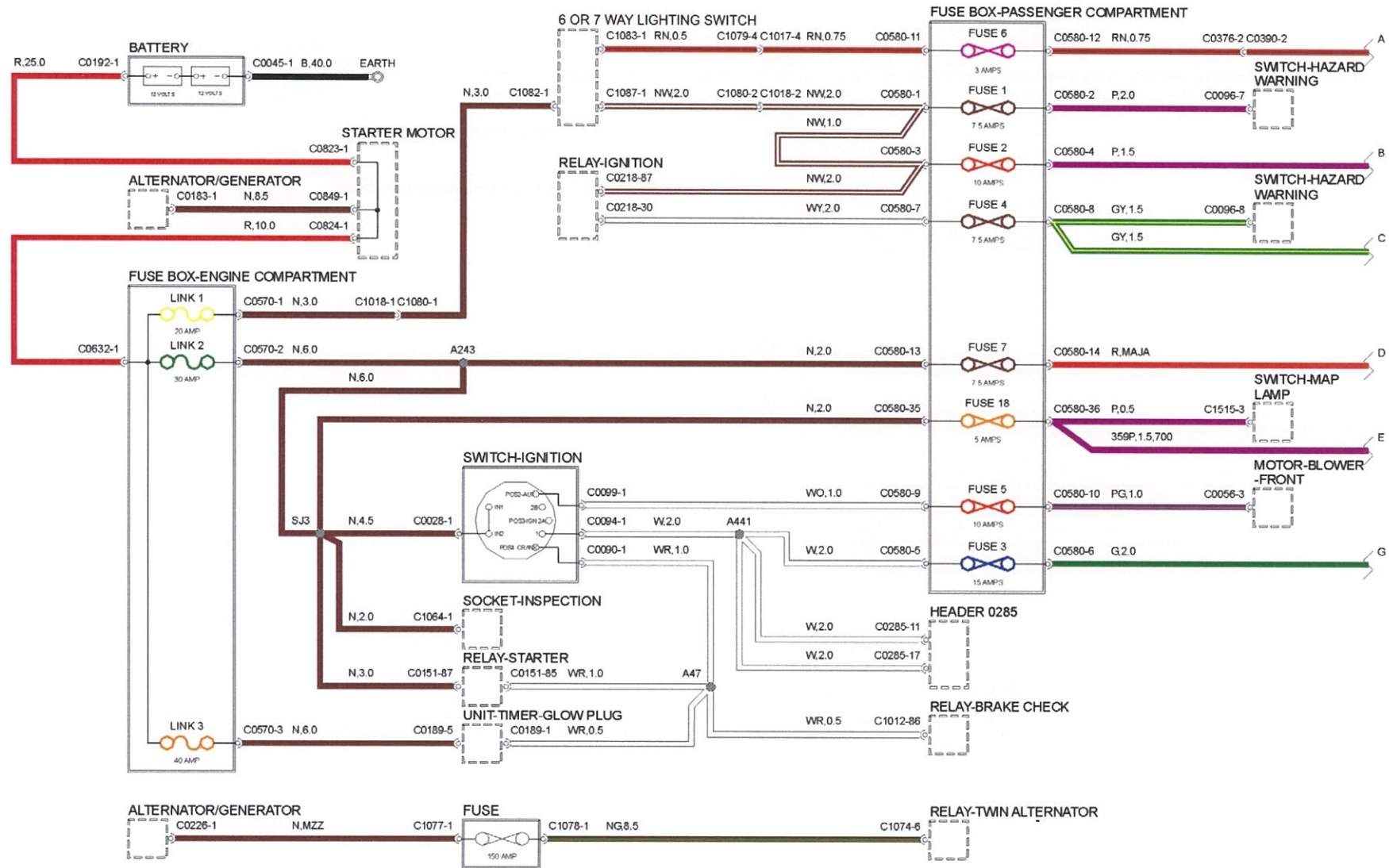


Fig 16 Power distribution I

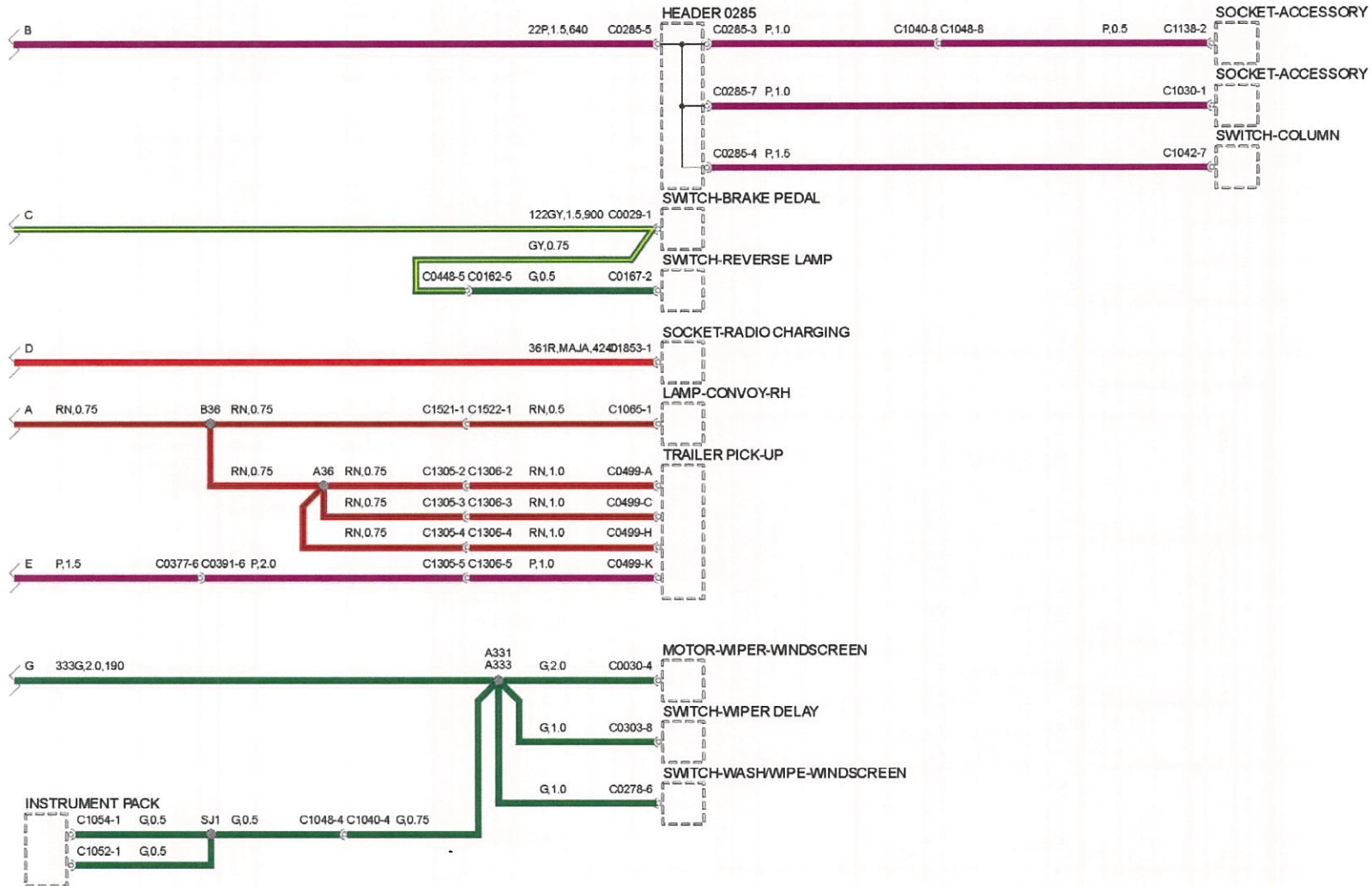


Fig 17 Power distribution II

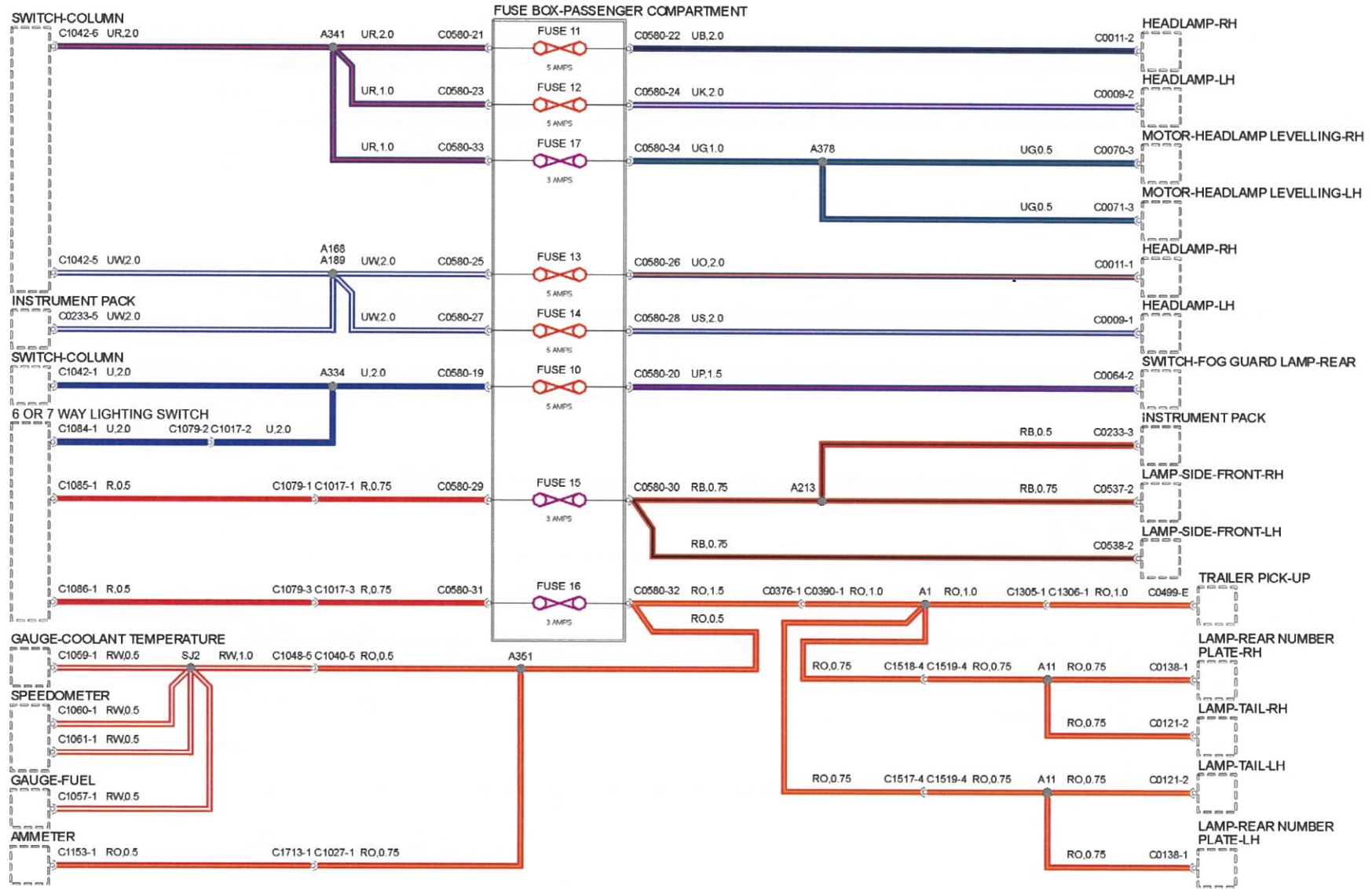


Fig 18 Power distribution III

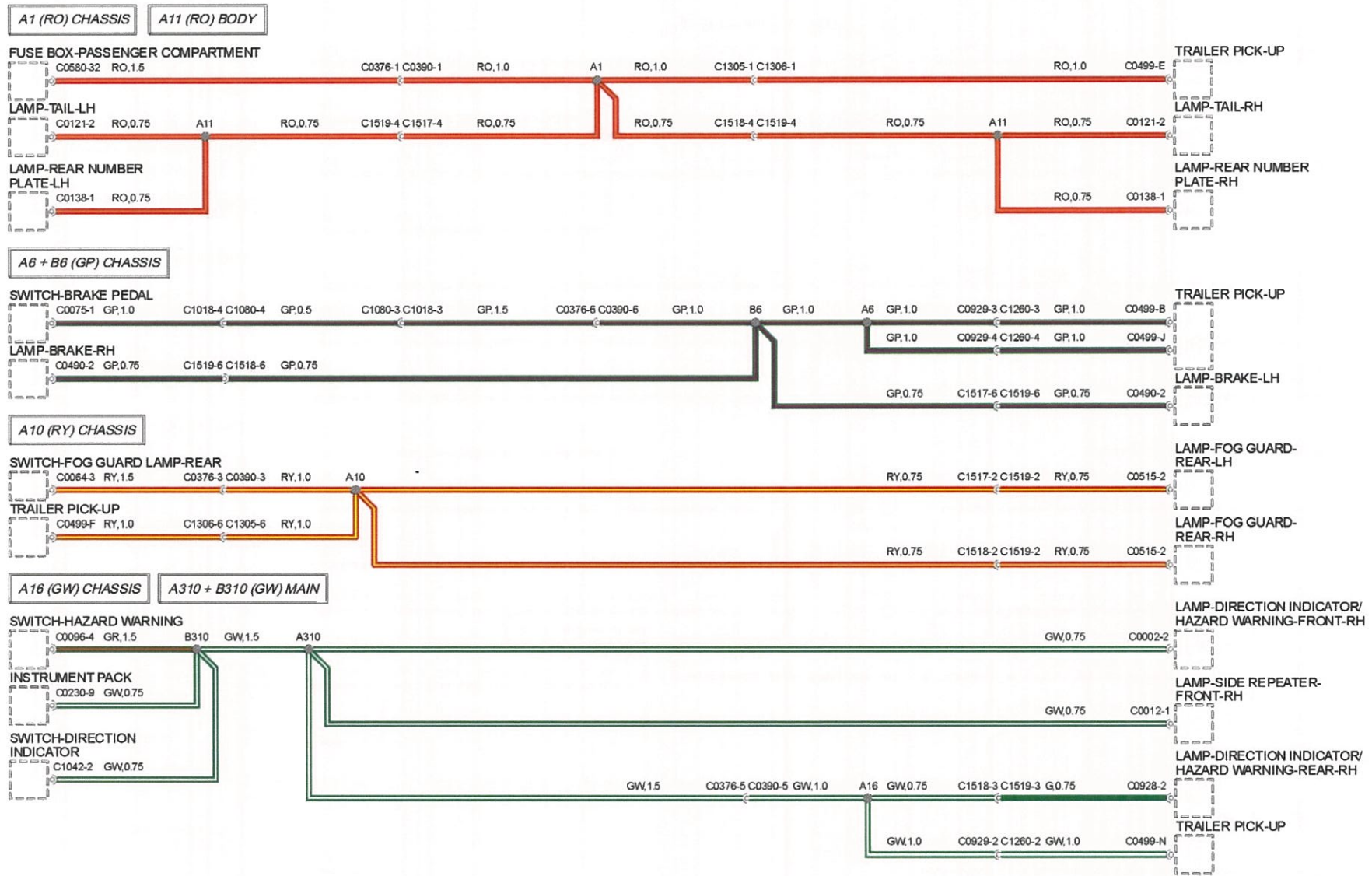


Fig 19 Splices and Centre taps I

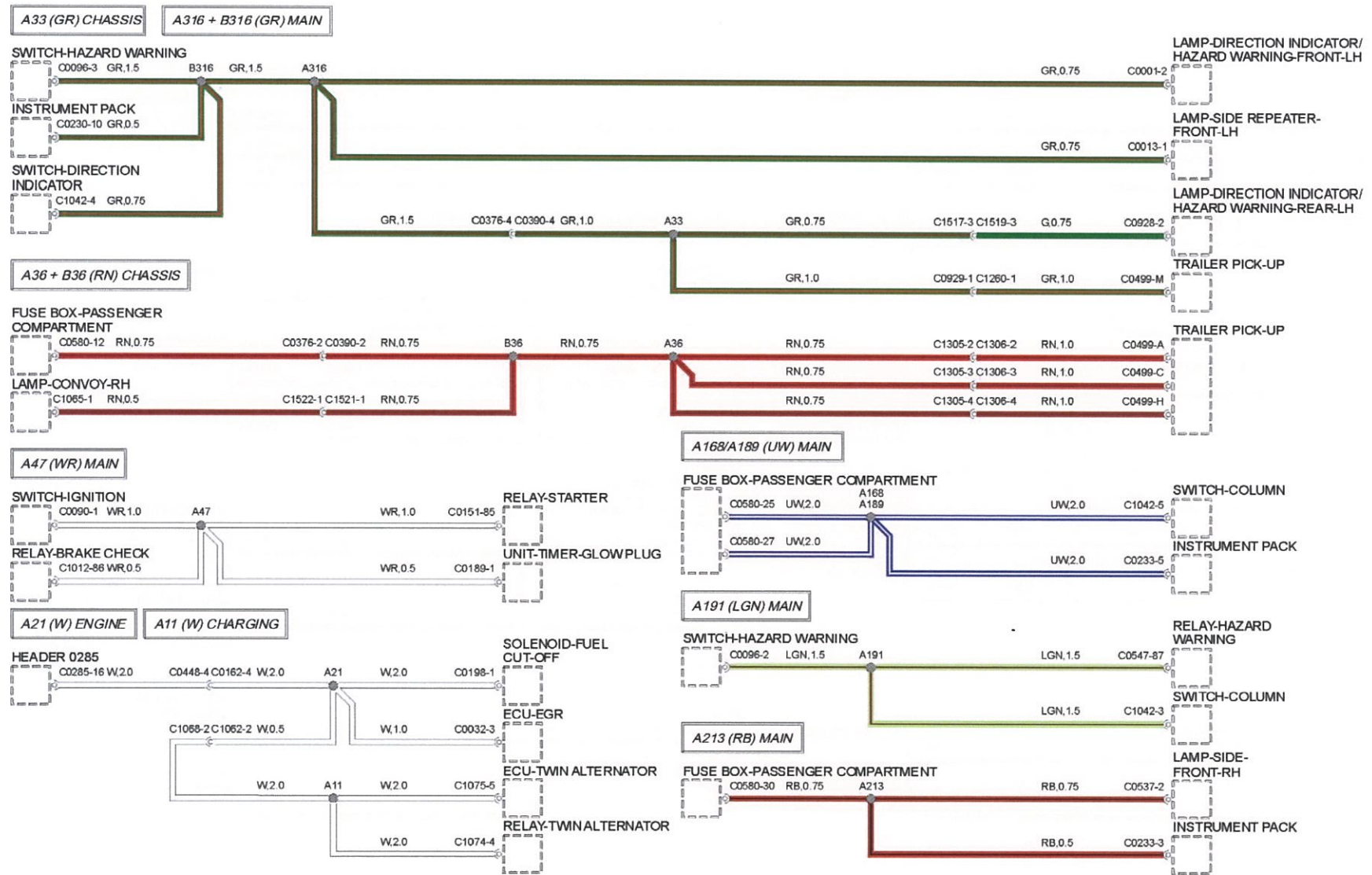


Fig 20 Splices and Centre taps II

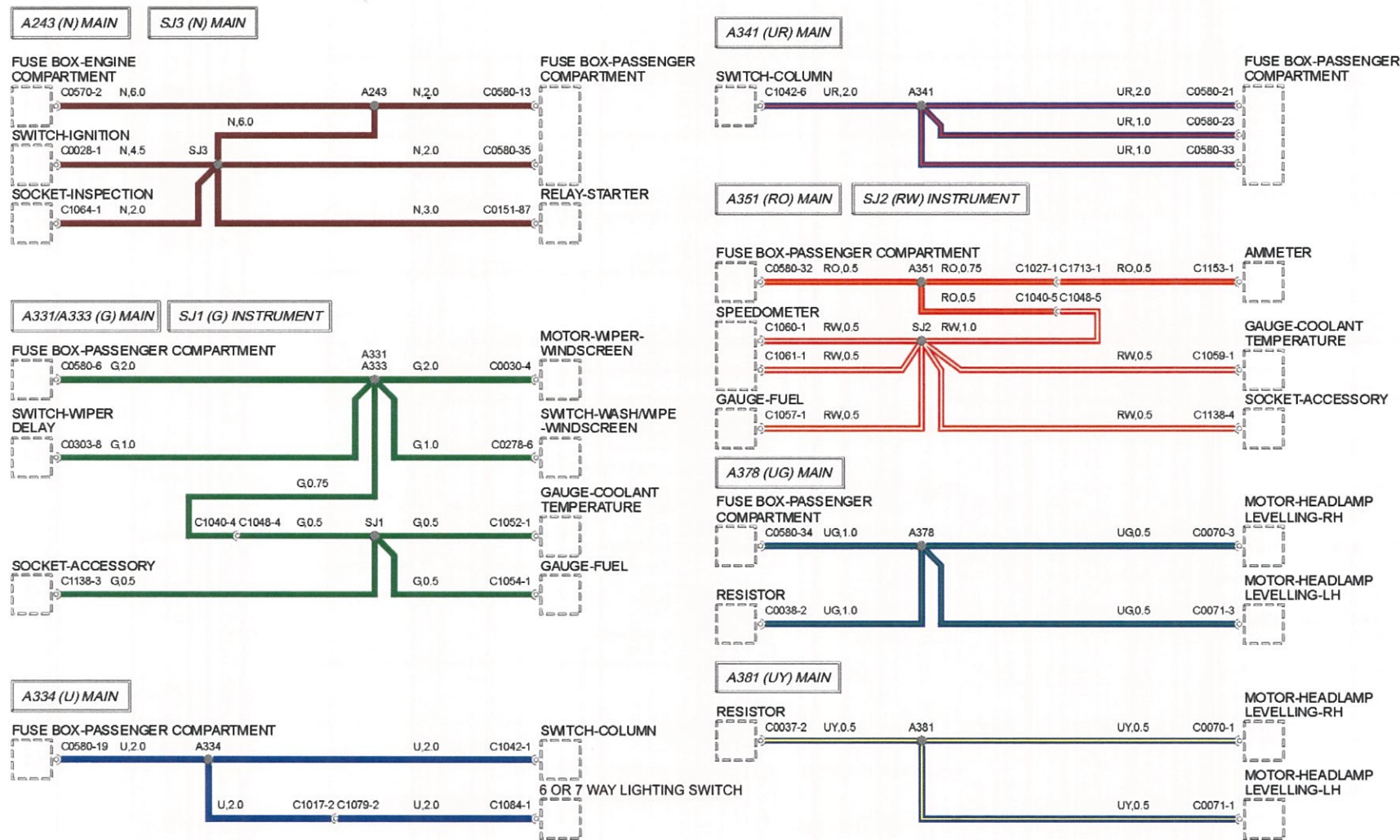


Fig 21 Splices and Centre taps III

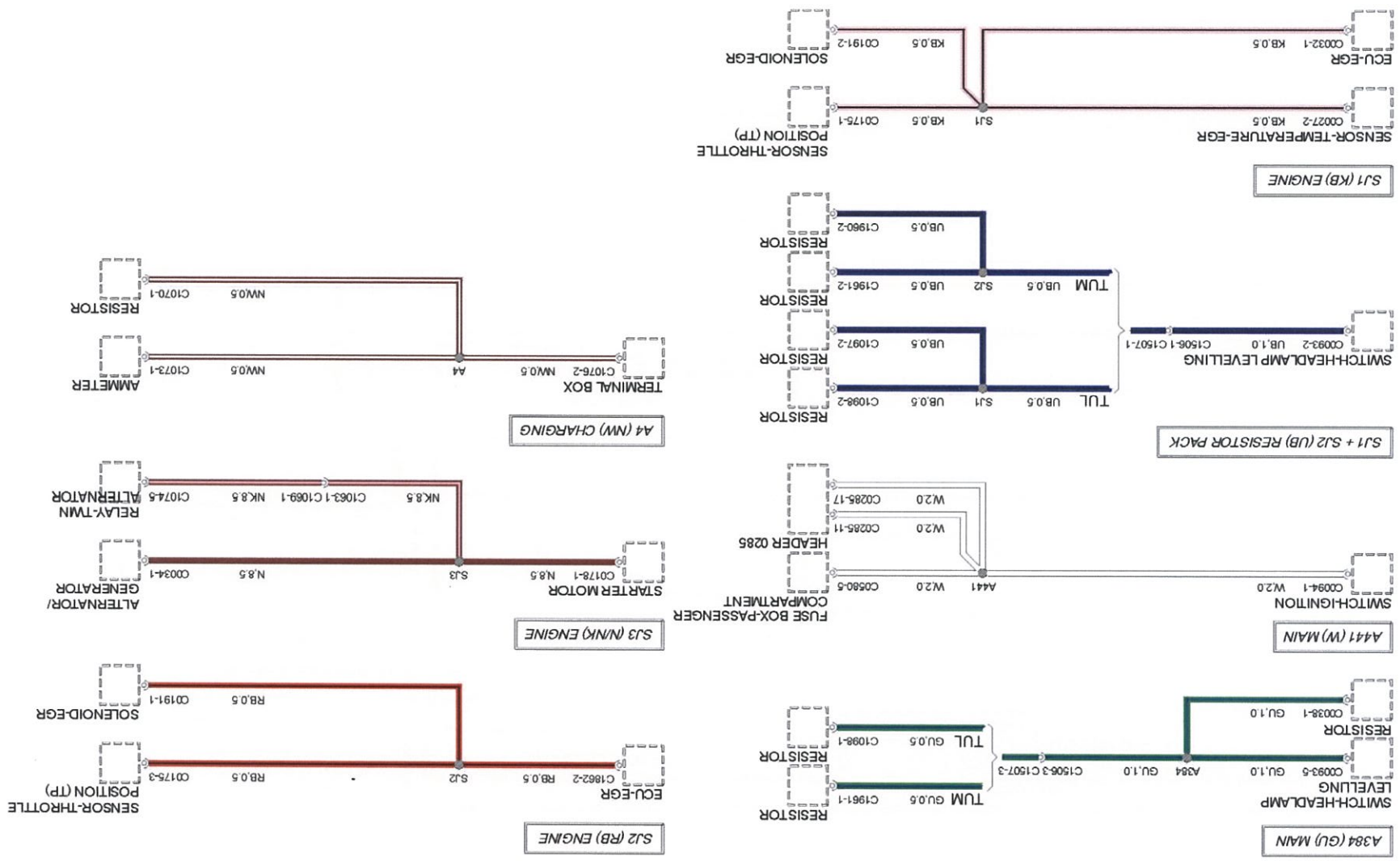


Fig 22 Splices and Centre taps IV

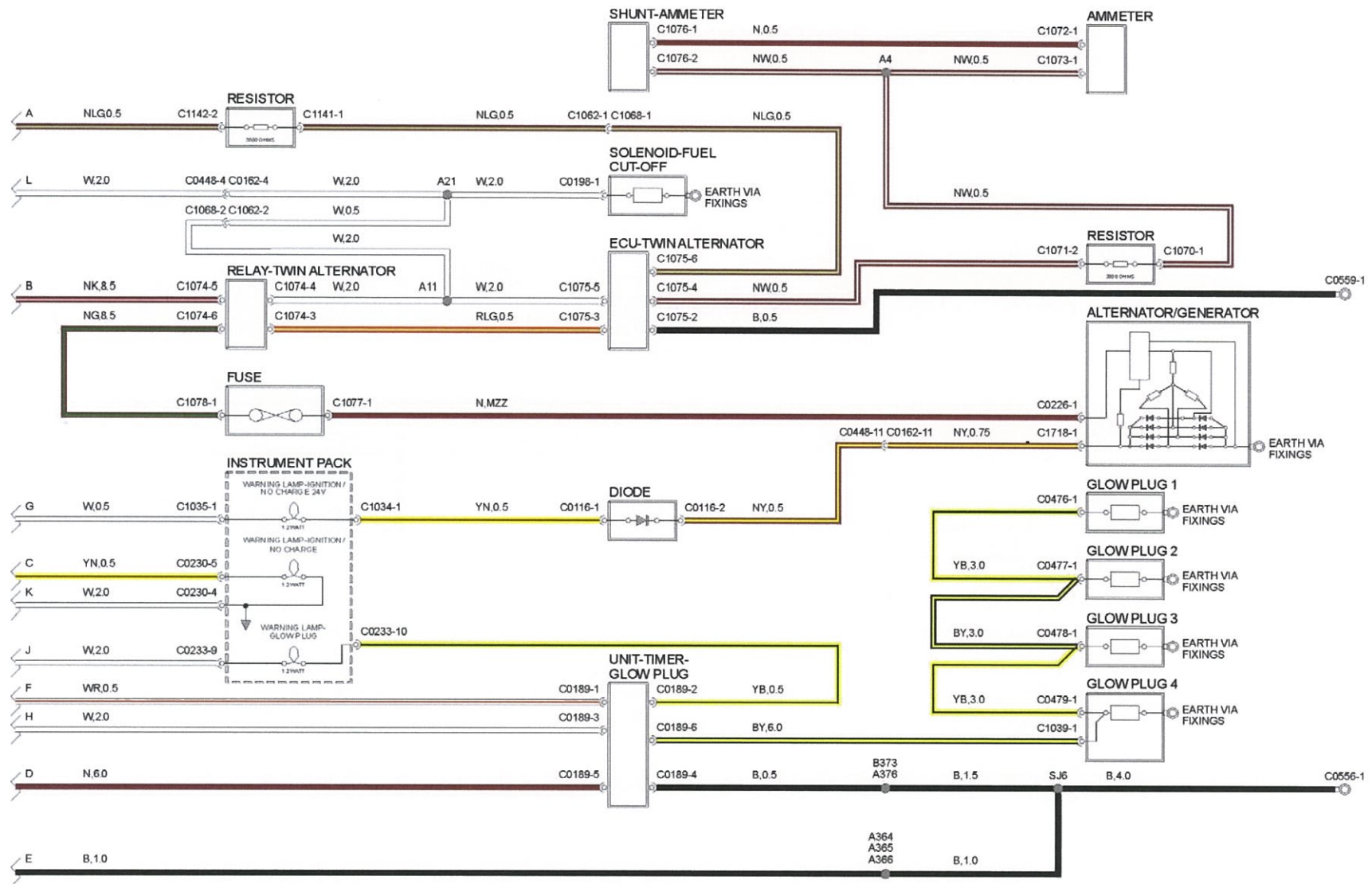


Fig 24 Starting and Charging II

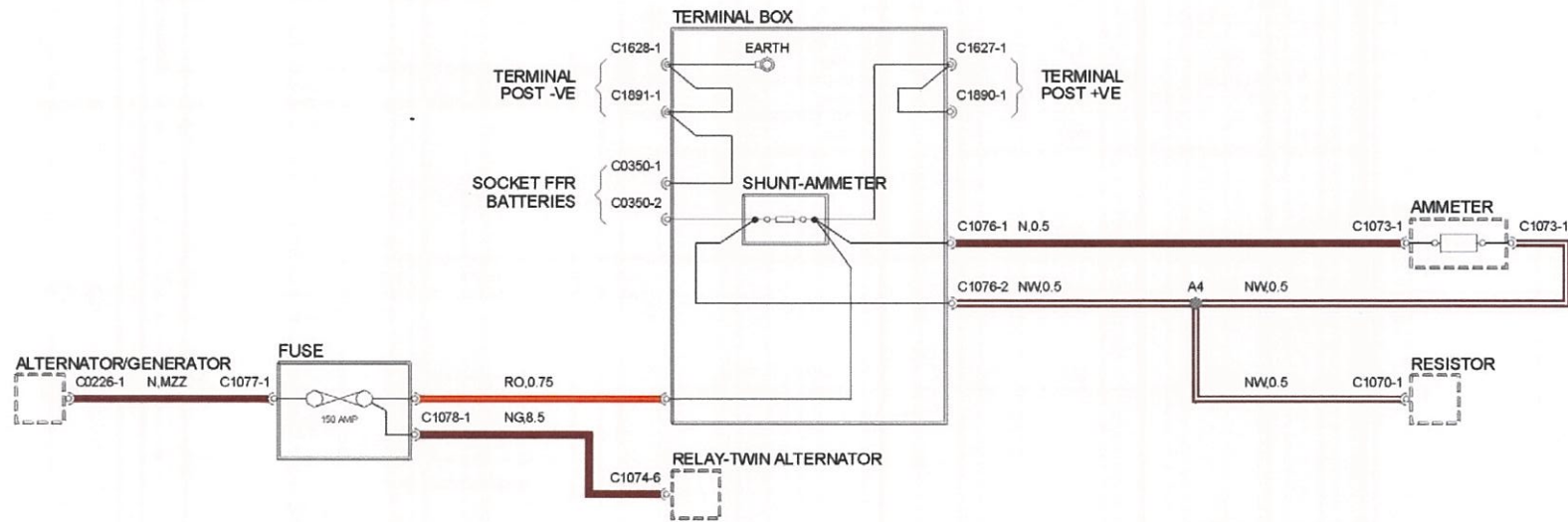


Fig 25 Terminal Box

CHAPTER 13-4

WINTERISED/WATERPROOF

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INTRODUCTION

1 This chapter covers the Technical description for the electrical system as fitted to Truck Utility Light (TUL) HS and Truck Utility Medium (TUM) HS Winter/water vehicles fitted with the 24 volt electrical system. The information given is applicable to both left and right hand drive vehicles.

GENERAL

2 The electrical system fitted to TUL and TUM winter/water vehicles has been designed to ensure the waterproof integrity of electrical components during deep water wading.

ELECTRICAL SYSTEMS**NOTE**

The electrical system is similar to winterised vehicles (refer to C hap 13-5) except for the layout and the run of the harnesses. The differences are described within this chapter.

3 The electrical systems on the TUL and TUM winter/water vehicles are made up of three main harnesses: Engine harness, Chassis harness and Main cable assembly harness.

4 In addition, several supplementary harnesses/cables, covering right and left hand wing components, instrument binnacle, radio, convoy lamp, rear body components, wiper link, glow plug link, heater and fuel system are fitted.

5 Connected together these harnesses form the vehicle harness, which supplies power to the instrument panel, switches and controls, interior and exterior lighting.

Engine harness assembly

6 The engine harness assembly connects the various electrical components fitted on the engine to the vehicle batteries and main cable assembly harness (refer to Chap 13-5).

Chassis harness assembly

7 The chassis harness connects the rear lamps and fuel tank to the main cable assembly harness. The stop lights and number plate lamp are connected directly to the chassis harness but the side, indicator, fog, and reverse lamps, share supplementary rear body harnesses. The convoy lamp and fuel tank have separate harnesses (refer to Chap 13-5).

Main cable harness assembly

8 The main cable harness assembly (Fig 1) connects to the front lamps, chassis harness, engine harness and the various instruments, switches and indicators within the vehicle. Winter/water variants incorporate the 20 way fuse box, relays, warning lights panel, switches and map lamp in a sealed centre console with the main fuse box a separate sealed unit.

- 8.1 The main cable assembly harness is made up to connect to the following items:
 - 8.1.1 Warning light panel.
 - 8.1.2 Instrument panel.
 - 8.1.3 Windscreen washer pump.
 - 8.1.4 Wiper motor.
 - 8.1.5 Horn/indicator/Dip switch.
 - 8.1.6 Ignition switch.
 - 8.1.7 Hazard warning switch.
 - 8.1.8 Rear fog switch.
 - 8.1.9 Heater/blower motor.
 - 8.1.10 Map reading lamp.
 - 8.1.11 Main lighting switch.
 - 8.1.12 Inspection sockets.
 - 8.1.13 Relays.
 - 8.1.14 Headlamp levelling switch.
 - 8.1.15 Headlamps and side lamps.
 - 8.1.16 Headlamp levelling motors.
 - 8.1.17 Indicators.
 - 8.1.18 Brake fluid level switch.
 - 8.1.19 Glow plug timer.
 - 8.1.20 Main fuse box.
 - 8.1.21 Side tank connections.

- 8.1.22 Heated rear windscreen switch and warning lamp.
- 8.1.23 Heated front windscreen switch and warning lamp.
- 8.1.24 Webasto heater connections.
- 8.1.25 Stop light switch.
- 8.1.26 Ammeter (FFR).
- 8.1.27 Radio.

9 The following list identifies the electrical components, their location and harness route within the vehicle and engine bay area:

9.1 In-line resistors and diodes. Integral within the main cable assembly harness and are replaceable.

9.1.1 Diode leads (3 off). Colours: Brown/yellow, Yellow/brown, light green/purple, Brown/light green.

9.1.2 In-line resistor lead. Colours: Yellow/blue, Blue/green.

9.2 Warning light leads. Grouped into two and plugged into the rear of the warning light housing mounted in the centre console and routed to the main cable assembly harness.

9.3 Plug 1 (natural).

9.3.1 Oil pressure. Colours: White/brown, White.

9.3.2 Ignition. Colours: Yellow/brown.

9.3.3 Brake circuit. Colours: Black/white.

9.3.4 Direction indicators. RH - Green/white, LH - Green/red.

9.4 Plug 2 (natural).

9.4.1 Trailer. Colours: Light green/purple.

9.4.2 Earth. Colours: Black.

9.4.3 Side lights. Colours: Red/black.

9.4.4 Fog lights. Colours: Red/yellow.

9.4.5 Main beam. Colours: Blue/white, Brown/light green.

9.4.6 Differential lock. Colours: Black/blue, White.

9.4.7 Glow plug. Colours: Yellow/black.

9.5 Horn, directional indicators, Dip switch and wash wipe switch. Located on the steering column and routed to the main harness assembly. (14 way moulded connector) Colours: Blue, Green/white, Light green/brown, Green/red, Blue/white, Blue/red, Purple, Purple/black, Blue/light green, Light green/black, White/green, Yellow/light green, Red/light green, Green.

- 9.6 Hazard switch. Located in the centre console. Plugged into the rear of the panel and routed to the main harness assembly. (8 way black connector) Colours: Black/red, Light green/Brown, Green/red, Green/white, Light green, Purple, Green/yellow.
- 9.7 In line resistor 2.7k 0.5 watt. Located behind the centre console. Routed into the main harness assembly. Colours: Yellow blue, Blue yellow.
- 9.8 Flash. (2 way natural connector) Colours: Green/red, green/white.
- 9.9 Rear fog switch. (5 way black connector) Located in the centre console. Plugged into the rear of the panel and routed to the main harness assembly. Colours: Blue/purple, Red/yellow.
- 9.10 Headlight level switch. (5 way natural connector) Located on the fascia in the auxiliary switch panel and on winter/water vehicles in the centre console. Routed to the main harness assembly. Colours: Blue/black, Yellow/blue, Green/blue.
- 9.11 Ignition switch. (4 single natural connectors) Located on the centre console. Routed to the main harness assembly. Colours: Brown, Brown, White, White/orange, White/red.
- 9.12 Instruments. Located on the fascia and plugged into the rear of the instrument binnacle. Routed to the main harness assembly (6 way connector grey connector). Colours: Green/blue, Black, Green, Green, Red/orange, Green/black.
- 9.13 Heater fan switch. Located on the fascia on the side of the instrument binnacle and plugged into the rear of the binnacle. Routed to the main harness assembly (3 way light grey connector). Colours: Green/slate, Green/yellow, Black.
- 9.14 Inspection sockets. Located in the centre console. Plugged into the rear of the panel (2 single black connectors). Colours: Black, Purple.
- 9.15 Wiper motor. Located behind the fascia lower panel and plugged into the wiper motor. Routed to the main harness assembly (6 way grey connector). Colours: Black, Brown/light green, Blue/light green, Green, Green, Red/light green.
- 9.16 Blackout lighting. Located in the centre console. Plugged into the rear of the panel and routed to the main harness assembly. (2 off 4 way connectors).
- 9.16.1 Plug 1 (black). Colours: Red/white, Blue, Red, Red/brown.
- 9.16.2 Plug 2 (natural). Colours: Brown, Brown/white.
- 9.17 Map reading light. (2 way natural connector) Located in the centre console. Plugged into the rear of the panel and routed to the main harness assembly. Colours: Purple/white.
- 9.18 Map reading light switch. (5 way black connector) Located in the centre console. Plugged into the rear of the panel and routed to the main harness assembly. Colours: Purple/white, Purple,
- 9.19 Relays. Located in the centre console. Routed into the main harness assembly.
- 9.19.1 Brake check relay (Black). Colours: Black, Black, White/red, Black/white.
- 9.19.2 Start relay (Black). Colours: White/red, White/red, Black, Brown.
- 9.19.3 Ignition cont. relay (Black). Colours: White/yellow, White, Black, Green/yellow.
- 9.19.4 Hazard/DI unit (Black). Colours: Light green/purple, Light green, Black, Light green/brown.

9.19.5 Front wipe delay (Black). Colours: White/green, Yellow/light green, Black, Brown/light green, Light green/black, Green.

9.19.6 Heated front screen relay (Black). Colours: Orange/slate, Purple/yellow, Light green/purple, Purple/orange.

9.19.7 Heated rear window relay (Black). Colours: Purple/brown, White/green, Black, White/black.

9.19.8 Webasto heater relay (Black). Colours: Purple/green, Purple/orange, Black, Purple, Purple/green.

9.20 Fusebox (20 way). Located on the L.H side of the centre console. Routed into the main harness assembly.

9.21 Plug 1. Colours: 1 Brown/white; 2 Purple; 3 Brown/white; 4 Purple; 5 Brown/white; 6 White/yellow; 7 Blue/white; 8 Blue/orange; 9 Blue/white; 10 Blue/slate; 11 Blue/red; 12 Blue/pink; 13 Blue/red; 14 Blue/black; 15 Red; 16 Black/green; 17 Red/brown; 18 Red/brown; 19 Red; 20 Red/black.

9.22 Plug 2. Colours: 1 White; 2 Green; 3 White/orange; 4 Purple/green; 5 Brown; 6 Purple; 7 Brown; 8 Purple; 9 Brown; 10 Purple; 11 Red/white; 12 Red/orange; 13 Blue; 14 Blue/purple; 15 Brown; 16 Purple/brown; 17 Brown; 18 Orange/slate; 19 Brown; 20 Purple.

9.23 Brake fluid level. (2 single natural connectors) Located in the engine compartment plugged into the top of the brake fluid reservoir, and is routed to the main harness assembly. Colours: Black, Black/white.

9.24 Stop light switch. (2 way grey connector) Located on the brake pedal box and is routed to the main harness assembly. Colours: Green/yellow, Green/purple.

9.25 Heater motor. (3 way light grey connector) Located in the engine compartment local to the heater motor and routed to the main harness assembly. Colours: Green/slate, Green/yellow, Purple/green.

9.26 Wash pump. (2 way natural connector, 2 way black connector) Located under the bonnet local to the windscreen wash reservoir and routed to the main harness assembly. Colours: Black, Black/light green, Light green/black.

9.27 Glow plug timer. (6 way black connector) Located in a sealed fuse box inside the vehicle on the bulkhead. Routed to the main harness assembly. Colours: White/red, Yellow/black, White, Black, Brown, Black/yellow.

9.28 Radio. Located inside the vehicle, routed to the main harness assembly. Colours: Black, Red.

9.29 Main fuses. Located in a sealed fuse box inside the vehicle on the bulkhead. Routed to the main harness assembly. Colours: Brown, Brown, Brown, Brown.

9.30 L.H wing connection (Grey 10 way connector). Located under the L.H wing, routed back to the main cable harness assembly. Colours: Green/red, Red/black, Purple/black, Blue/slate, Blue/pink, Light green/black, Black/light green, Blue/green, Black/yellow, Black.

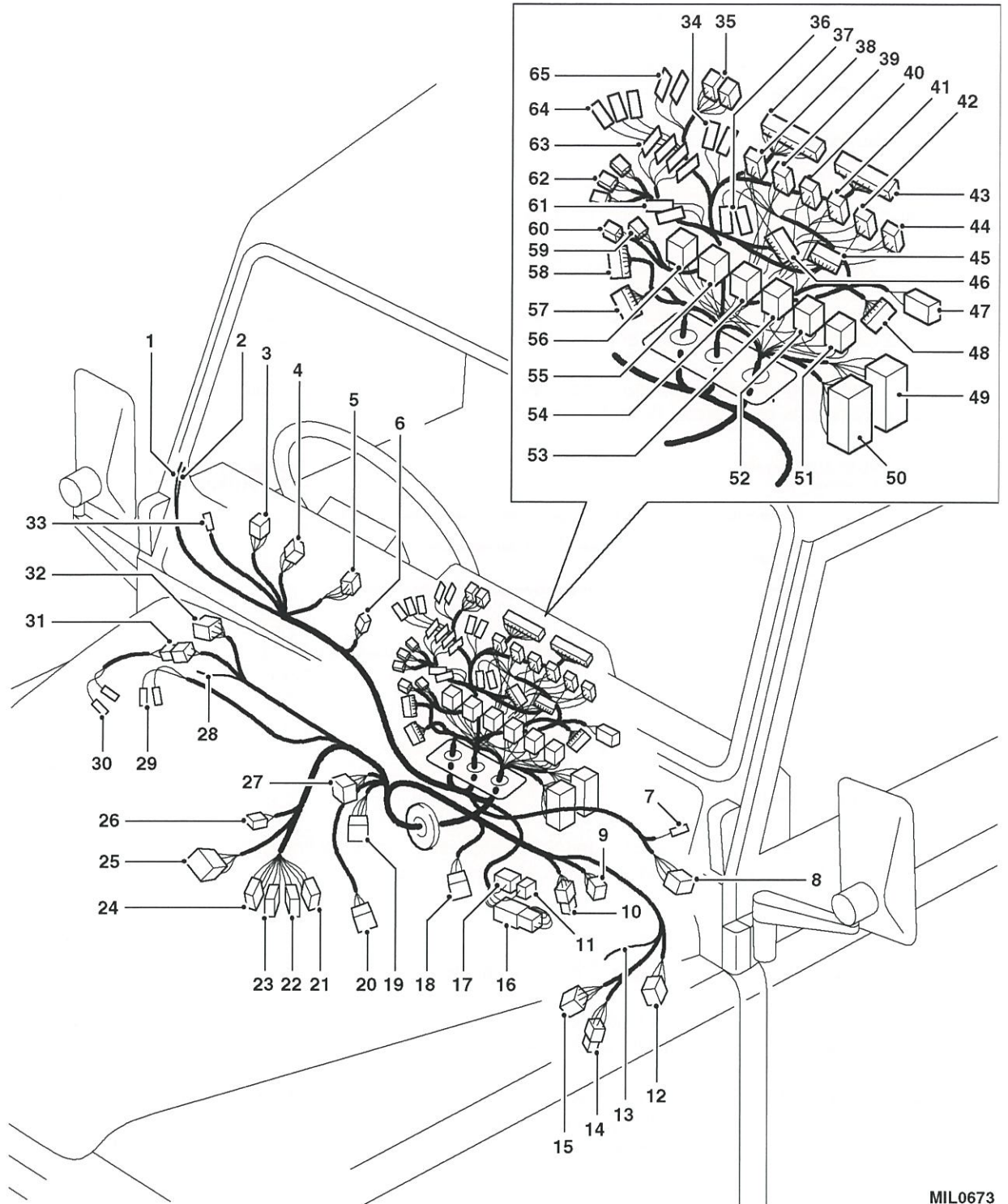
9.31 Horn. (2 single natural connectors) Located behind radiator grille plugged into horn. Routed back to main harness assembly. Colours: Purple/black, Black.

9.32 Glow plug. (Light grey connector) Located under the bonnet local to glow plugs. Routed back to the main harness assembly. Colours: Black/yellow.

- 9.33 Starter solenoid. (2 way natural connector) Located under the bonnet local to the starter motor, routed back to the main harness assembly. Colours: White/red.
- 9.34 Side Tank connections. (3 way black connector) Located under bonnet local to bulkhead. Routed to main harness assembly. Colours: Green/black, Black.
- 9.35 Chassis connections (3 off 4 way). Located under the bonnet local to the bulkhead. Routed to the main harness assembly.
- 9.35.1 Plug 1. (4 way black connector) Colours: Red/orange, Red/brown, Red/yellow, Green/red.
- 9.35.2 Plug 2. (4 way white connector) Colours: Green/brown, White/black, Green, Brown/light green.
- 9.36 Engine connections. (14 Way grey connector). Located under the bonnet local to the bulkhead. Routed to main harness assembly. Colours: White/brown, Green/blue, Brown/yellow, White, Green/yellow, Green/brown, Black/blue, Black, Black, Black, Brown/yellow, Black, White/red, Black.
- 9.37 R.H wing connector (Grey 10 way). Colours: Green/white, Red/black, Blue/orange, Blue/black, Blue/yellow, Blue/green, Black.
- 9.38 Heated rear window switch (5 way natural connector). Colours: White, White/green.
- 9.39 Heated front windscreen (5 way black connector). Colours: Brown/light green, Black.
- 9.40 Heated rear screen warning lamp (single black connector). Colour: White/black.
- 9.41 Hazard switch warning lamp (single black connector). Colour: Black.
- 9.42 Rear wash wipe switch (Green connectors). Colour: Green.
- 9.43 Webasto heater switch (2 off natural single connectors). Colours: Blue/purple, Purple.
- 9.44 Webasto heater connector (6 way grey connector). Colours: Purple/orange, Blue/purple, Purple, Brown/green, Blue/green, Black.

KEY TO FIG 1

1	Breather tube A front	34	Inspection sockets
2	Breather tube B front	35	Black out lighting 1 & 2
3	Instruments 1	36	Alternator 2A & 2B
4	Resistor pack connection	37	Warning lamp 1
5	Horn/D.I./Dip/W/wipe switch	38	Hazard switch
6	Heater switch	39	Rear fog switch
7	HFS earth	40	HFS switch
8	Wiper motor	41	HRW switch
9	Radio	42	H/L level switch
10	Ammeter illumination blank	43	Warning lamp
11	Main fuse 4	44	Map lamp switch
12	LH wing connection	45	Header connection 2
13	Front breather tube A	46	Header connection 3
14	Heater blank	47	Map lamp
15	Heater motor	48	Header connection 6
16	Glow plug timer	49	Fuse box 2
17	Main fuse 1, 2 & 3	50	Fuse box 1
18	Webasto RFI connection	51	Brake check relay
19	Header connection 7	52	Ignition contact relay
20	Glow plug	53	Start relay
21	Chassis connection	54	Webasto relay
22	Tank connection	55	HRW relay
23	Chassis connection 3	56	HFS relay
24	Chassis connection 2	57	Header connection
25	Engine connection	58	Header connection
26	Webasto fuel pump connection	59	Hazard/D.I unit
27	Header connection 1	60	Front wipe delay
28	Front breather tube B	61	Resistor 1 & 2
29	Stop switch	62	Diodes A, B & D
30	Brake fluid	63	RWW 1, 2, 3 & 4
31	Brake fluid switch	64	Ignition switch
32	RH wing connection	65	Webasto switch 1 & 2
33	FS connection		



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Fig 1 Main cable harness assembly

HOW TO USE THE CIRCUIT DIAGRAMS

10 The circuit diagrams are presented with Power and Earth distribution first, followed by individual circuits for each electrical system on the vehicle.

Power distribution

11 The power distribution diagram shows the connections from the battery to the engine and fuse boxes. It also shows the internal circuitry of the fuse boxes.

11.1 The fuse box details are followed by the earth distribution diagram.

11.2 The Header joints, Splices and centre taps sections follow on outlining the way in which internal harness splices and header joints distribute power in the harness.

11.3 This information should be used during diagnosis of electrical faults to check symptoms in associated circuits and narrow down the search area.

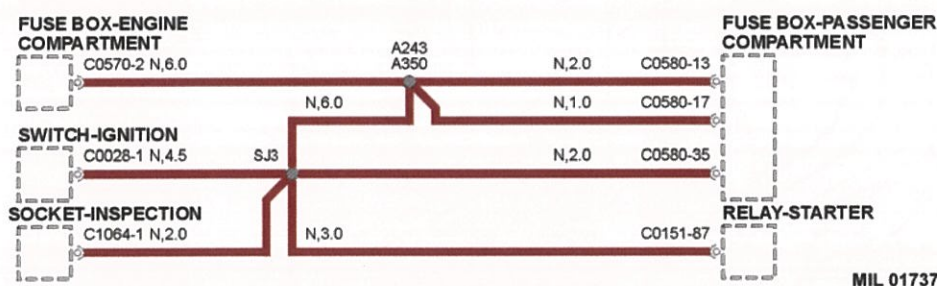


Fig 2 Power distribution

Headers, splices and centre taps

12 Header and splice circuits present the joint(s) and wiring up to the first component. Splices are identified by a number with an alphabetical prefix and wire colour.

Wire attributes

13 Additional information separated by a “,” is shown along side the wire colour.

13.1 Wire gauge is the cross sectional area of the wire in square millimetres. This is included to help in selecting the correct wire during harness repair.

13.2 Wire length (Power and Earth distribution only) is the length of wire in millimetres. This can be used to locate internal harness splices; look for the shortest wire between the joint and connector. For example, it can be seen that C0570-2 is 730 mm from joint A350 (refer to Fig 2).

Connectors

14 Header joints are identified by their corresponding connector number with a numbered suffix to indicate the pin-out detail of wire, i.e. C0580-4 identifies connector 0580, pin number 4 (refer to Fig 3). Wire insulation colour is identified in the normal way. Where wires have a predominant colour with a secondary colour stripe, the main colour is identified first, i.e. LGS – Light Green with a Slate stripe.

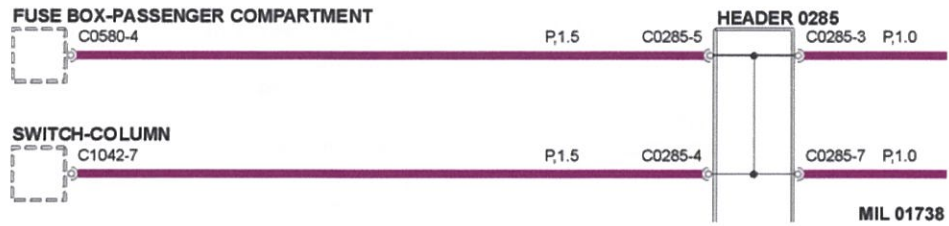


Fig 3 Connectors

Earth distribution

15 The ground distribution section comprises a number of Headers, Splices and centre taps circuits. These are used in a similar manner to those in Power distribution; to narrow the search area by checking for fault symptoms in associated circuits.

Line types

16 Fig 4 means that the wire connects to another circuit.

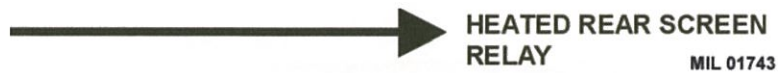


Fig 4 Line types I

17 The “cup and ball” symbol indicates the male and female halves of the connector (refer to Fig 5).

17.1 Plug on lead, fly lead (Fig 5 (A)), wired directly to the component.

17.2 Connector plugs directly into circuit (Fig 5 (B)).

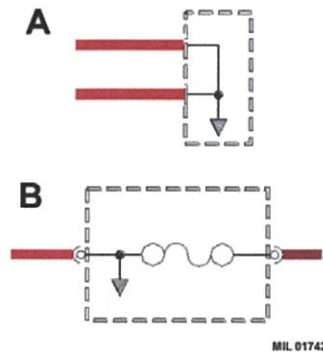


Fig 5 Line types II

Components

18 The name, or description of the component is shown. A dotted outline indicates that the component is not shown in its entirety.

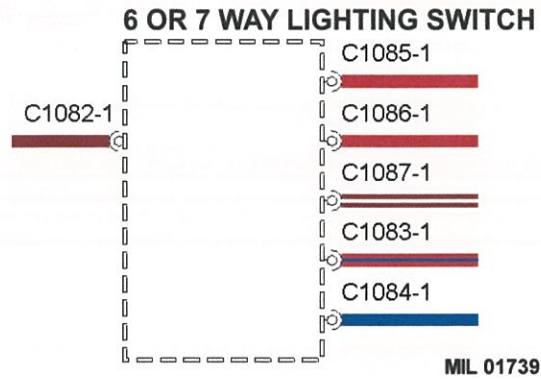


Fig 6 Components

Earth points

19 Earth points are identified with an eyelet symbol and a connector number, except where components are grounded through their fixings, when only the eyelet is shown.



Fig 7 Earth points

Fuses and diodes

20 Fusible links (refer to Fig 8 (A)) and current fuses (B), are identified as shown. The direction of the arrow in a diode symbol (C) indicates the direction of flow. The Zener diode (D) prevents current flow until a precise voltage is reached.

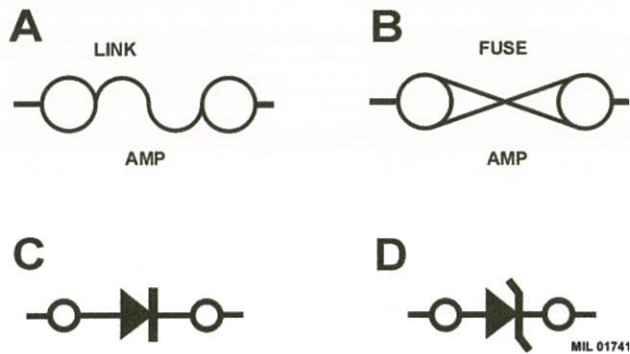


Fig 8 Fuses and diodes

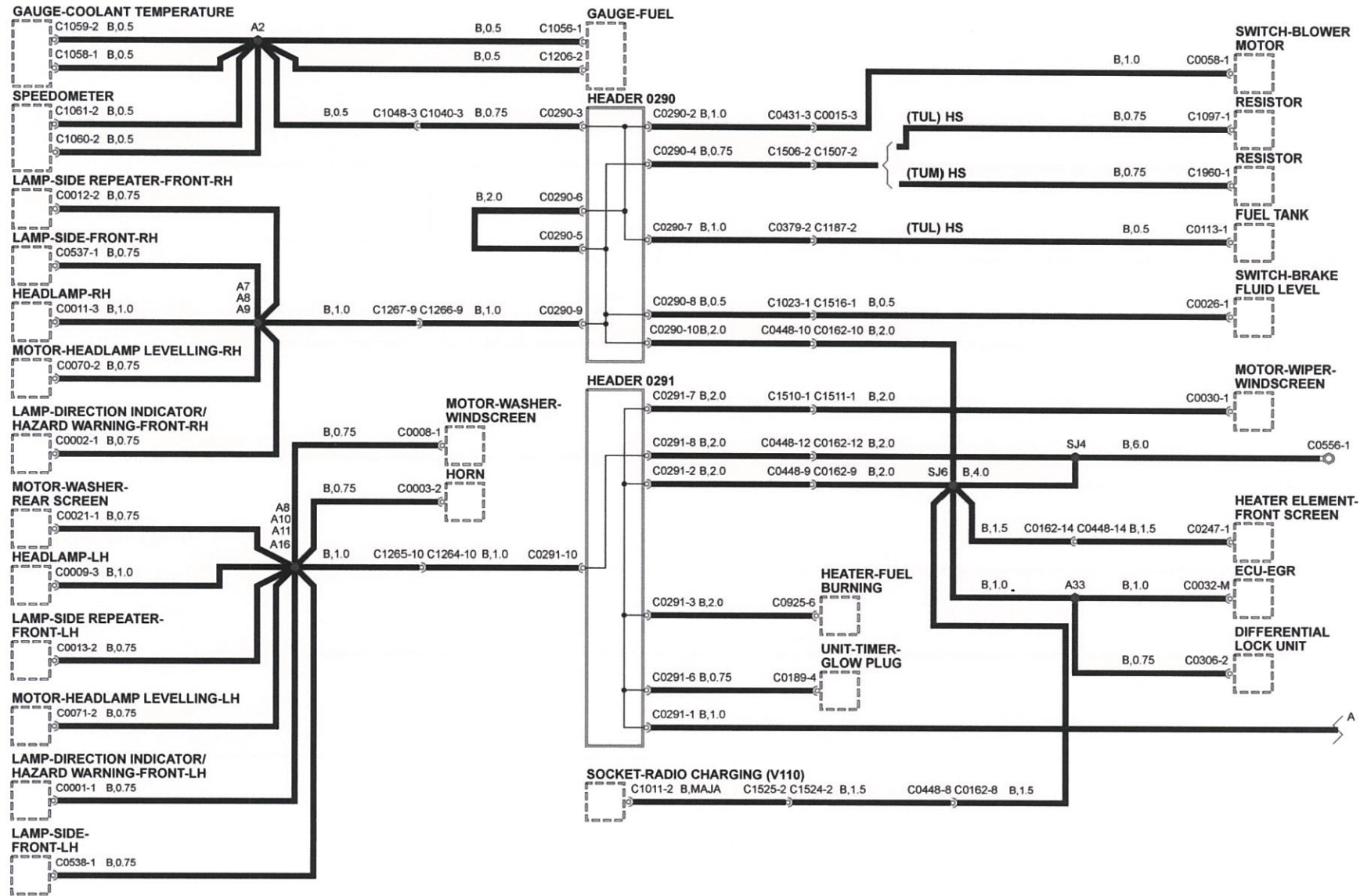


Fig 9 Earth distribution I

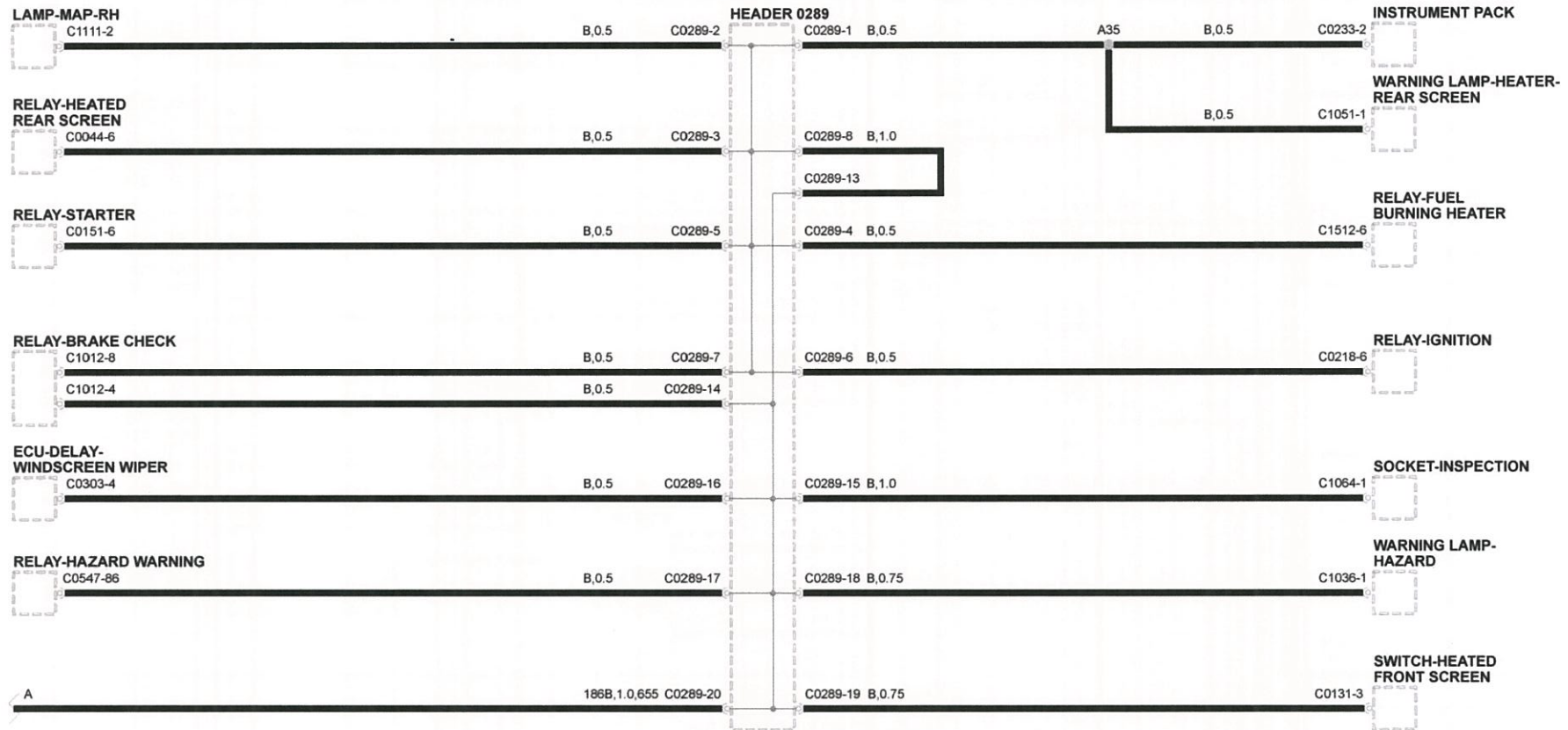


Fig 10 Earth distribution II

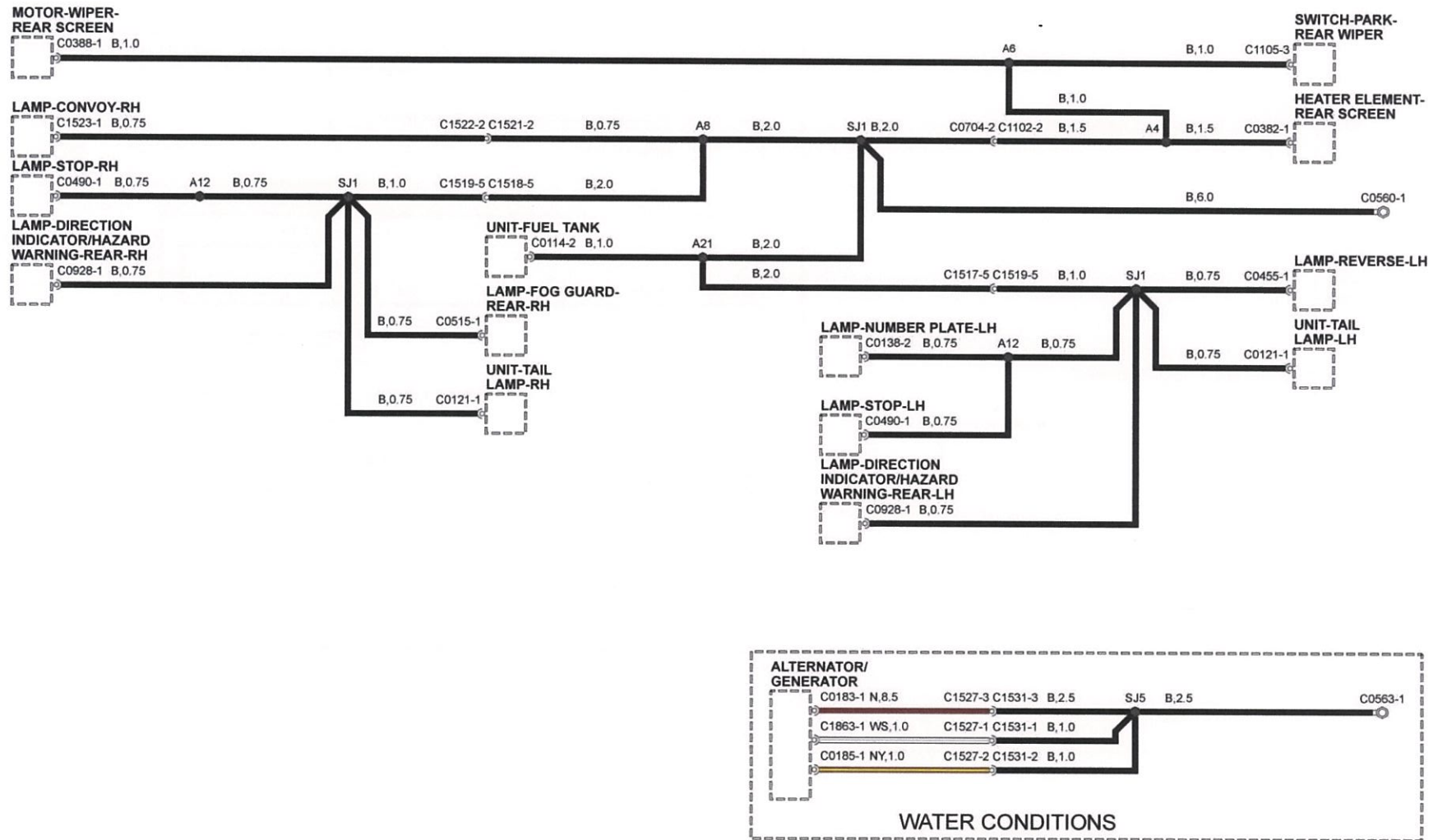


Fig 11 Earth distribution III

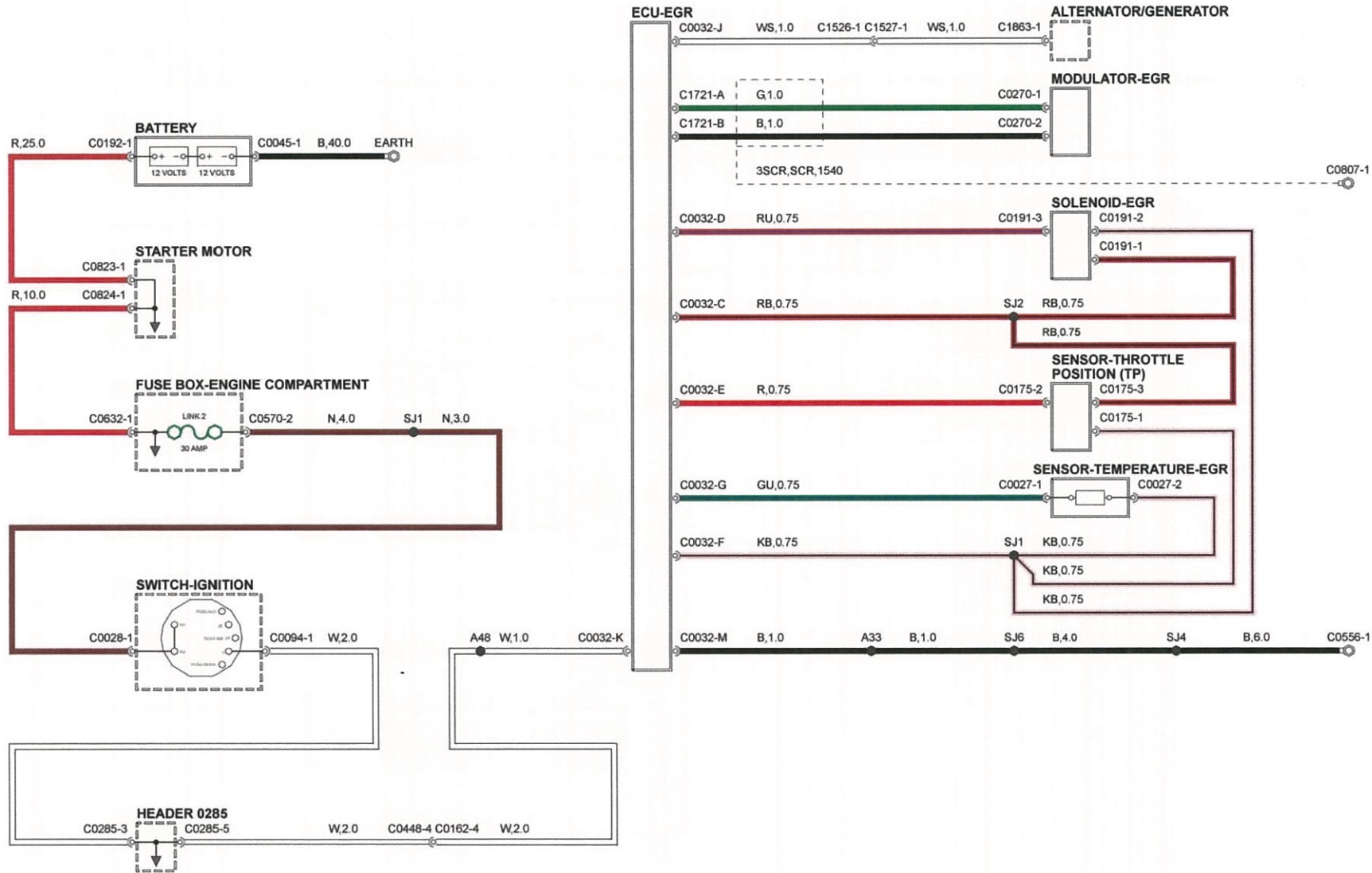


Fig 12 EGR

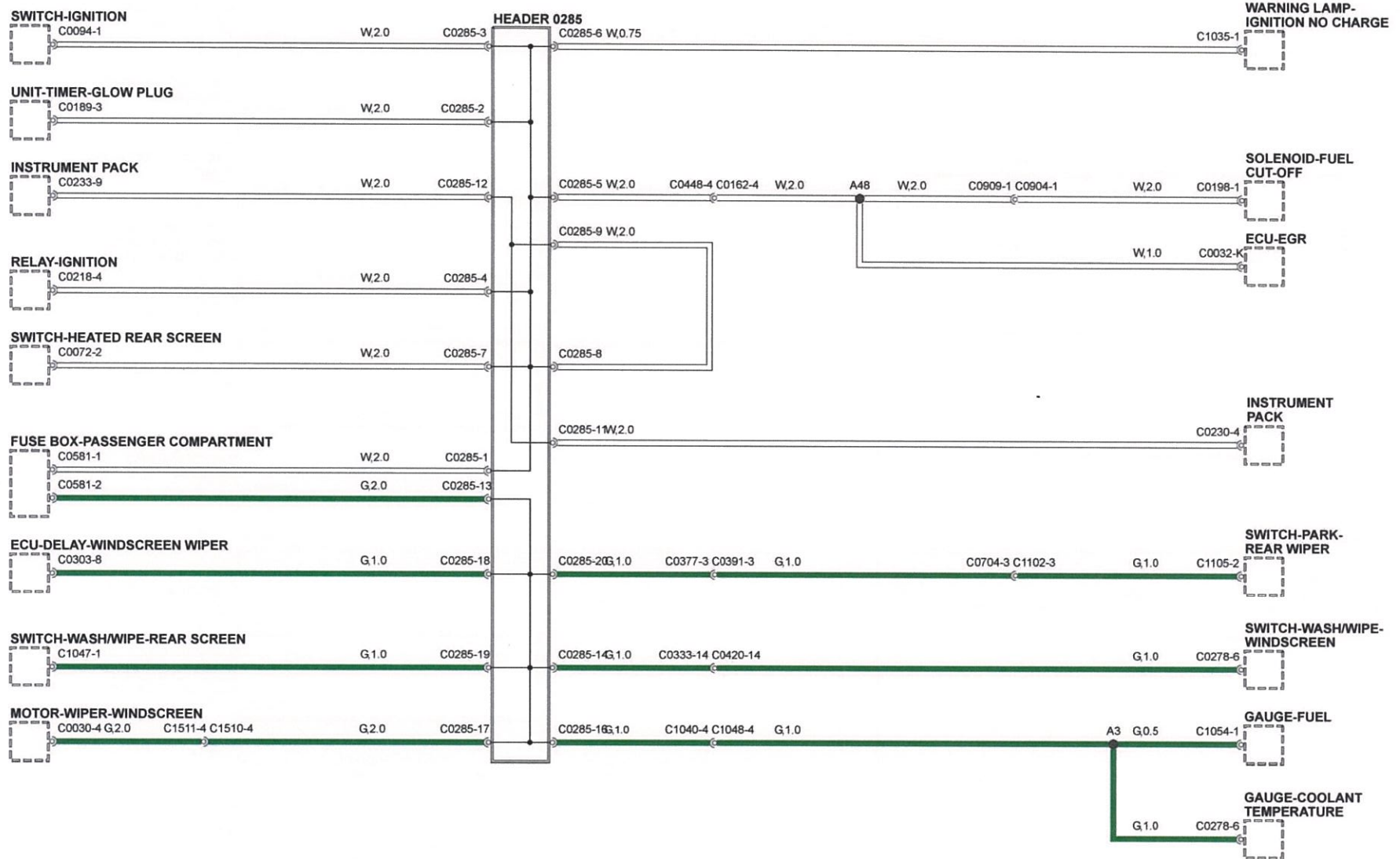


Fig 13 Header joints I

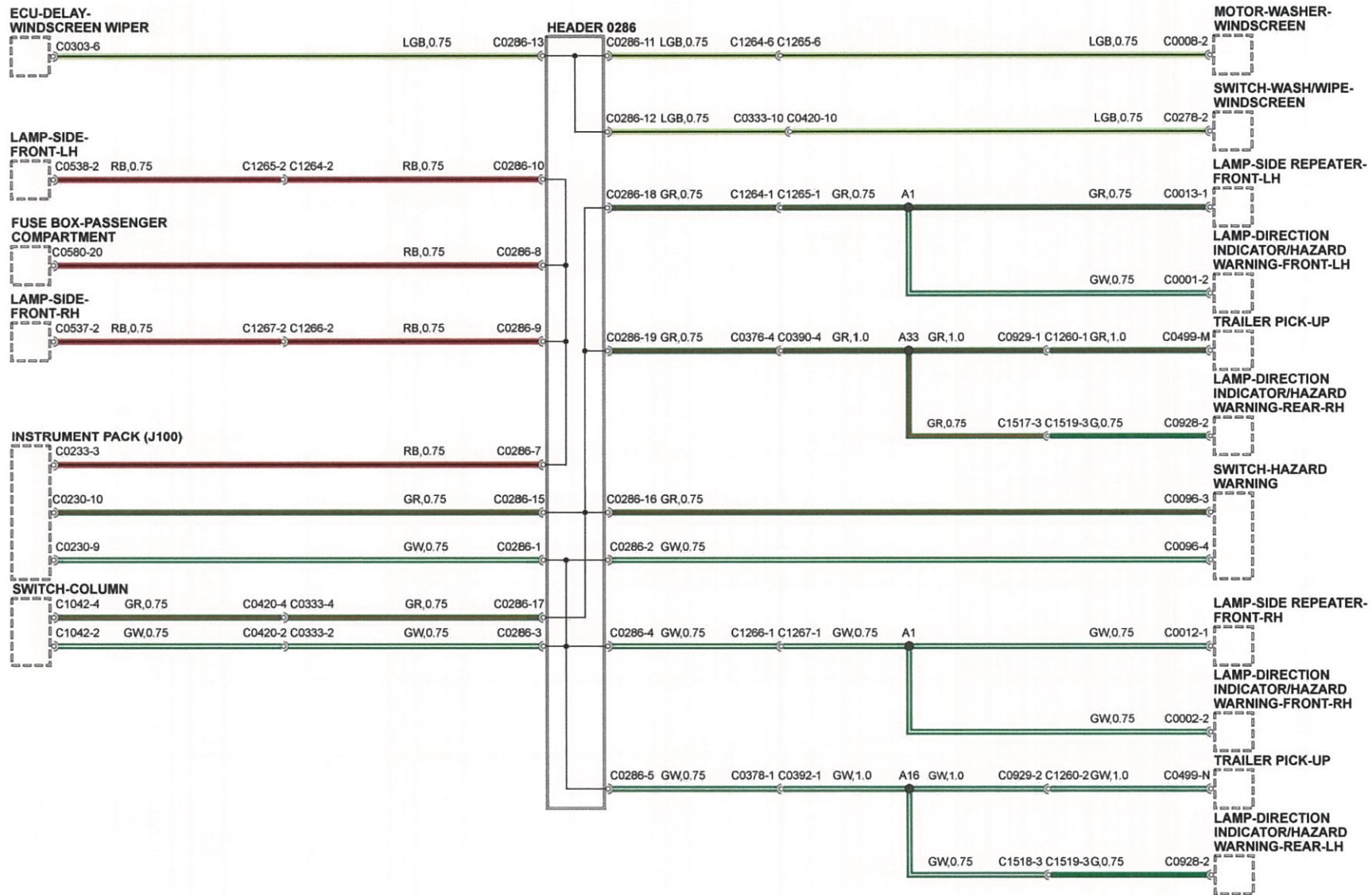


Fig 14 Header joints II

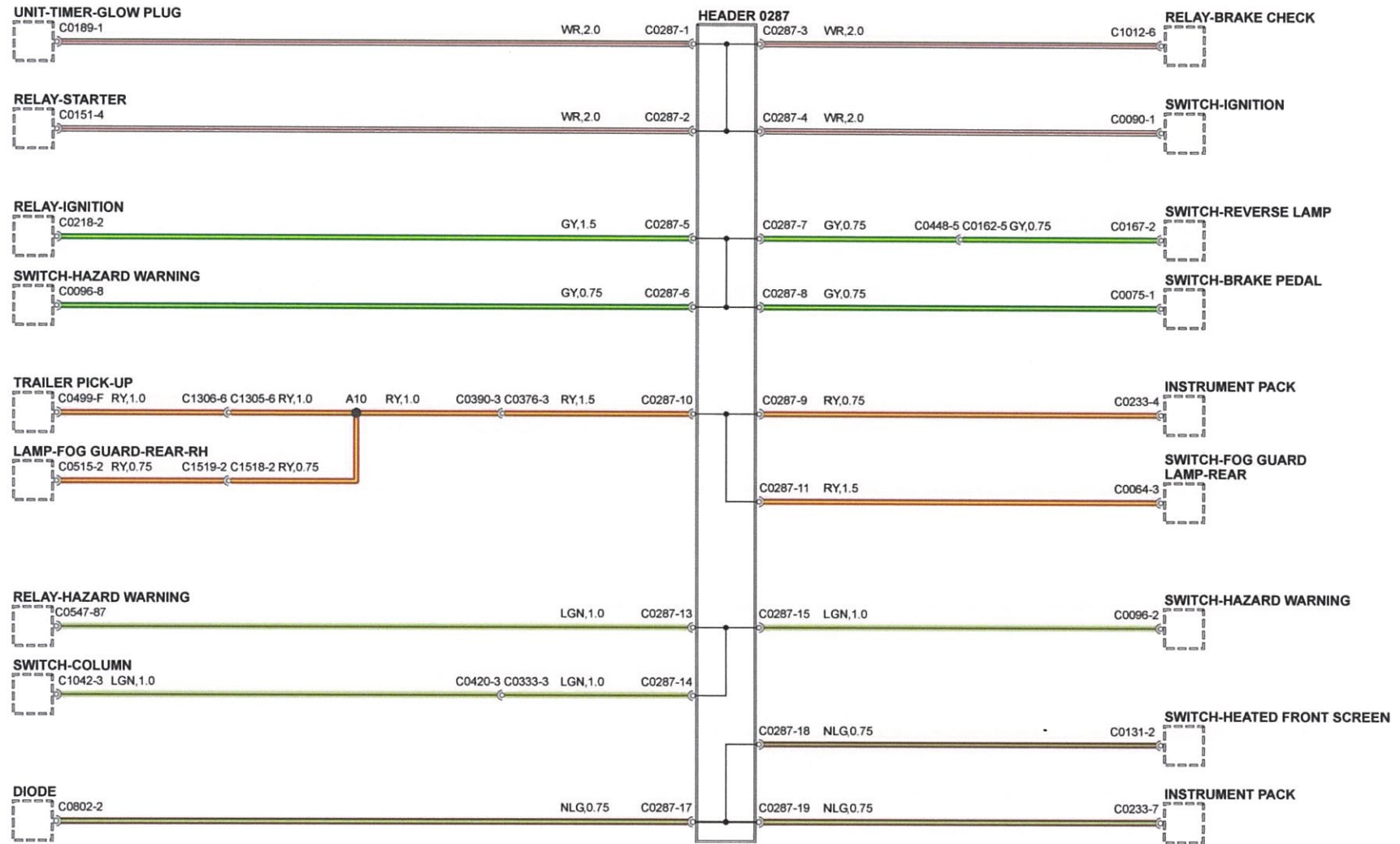


Fig 15 Header joints III

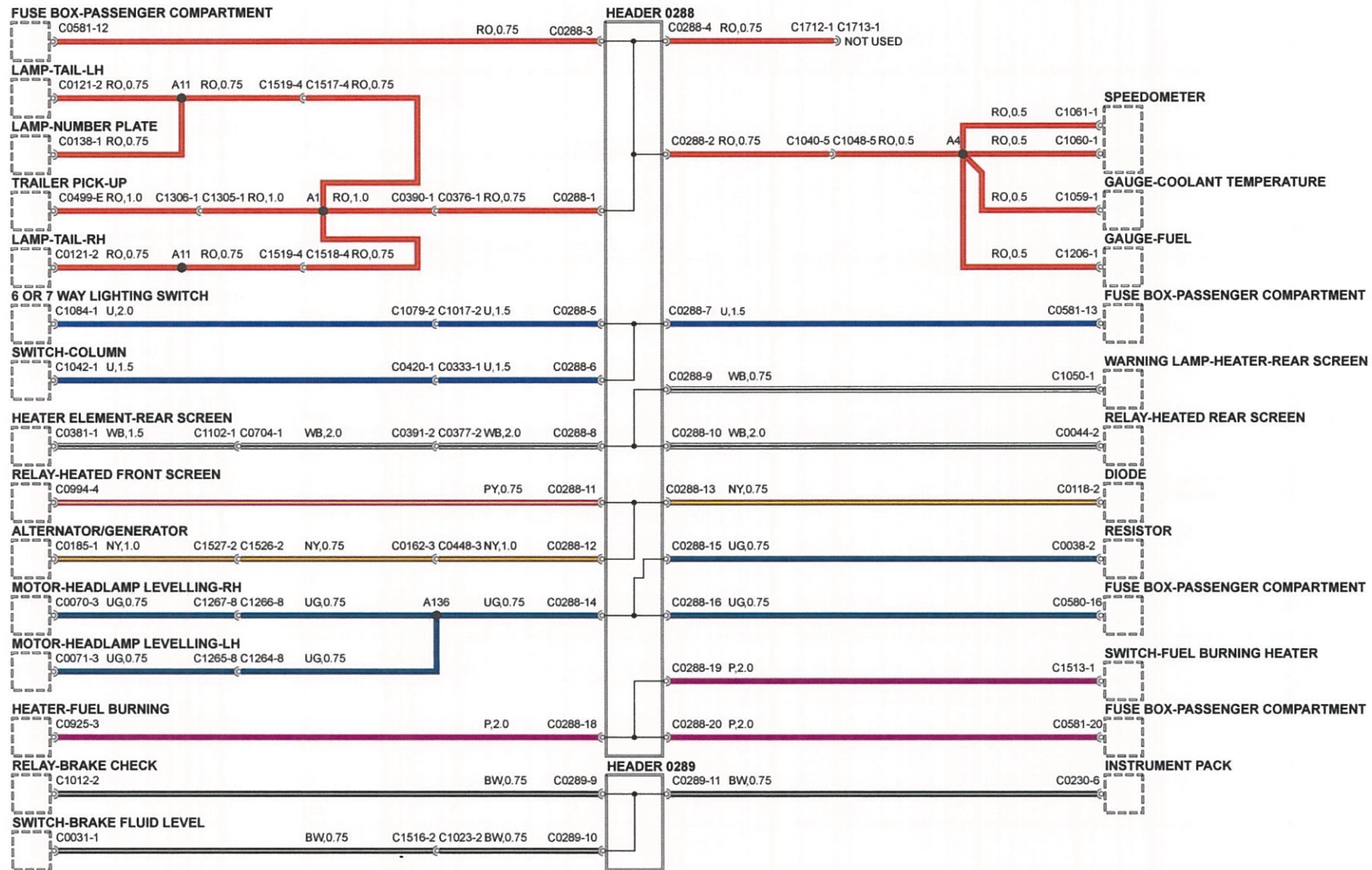


Fig 16 Header joints IV

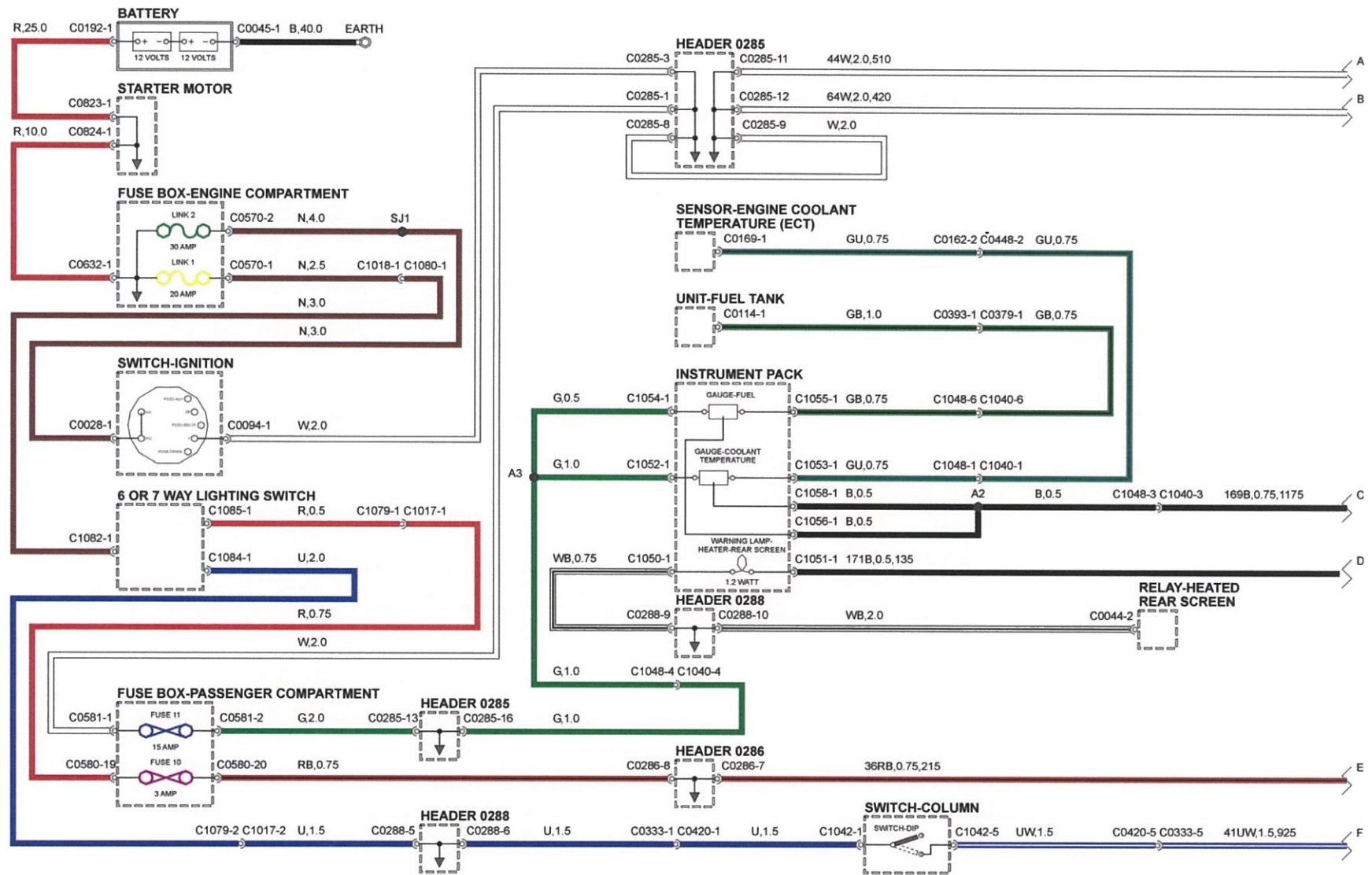


Fig 17 Instruments I

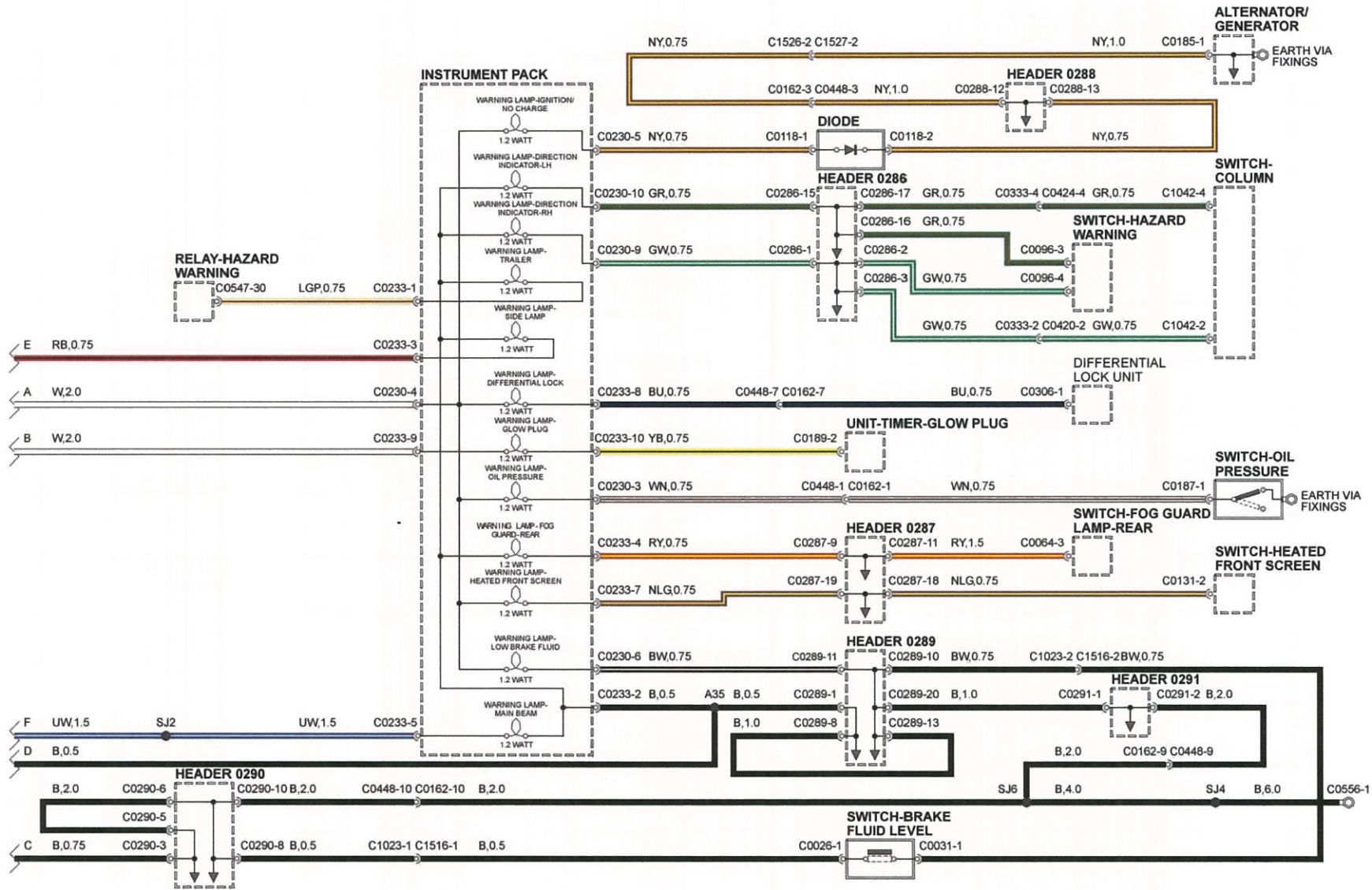


Fig 18 Instruments II

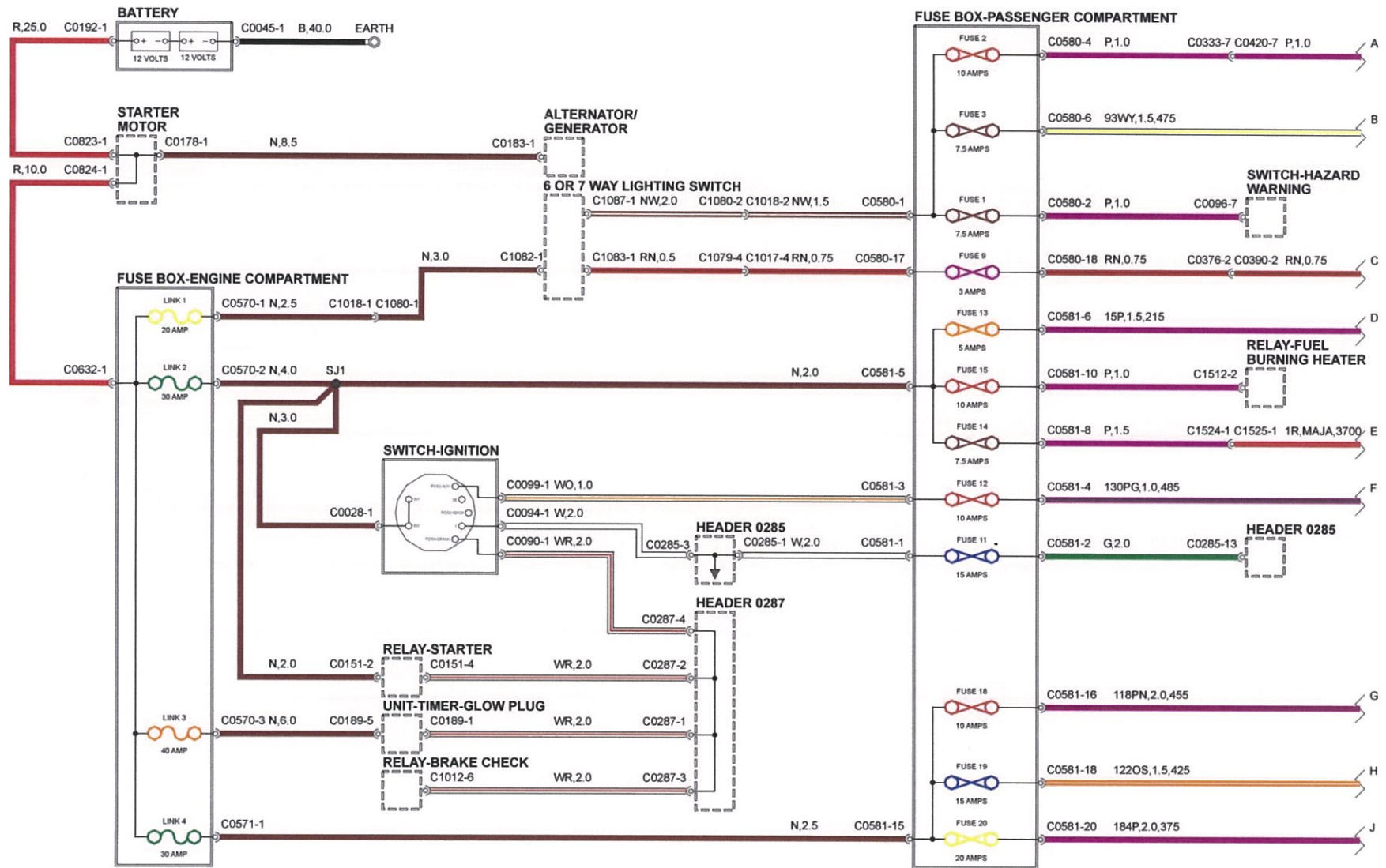


Fig 19 Power distribution I

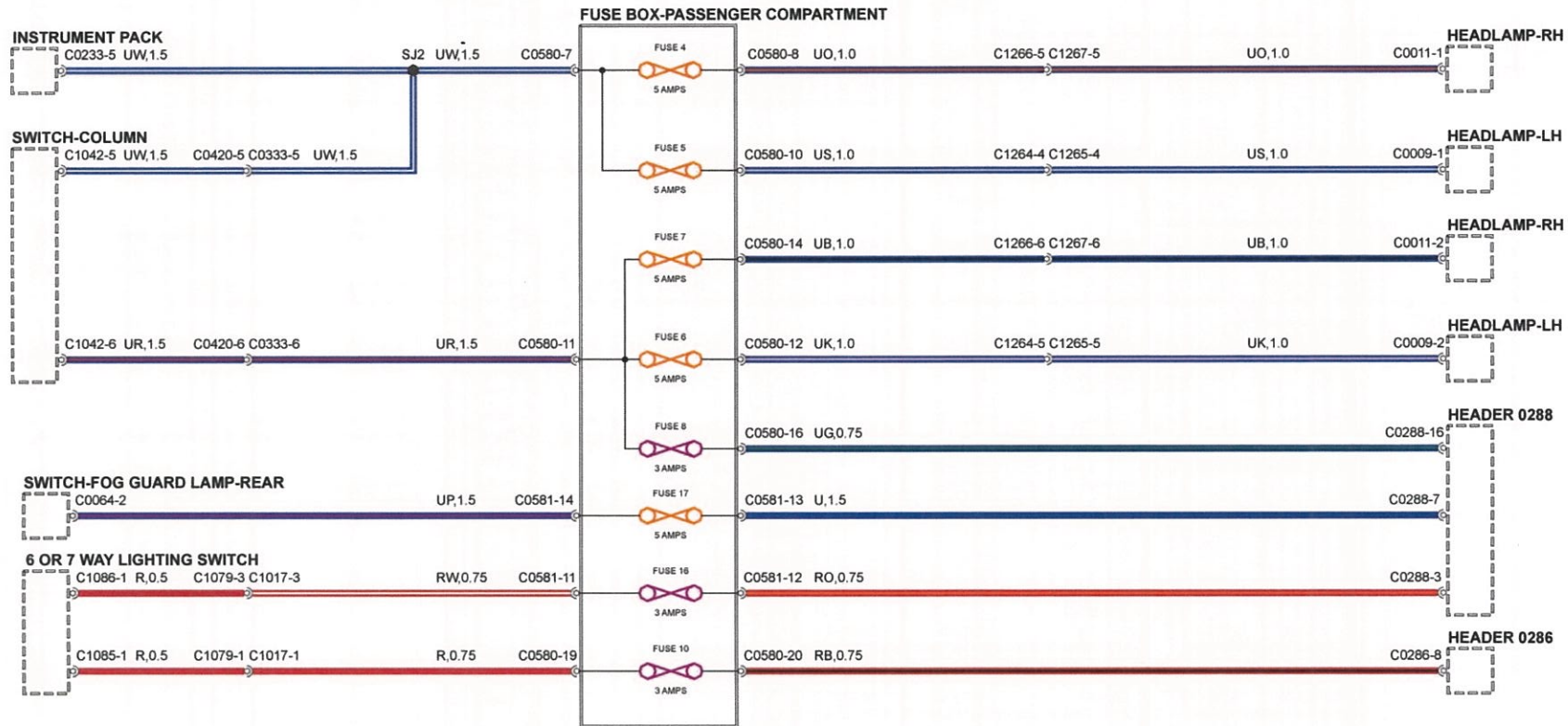


Fig 20 Power distribution II

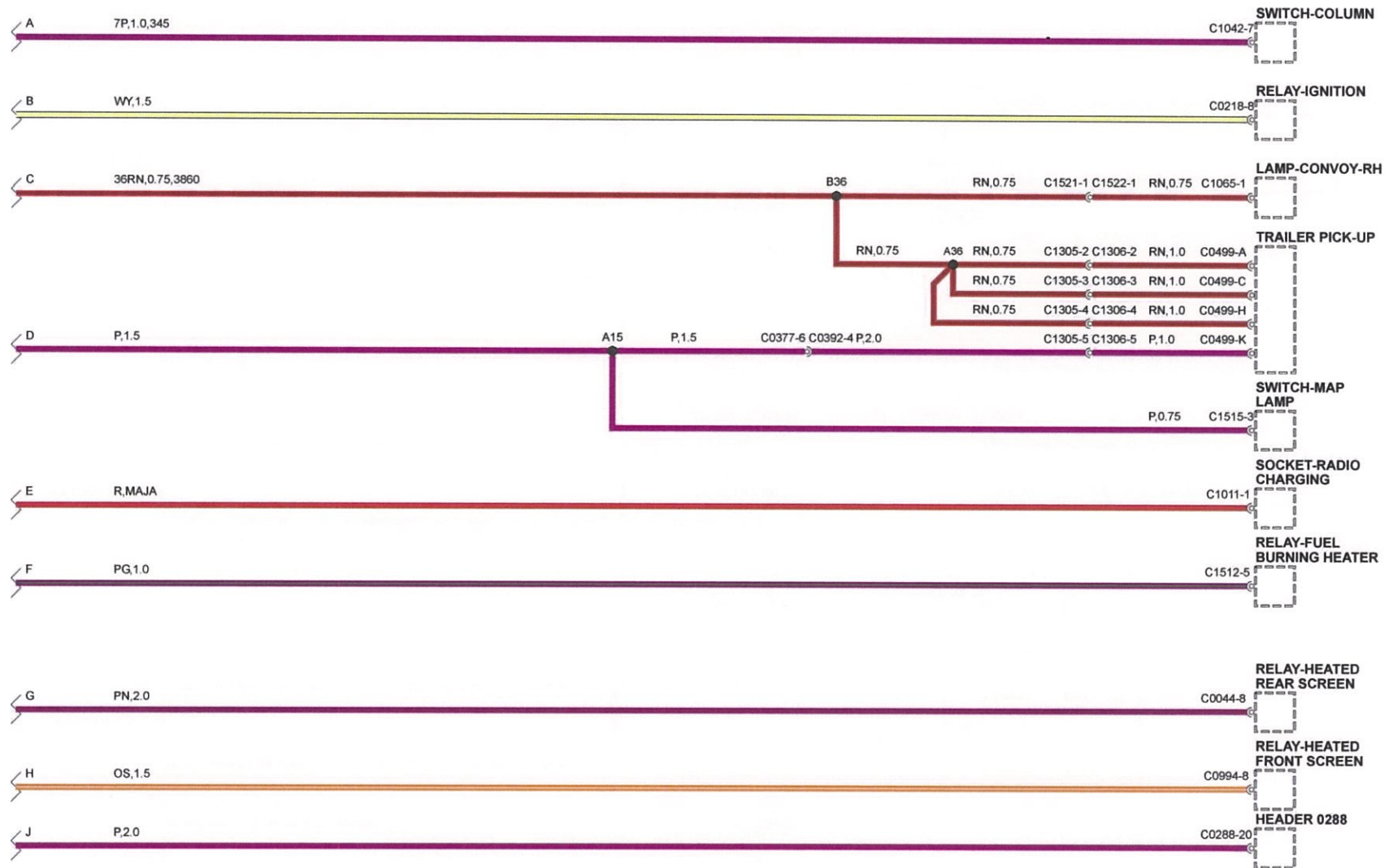
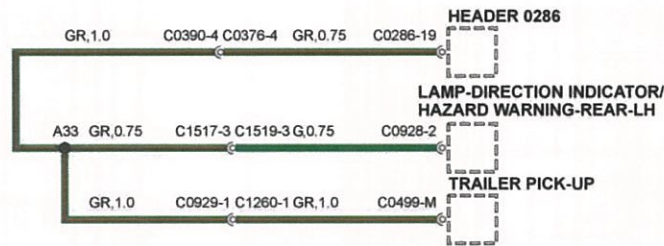
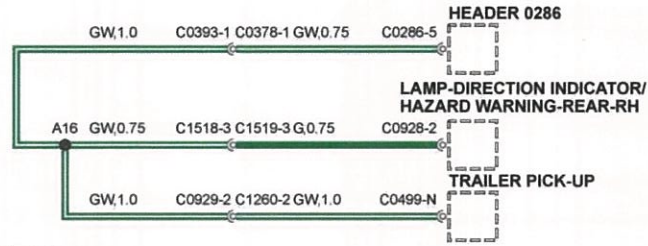


Fig 21 Power distribution III

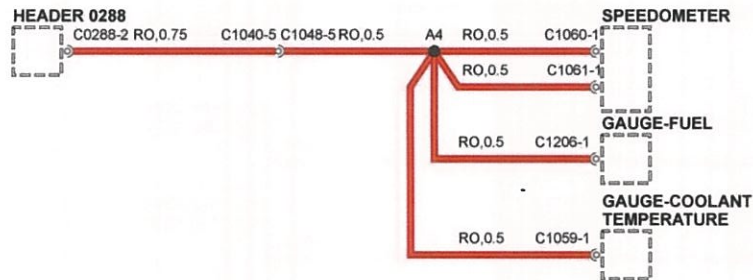
A33 (GR) CHASSIS



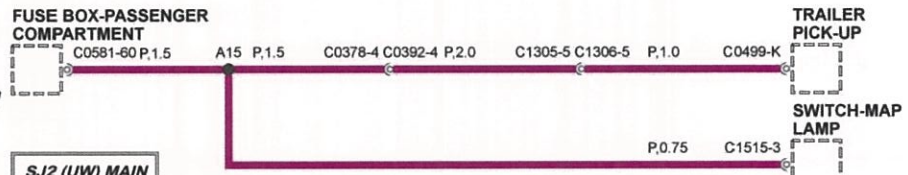
A16 (GW) CHASSIS



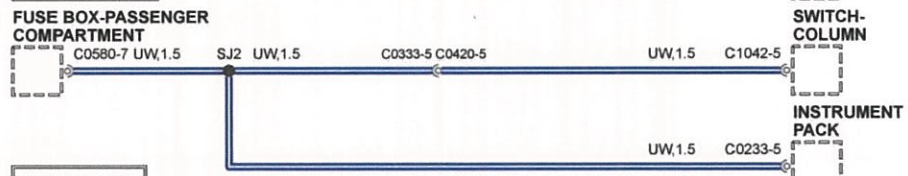
A4 (RO) INSTRUMENT



A15 (P) MAIN



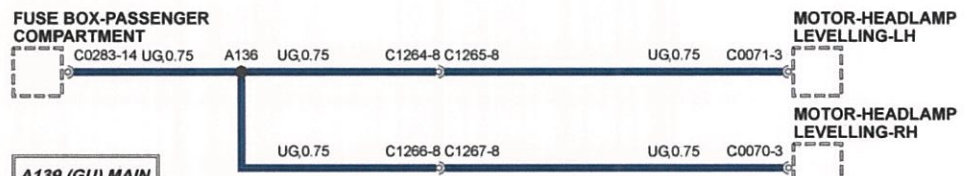
SJ2 (UW) MAIN



SJ1 (N) MAIN



A136 (UG) MAIN



A139 (GU) MAIN

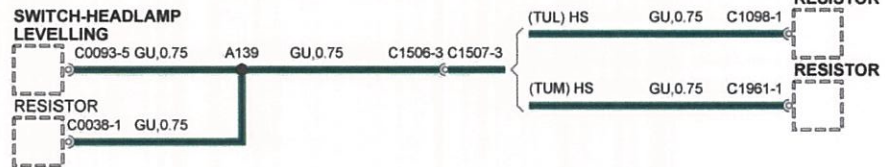


Fig 22 Splices and Centre taps I

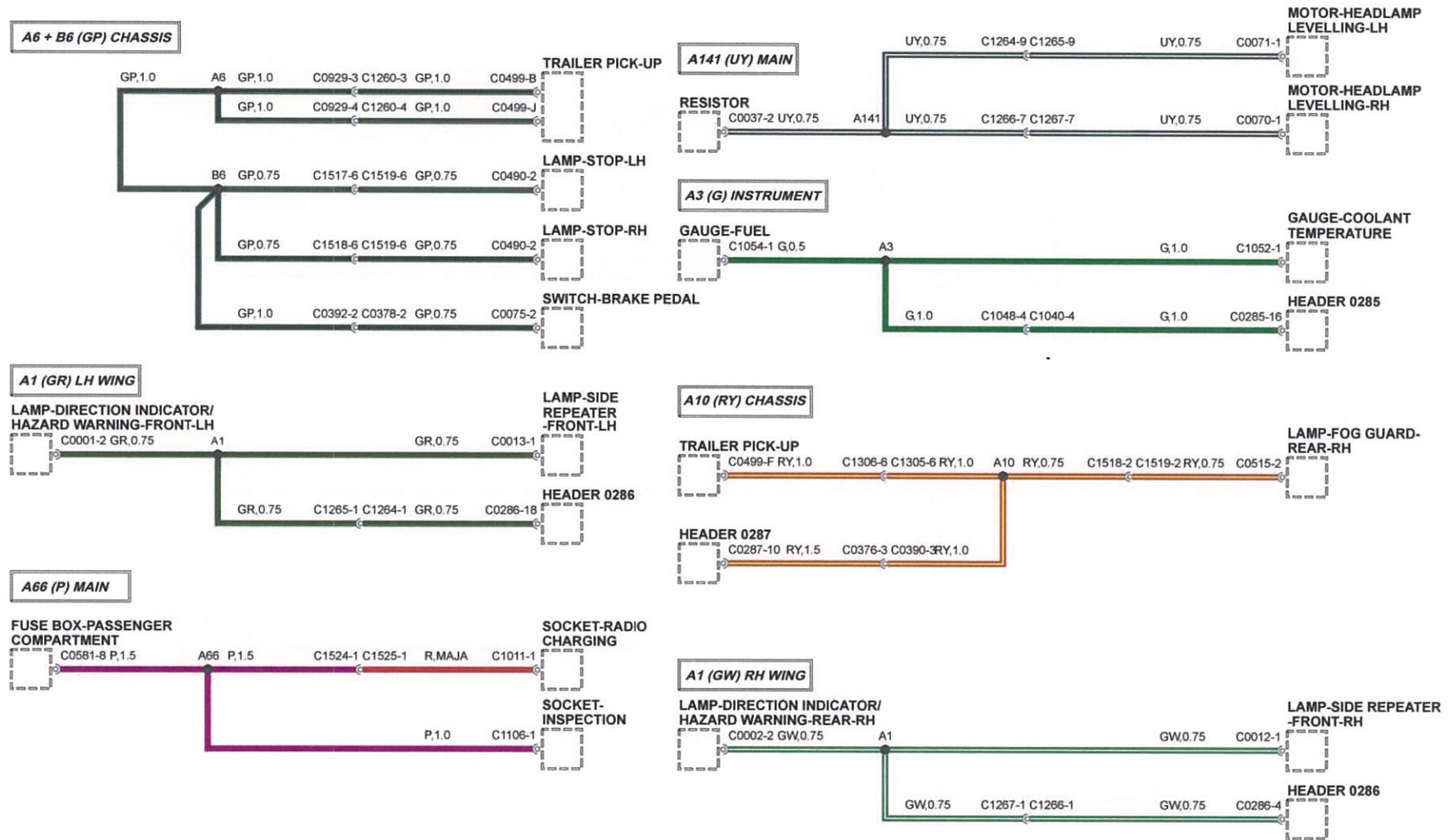


Fig 23 Splices and Centre taps II

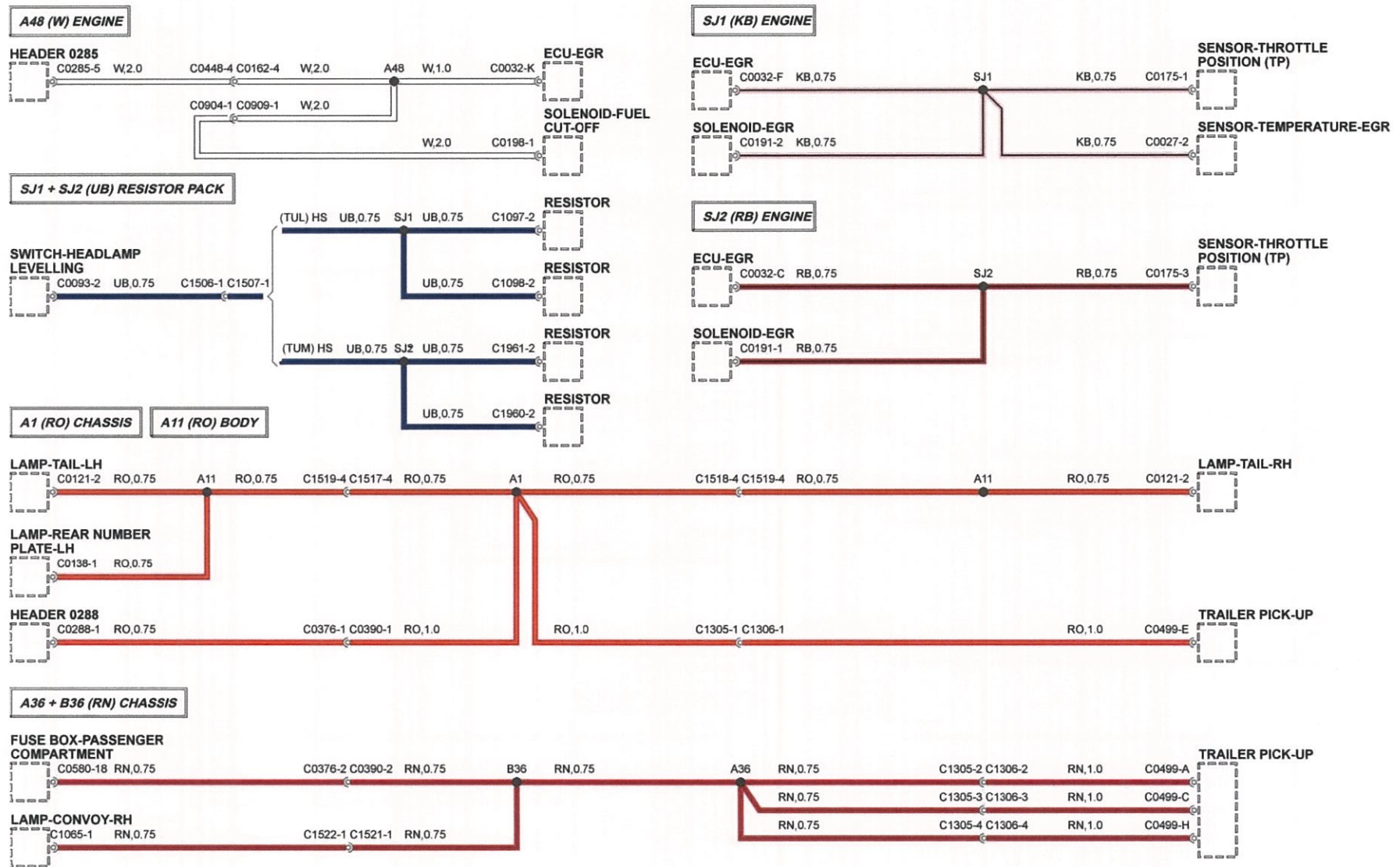


Fig 24 Splices and Centre taps III

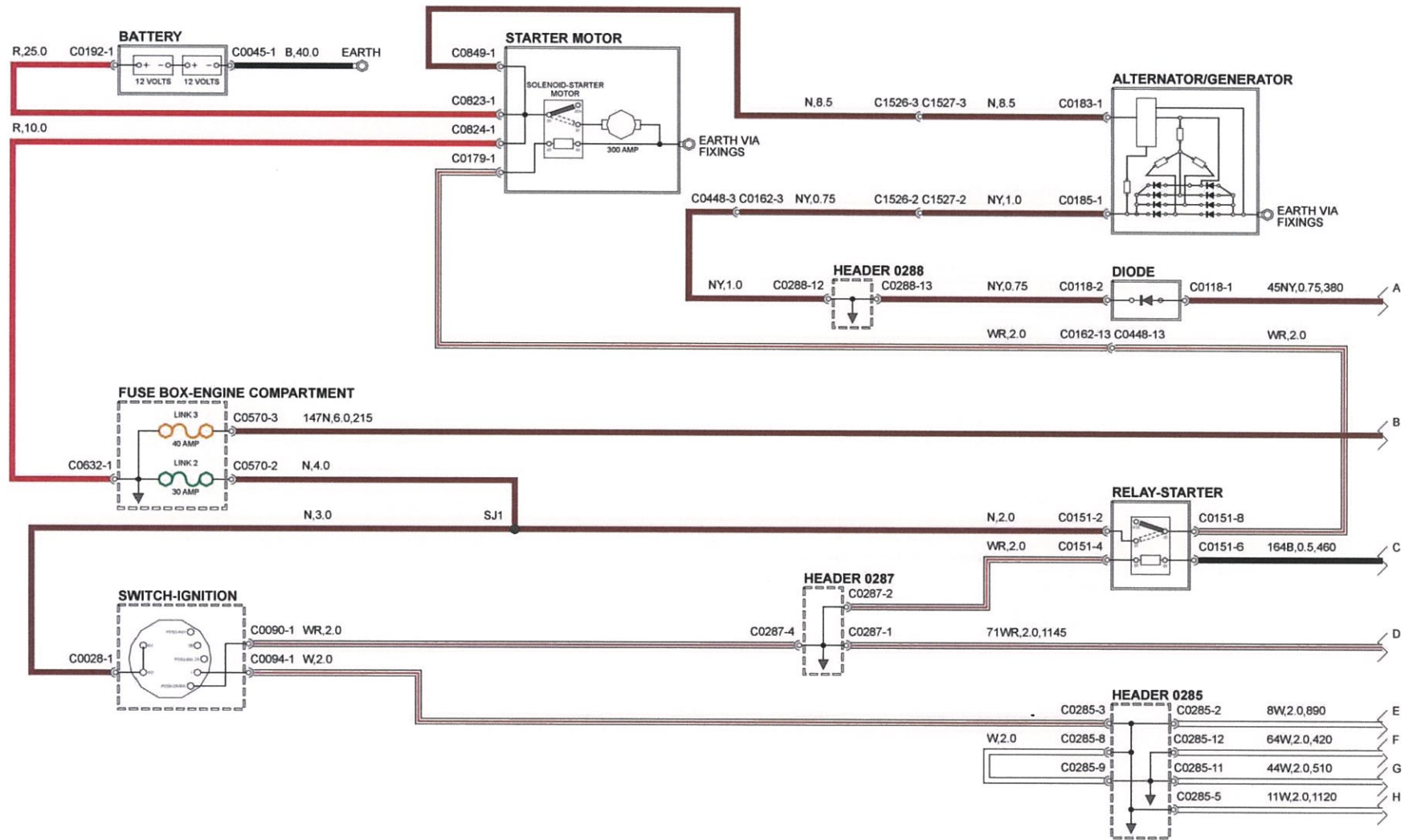


Fig 25 Starting and Charging I

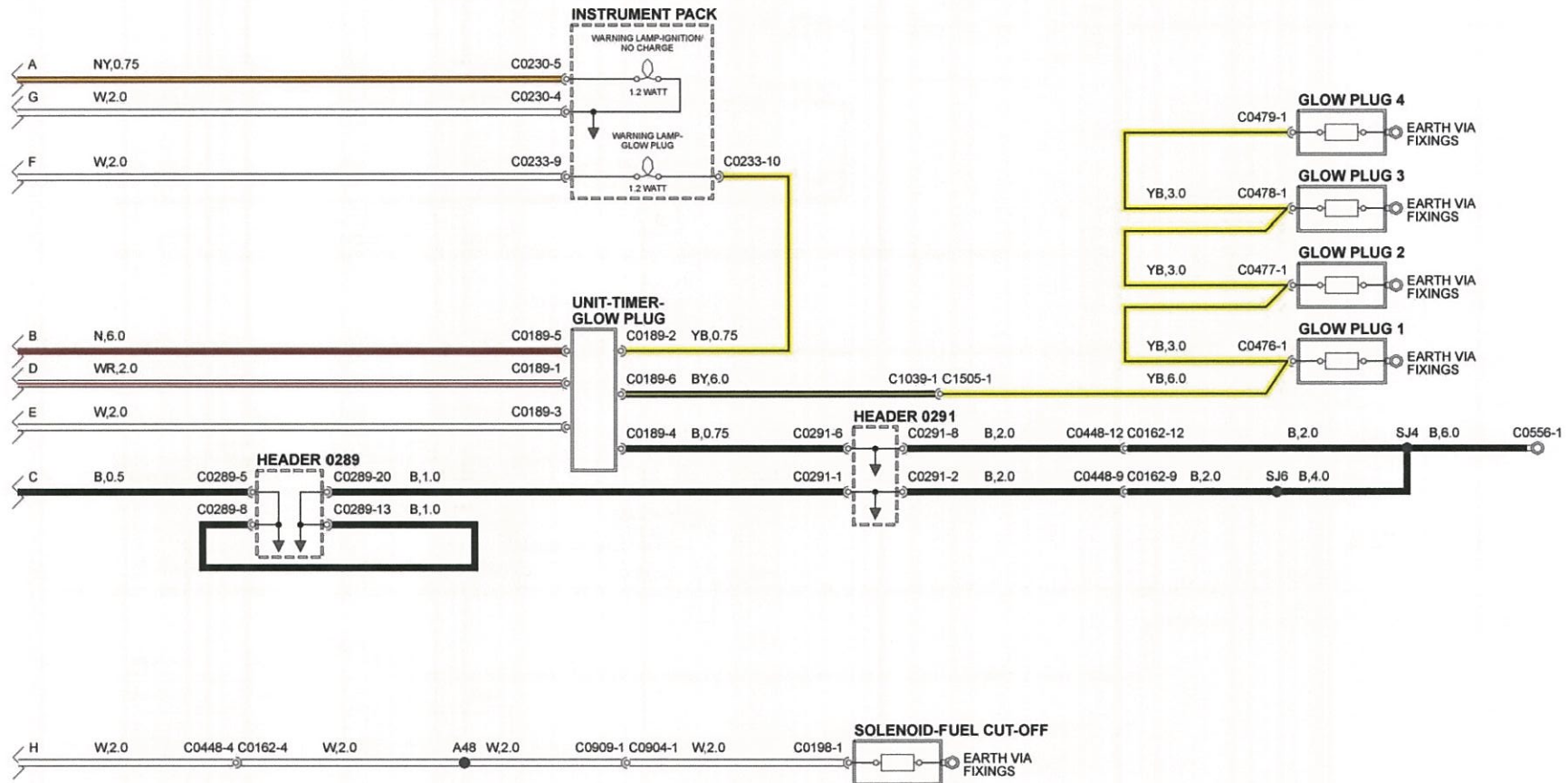


Fig 26 Starting and Charging II

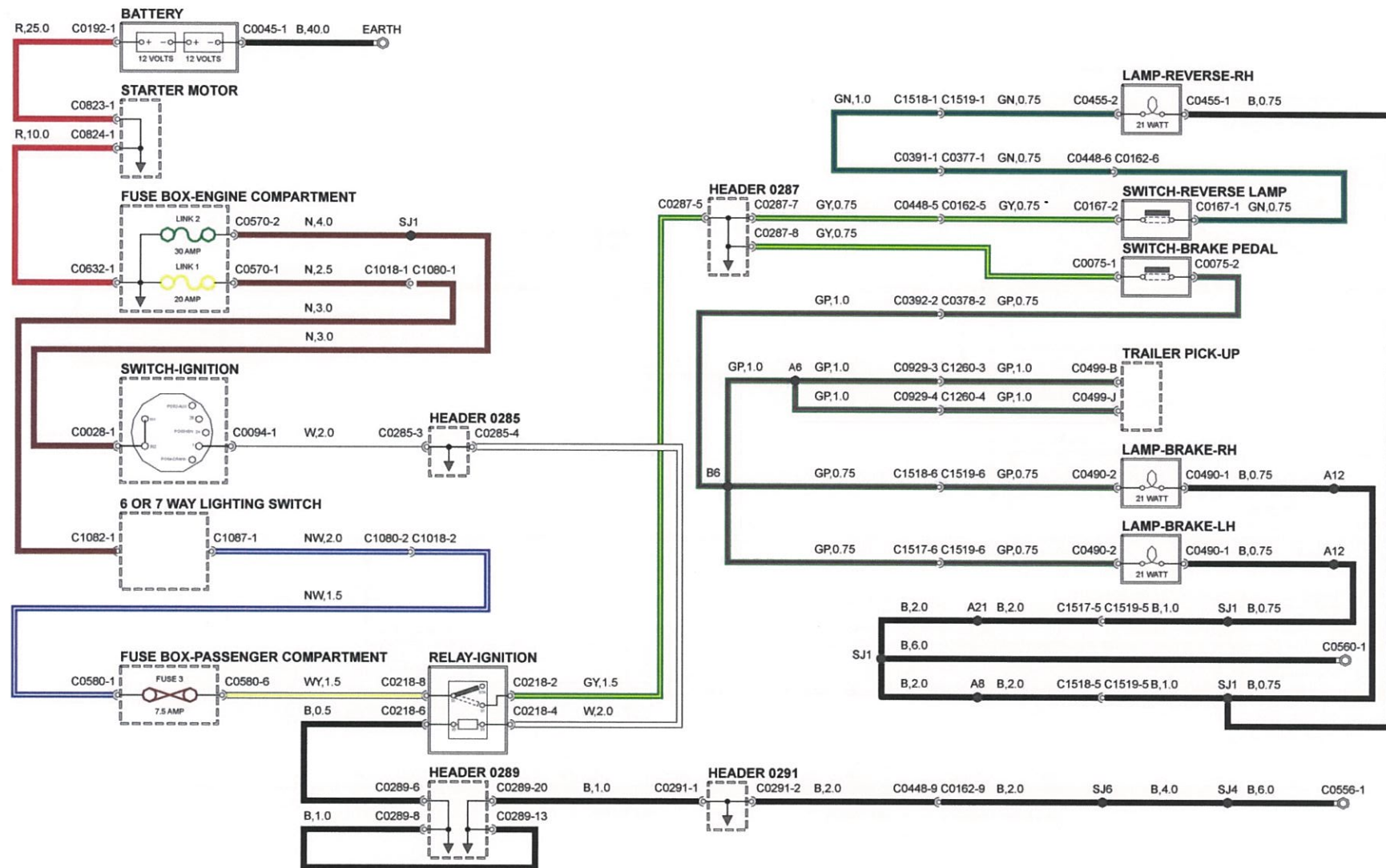


Fig 27 Brake reverse lamps

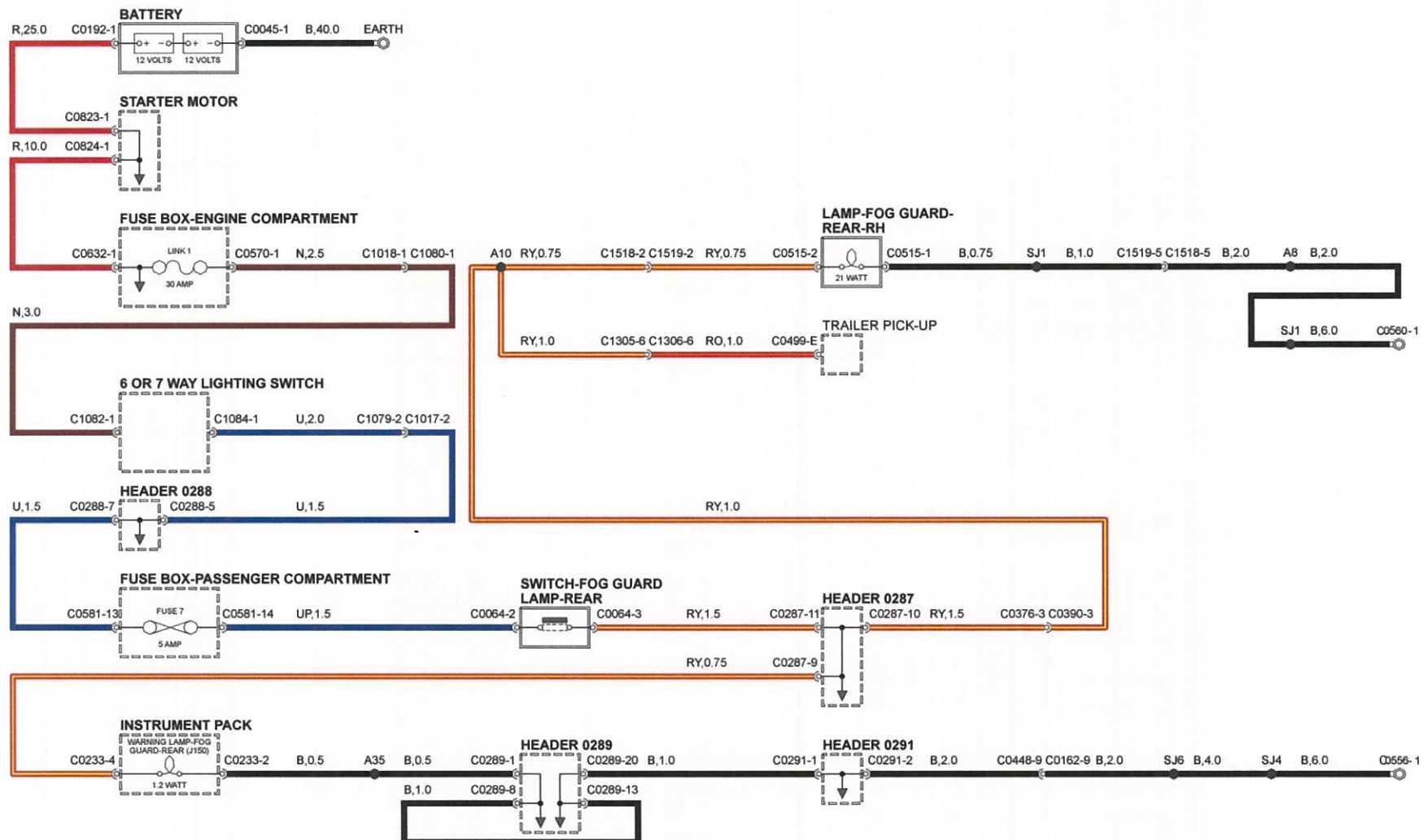


Fig 28 Fog lamps

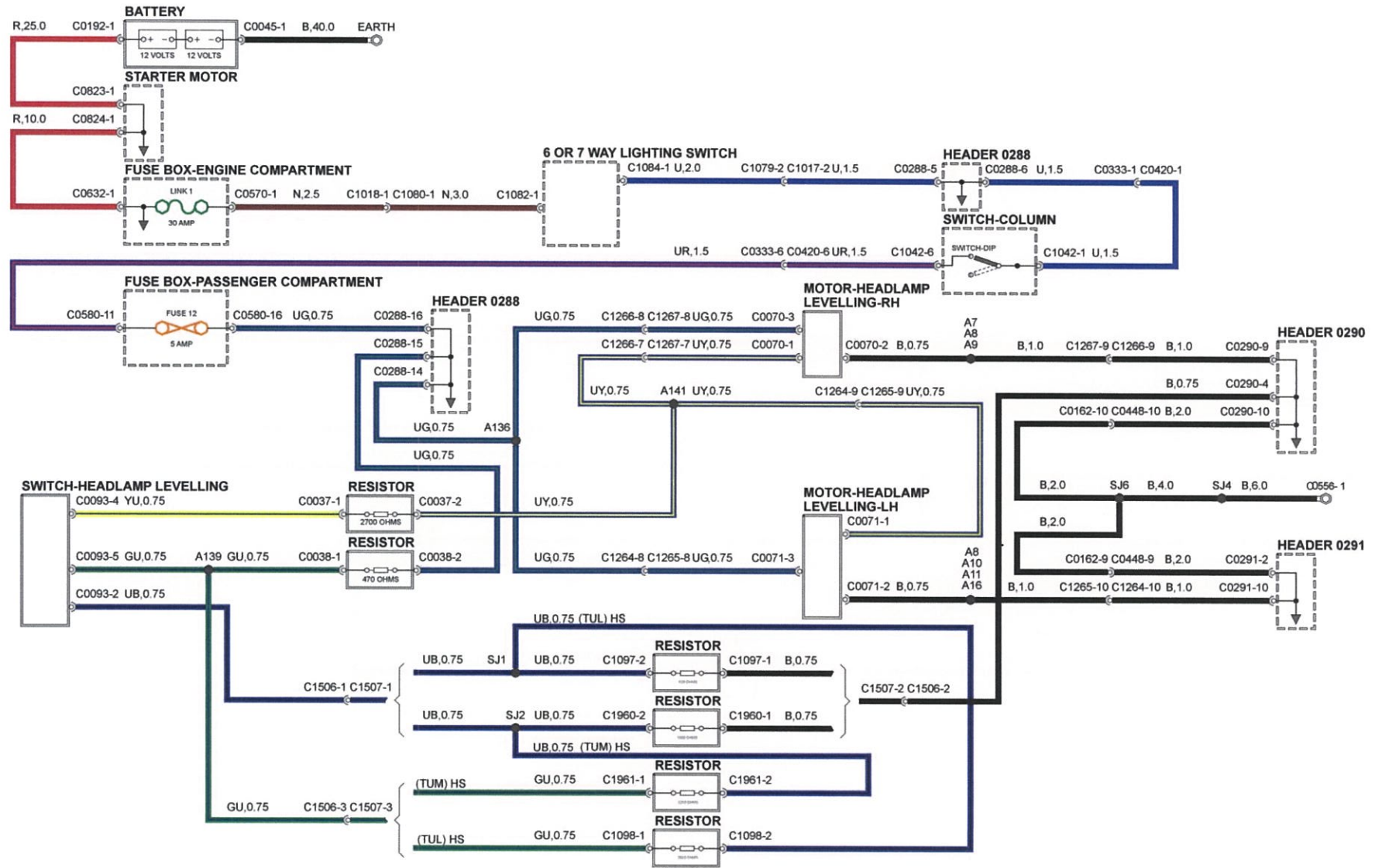


Fig 29 Headlamp levelling

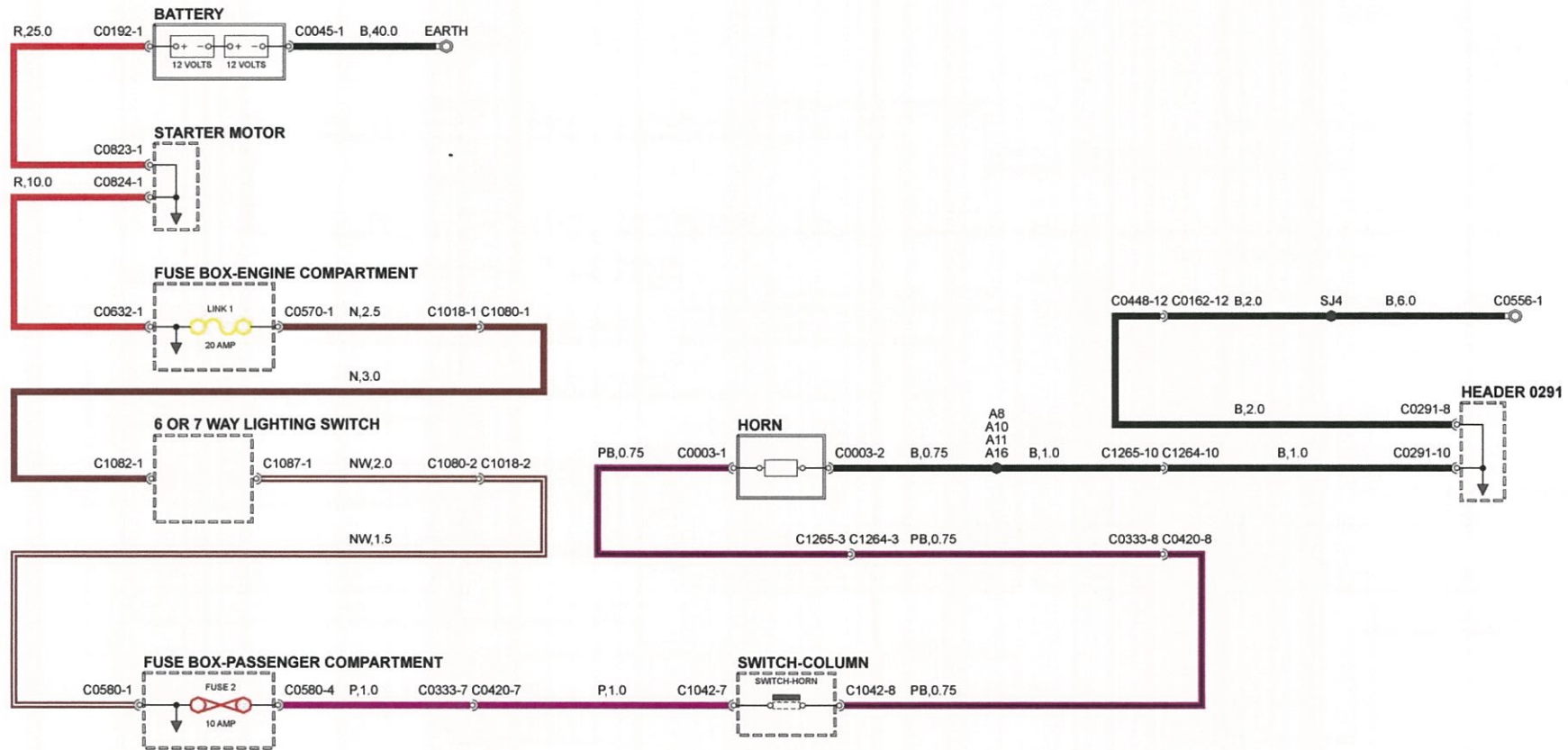


Fig 30 Horn

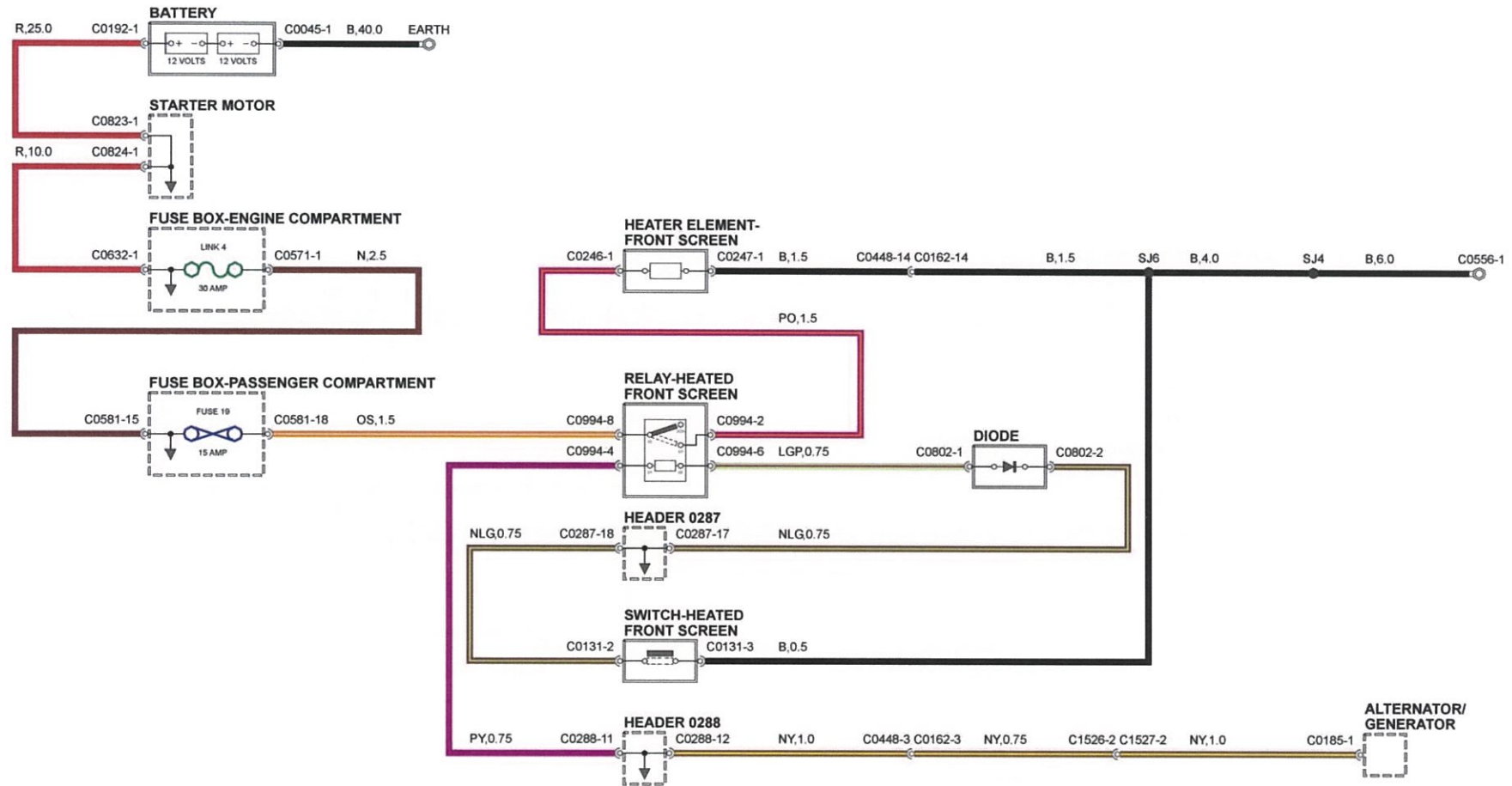


Fig 31 Heated front screen

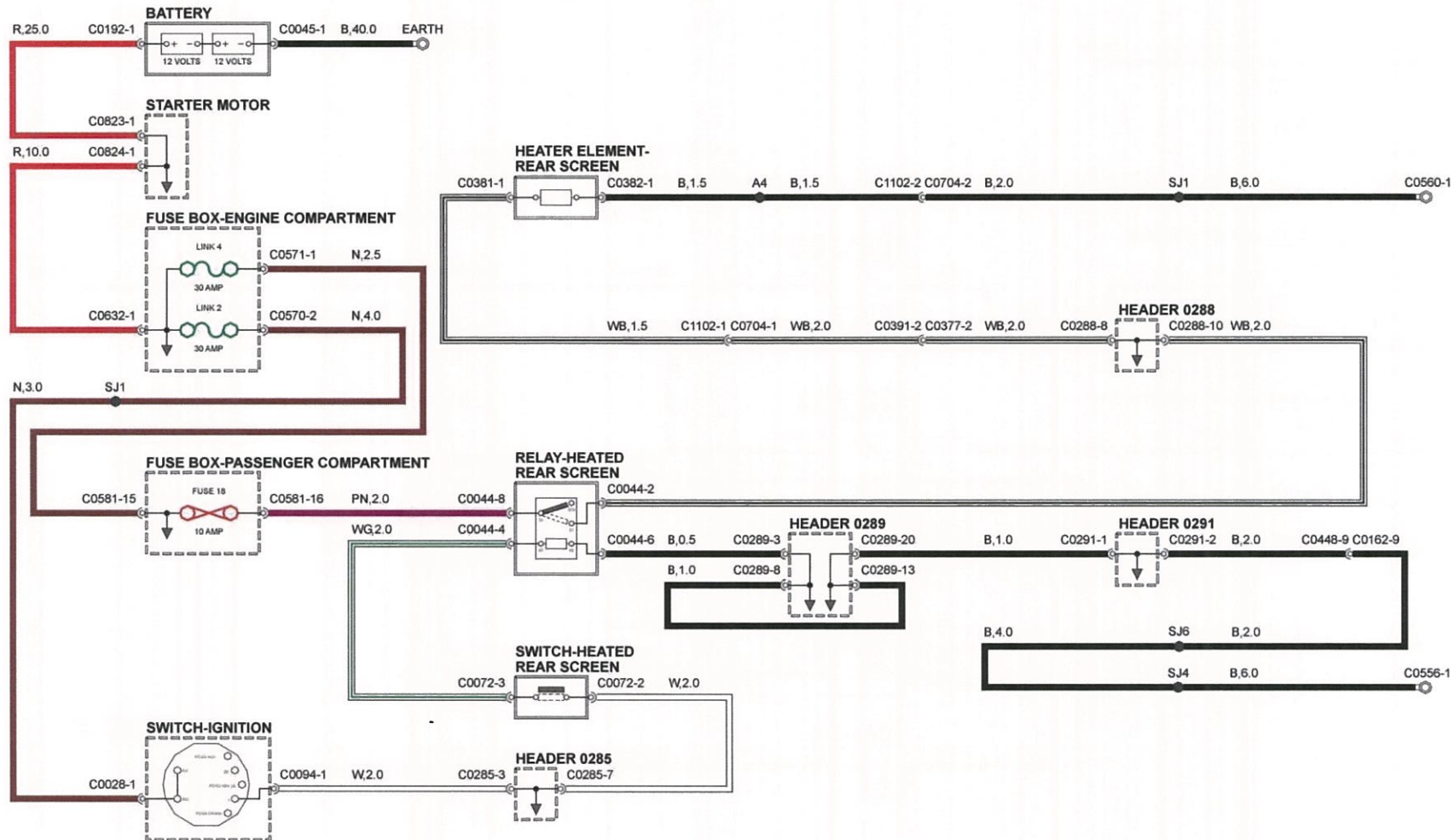


Fig 32 Heated rear screen

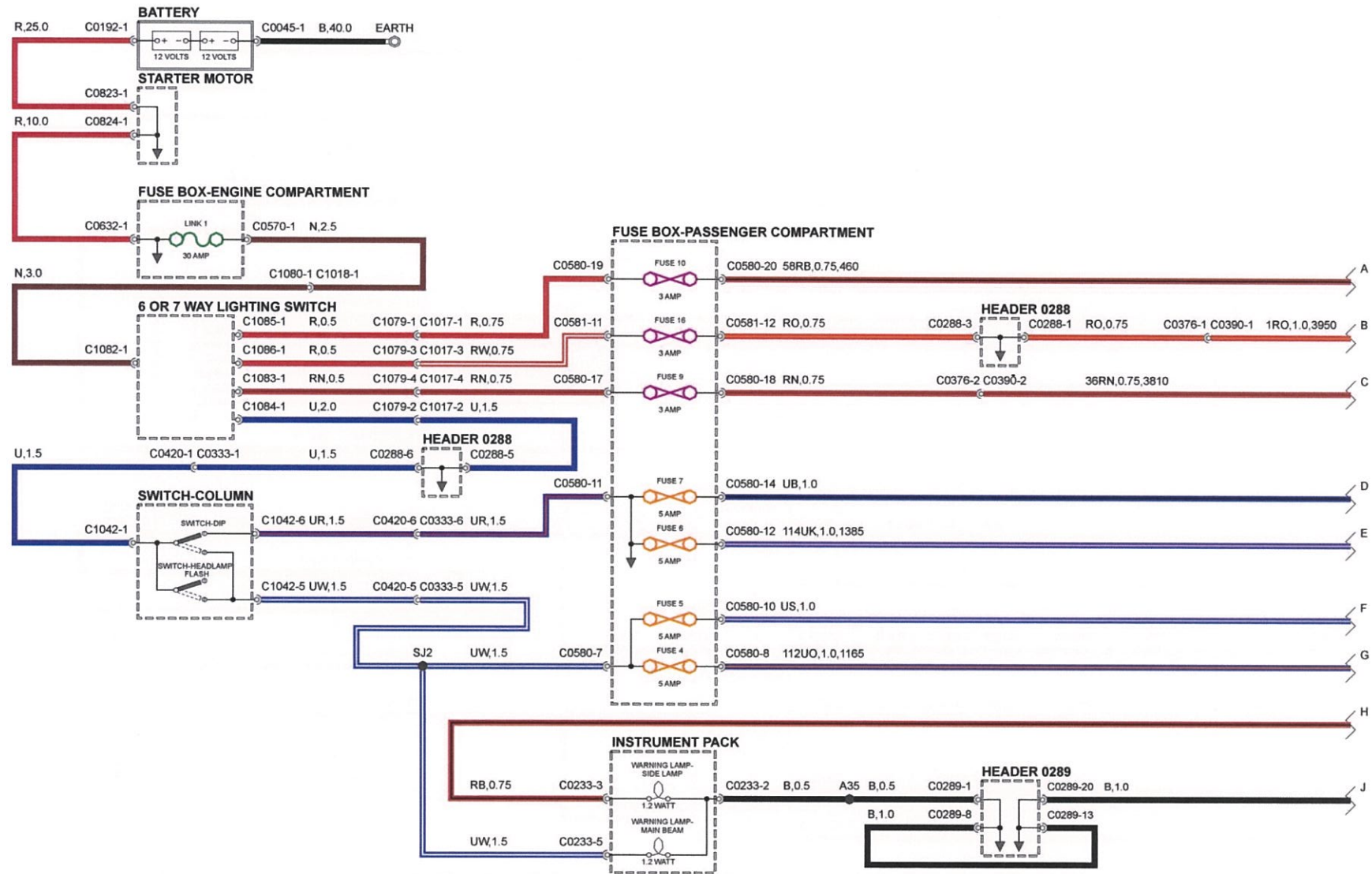


Fig 33 Head, side and number plate lamps I

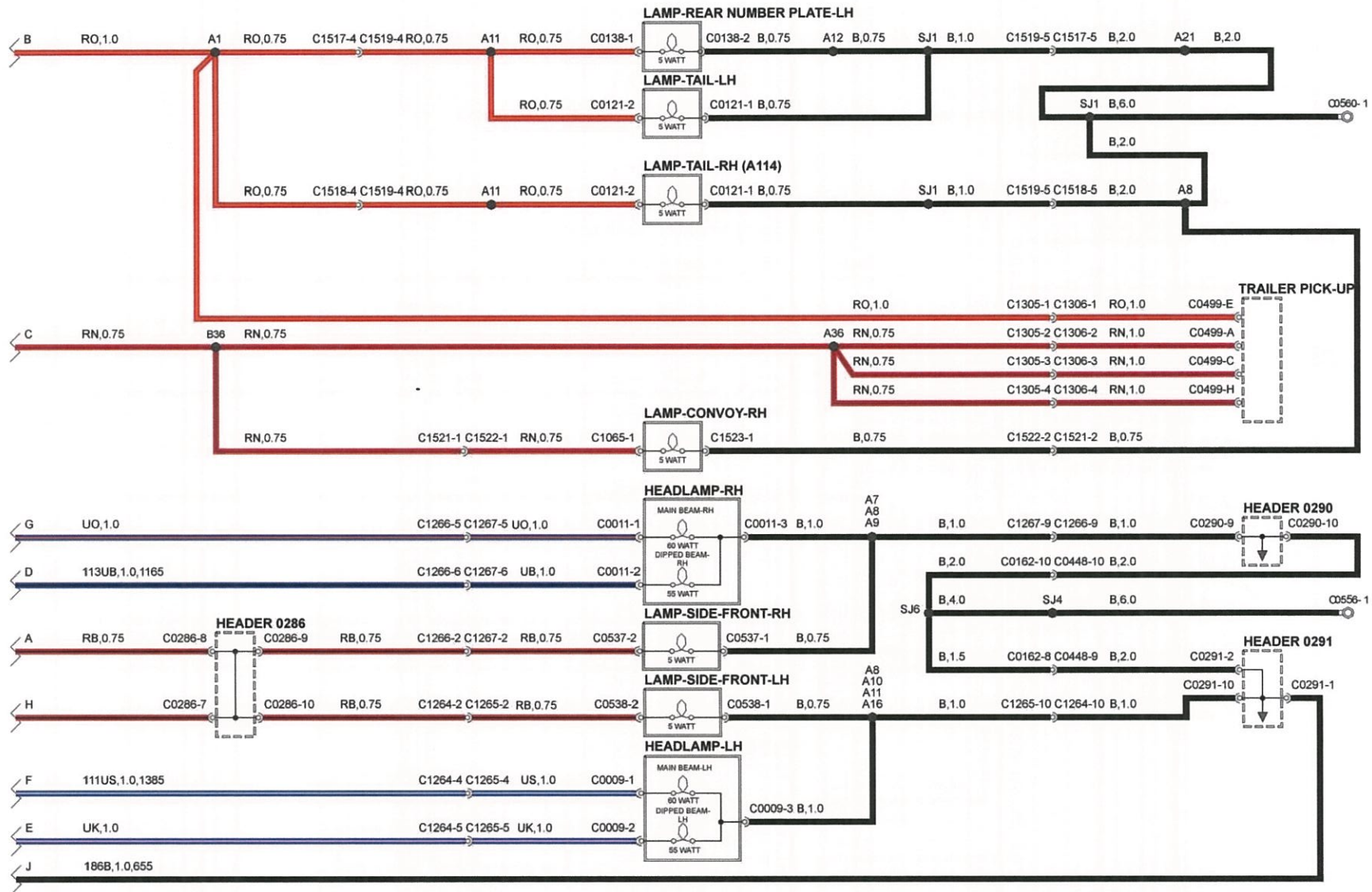


Fig 34 Head, side and number plate lamps II

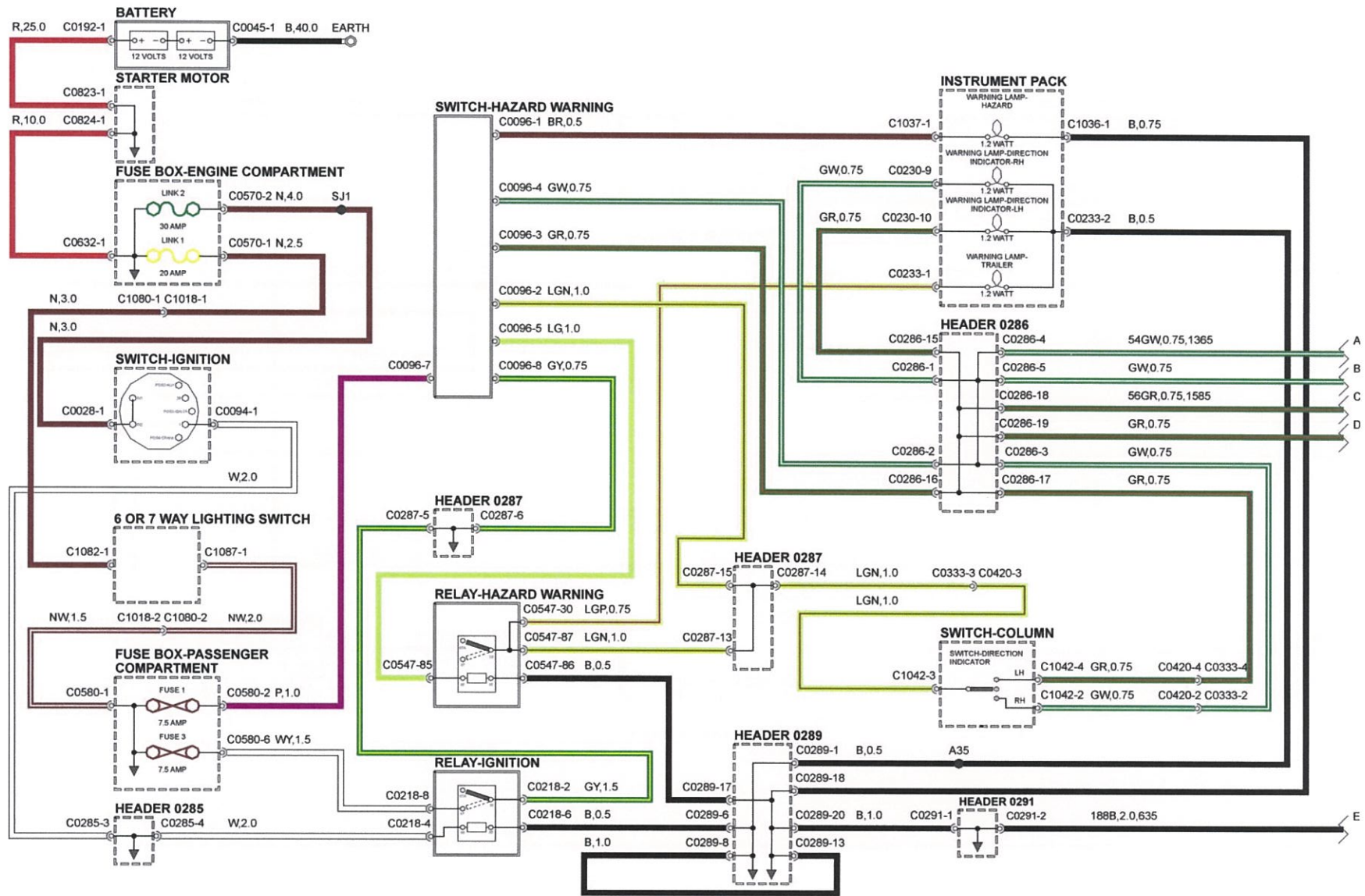


Fig 35 Indicators and Hazards I

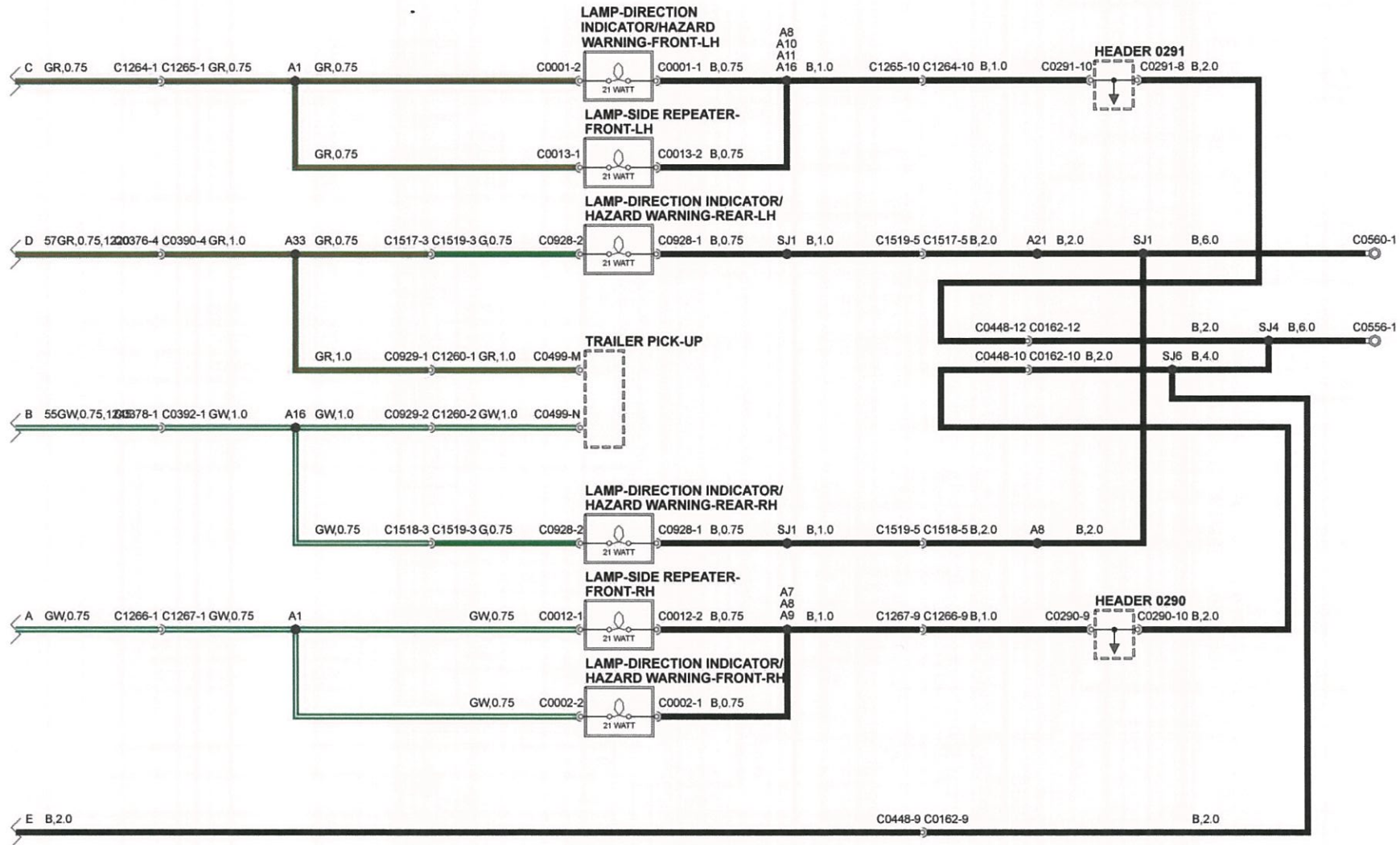


Fig 36 Indicators and Hazards II

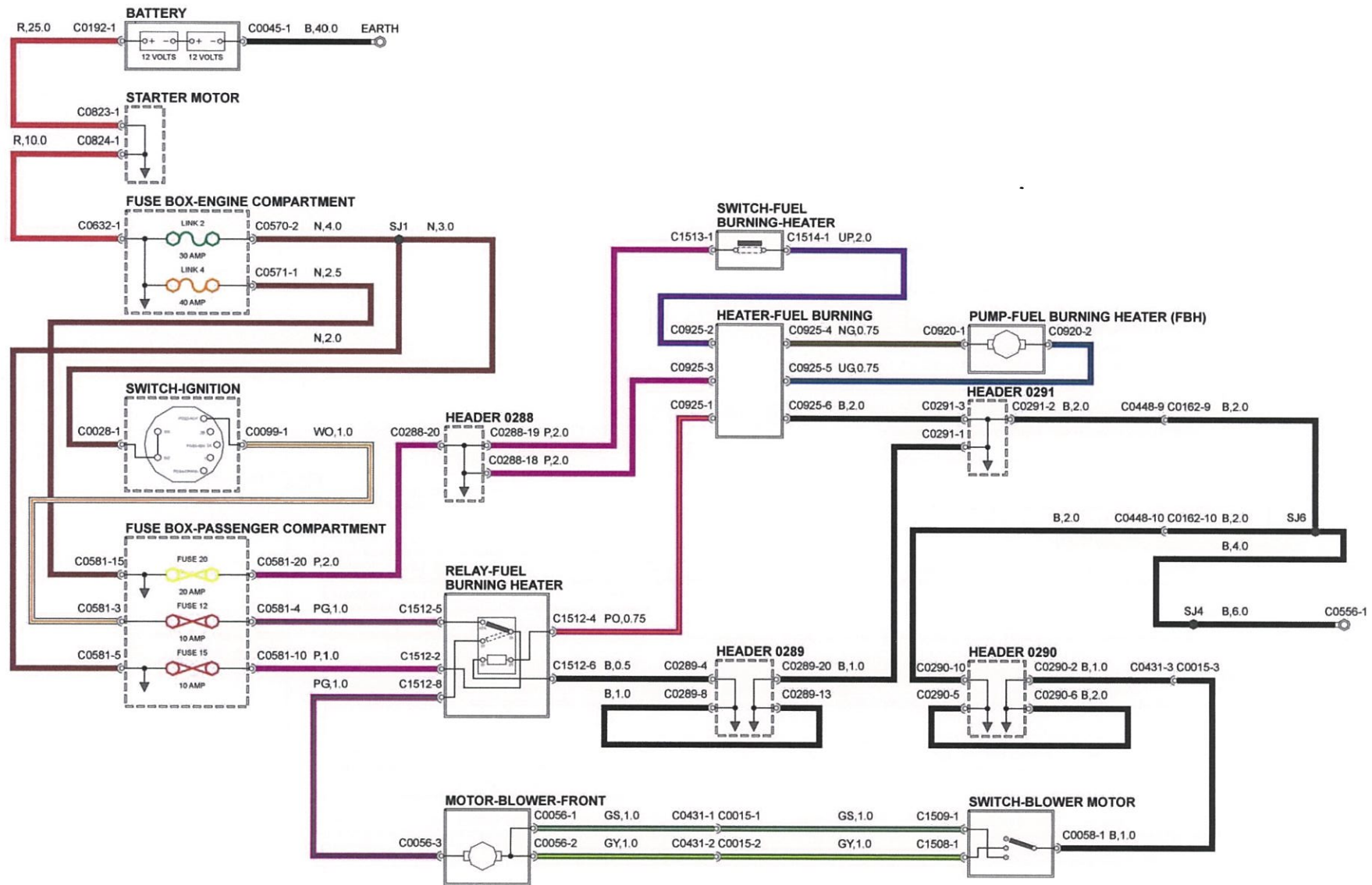


Fig 37 Fuel burning heater

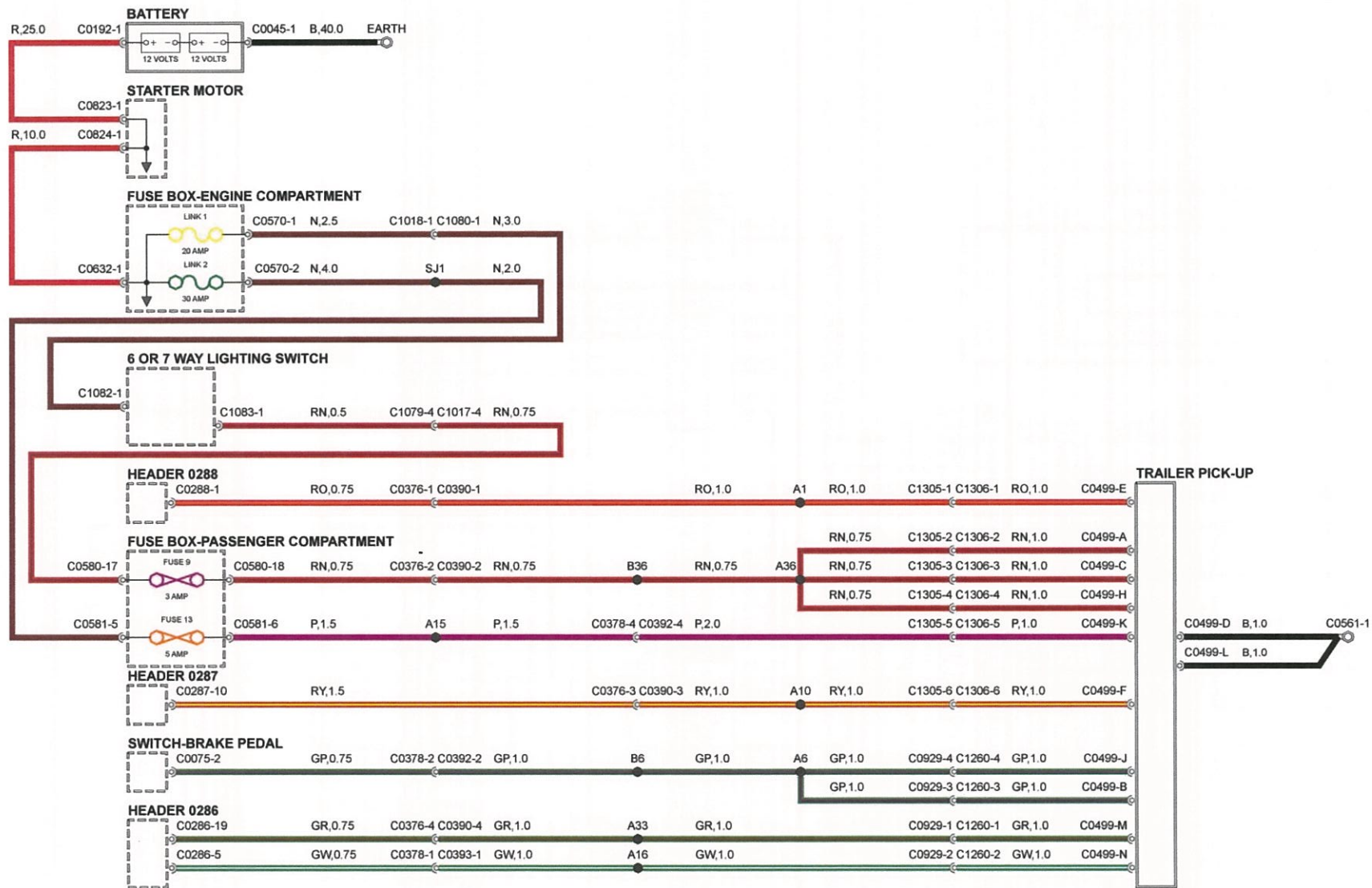


Fig 38 Trailer socket

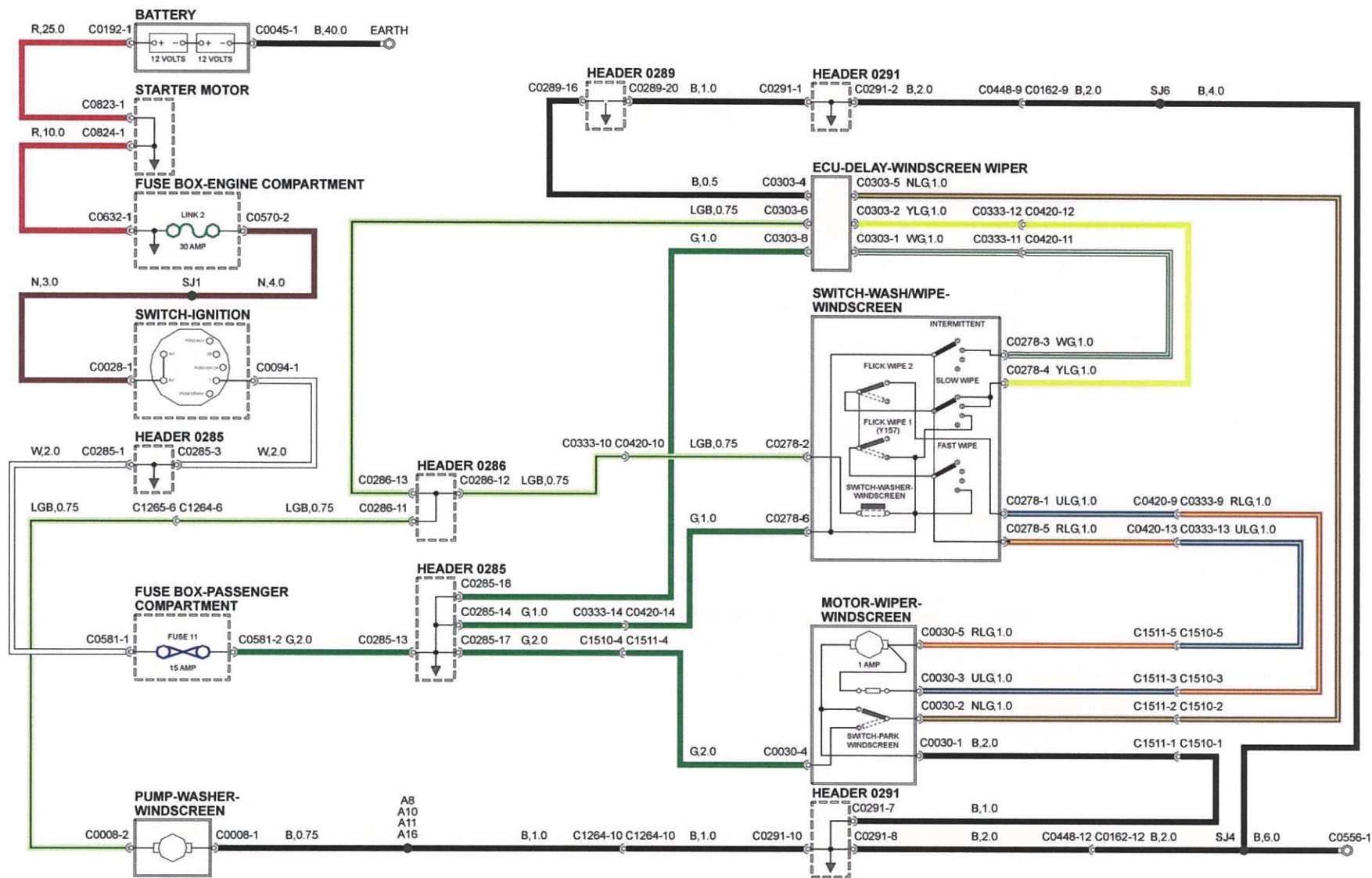


Fig 39 Wipers and washers - front

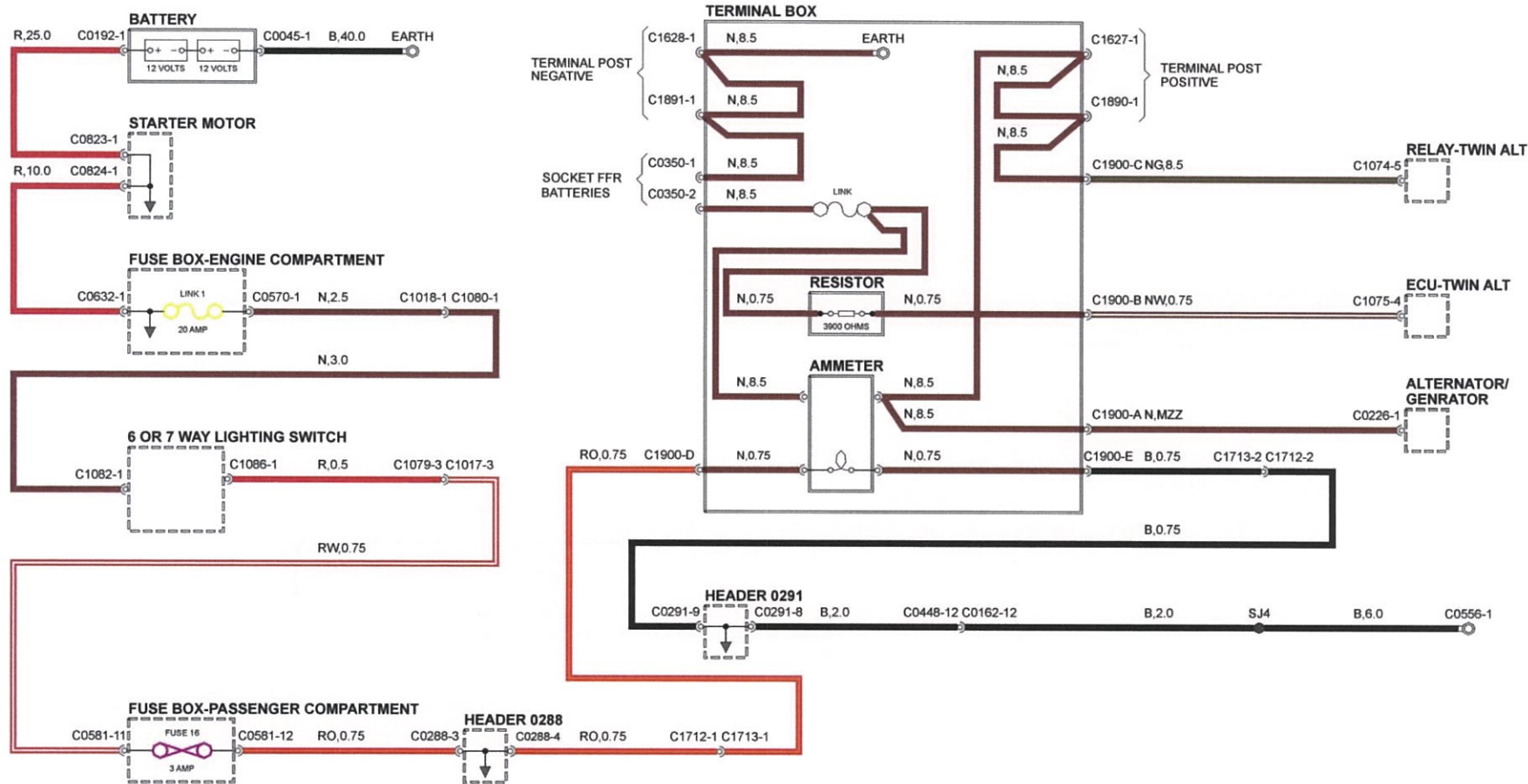


Fig 41 Terminal box

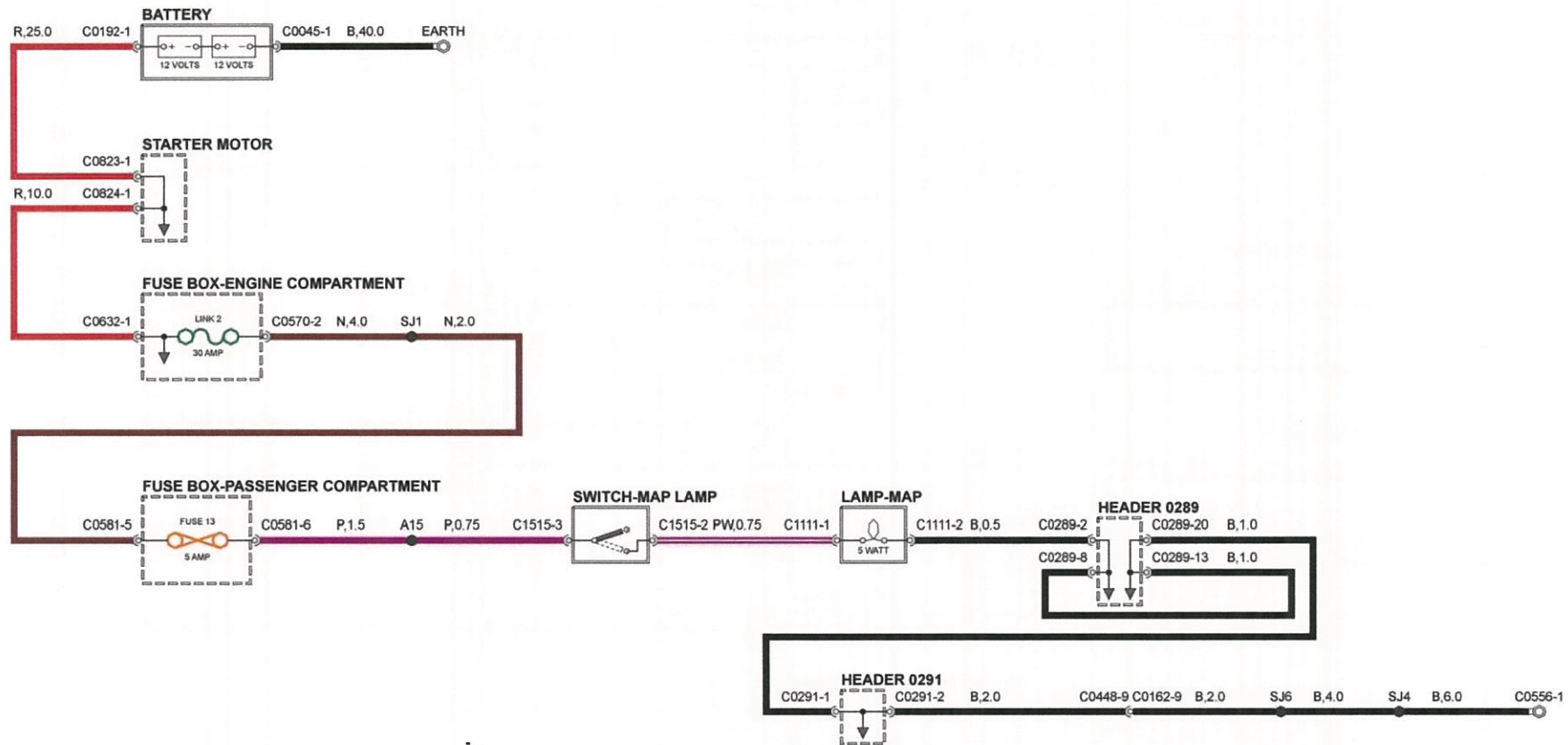


Fig 42 Interior lamps

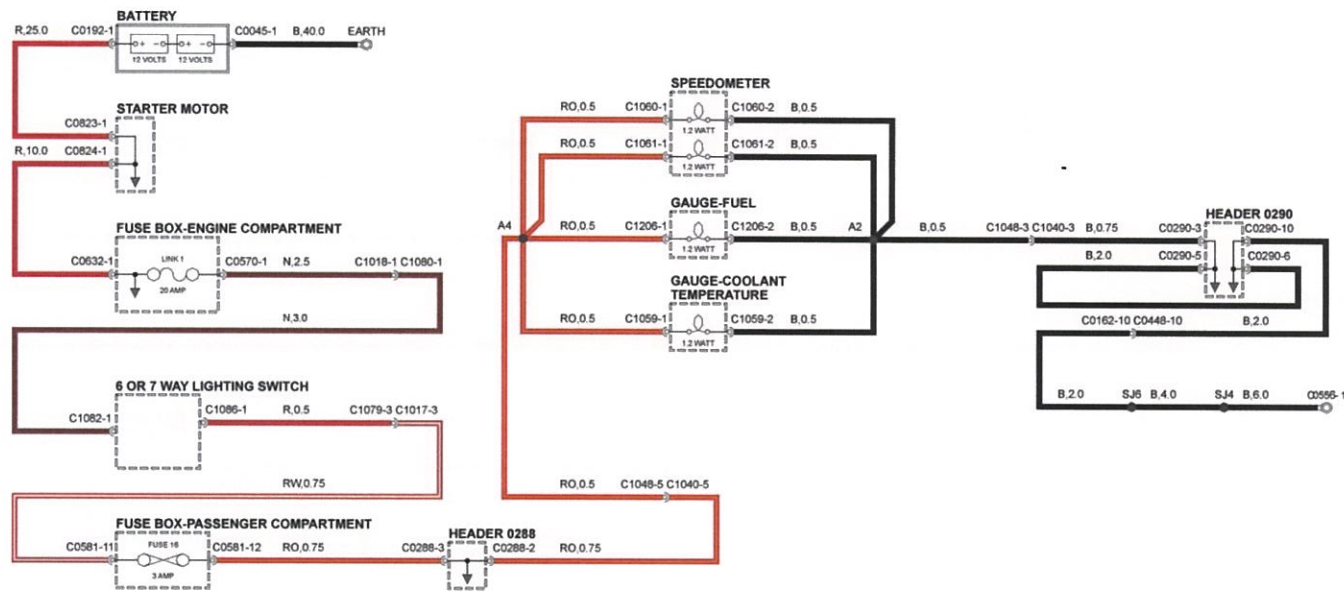


Fig 43 Interior illumination

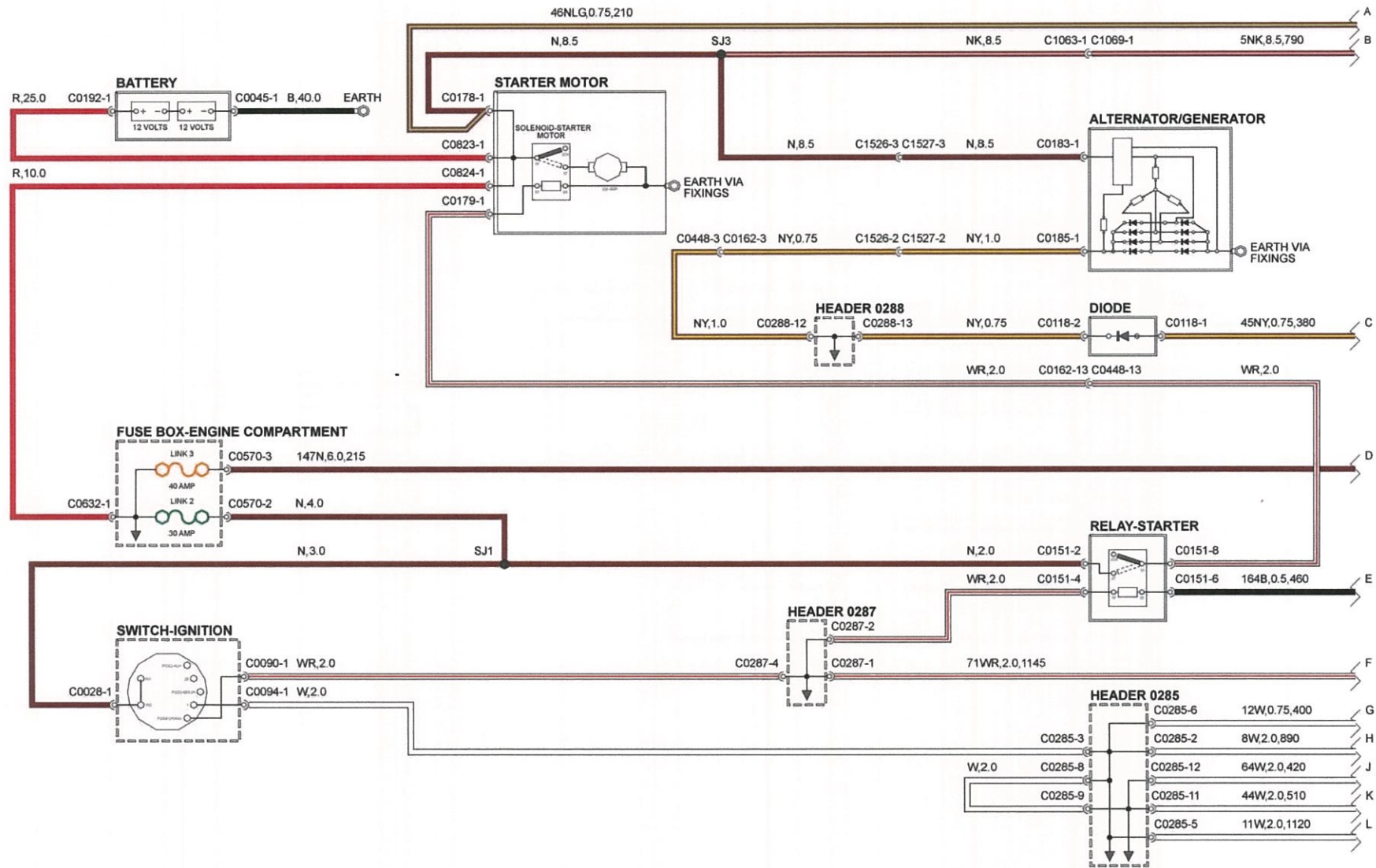


Fig 44 Starting and Charging - FFR

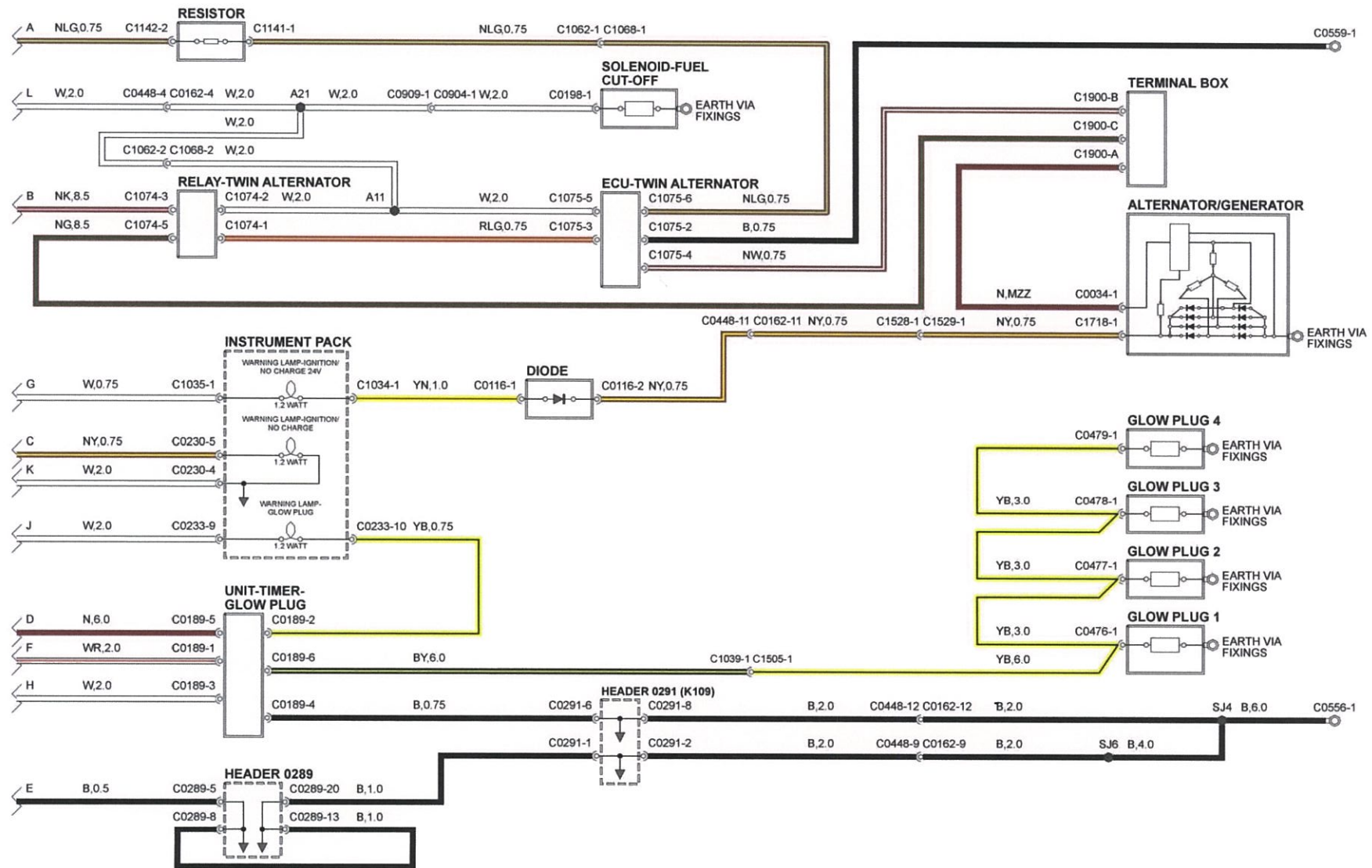


Fig 45 Starting and Charging II - FFR

CHAPTER 13-5

WINTERISED

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- 6 Engine and auxiliary harness assemblies
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INTRODUCTION

1 This chapter covers the technical description for the electrical system as fitted to Truck Utility Light (TUL) HS and Truck Utility Medium (TUM) HS winterised vehicles fitted with the 24 volt electrical system. The information given is applicable to both left and right hand drive vehicles.

GENERAL

2 The electrical system fitted to Truck Utility Light (HS), and Truck Utility Medium (HS) winterised vehicles has been designed to provide a comfortable environment for the user in sub-zero temperatures.

ELECTRICAL SYSTEMS

3 The electrical systems on the TUL and TUM winterised vehicles are made up of three main harnesses: Engine harness, Chassis harness and Main cable assembly harness.

4 In addition, several supplementary harnesses/cables, covering right and left hand wing components, instrument binnacle, radio, convoy lamp, rear body components, wiper link, glow plug link, heater and fuel system are fitted.

5 Connected together these harnesses form the vehicle harness, which supplies power to the instrument panel, switches and controls, interior and exterior lighting. Each harness can be disconnected and separated individually.

Engine and auxiliary harness assemblies

6 The engine and auxiliary harnesses (Fig 1) connect the various electrical components fitted on the engine to the vehicle batteries and main cable assembly harness.

6.1 When the starter switch is turned to position III, an electrical current is sent from the battery to the starter motor, which cranks the engine over.

6.2 When the engine is running, the single drive belt at the front of the engine turns the alternator, which generates electricity to maintain the efficient operation of the vehicle and ancillary equipment.

6.3 The engine harness assembly is made up of the following items:-

6.3.1 Alternator ECU Feed (FFR)

6.3.2 Twin alternator interlink (FFR)

6.3.3 Reverse switch

6.3.4 Diff lock switch

6.3.5 Fuel shut-off switch

6.3.6 Oil pressure switch

6.3.7 Water temperature switch

6.3.8 Alternator connections

6.3.9 EGR valve

6.3.10 Throttle pot

6.3.11 Diagnostics

6.3.12 ECU coolant temp

6.3.13 Starter solenoid (FFR)

6.3.14 Tachometer

6.4 There are various ancillary leads within the engine bay area that are not part of the engine harness assembly, but functional to the engine itself. There are also leads supplying other components within the electrical system, but will be mentioned in this paragraph.

6.5 Earth lead (part of negative earth cable). The earth lead, which connects the engine/gearbox assembly to the chassis, is fitted to prevent the drive train becoming live and, therefore, prevent electric shocks.

6.6 Low brake fluid level indicator. The lead runs from the top of the brake fluid reservoir to the main cable harness and operates the brake warning light in the instrument panel should the fluid level become low.

6.7 Brake pedal stop switch. The lead runs from the switch mounted on top of the brake pedal box to the main cable assembly harness. The switch operates the stop lights at the rear of the vehicle when the brake pedal is depressed.

7 The following list identifies the electrical components location and their harness route within the engine bay area:-

7.1 Water temperature switch lead. Routes from the thermostat housing through the engine harness to the main cable assembly harness. Colours: Green/blue

- 7.2 Engine harness leads (5 off). Route from the starter solenoid to the main cable assembly harness. Colours: White/red, Brown (4 off) Brown/light green (FFR)
- 7.3 Heater plug lead (1 off). Routes from the main cable assembly harness to No.1 heater plug on the RH side of the cylinder head. Colours: Brown /yellow
- 7.4 Heater plug connecting leads (3 off). Route from No.4 cylinder heater plug to the three other heater plugs. Colours: Yellow/black
- 7.5 Alternator leads (3 off). Route from the rear of the alternator through the engine harness assembly to the main cable assembly harness. Colours: Brown/yellow, Brown, Brown.
- 7.6 Fuel cut-off solenoid lead. Routes from the fuel injection pump through the engine harness assembly to the main cable assembly harness. Colours: White.
- 7.7 Oil pressure switch lead. Routes from the oil filter housing through the engine harness assembly to the main cable assembly harness. Colours: White/brown
- 7.8 Positive battery cable. Routes from the starter motor to the vehicle battery and inter vehicle socket. Colour: Red
- 7.9 Negative earth cable. Routes from vehicle battery to inter vehicle socket and transfer box casing via chassis earthing point. Colour: Black
- 7.10 Battery link cable. Links both batteries, negative to positive. Colour: Red.
- 7.11 Low brake fluid level indicator lead (2 off). Route from the brake fluid reservoir to the main cable assembly harness. Colour: Black/white, Black.
- 7.12 Brake pedal stop switch leads. Route to from the pedal box to the main cable assembly harness. Colour: Green/purple, Green/yellow
- 7.13 Webasto heater connection. (Grey plug) From main harness to Webasto RFI filter.

Chassis and rear body harness assemblies

8 The chassis and rear body harnesses (Fig 2) connect the rear lamps and fuel tank to the main cable assembly harness. The stop lights and number plate lamp are connected directly to the chassis harness but the side, indicator, fog, and reverse lamps, share supplementary rear body harnesses. The convoy lamp and fuel tank have separate harnesses.

- 8.1 The chassis harness assembly is made up to connect to the following items:
- 8.1.1 Stop lights
 - 8.1.2 Convoy lamp
 - 8.1.3 Trailer socket
 - 8.1.4 Number plate lamp
 - 8.1.5 Rear lamps
 - 8.1.6 Rear fuel tank connection, (TUM and Field Ambulance only)
 - 8.1.7 Rear wiper motor
 - 8.1.8 Reverse light

- 8.1.9 Fog lamps
- 8.1.10 Tail lights
- 8.1.11 Rear directional indicators
- 8.1.12 Gearbox earth.

9 The following list identifies the electrical component locations and their harness route along the chassis.

9.1 Stop lights. Route from stoplights to the chassis cable assembly harness. Colours: Green/purple, black.

9.2 Convoy lamp harness leads (2 off). One routing from the convoy lamp to the chassis harness 6 way connector, the other to earth. Colours: Red/brown, Black.

9.3 Trailer socket leads (12 off). Route from the rear chassis cross member to the chassis harness connecting on the inside of the vehicle. Colours: Unipren (yellow) with lettered identification tags to ensure correct connection to chassis harness leads as follows:

9.3.1 A - Red/brown, B - Green/purple, C - Red/brown, D - Black, E - Red/orange, F - Red/yellow, H - Red/brown, J - Green/purple, K - Purple, L - Black, M - Green/purple, N - Green/purple.

9.4 Number plate lamp leads (2 off). Route from the number plate lamp to a connector on the chassis harness. Colours: Red/orange, black.

9.5 Gearbox earth leads (5 off). Colour: Black.

9.6 Rear tank leads (2 off, TUM only). Route from the fuel tank to the chassis harness via the 3 way connector. Colours: Green/Black, black.

9.7 Chassis harness main connections. Connects the various electrical components, by way of moulded connectors, to the main cable assembly.

9.7.1 Plug 1 (orange). Colours: Red/orange, Red/brown, Red/yellow, Green/red.

9.7.2 Plug 2 (blue). Colours: Green/brown, White/black, Green, Brown/light green.

9.7.3 Plug 3 (grey). Colours: Green/white, Green/purple, Red/light green, Purple.

9.7.4 Plug 4 (black). Colours: Green/black

9.8 Rear lamp harnesses. Separate harnesses, for LH and RH lamps, which connect to the chassis harness assembly via two 6 way connectors. Colours: LH - Red/yellow, Green/red, Red/orange, Black. RH - Green/brown, Red/yellow, Green/white, Red/orange, Black. Green/purple.

Main cable harness assembly

10 The main cable harness assembly (Fig 3) connects to the front lamps, chassis harness, engine harness and the various instruments, switches and indicators within the vehicle.

- 10.1 The main cable assembly harness is made up to connect to the following items:
 - 10.1.1 Warning light panel
 - 10.1.2 Instrument panel

- 10.1.3 Windscreen washer pump
- 10.1.4 Wiper motor
- 10.1.5 Horn/indicator/Dip switch
- 10.1.6 Ignition switch
- 10.1.7 Hazard warning switch
- 10.1.8 Rear fog switch
- 10.1.9 Heater/blower motor
- 10.1.10 Map reading lamp
- 10.1.11 Main lighting switch
- 10.1.12 Inspection sockets
- 10.1.13 Relays
- 10.1.14 Headlamp levelling switch
- 10.1.15 Headlamps and side lamps
- 10.1.16 Headlamp levelling motors
- 10.1.17 Indicators
- 10.1.18 Brake fluid level switch
- 10.1.19 Glow plug timer
- 10.1.20 Main fuse box
- 10.1.21 Side tank connections
- 10.1.22 Heated rear windscreen switch and warning lamp
- 10.1.23 Heated front windscreen switch and warning lamp.
- 10.1.24 Webasto heater connections
- 10.1.25 Stop light switch
- 10.1.26 Ammeter (FFR)
- 10.1.27 Radio

11 The following list identifies the electrical components, their location and harness route within the vehicle and engine bay area:

11.1 In-line resistors and diodes . Integral within the main cable assembly harness and are replaceable.

11.1.1 Diode leads (3 off) . Colours: Brown/yellow, Yellow/brown. Light green/purple, Brown/light green.

- 11.1.2 In-line resistor lead. Colours: Yellow/blue, Blue/green.
- 11.2 Warning light leads. Grouped into two and plugged into the rear of the warning light housing mounted in the instrument binnacle and routed to the main cable assembly harness.
- 11.3 Plug 1 (natural)
 - 11.3.1 Oil pressure. Colours: White/brown, White.
 - 11.3.2 Ignition. Colours: Yellow/brown.
 - 11.3.3 Brake circuit. Colours: Black/white.
 - 11.3.4 Direction indicators. RH - Green/white, LH - Green/red
- 11.4 Plug 2 (natural)
 - 11.4.1 Trailer. Colours: Light green/purple
 - 11.4.2 Earth. Colours: Black
 - 11.4.3 Side lights. Colours: Red/black
 - 11.4.4 Fog lights. Colours: Red/yellow
 - 11.4.5 Main beam. Colours: Blue/white, Brown/light green
 - 11.4.6 Differential lock. Colours: Black/blue, White
 - 11.4.7 Glow plug. Colours: Yellow/black
- 11.5 Horn, directional indicators, Dip switch and wash wipe switch. Located on the steering column and routed to the main harness assembly. (14 way moulded connector) Colours: Blue, Green/white, Light green/brown, Green/red, Blue/white, Blue/red, Purple, Purple/black. Blue/light green, Light green/black, White/green, Yellow/light green, Red/light green, Green.
- 11.6 Hazard switch. Located on the fascia in the auxiliary switch. Plugged into the rear of the panel and routed to the main harness assembly. (8 way black connector) Colours: Black/red, Light green/Brown, Green/red, Green/white, Light green, Purple, Green/yellow.
- 11.7 In line resistor 2.7k 0.5 watt. Located behind the fascia. Routed into the main harness assembly. Colours: Yellow blue, Blue yellow.
- 11.8 Flash. (2 way natural connector) Colours: Green/red, green/white.
- 11.9 Rear fog switch. (5 way black connector) Located on the fascia in the auxiliary switch panel. Plugged into the rear of the panel and routed to the main harness assembly. Colours: Blue/purple, Red/yellow.
- 11.10 Headlight level switch. (5 way natural connector) Located on the fascia in the auxiliary switch panel. Routed to the main harness assembly. Colours: Blue/black, Yellow/blue, Green/blue.
- 11.11 Ignition switch. (4 single natural connectors) Located on the steering column. Routed to the main harness assembly. Colours: Brown, Brown, White, White/orange, White/red.
- 11.12 Instruments. Located on the fascia and plugged into the rear of the instrument binnacle. Routed to the main harness assembly (6 way connector grey connector). Colours: Green/blue, Black, Green, Green, Red/orange, Green/black.

11.13 Heater fan switch. Located on the fascia on the side of the instrument binnacle and plugged into the rear of the binnacle. Routed to the main harness assembly (3 way light grey connector). Colours: Green/slate, Green/yellow, Black.

11.14 Inspection sockets. Located on the fascia in the centre panel. Plugged into the rear of the panel (2 single black connectors). Colours: Black, Purple.

11.15 Wiper motor. Located behind the fascia lower panel and plugged into the wiper motor. Routed to the main harness assembly (6 way grey connector). Colours: Black, Brown/light green, Blue/light green, Green, Green, Red/light green.

11.16 Blackout lighting. Located in the fascia centre. Plugged into the rear of the panel and routed to the main harness assembly. (2 off 4 way connectors).

11.16.1 Plug 1 (black). Colours: Red/white, Blue, Red, Red/Brown.

11.16.2 Plug 2 (natural). Colours: Brown, Brown/white.

11.17 Map reading light. (2 way natural connector) Located on the fascia in the centre panel. Plugged into the rear of the panel and routed to the main harness assembly. Colours: Purple/white.

11.18 Map reading light switch. (5 way black connector) Located on the fascia in the centre panel. Plugged into the rear of the panel and routed to the main harness assembly. Colours: Purple/white, Purple,

11.19 Relays. Located below the fascia behind the fuse box cover. Routed into the main harness assembly.

11.19.1 Brake check relay (Black). Colours: Black, Black, White/red, Black/white.

11.19.2 Start relay (Black). Colours: White/red, White/red, Black, Brown.

11.19.3 Ignition cont. relay (Black). Colours: White/yellow, White, Black, Green/yellow

11.19.4 Hazard/DI unit (Black). Colours: Light green/purple, Light green, Black, Light green/Brown.

11.19.5 Front wiper delay (Black). Colours: White/green, Yellow/light green, Black, Brown/light green, Light green/black, Green.

11.19.6 Heated front screen relay (Black). Colours: Orange/slate, Purple/yellow, Light green/purple, Purple/orange.

11.19.7 Heated rear window relay (Black). Colours: Purple/brown, White/green, Black, White/black.

11.19.8 Webasto heater relay (Black). Colours: Purple/green, Purple/orange, Black, Purple, Purple/green.

11.20 Fusebox (20 way). Located below the fascia and under the fuse box cover. Routed into the main harness assembly.

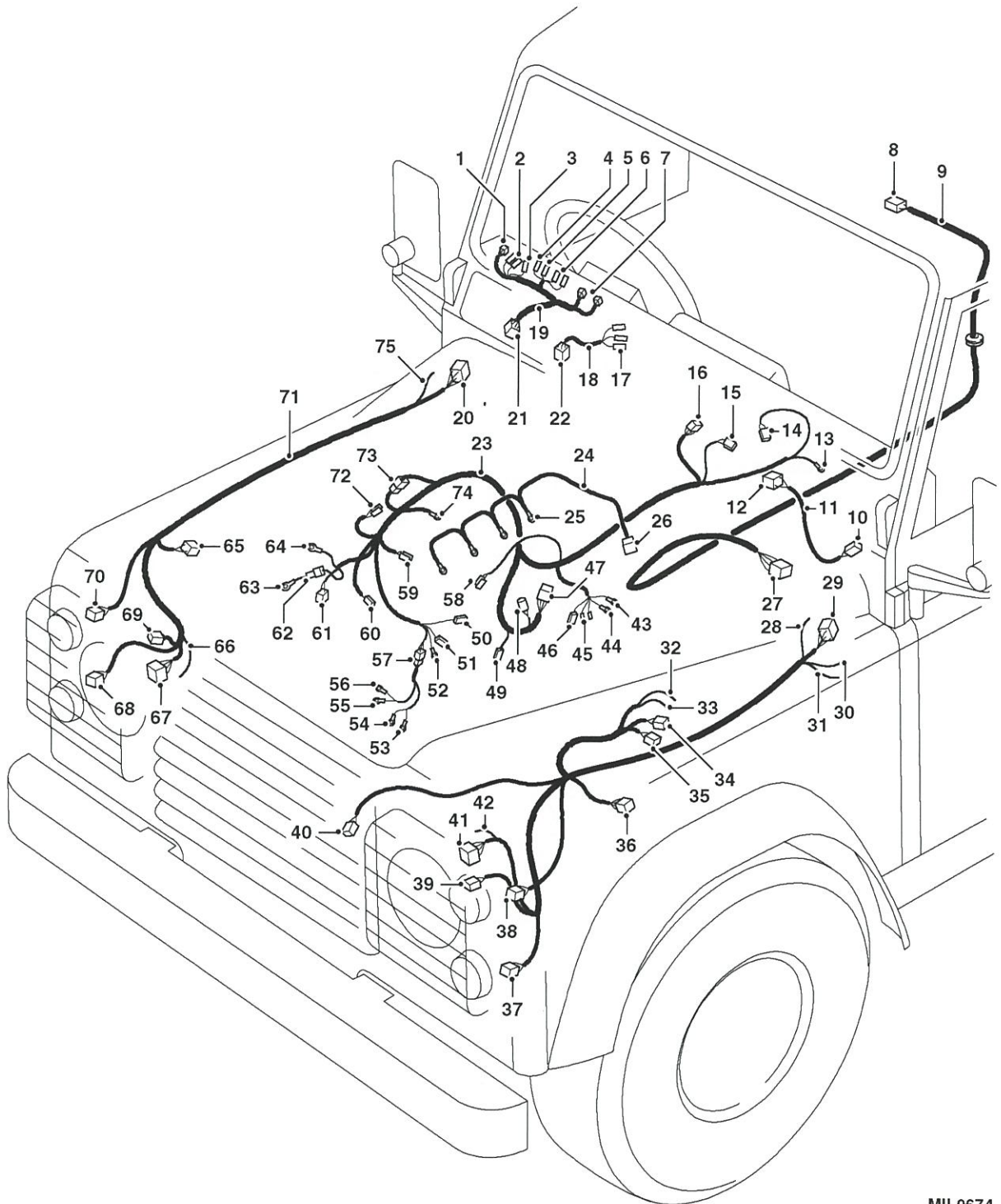
11.21 Plug 1. Colours: 1 Brown/white; 2 Purple; 3 Brown/white; 4 Purple; 5 Brown/white; 6 White/yellow; 7 Blue/white; 8 Blue/orange; 9 Blue/white; 10 Blue/slate; 11 Blue/red; 12 Blue/pink; 13 Blue/red; 14 Blue/black; 15 Red; 16 Black/green; 17 Red/brown; 18 Red/brown; 19 Red; 20 Red/black.

- 11.22 Plug 2. Colours: 1 White, 2 Green, 3 White/orange, 4 Purple/green, 5 Brown, 6 Purple; 7 Brown; 8 Purple, 9 Brown; 10 Purple, 11 Red/white, 12 Red/orange, 13 Blue, 14, Blue/purple; 15 Brown; 16 Purple/brown; 17 Brown; 18 Orange/slate; 19 Brown; 20 Purple.
- 11.23 Brake fluid level. (2 single natural connectors) Located in the engine compartment plugged into the top of the brake fluid reservoir, and is routed to the main harness assembly. Colours: Black, Black/white.
- 11.24 Stop light switch. (2 way grey connector) Located on the brake pedal box and is routed to the main harness assembly. Colours: Green/yellow, Green/purple.
- 11.25 Heater motor. (3 way light grey connector) Located in the engine compartment local to the heater motor and routed to the main harness assembly. Colours: Green/ slate, Green/yellow, Purple/green.
- 11.26 Wash pump. (2 way natural connector, 2 way black connector) Located under the bonnet local to the windscreen wash reservoir and routed to the main harness assembly. Colours: Black, Black/light green, Light green/black.
- 11.27 Glow plug timer. (6 way black connector) Located under the bonnet on the bulkhead. Routed to the main harness assembly. Colours: White/red, Yellow/black, White, Black, Brown, Black/yellow.
- 11.28 Radio. Located inside the vehicle, routed to the main harness assembly. Colours: Black, Red.
- 11.29 Main fuses. Located under the bonnet against the bulkhead. Routed to the main harness assembly. Colours: Brown, Brown, Brown, Brown.
- 11.30 L.H wing connection (Grey 10 way connector). Located under the L.H wing, routed back to the main cable harness assembly. Colours: Green/red, Red/black, Purple/black, Blue/slate, Blue/pink, Light green/black, Black/light green, Blue/green, Black/yellow, Black.
- 11.31 Horn. (2 single natural connectors) Located behind radiator grille plugged into horn. Routed back to main harness assembly. Colours: Purple/black, Black.
- 11.32 Glow plug. (Light grey connector) Located under the bonnet local to glow plugs. Routed back to the main harness assembly. Colours: Black/yellow.
- 11.33 Starter solenoid. (2 way natural connector) Located under the bonnet local to the starter motor, routed back to the main harness assembly. Colours: White/red.
- 11.34 Side Tank connections. (3 way black connector) Located under bonnet local to bulkhead. Routed to main harness assembly. Colours: Green/black, Black.
- 11.35 Chassis connections (3 off 4 way). Located under the bonnet local to the bulkhead. Routed to the main harness assembly.
- 11.35.1 Plug 1. (4 way black connector) Colours: Red/orange, Red/brown, Red/yellow, Green/red.
- 11.35.2 Plug 2. (4 way white connector) Colours: Green/brown, White/black, Green, Brown/light green.
- 11.36 Engine connections. (14 Way grey connector). Located under the bonnet local to the bulkhead. Routed to main harness assembly. Colours: White/brown, Green/blue, Brown/yellow, White, Green/yellow, Green/brown, Black/blue, Black, Black, Black, Brown/yellow, Black, White/red, Black.

- 11.37 R.H wing connector (Grey 10 way). Colours: Green/white, Red/black, Blue/orange, Blue/black, Blue/yellow, Blue/green, Black.
- 11.38 Heated rear window switch (5 way natural connector). Colours: White, White/green.
- 11.39 Heated front windscreen (5 way black connector). Colours: Brown/light green, Black.
- 11.40 Heated rear screen warning lamp (single black connector). Colour: White/black.
- 11.41 Hazard switch warning lamp (single black connector). Colour: Black
- 11.42 Rear wash wipe switch (Green connectors). Colour: Green.
- 11.43 Webasto heater switch (2 off natural single connectors). Colours: Blue/purple, Purple.
- 11.44 Webasto heater (RFI) connector (6 way grey connector). Colours: Purple/orange, Blue/purple, Purple, Brown/green, Blue/green, Black.

KEY TO FIG 1

1	Fuel gauge illumination	39	LH H/L level
2	Fuel indicator 1,2	40	Horn connection
3	Fuel indicator earth	41	LH headlamp
4	Water temperature earth	42	Front breather tube
5	Water temperature gauge illumination	43	Starter solenoid FFR
6	Temperature indicator	44	Starter solenoid
7	Speedo illumination	45	Resistor
8	Radio	46	Starter A
9	Radio harness	47	Engine main harness conns
10	Wiper motor connection	48	2 way econ seal
11	Wiper link harness	49	Twin alternator link
12	Main harness connection	50	EGR valve
13	Earth	51	Alternator C
14	Diff lock	52	Alternator C earth
15	Reverse switch	53	Alternator connection 3
16	Diagnostic socket	54	Alternator connection 2
17	Heater switch connection	55	Alternator connection 1
18	Heater switch harness	56	Tacho connection 1
19	Instrument harness	57	Alternator A,B connection
20	RH wing main harness connection	58	Coolant temperature (ECU)
21	Instrument main harness connection	59	Water temperature
22	Main harness connection	60	Oil pressure switch
23	Engine harness	61	Alternator A connection
24	Glow plug harness	62	Alternator link 1
25	Glow plug connections	63	Alternator CINN 1
26	Glow plug main harness connection	64	Alternator earth
27	Radio main harness connection	65	RH repeater
28	Front breather tube	66	Front breather tube
29	LH wing main harness connection	67	RH headlamp
30	Front washer tube connection	68	RH flasher
31	Rear washer tube connection	69	RH H/L level
32	Front washer tube	70	RH side lamp
33	Rear washer tube	71	RH wing harness
34	Front wash pump	72	Throttle pot
35	Rear wash pump	73	Fuel shut off harness
36	LH repeater	74	Fuel shut off
37	LH flash	75	Front breather tube B
38	LH side lamp		

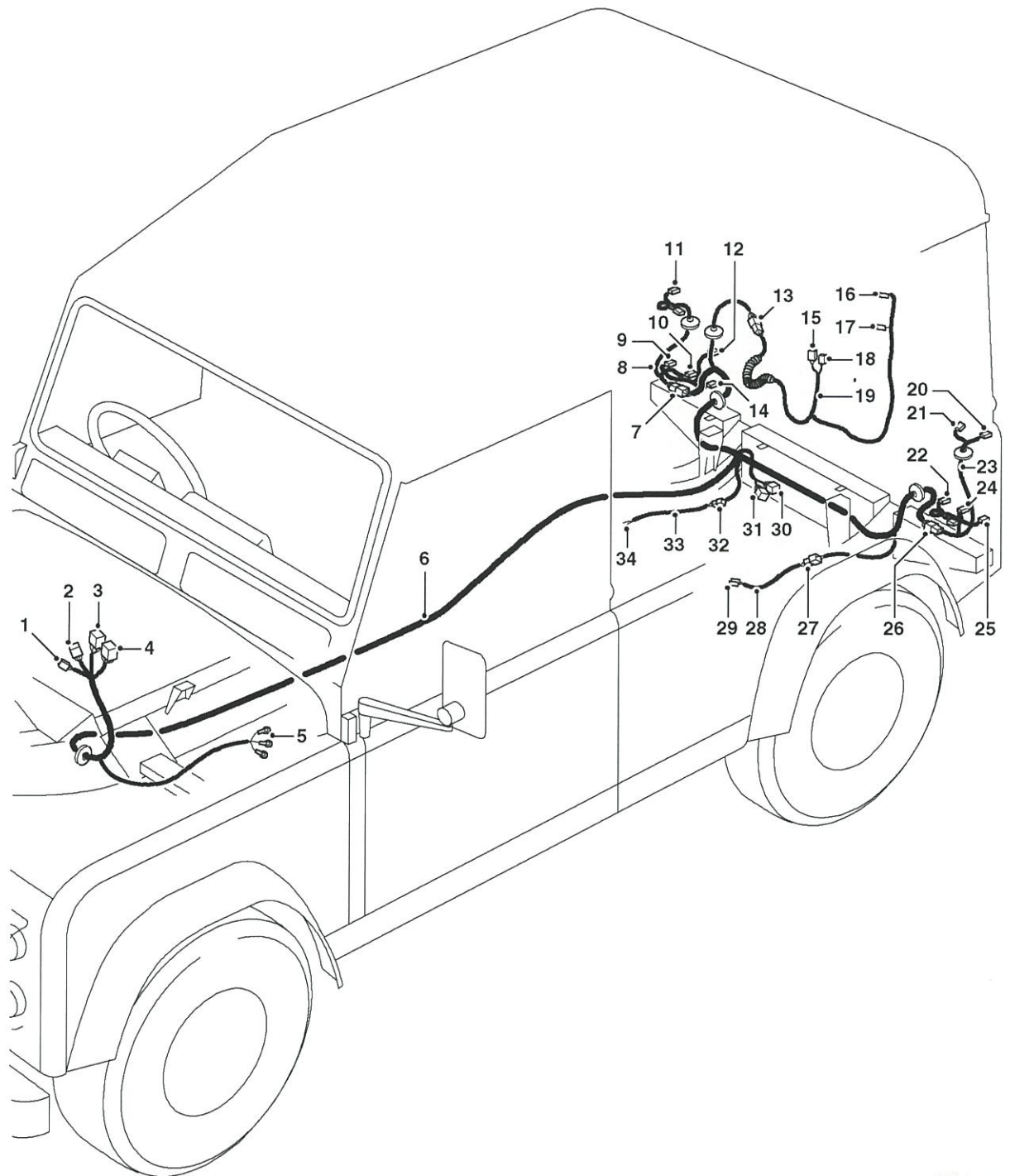


MIL0674

Fig 1 Engine and auxiliary harness assemblies

KEY TO FIG 2

1	Main harness connection 4	18	Wiper park switch
2	Main harness connection 3	19	Rear w/w, rear HS harness
3	Main harness connection 1	20	LH rear stop light
4	Main harness connection 2	21	Number plate light
5	Gear box earths	22	LH rear fog light
6	Chassis harness	23	LH rear body harness
7	RH body connection	24	LH rear indicator flash
8	RH body harness	25	LH tail light
9	RH tank light	26	LH body connection
10	RH rear indicator flash	27	Rear tank connection
11	RH rear stop light	28	Rear tank link
12	Reverse light	29	Rear tank
13	Wiper motor connection	30	Trailer connection 2
14	RH fog lamp	31	Trailer connection 1
15	Wiper motor	32	Convoy light connection
16	Heated rear window	33	Convoy light link
17	Rear window earth	34	Convoy light

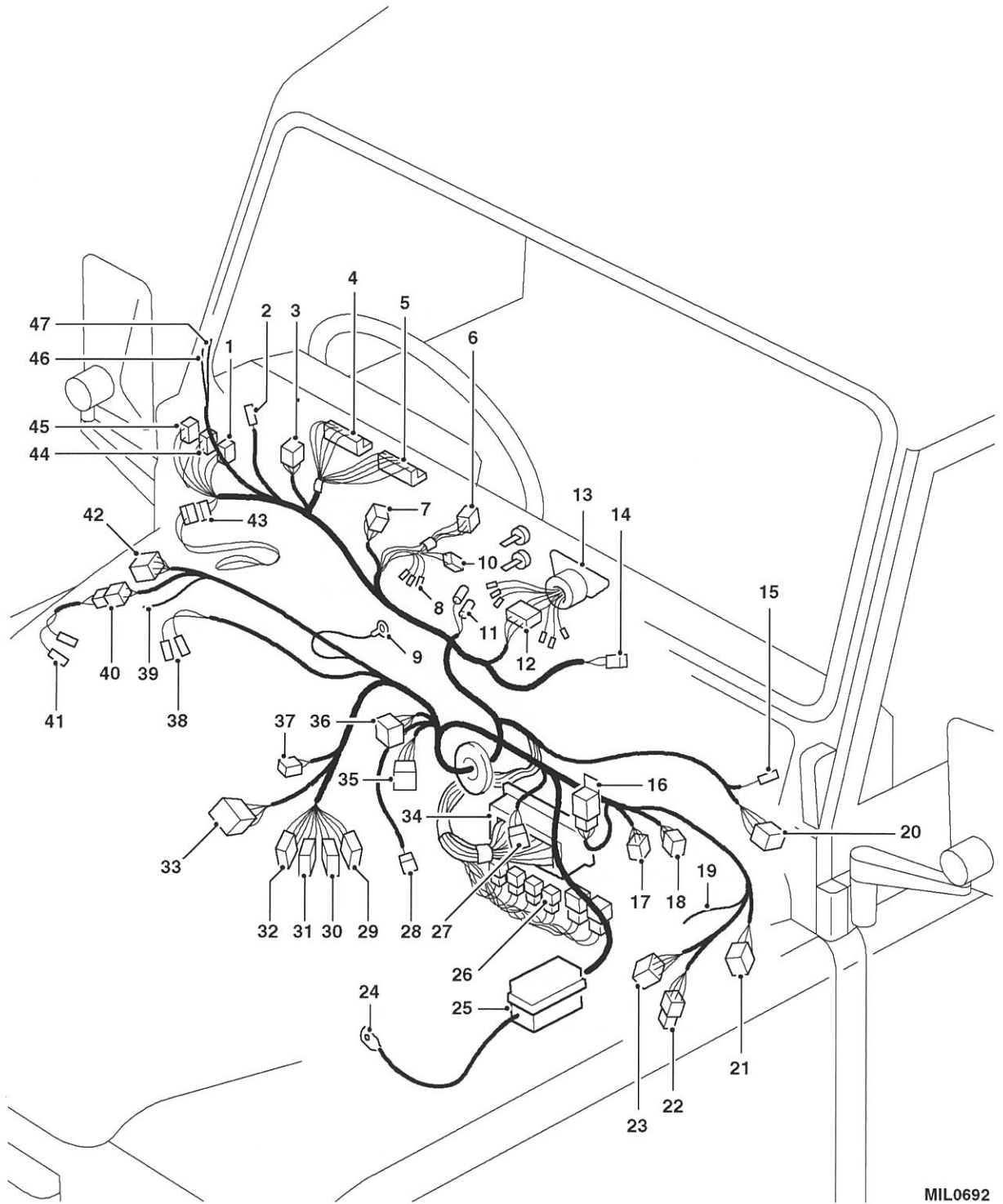


MIL0675

Fig 2 Chassis and rear body harness assemblies

KEY TO FIG 3

1	H/L level switch connection	25	Main fuse box
2	HFS connectio	26	Relays
3	Instrument harness connection	27	Webasto RFI connection
4	Warning lamp 1	28	Glow plug connection
5	Warning lamp 2	29	Chassis harness connection 1
6	Horn/ DI/Dip/ W/Wipe switch	30	Tank connection
7	Resistor pack connection	31	Chassis harness connection 3
8	Ignition switch	32	Chassis harness connection 2
9	Earth	33	Engine harness connection
10	Heater switch	34	Auxiliary fuse box
11	Inspection sockets	35	Header connection 7
12	B.O lighting connection	36	Header connection 1
13	B.O. lighting switch	37	Webasto fuel pump connection
14	Map lamp switch	38	Stop light switch
15	HFS earth	39	Front breather tube B
16	Glow plug timer	40	Brake fluid connection
17	Ammeter illumination	41	Brake fluid switch
18	Radio connection	42	RH wing connection
19	Front breather tube A	43	H/L levelling switch link
20	Wiper motor	44	Hazard switch connection
21	LH wing connection	45	Fog lamp switch connection
22	Heater blank	46	Front breather tube A
23	Heater motor	47	Front breather tube B
24	Starter motor connection		



MIL0692

Fig 3 Main cable harness assembly

HOW TO USE THE CIRCUIT DIAGRAMS

12 The circuit diagrams are presented with Power and Earth distribution first, followed by individual circuits for each electrical system on the vehicle.

Power distribution

13 The power distribution diagram shows the connections from the battery to the engine and fuse boxes. It also shows the internal circuitry of the fuse boxes.

13.1 The fuse box details are followed by the earth distribution diagram.

13.2 The Header joints, Splices and centre taps sections follow on outlining the way in which internal harness splices and header joints distribute power in the harness.

13.3 This information should be used during diagnosis of electrical faults to check symptoms in associated circuits and narrow down the search area.

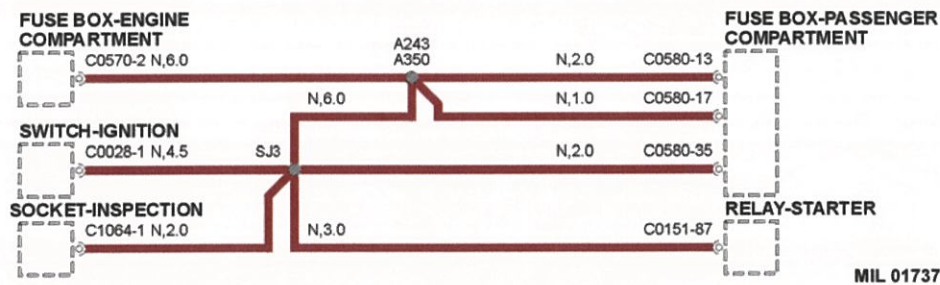


Fig 4 Power distribution

Headers, splices and centre taps

14 Header and splice circuits present the joint(s) and wiring up to the first component. Splices are identified by a number with an alphabetical prefix and wire colour.

Wire attributes

15 Additional information separated by a “,” is shown along side the wire colour.

15.1 Wire gauge is the cross sectional area of the wire in square millimetres. This is included to help in selecting the correct wire during harness repair.

15.2 Wire length (Power and Earth distribution only) is the length of wire in millimetres. This can be used to locate internal harness splices; look for the shortest wire between the joint and connector. For example, it can be seen that C0570-2 is 730 mm from joint A350 (refer to Fig 4).

Connectors

16 Header joints are identified by their corresponding connector number with a numbered suffix to indicate the pin-out detail of wire, i.e. C0580-4 identifies connector 0580, pin number 4 (refer to Fig 5). Wire insulation colour is identified in the normal way. Where wires have a predominant colour with a secondary colour stripe, the main colour is identified first, i.e. LGS – Light Green with a Slate stripe.

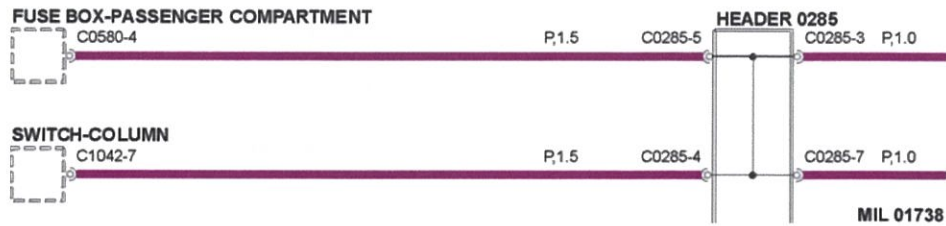


Fig 5 Connectors

Earth distribution

17 The ground distribution section comprises a number of Headers, Splices and centre taps circuits. These are used in a similar manner to those in Power distribution; to narrow the search area by checking for fault symptoms in associated circuits.

Line types

18 Fig 6 means that the wire connects to another circuit.

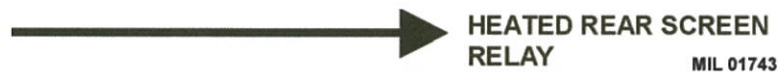


Fig 6 Line types I

19 The “cup and ball” symbol indicates the male and female halves of the connector (refer to Fig 7).

19.1 Plug on lead, fly lead (Fig 7 (A)), wired directly to the component.

19.2 Connector plugs directly into circuit (Fig 7 (B)).

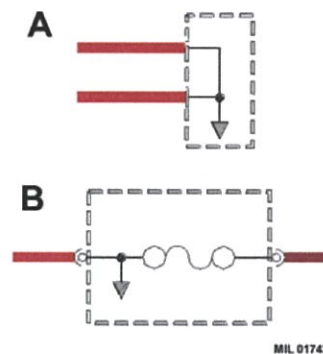


Fig 7 Line types II

Components

20 The name, or description of the component is shown. A dotted outline indicates that the component is not shown in its entirety.

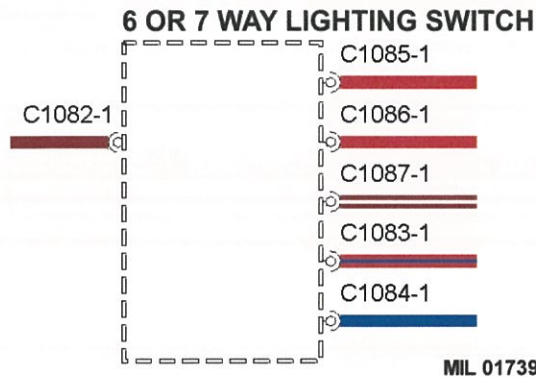


Fig 8 Components

Earth points

21 Earth points are identified with an eyelet symbol and a connector number, except where components are grounded through their fixings, when only the eyelet is shown.

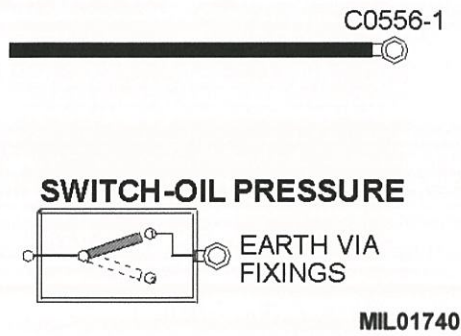


Fig 9 Earth points

Fuses and diodes

22 Fusible links (refer to Fig 10 (A)) and current fuses (B), are identified as shown. The direction of the arrow in a diode symbol (C) indicates the direction of flow. The Zener diode (D) prevents current flow until a precise voltage is reached.

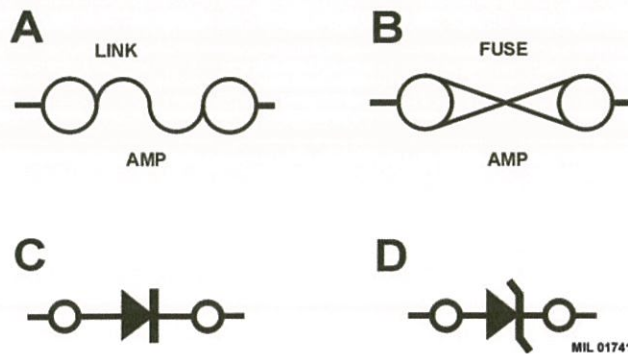


Fig 10 Fuses and diodes

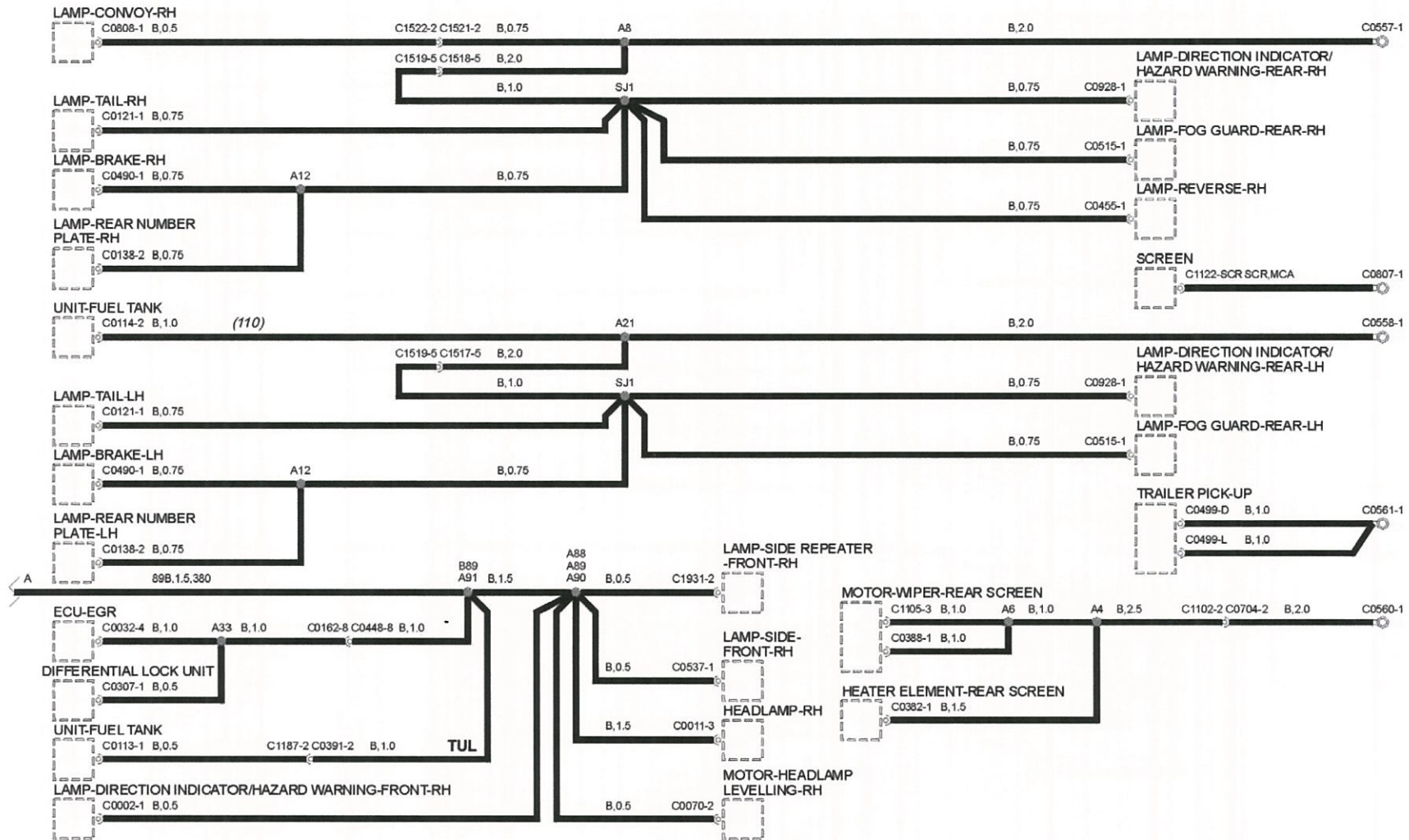


Fig 12 Earth distribution II

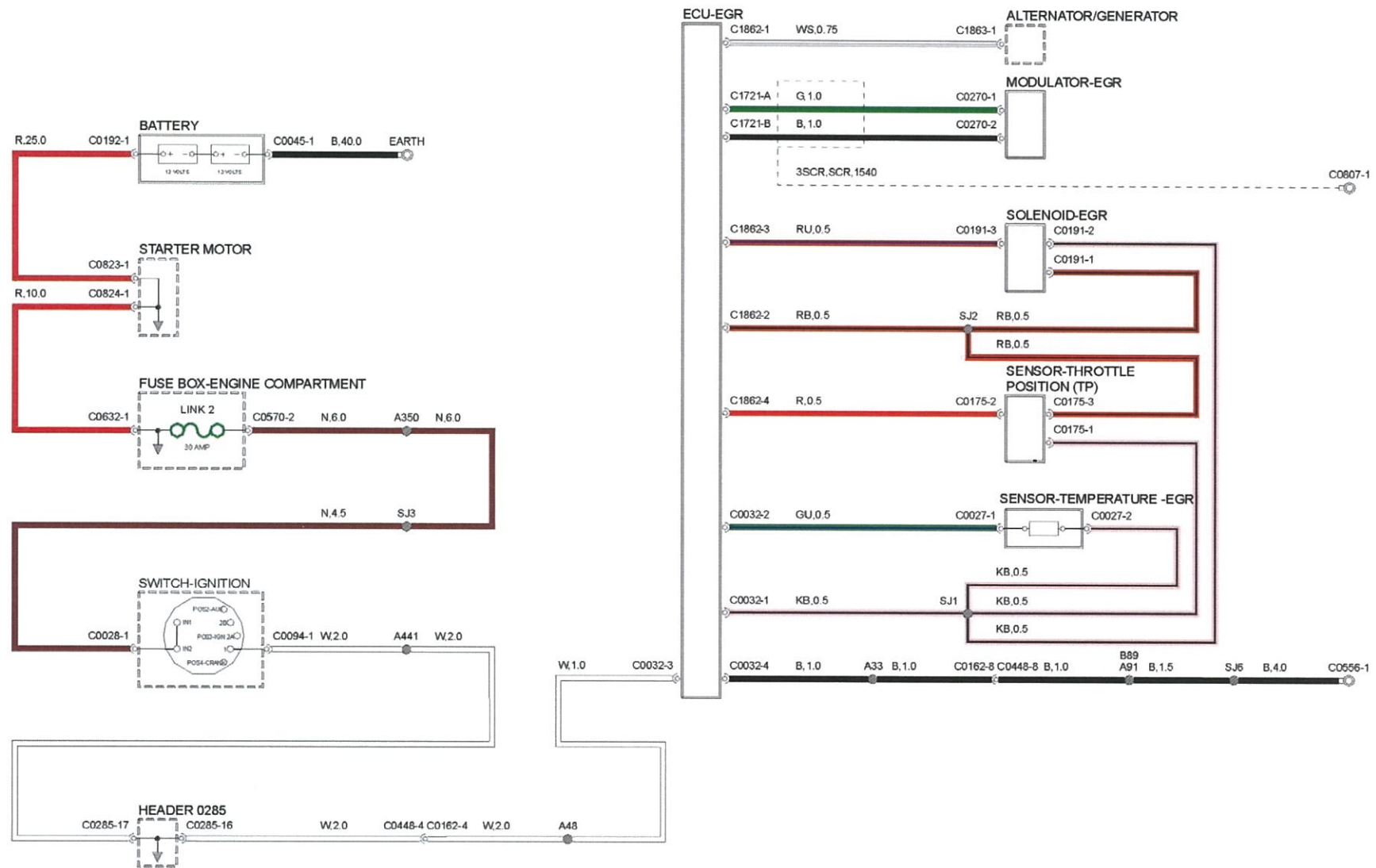


Fig 13 EEGR

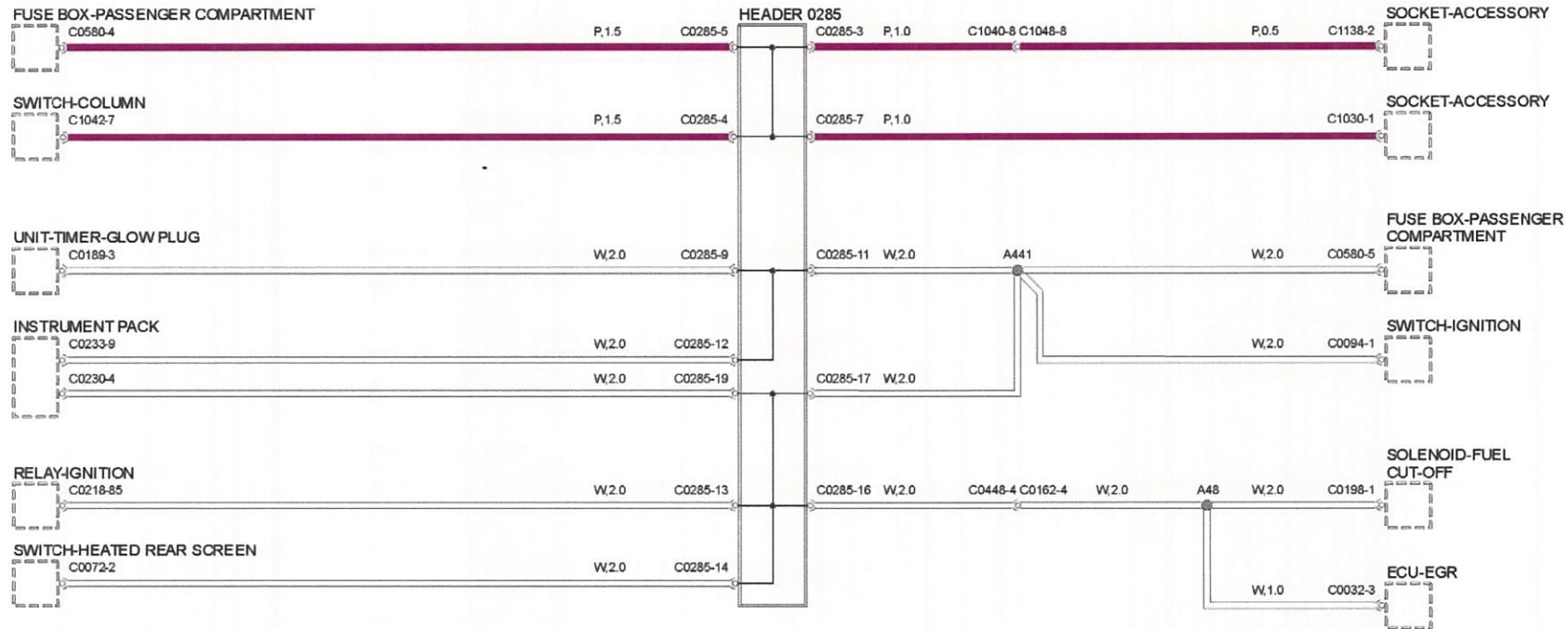


Fig 14 Header joints

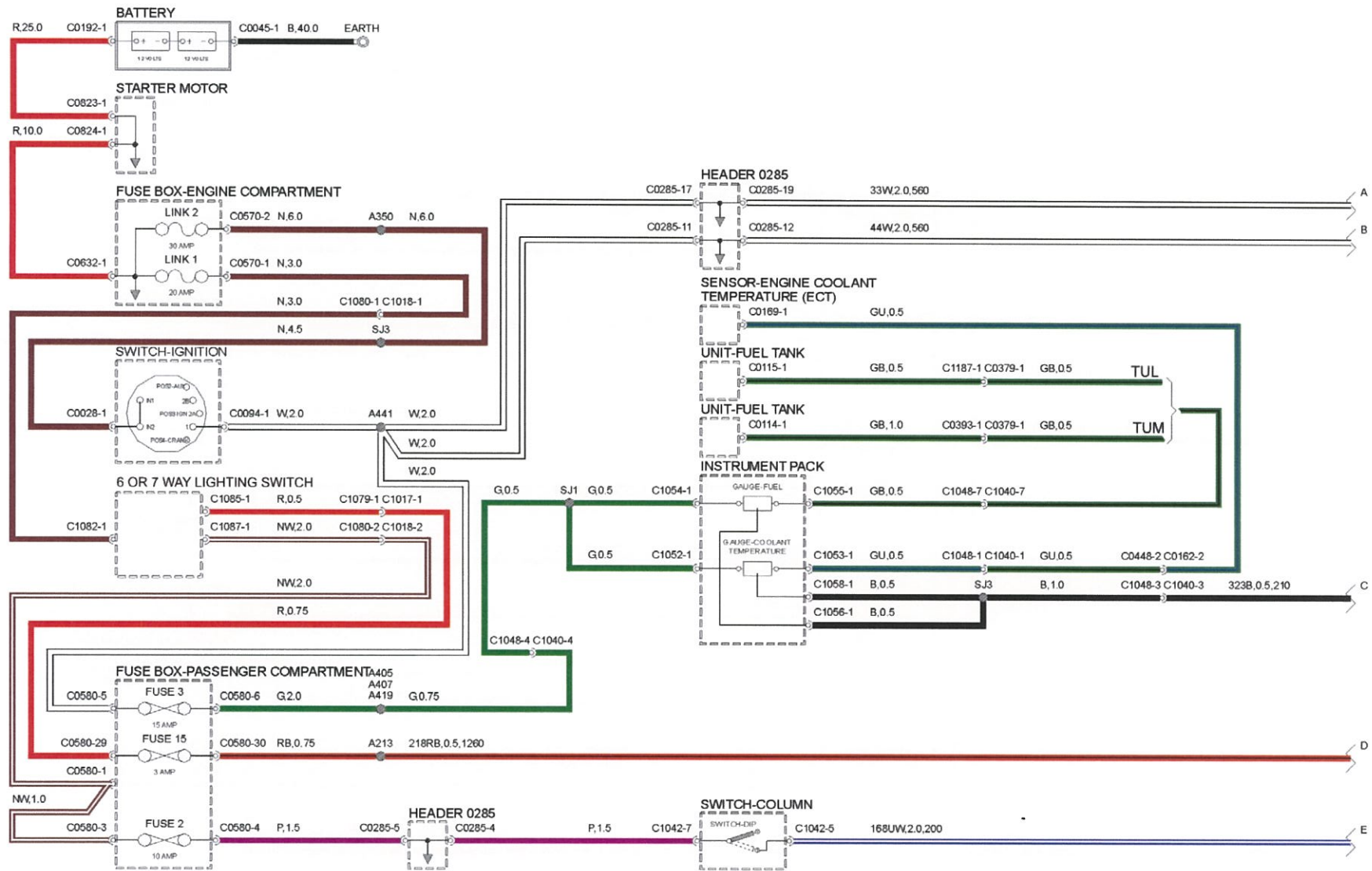


Fig 15 Instruments I

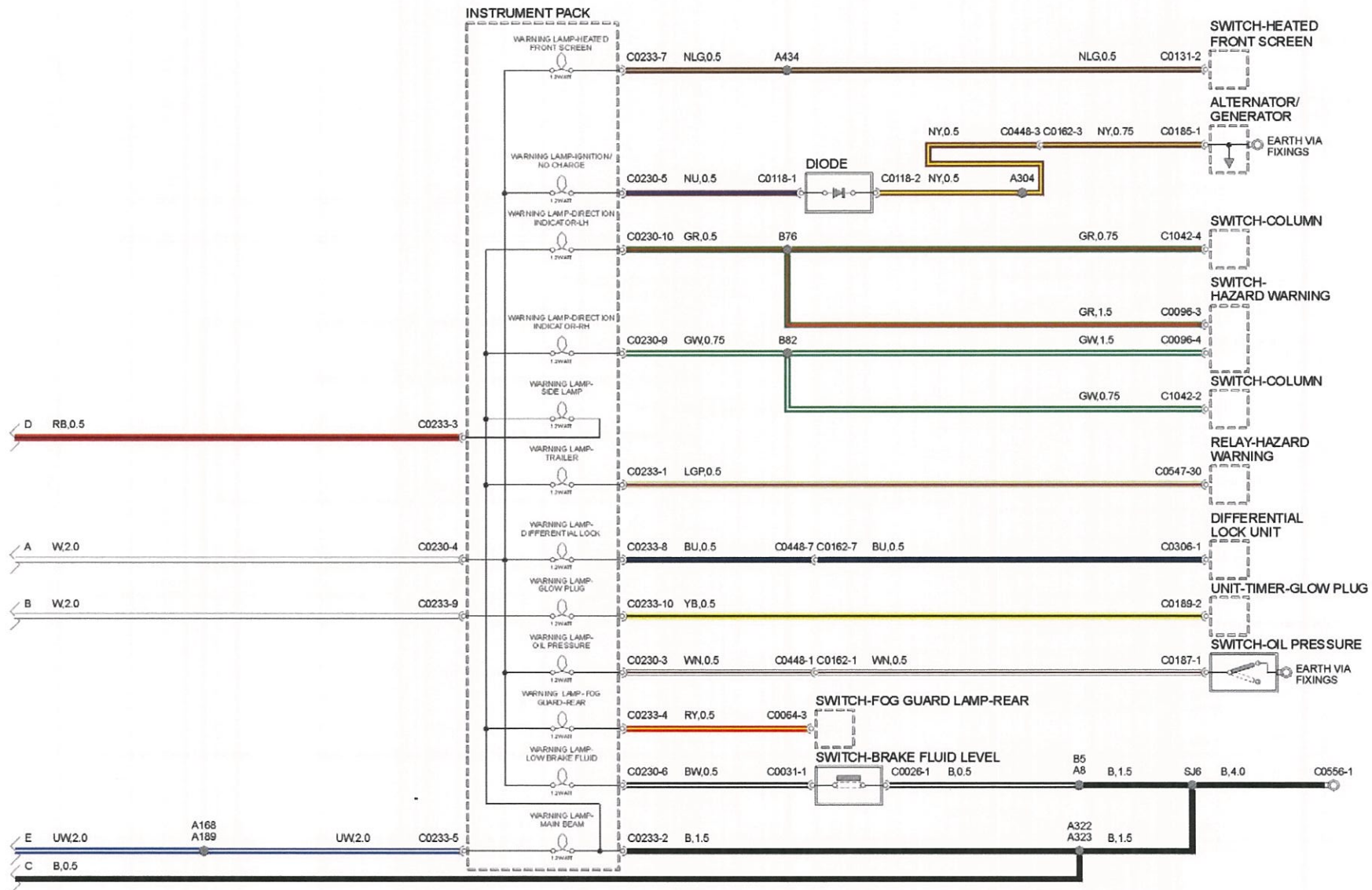


Fig 16 Instruments II

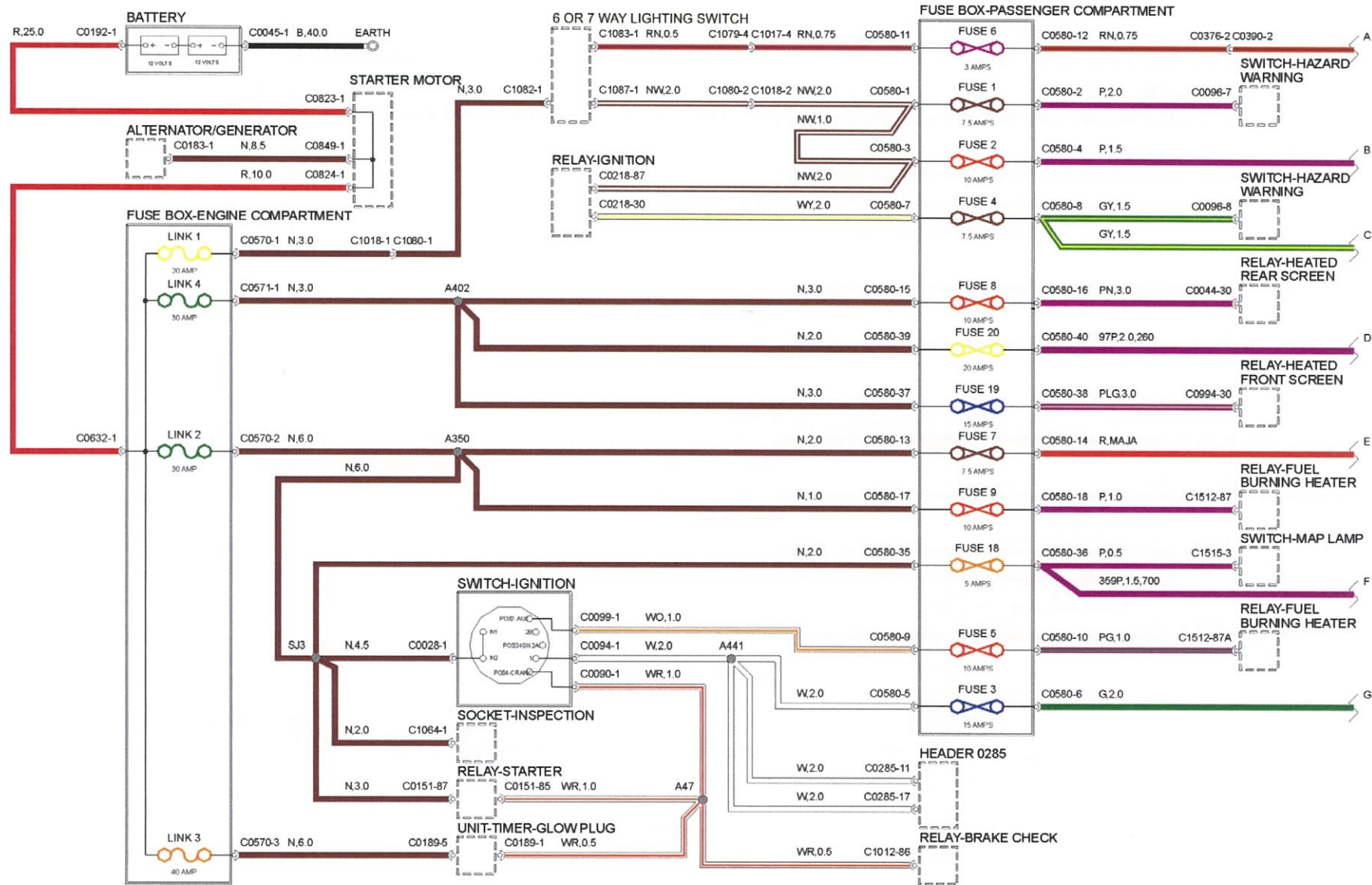


Fig 17 Power distribution I

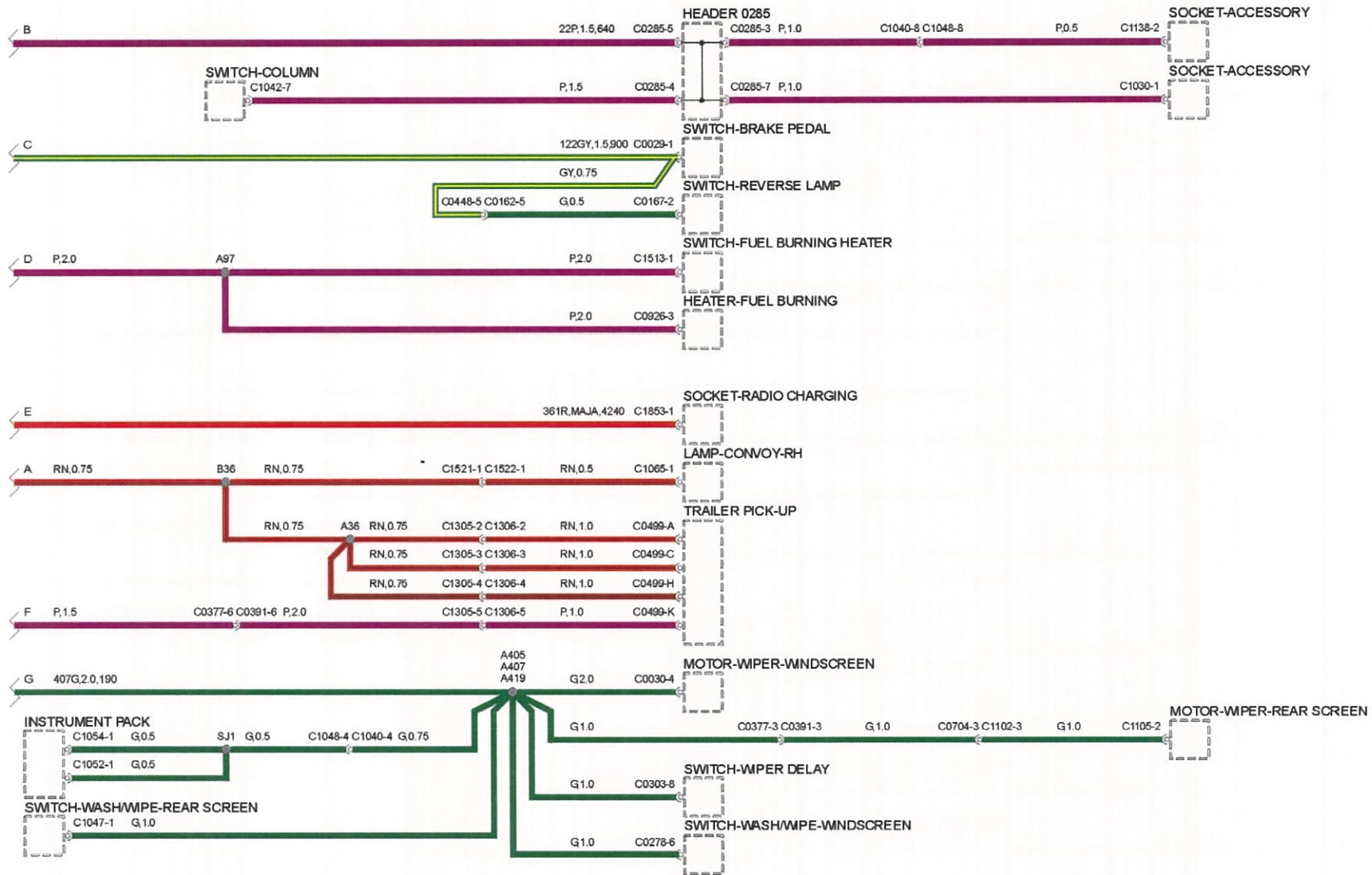


Fig 18 Power distribution II

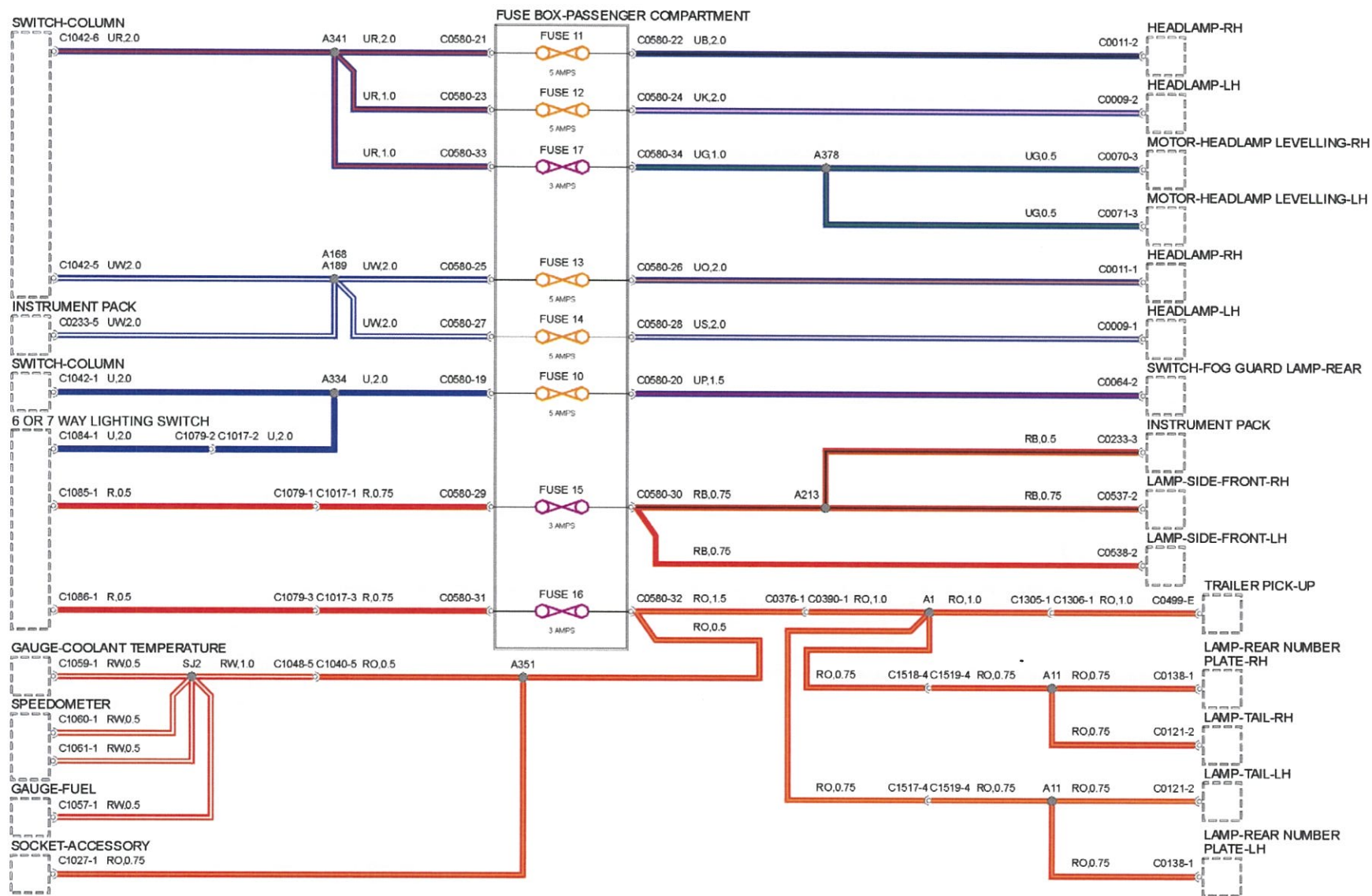


Fig 19 Power distribution III

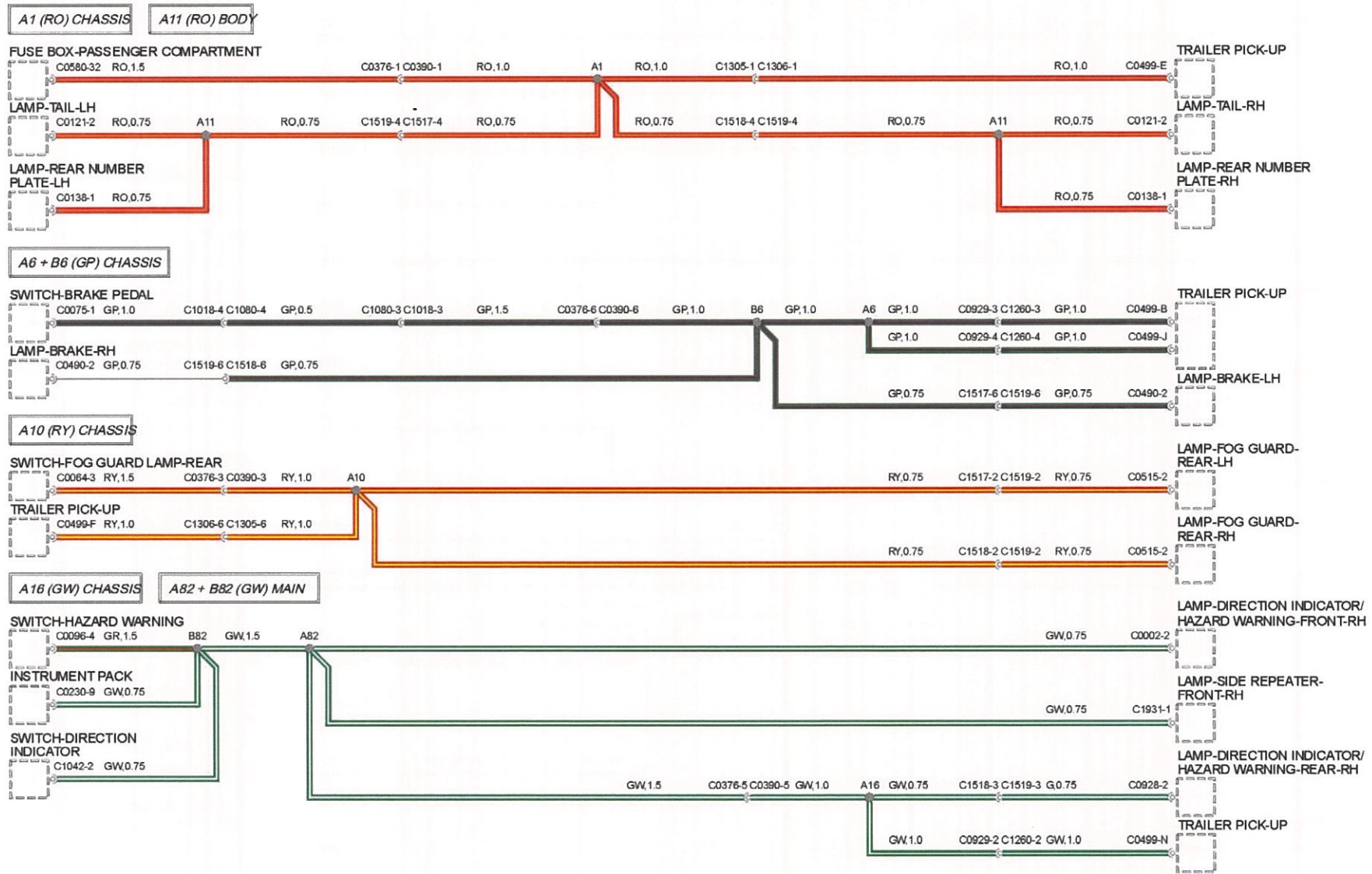


Fig 20 Splices and Centre taps I

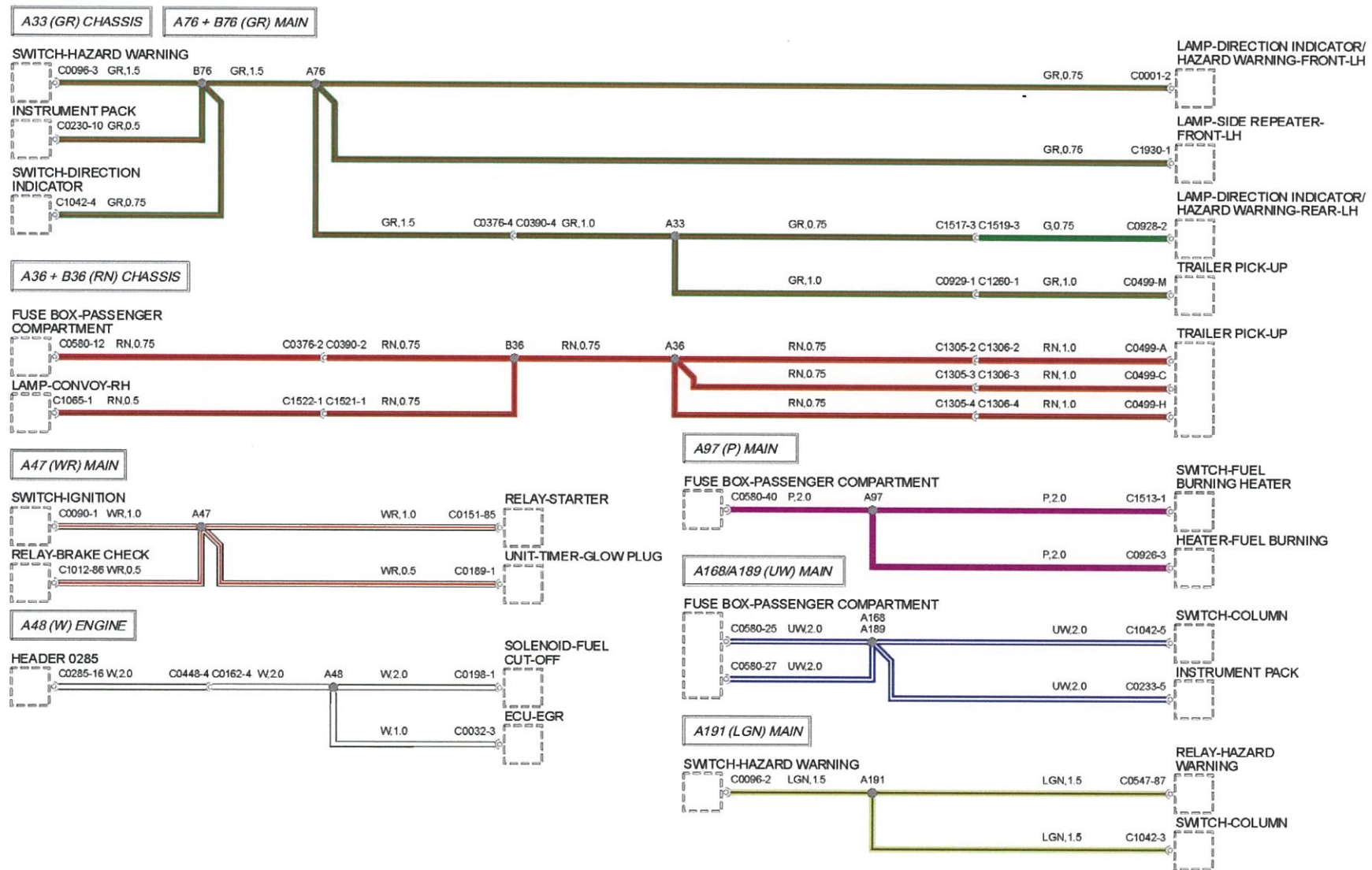


Fig 21 Splices and Centre taps II

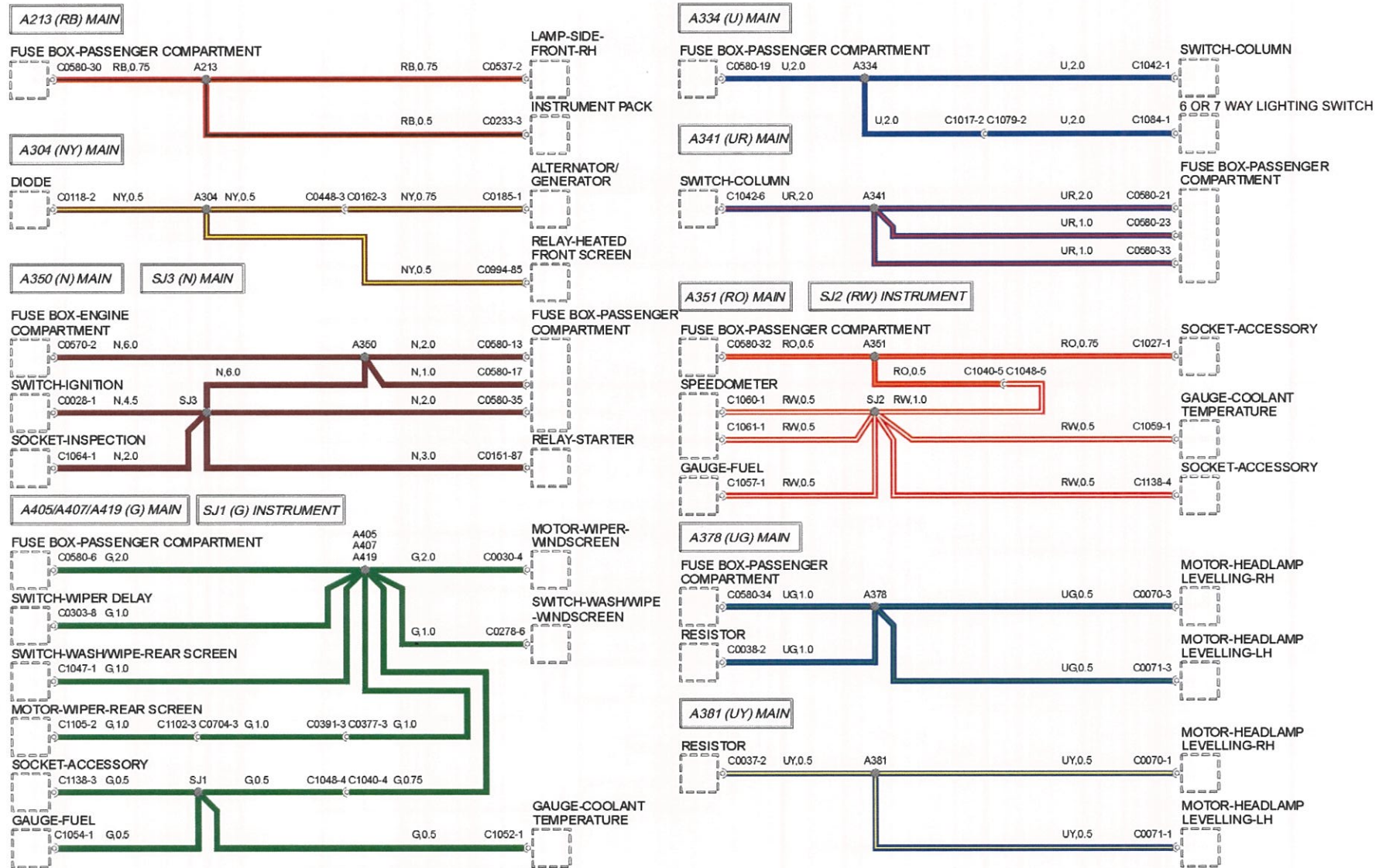


Fig 22 Splices and Centre taps III

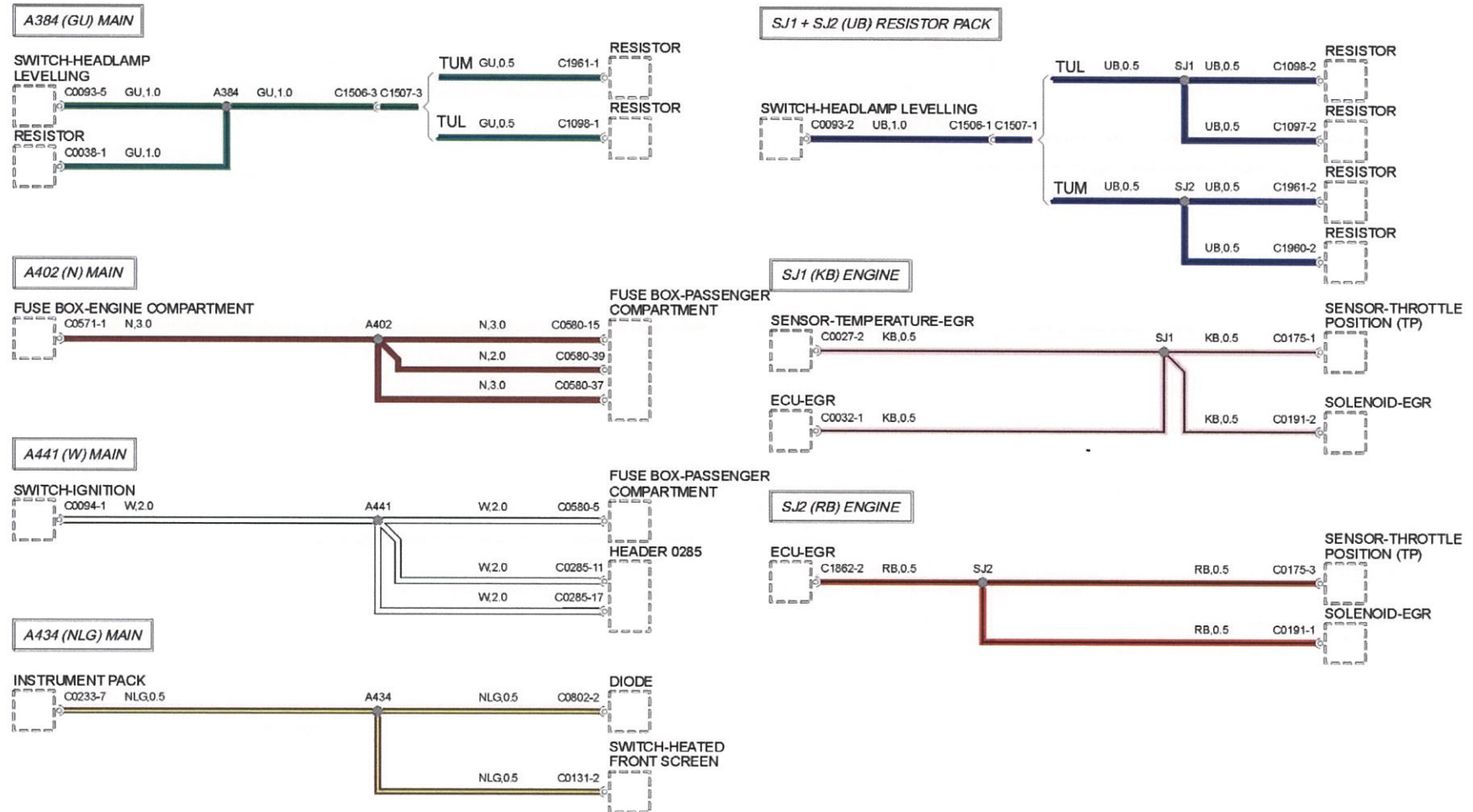


Fig 23 Splices and Centre taps IV

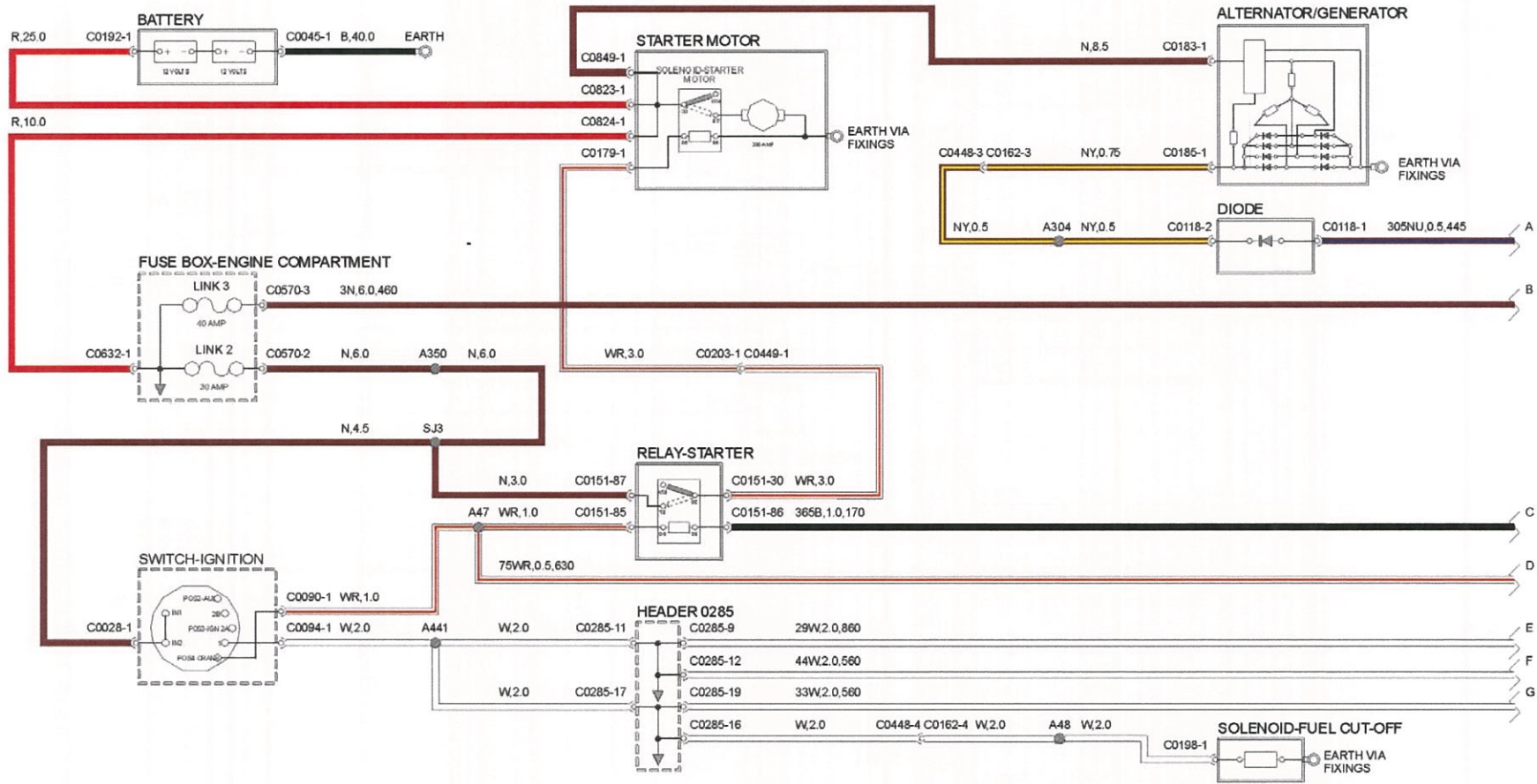


Fig 24 Starting and Charging I

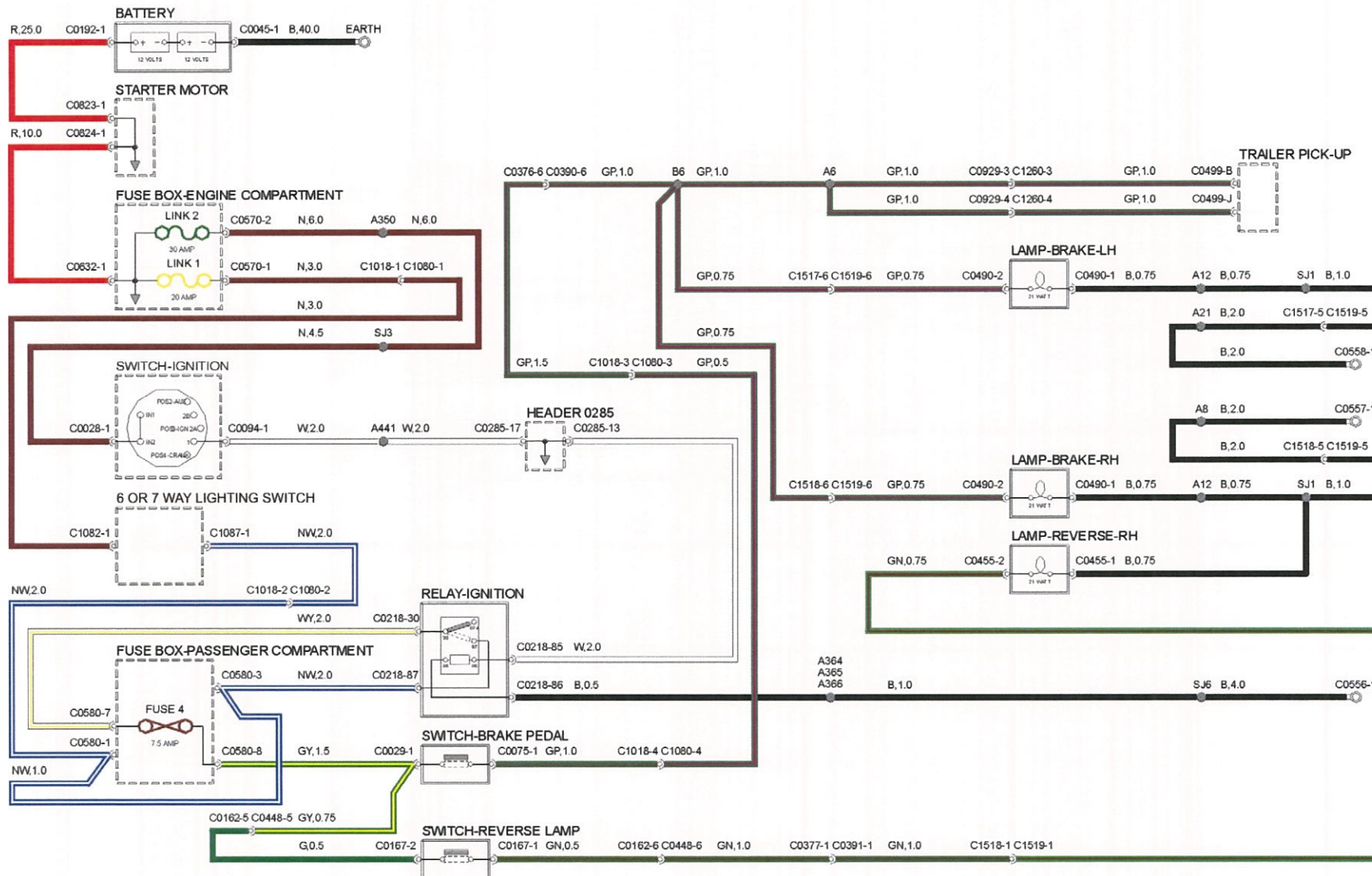


Fig 26 Brake reverse lamps

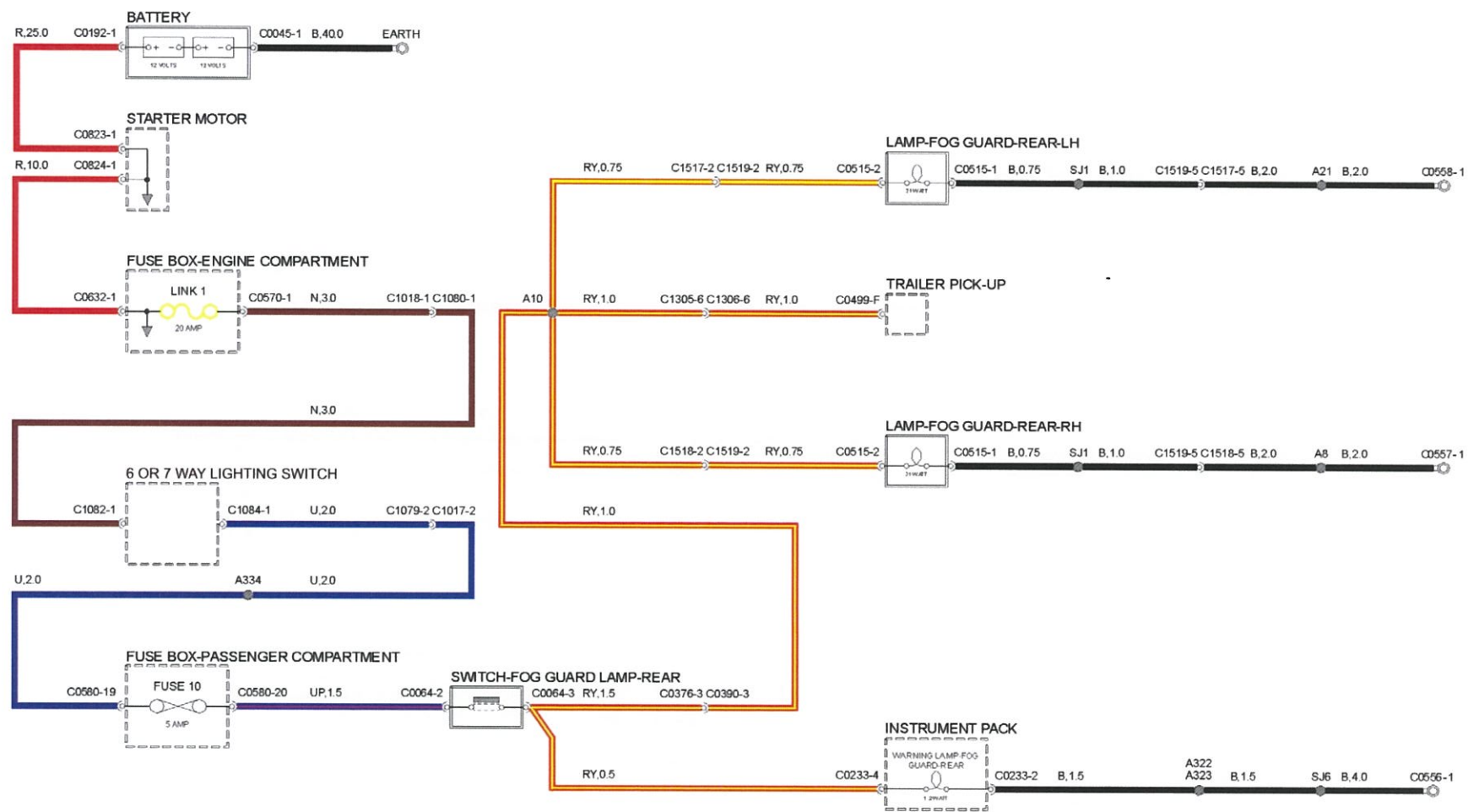


Fig 27 Fog lamps

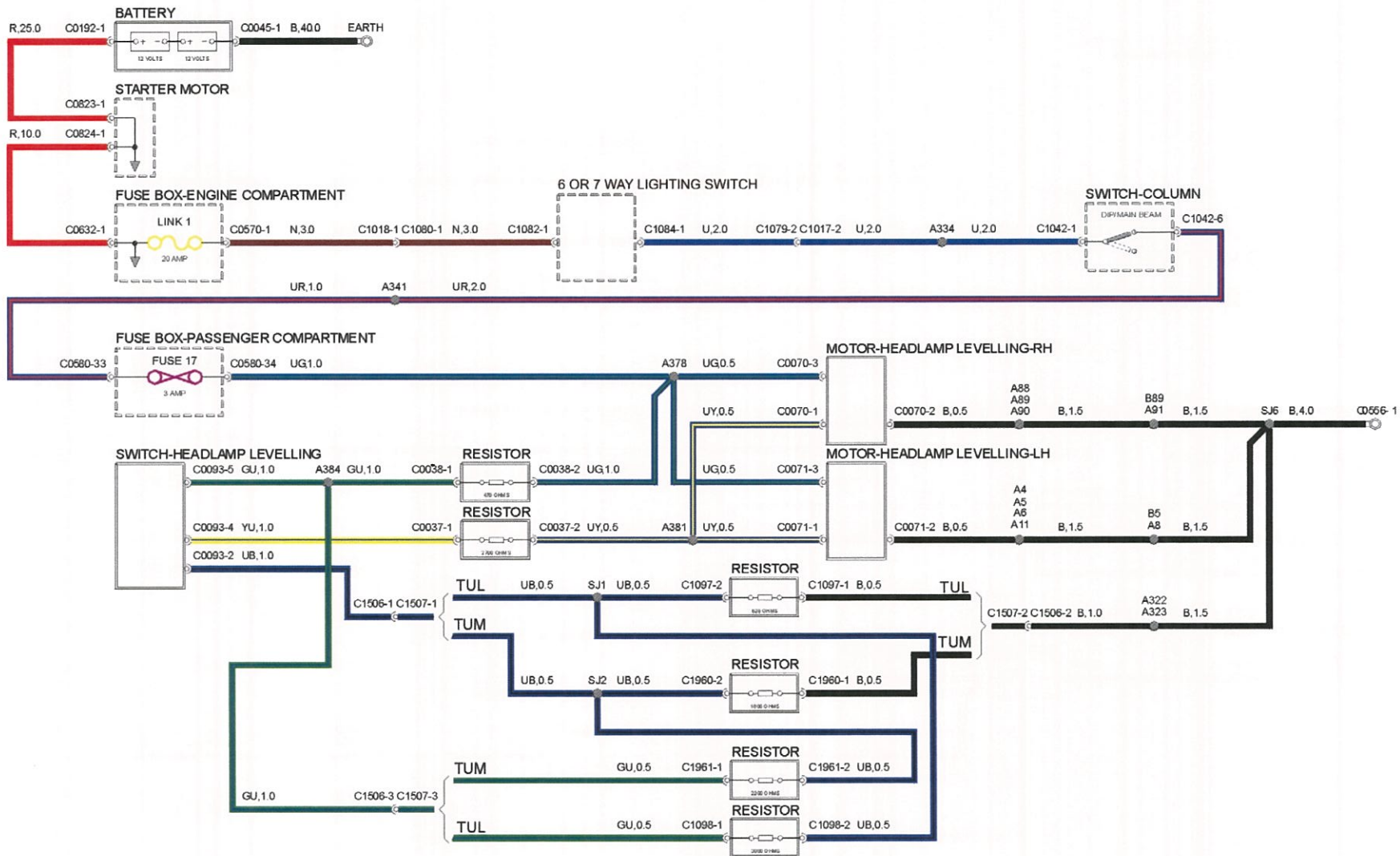


Fig 28 Headlamp levelling

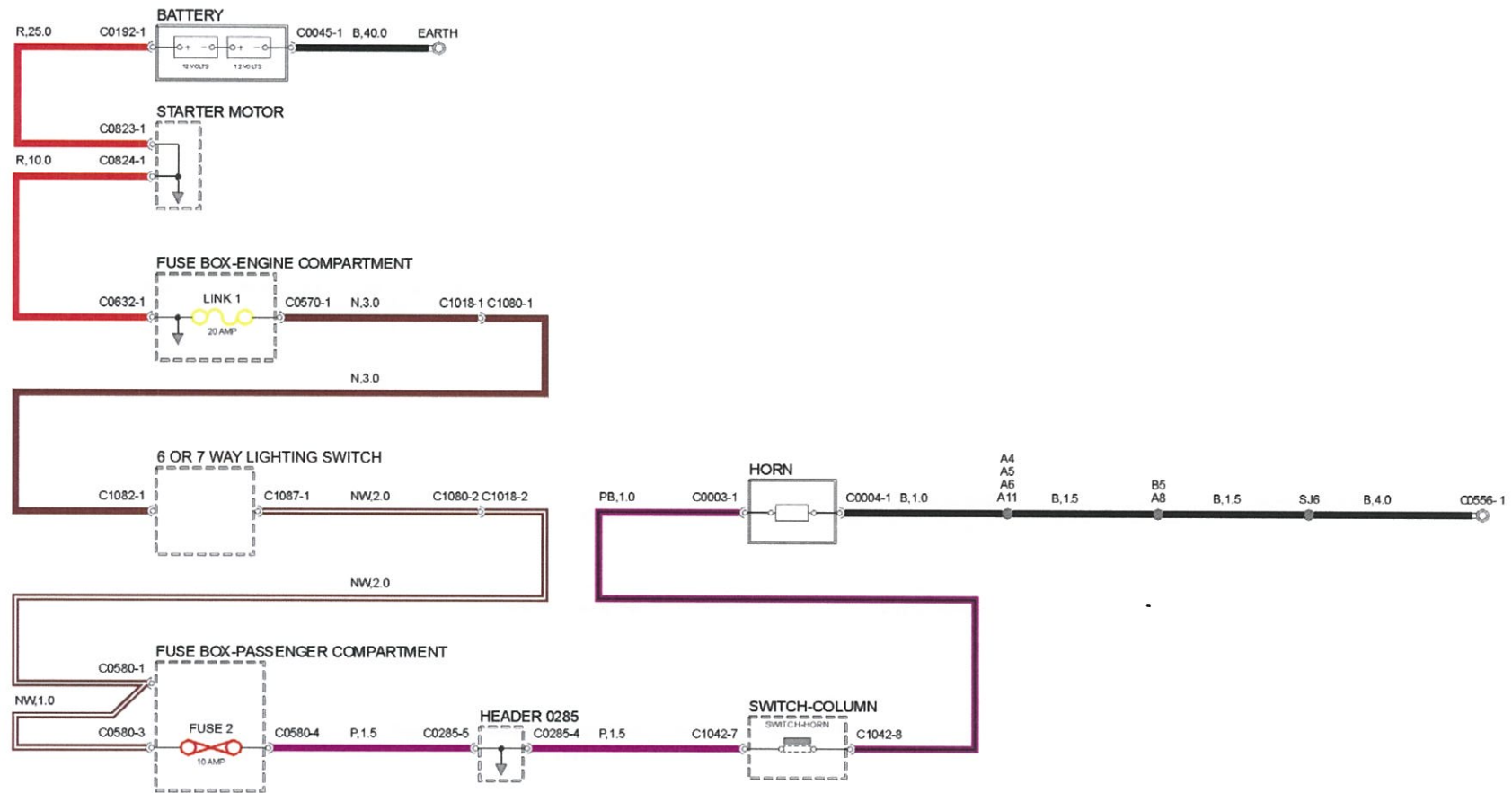


Fig 29 Horn

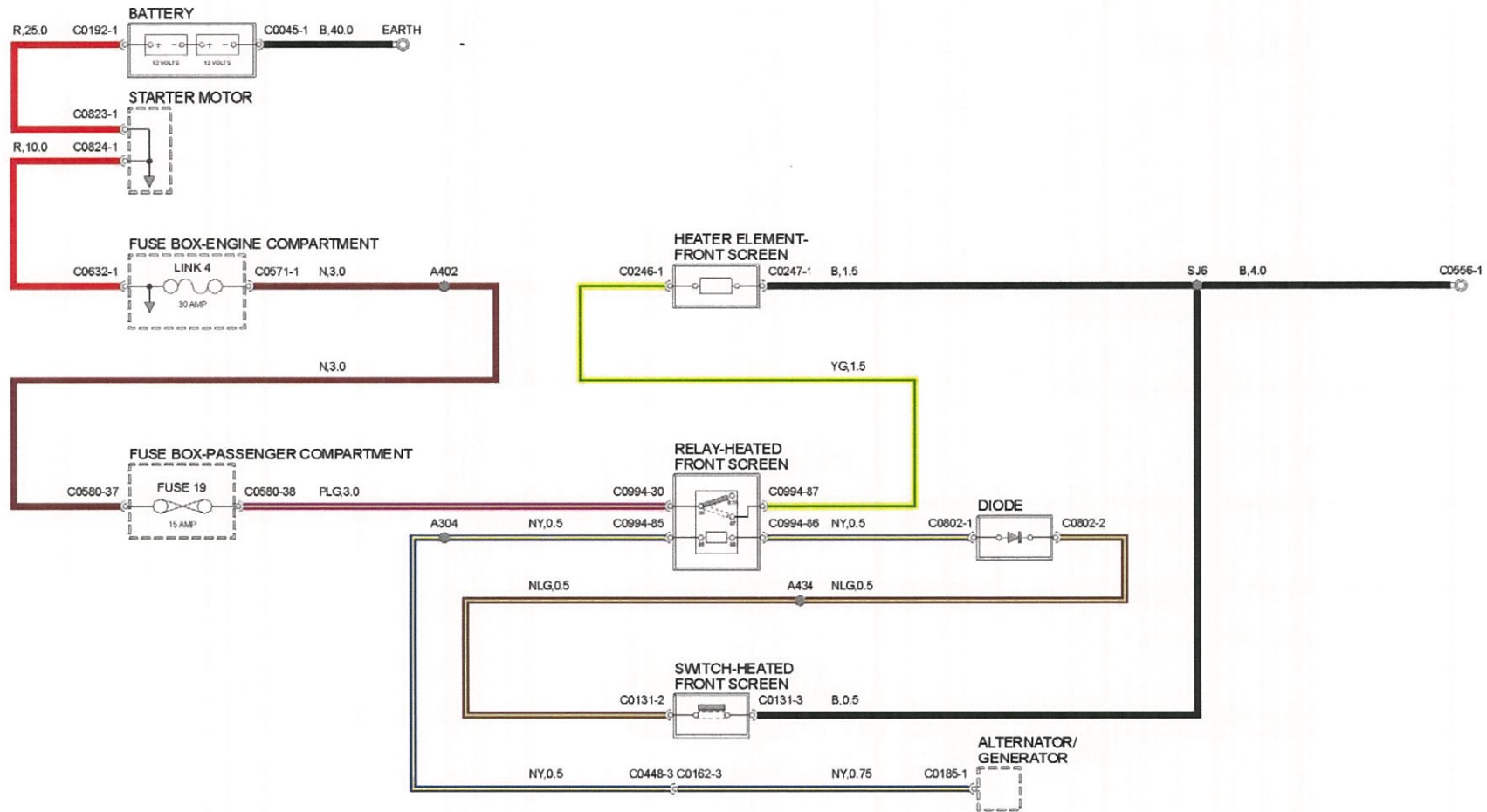


Fig 30 Heated front screen

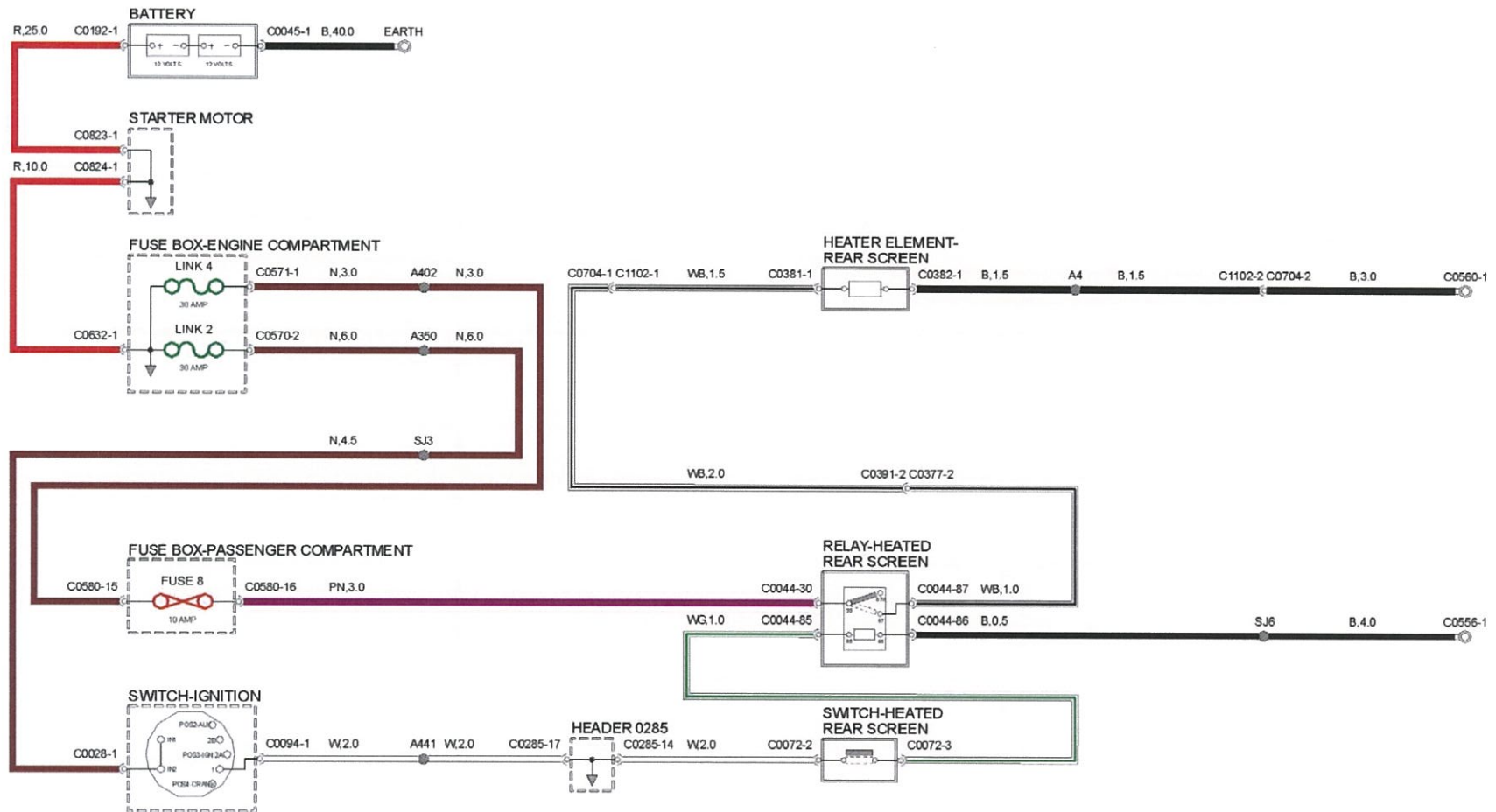


Fig 31 Heated rear screen

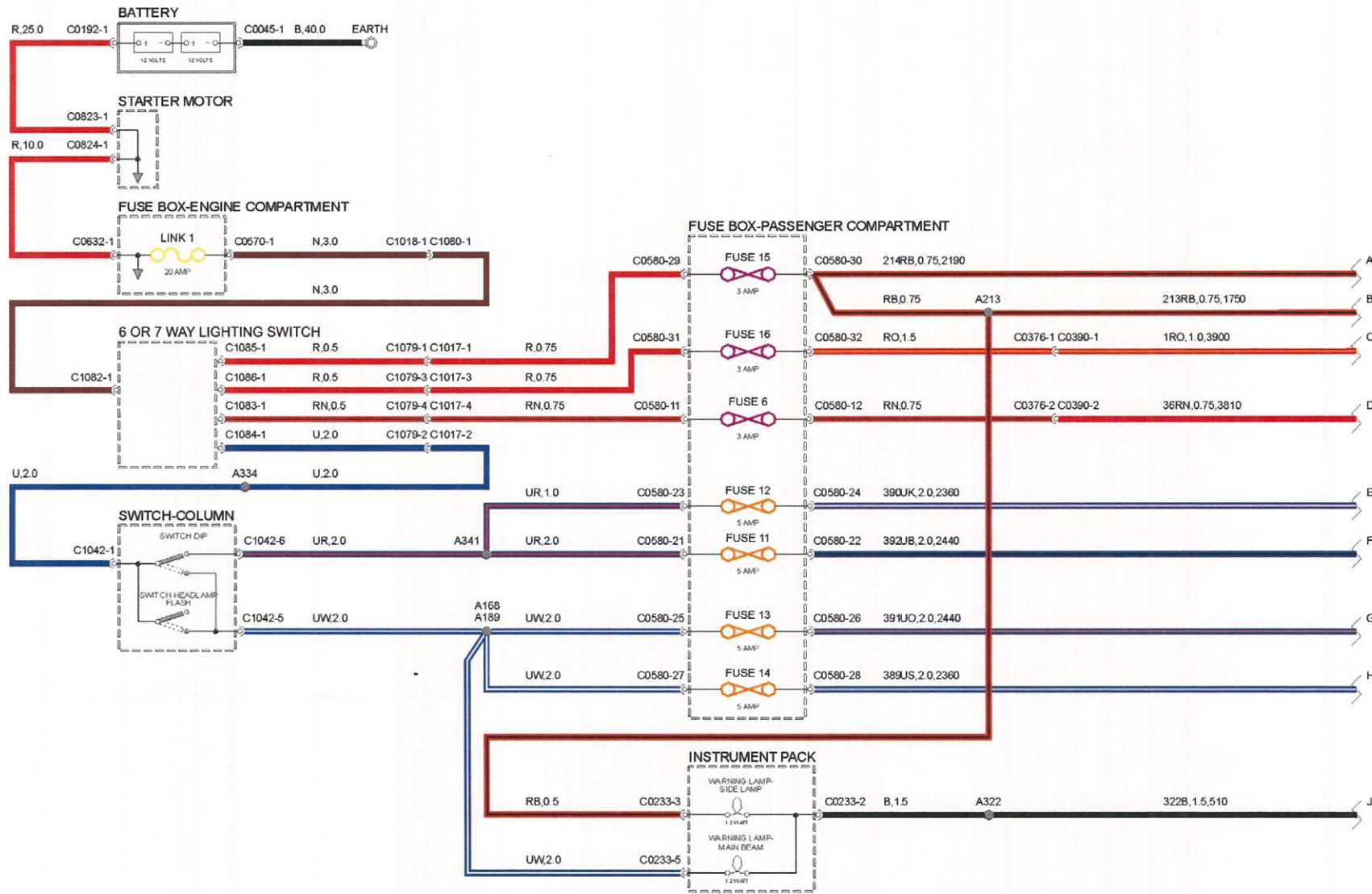


Fig 32 Head, side and number plate lamps I

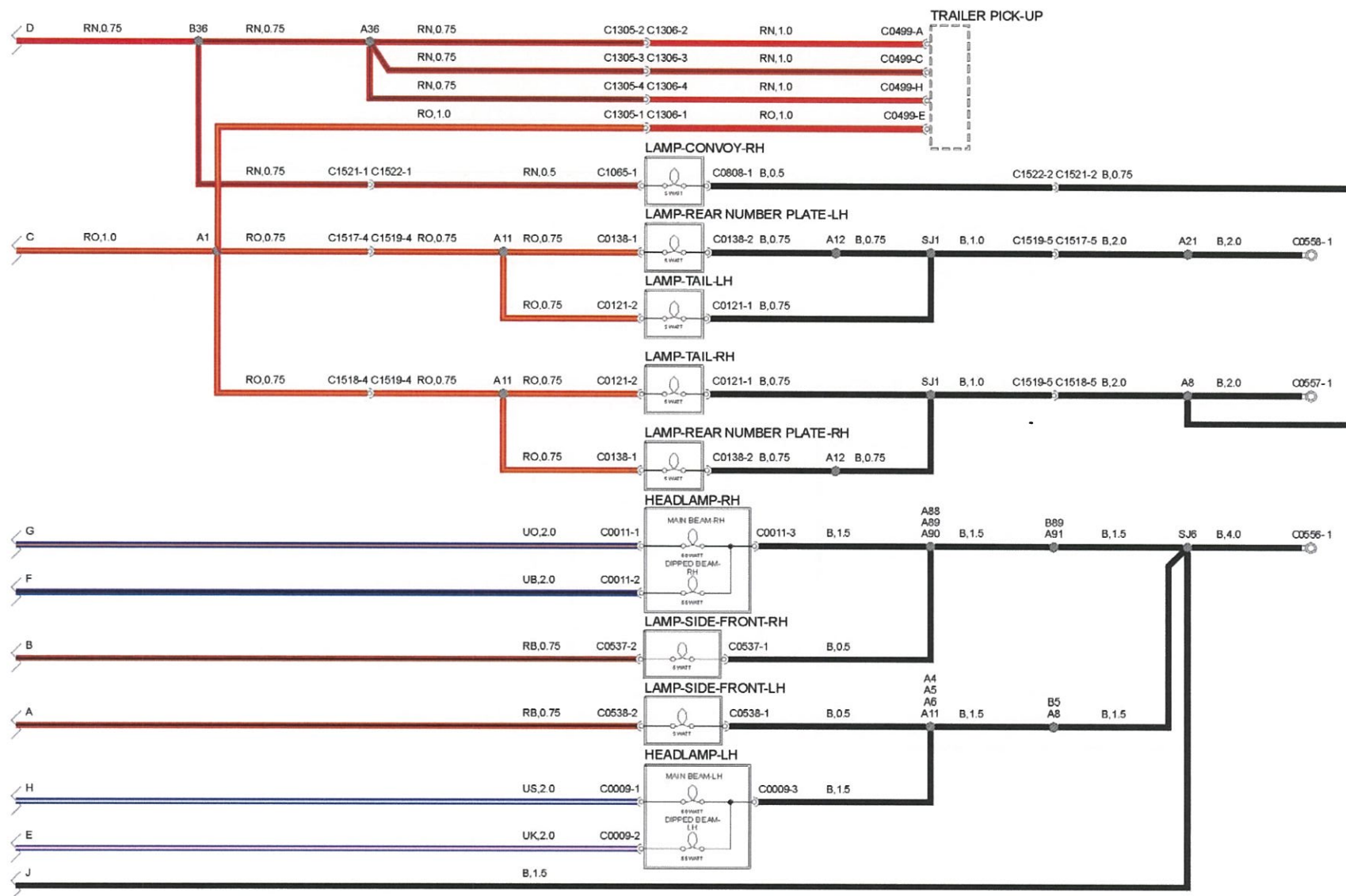


Fig 33 Head, side and number plate lamps II

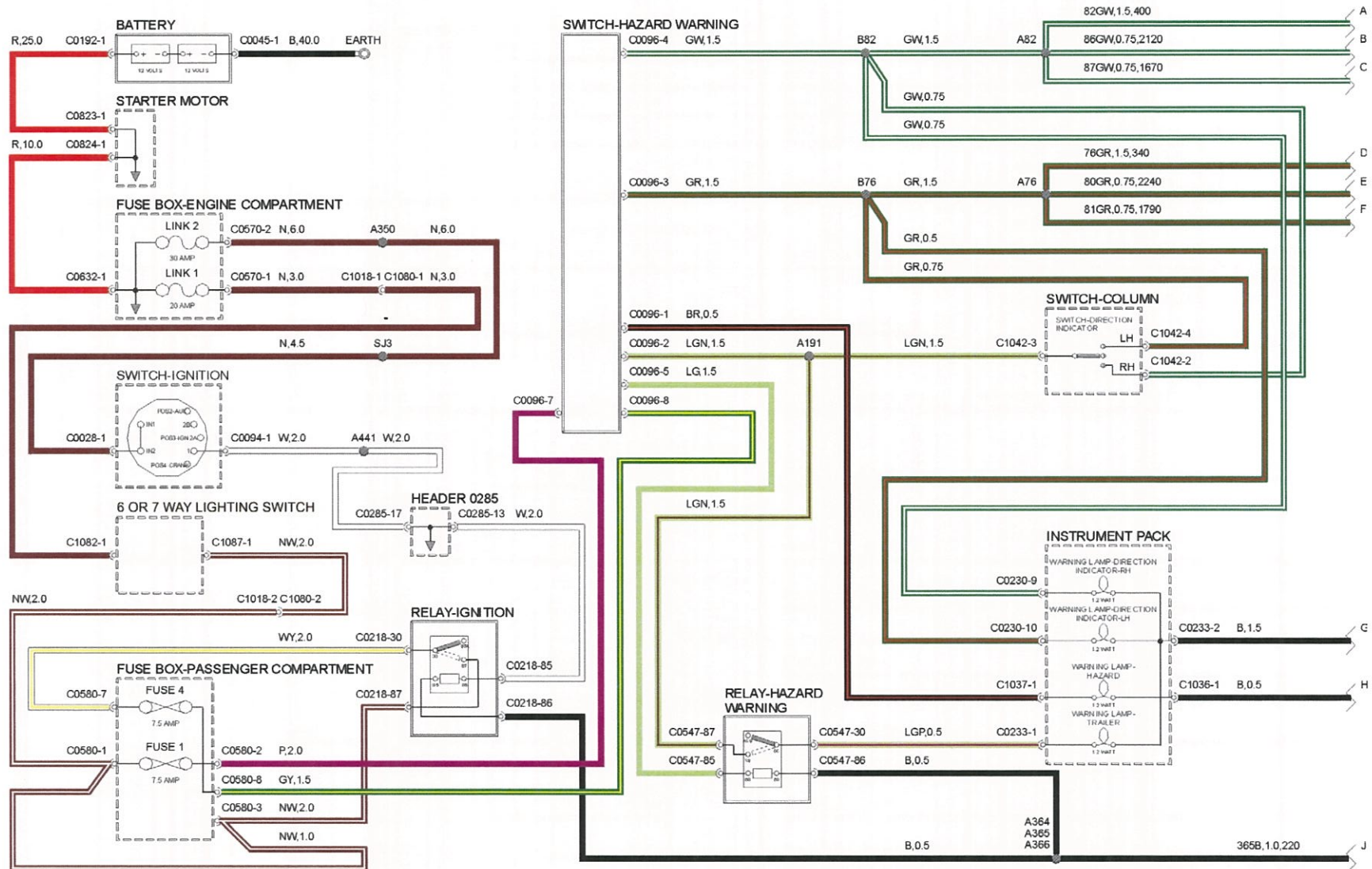


Fig 34 Indicators and Hazards I

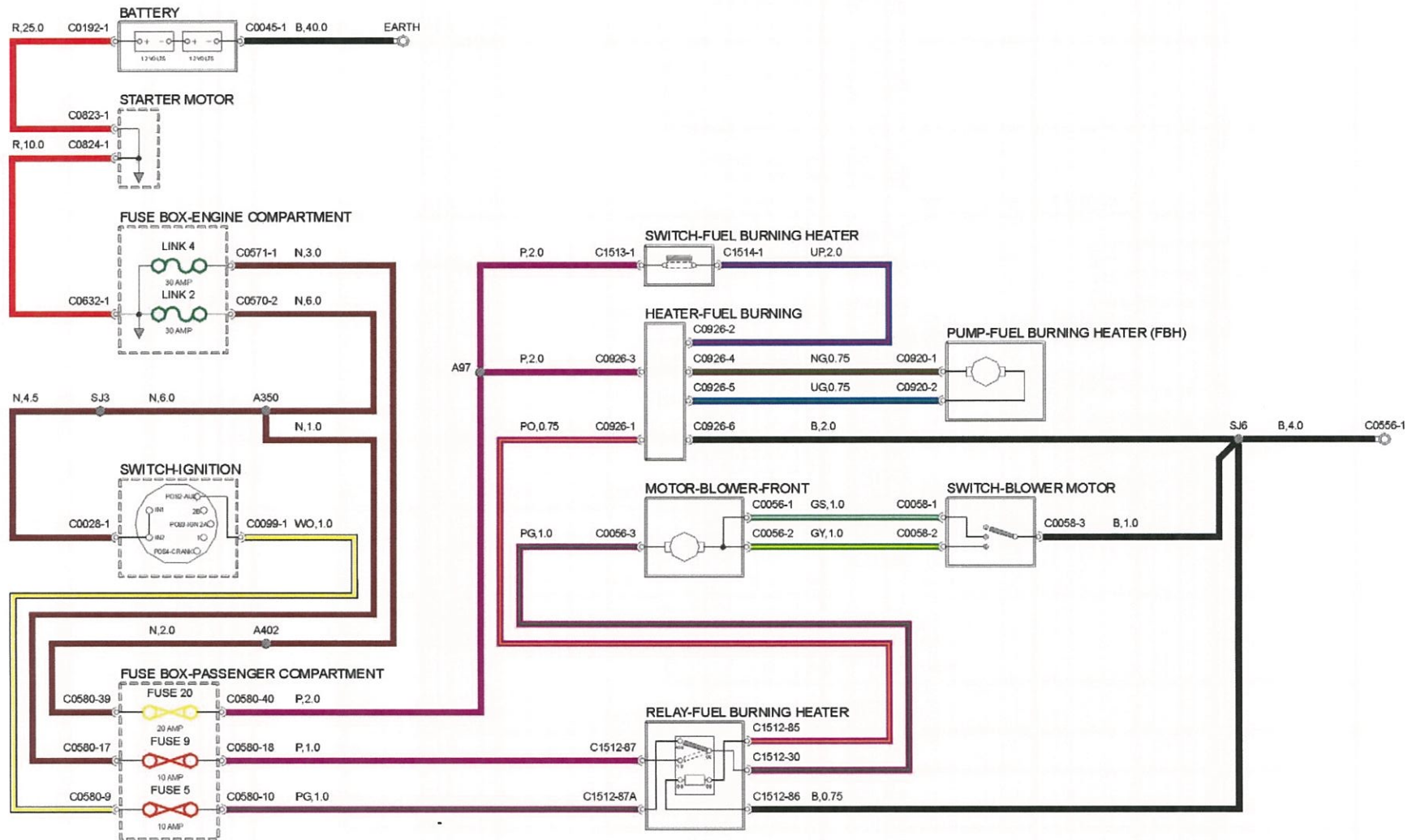


Fig 36 Fuel burning heater

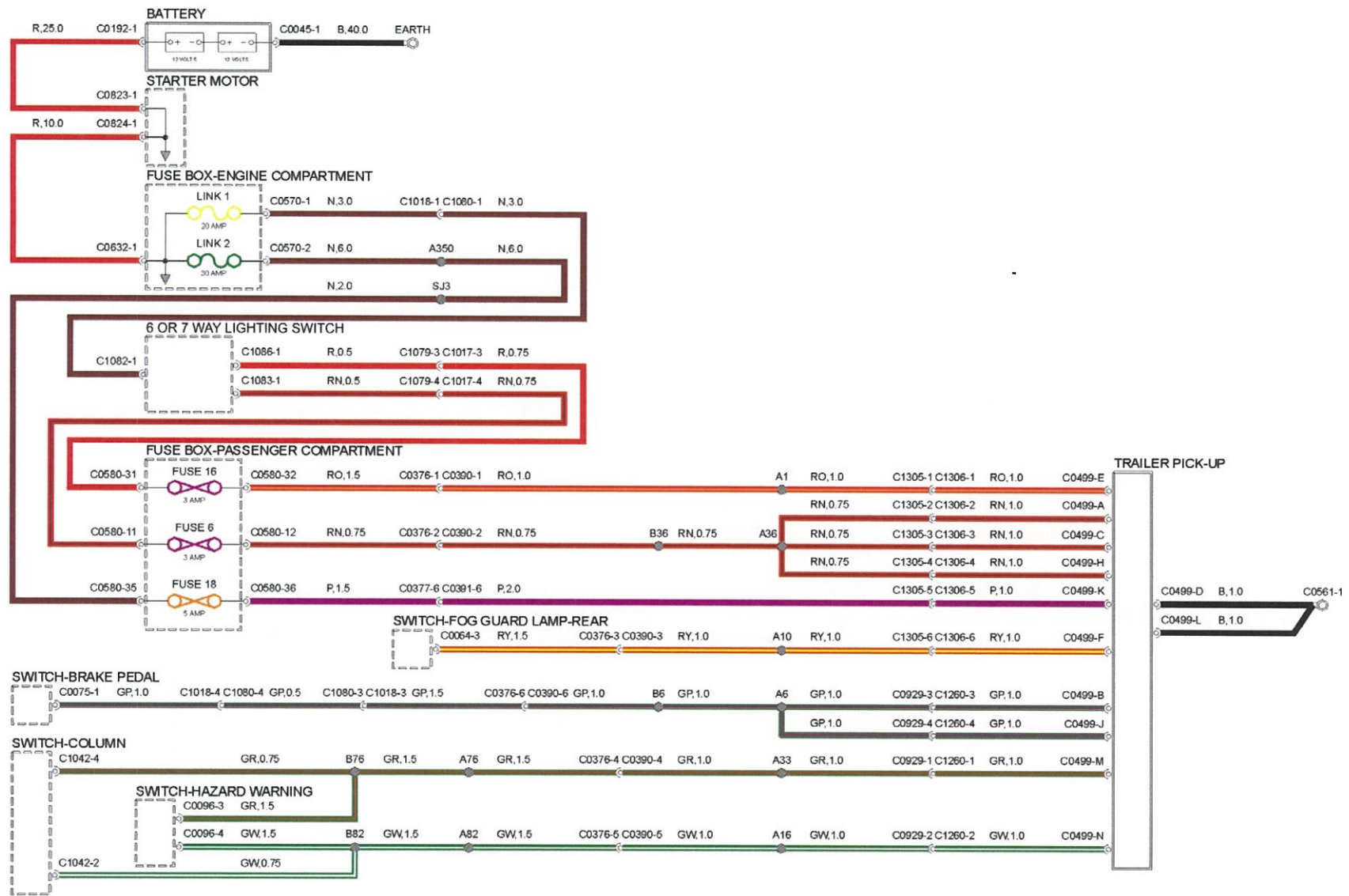


Fig 37 Trailer socket

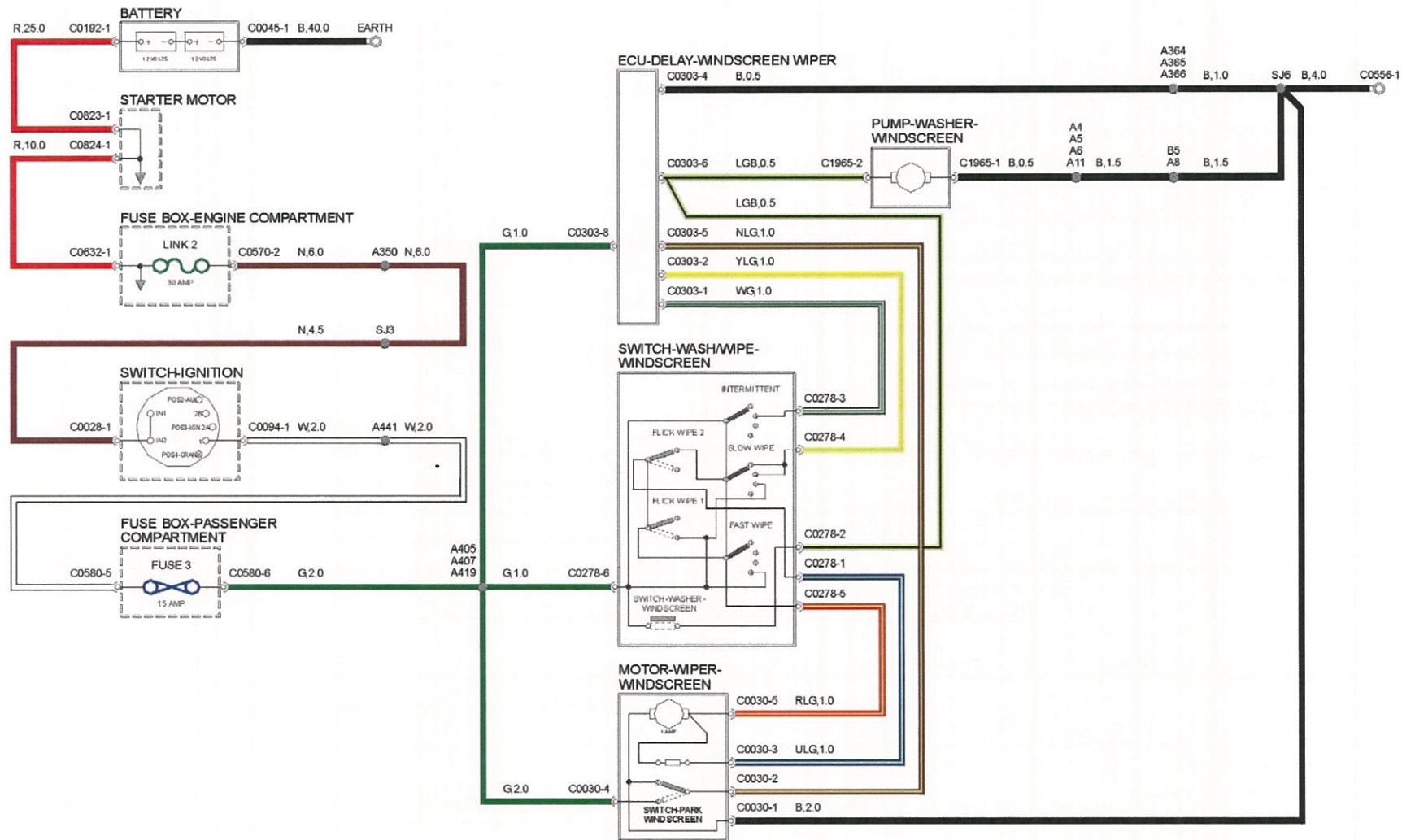


Fig 38 Wipers and washers - front

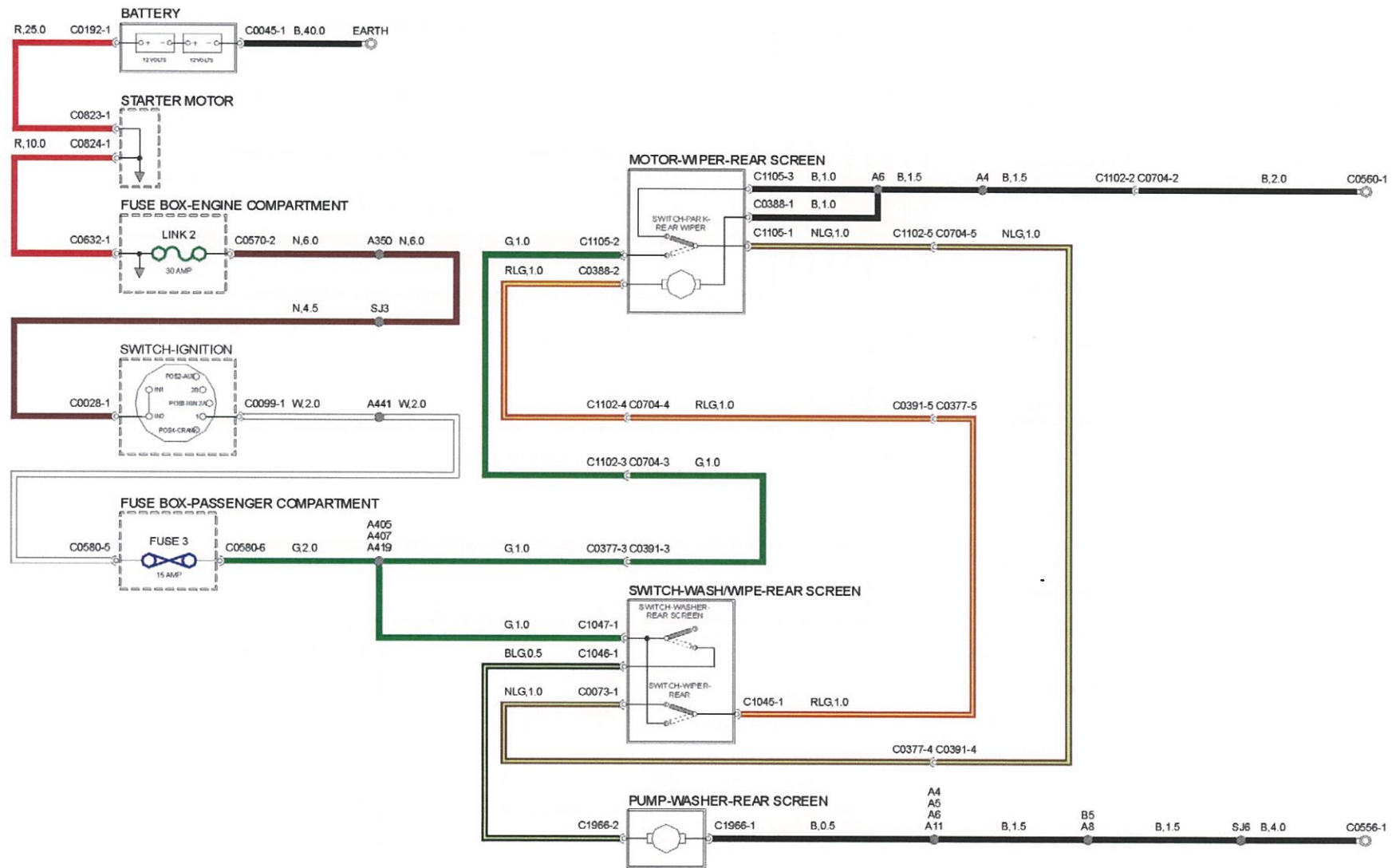


Fig 39 Wipers and washers - rear

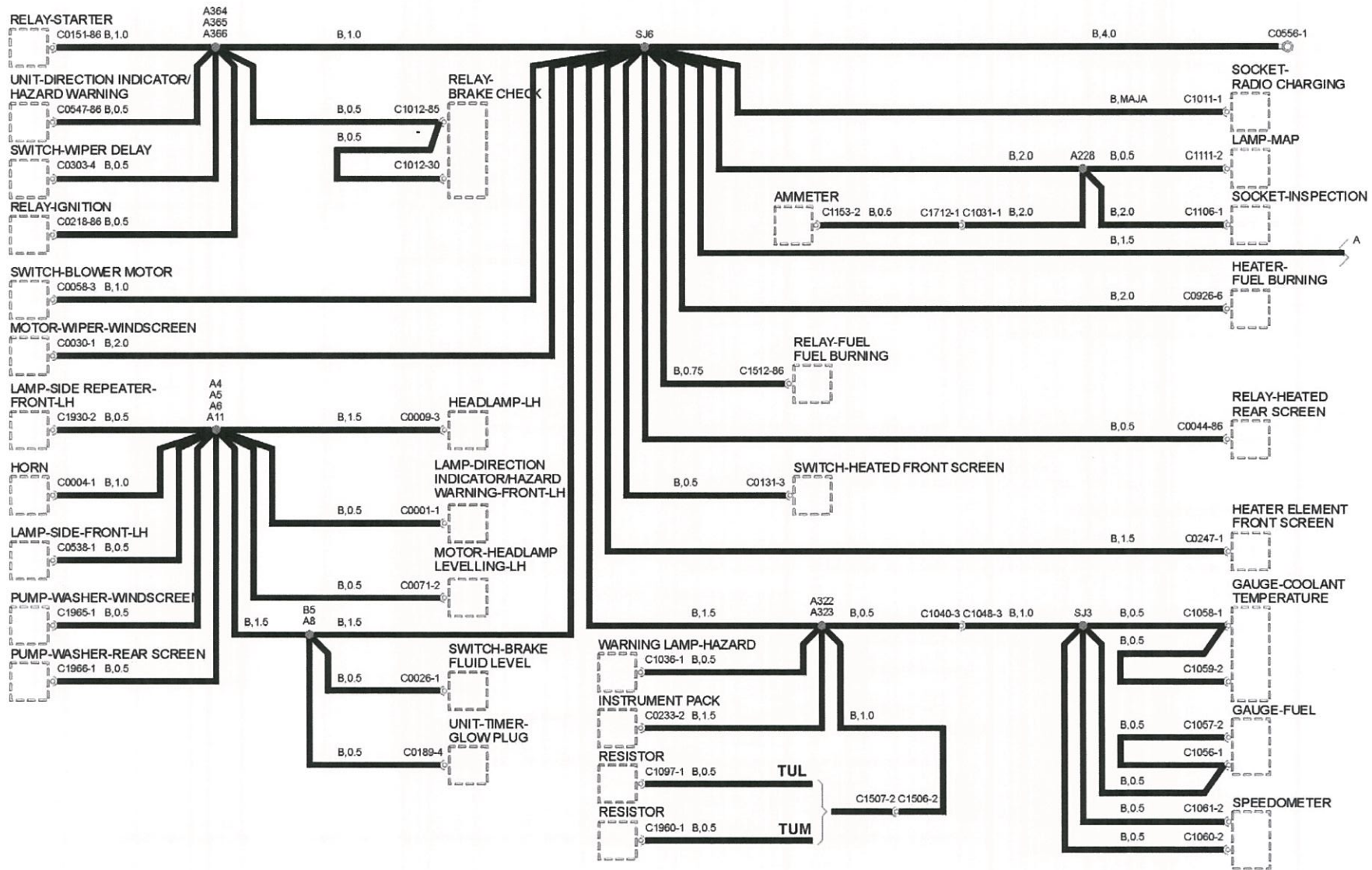


Fig 40 Earth distribution I - FFR

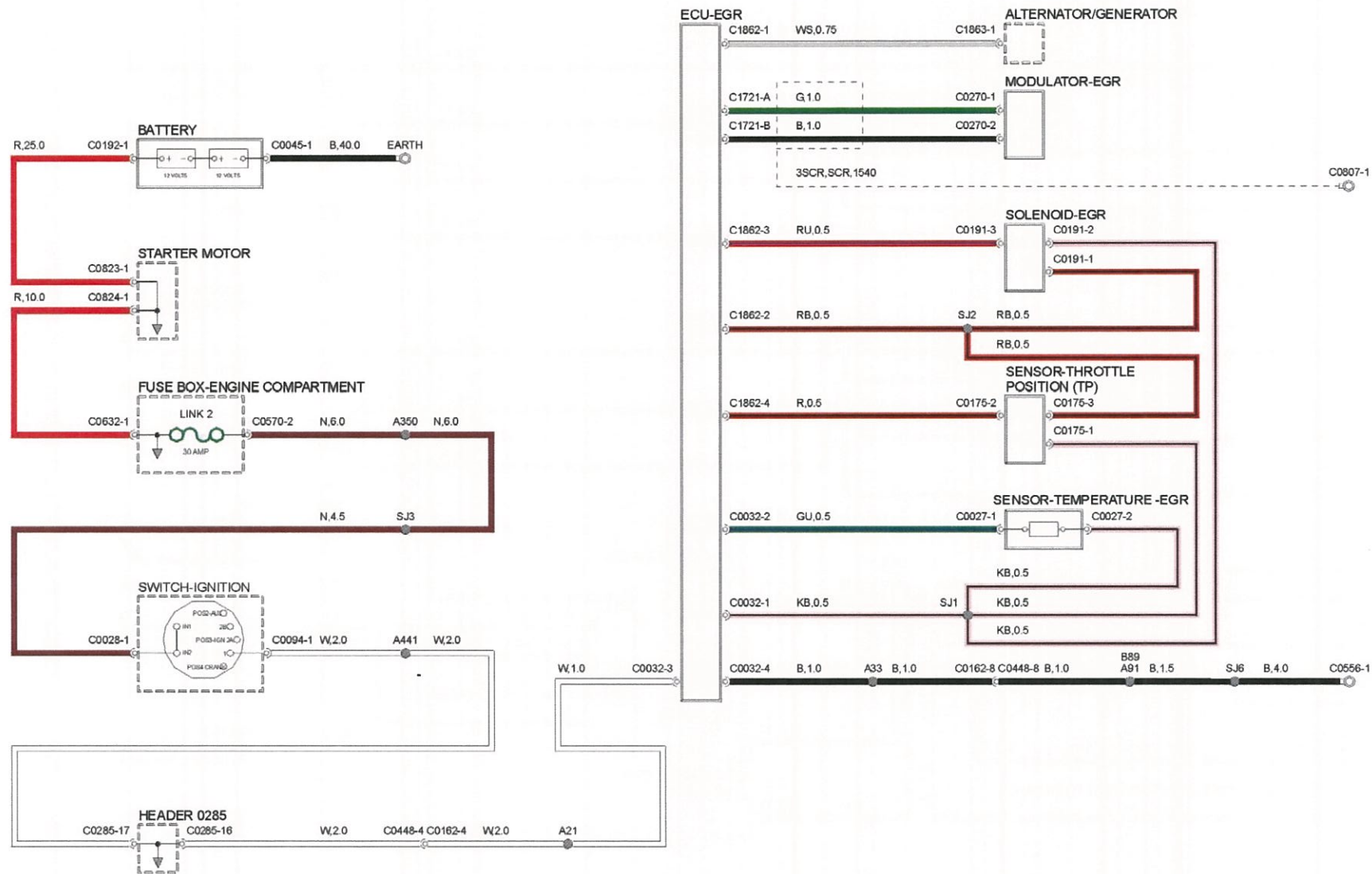


Fig 42 EGR - FFR

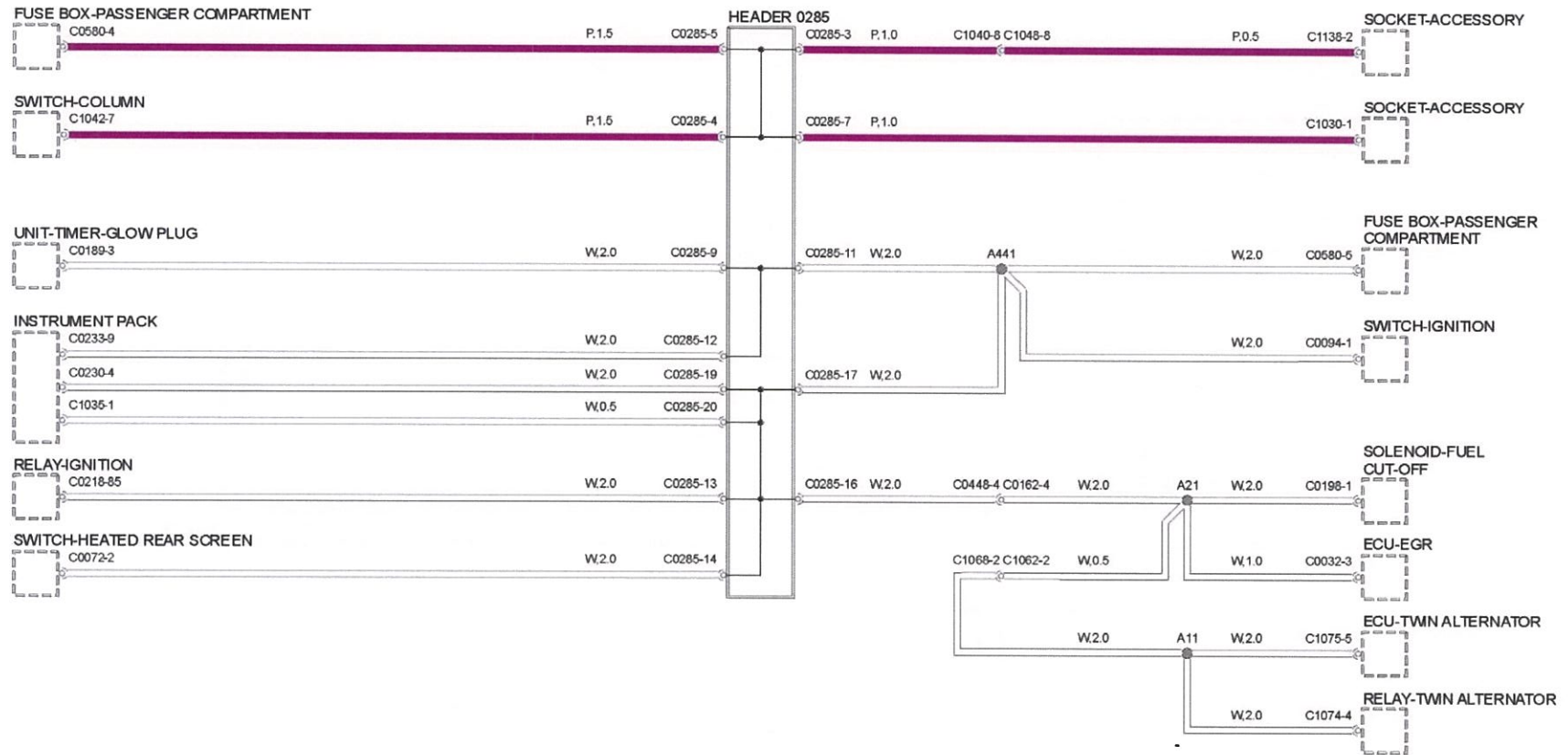


Fig 43 Header joints - FFR

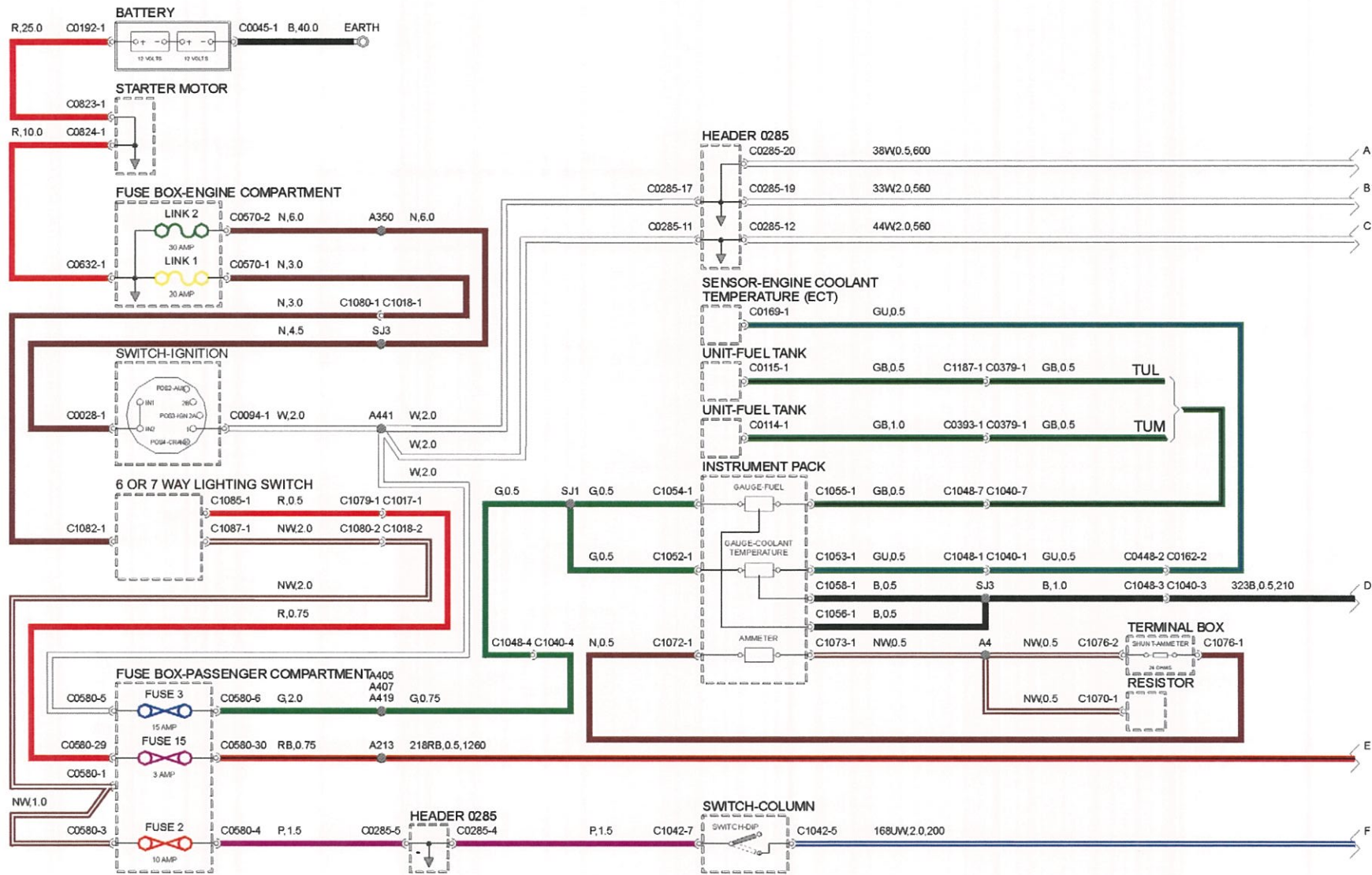


Fig 44 Instruments I - FFR

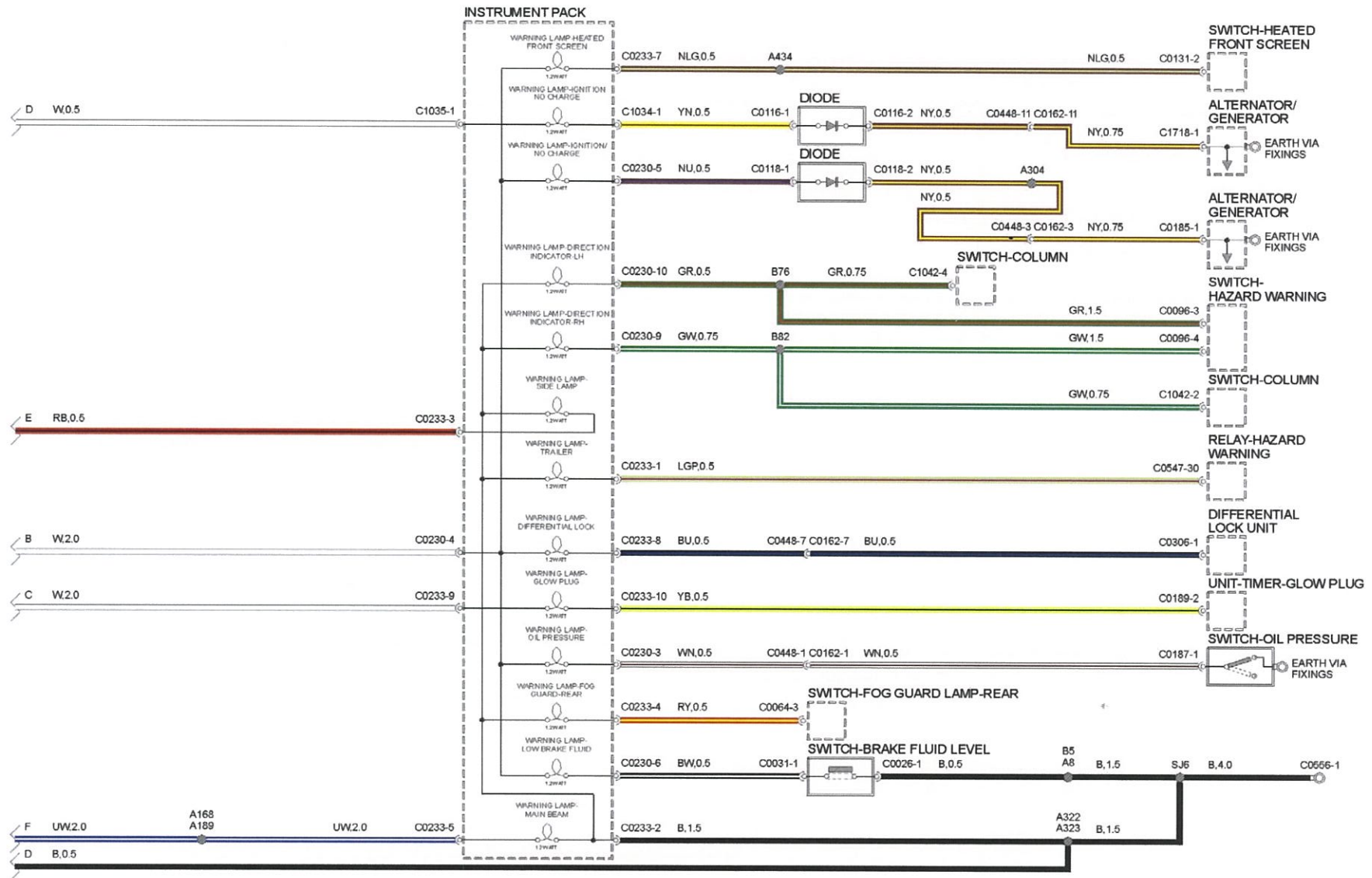


Fig 45 Instruments II - FFR

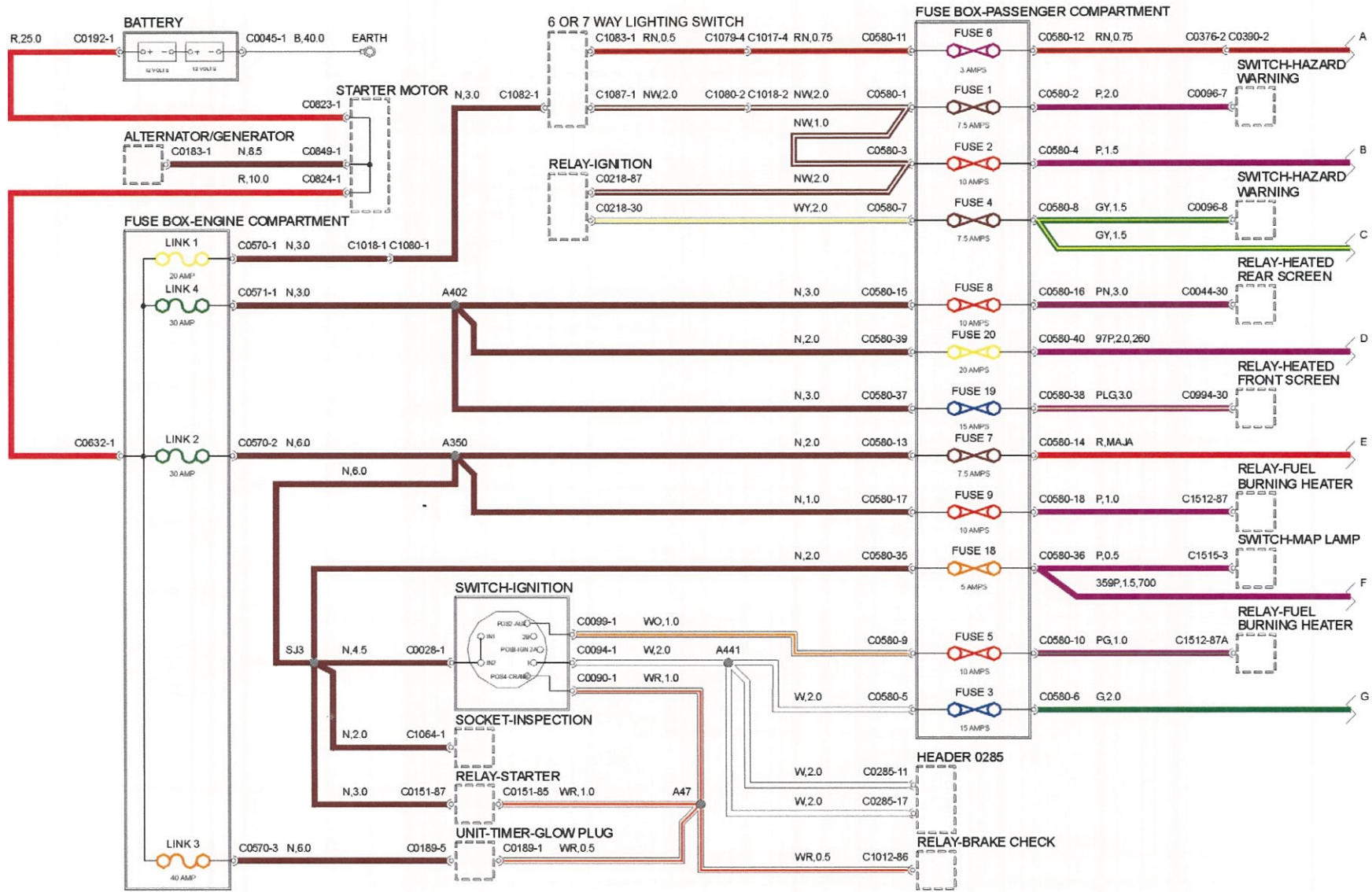


Fig 46 Power distribution I - FFR

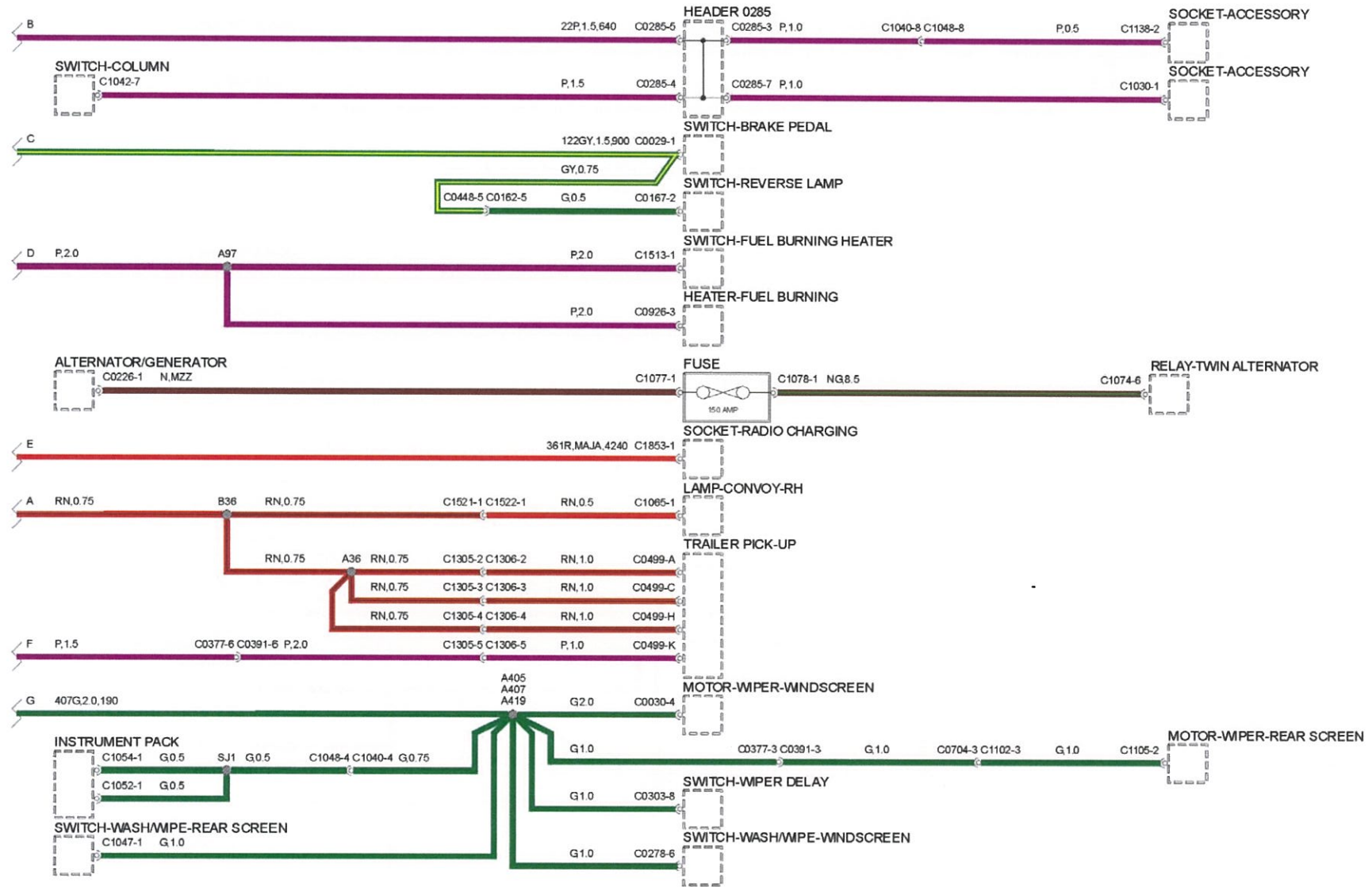


Fig 47 Power distribution II - FFR

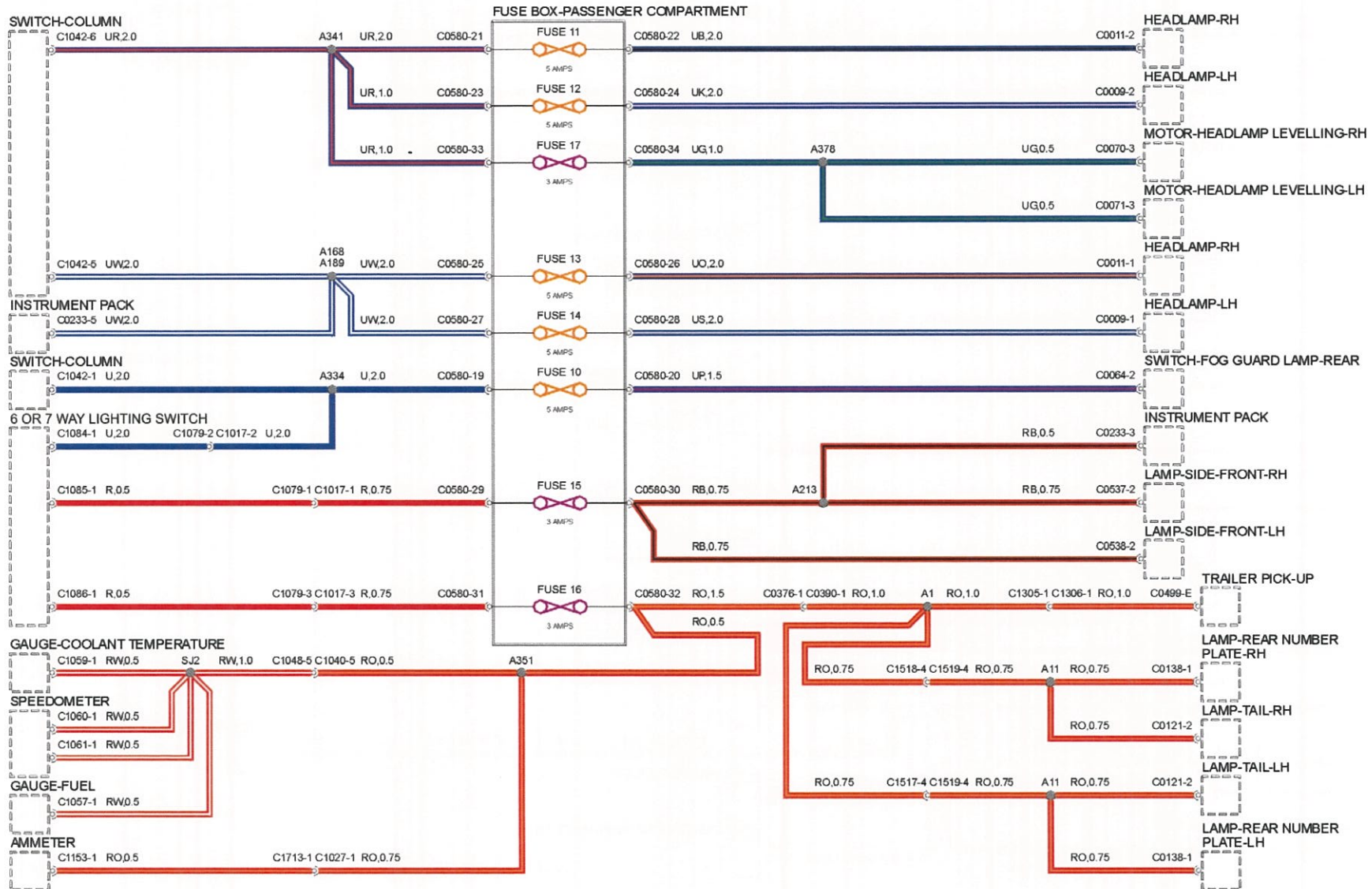


Fig 48 Power distribution III - FFR

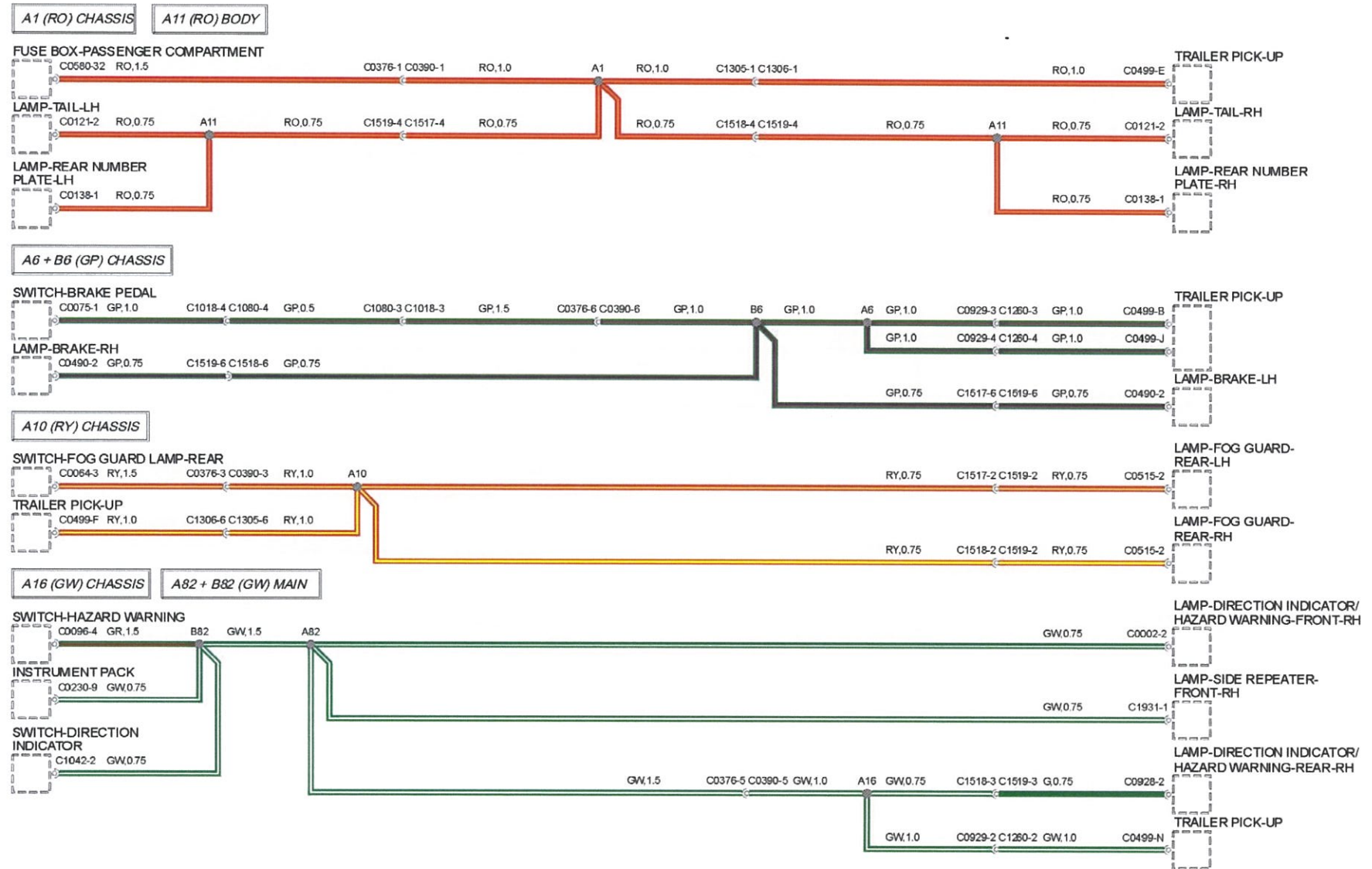


Fig 49 Splices and Centre taps I - FFR

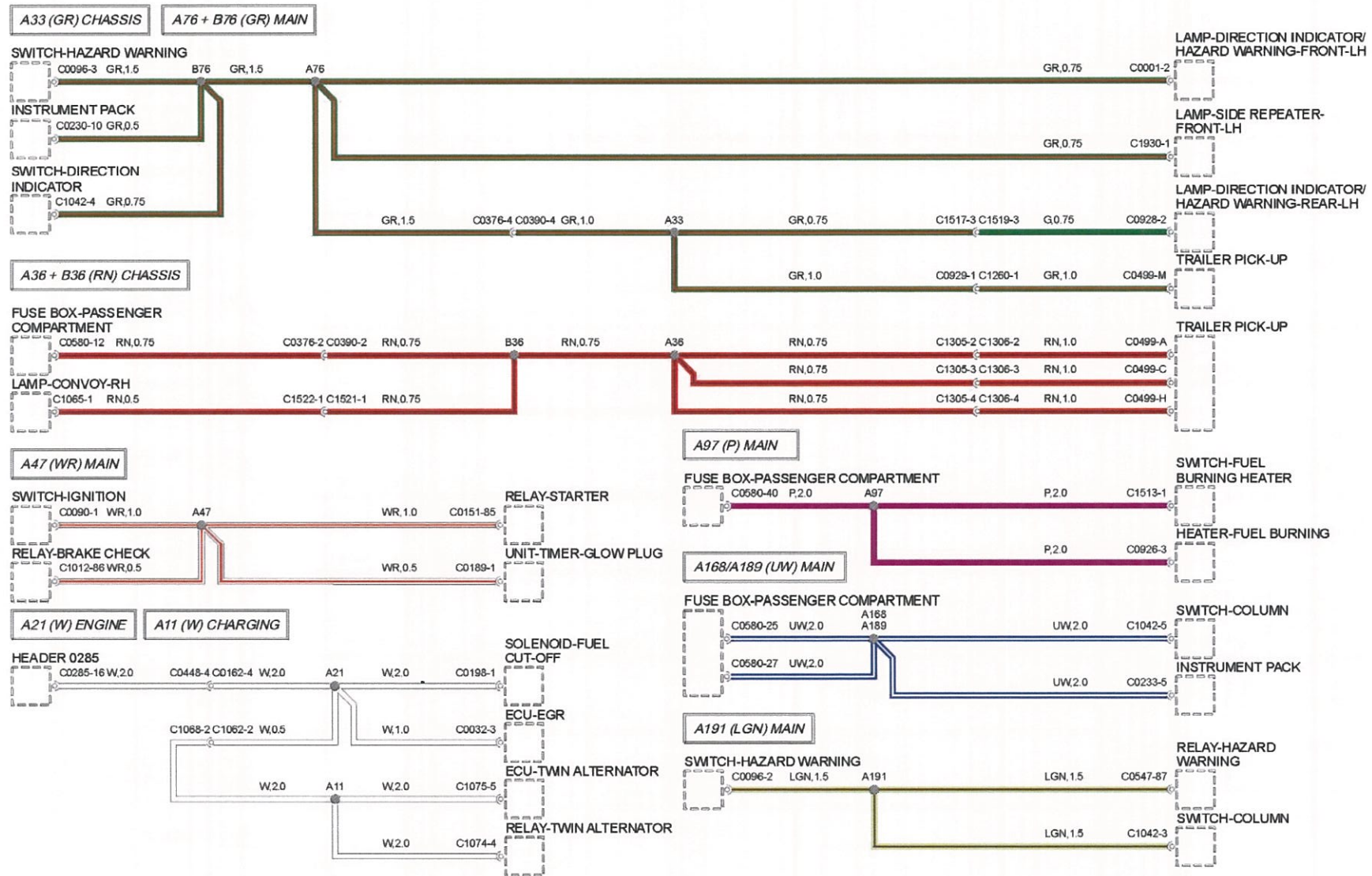


Fig 50 Splices and Centre taps II - FFR

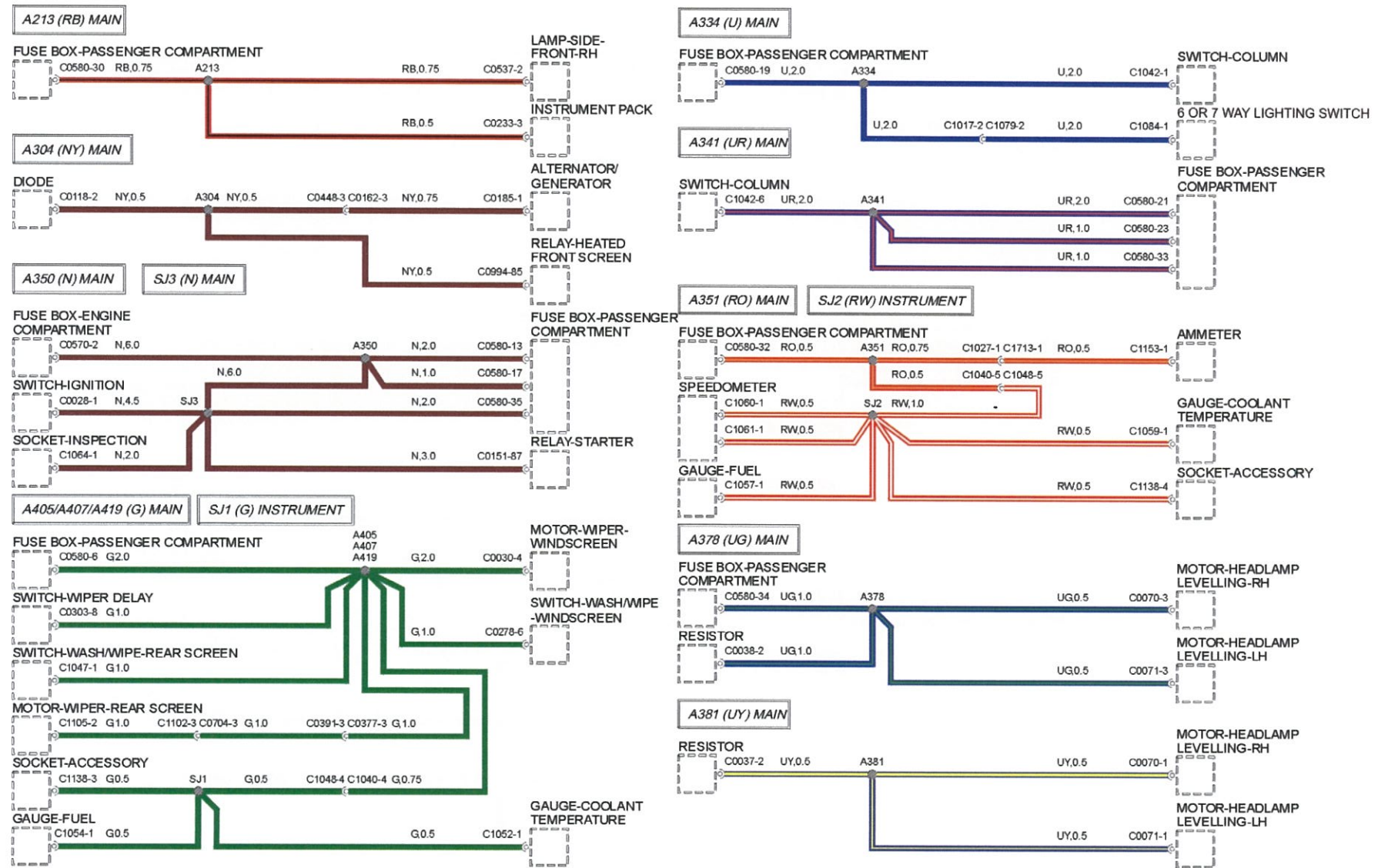


Fig 51 Splices and Centre taps III - FFR

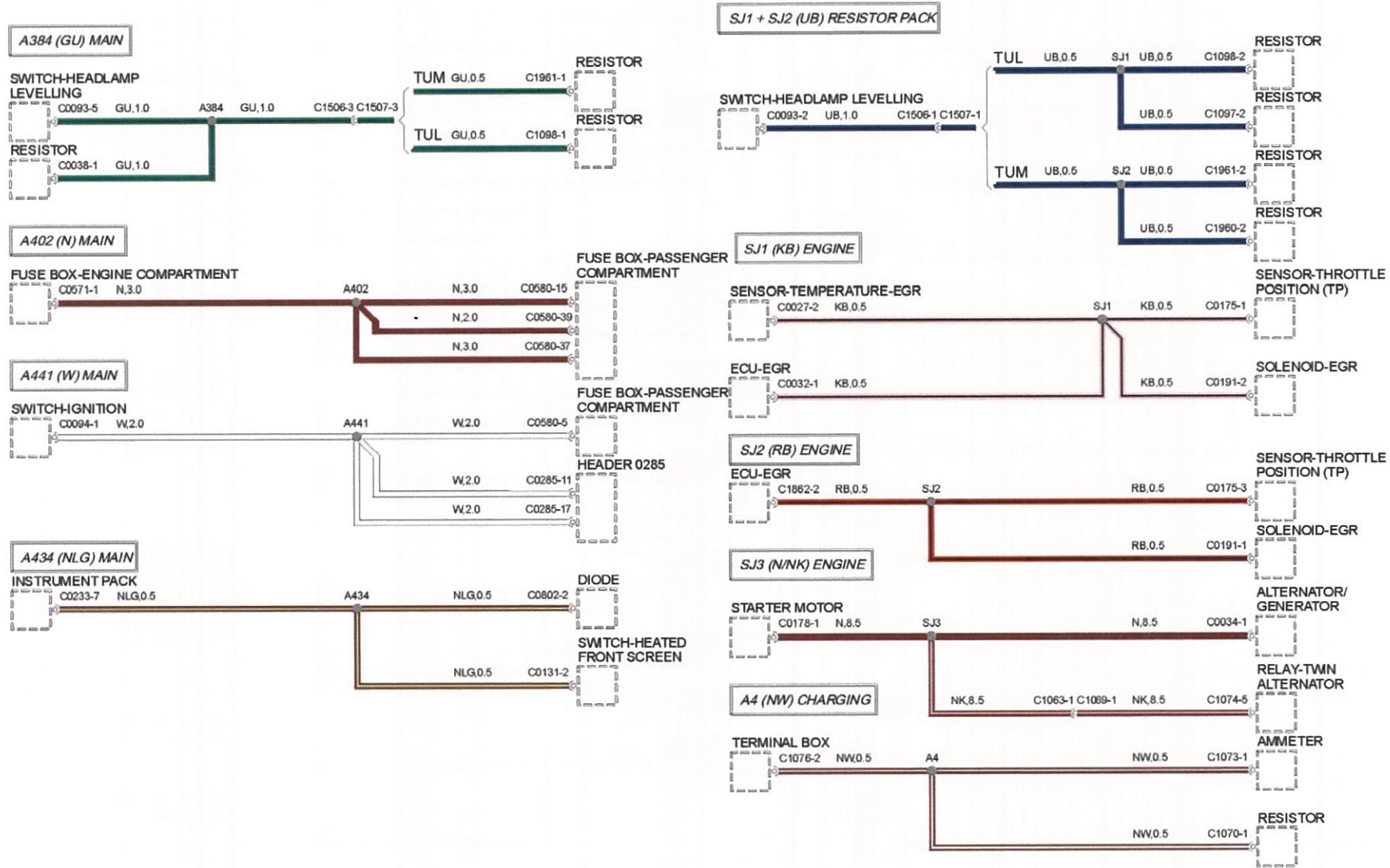


Fig 52 Splices and Centre taps IV - FFR

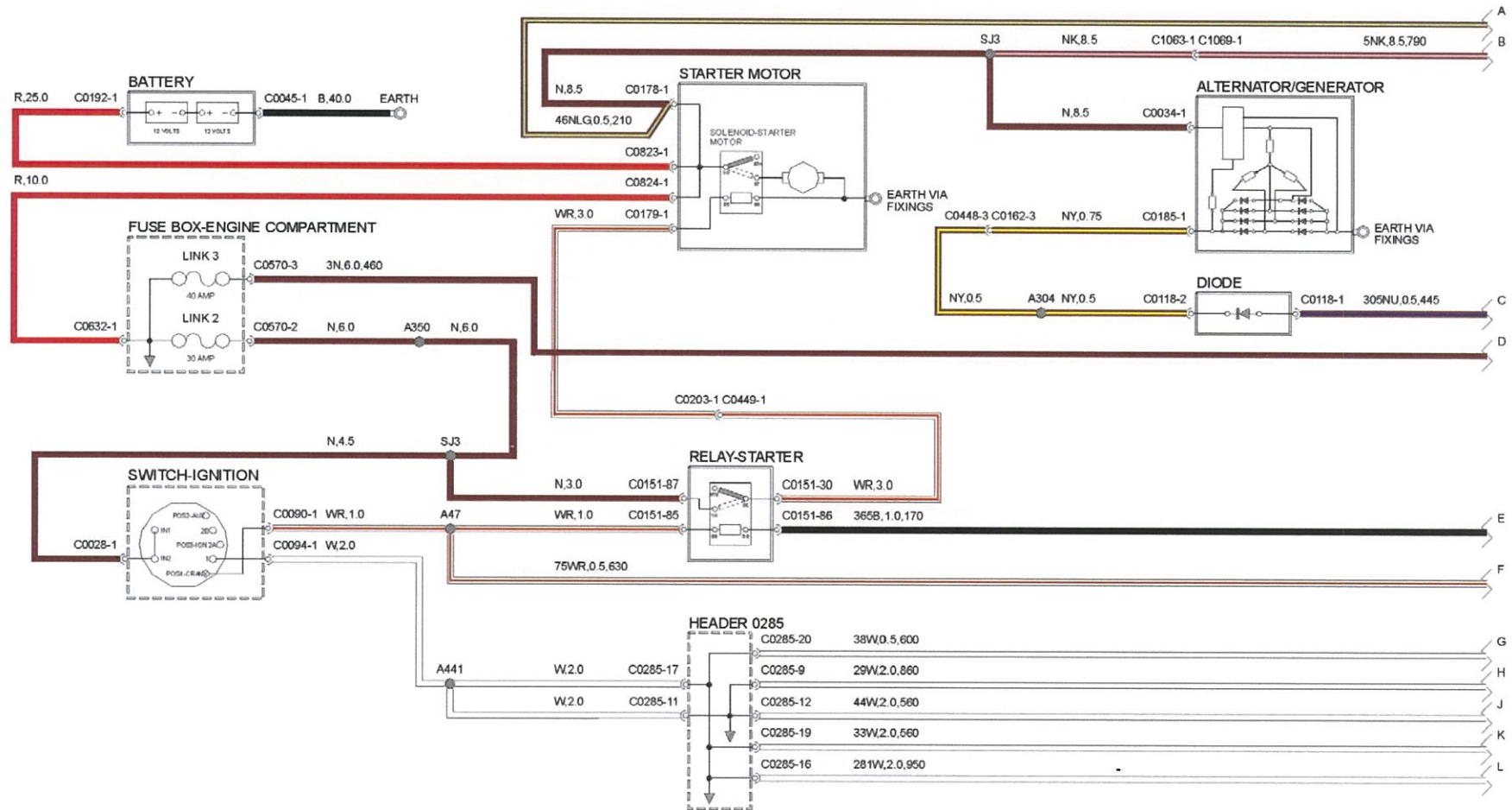


Fig 53 Starting and Charging I - FFR

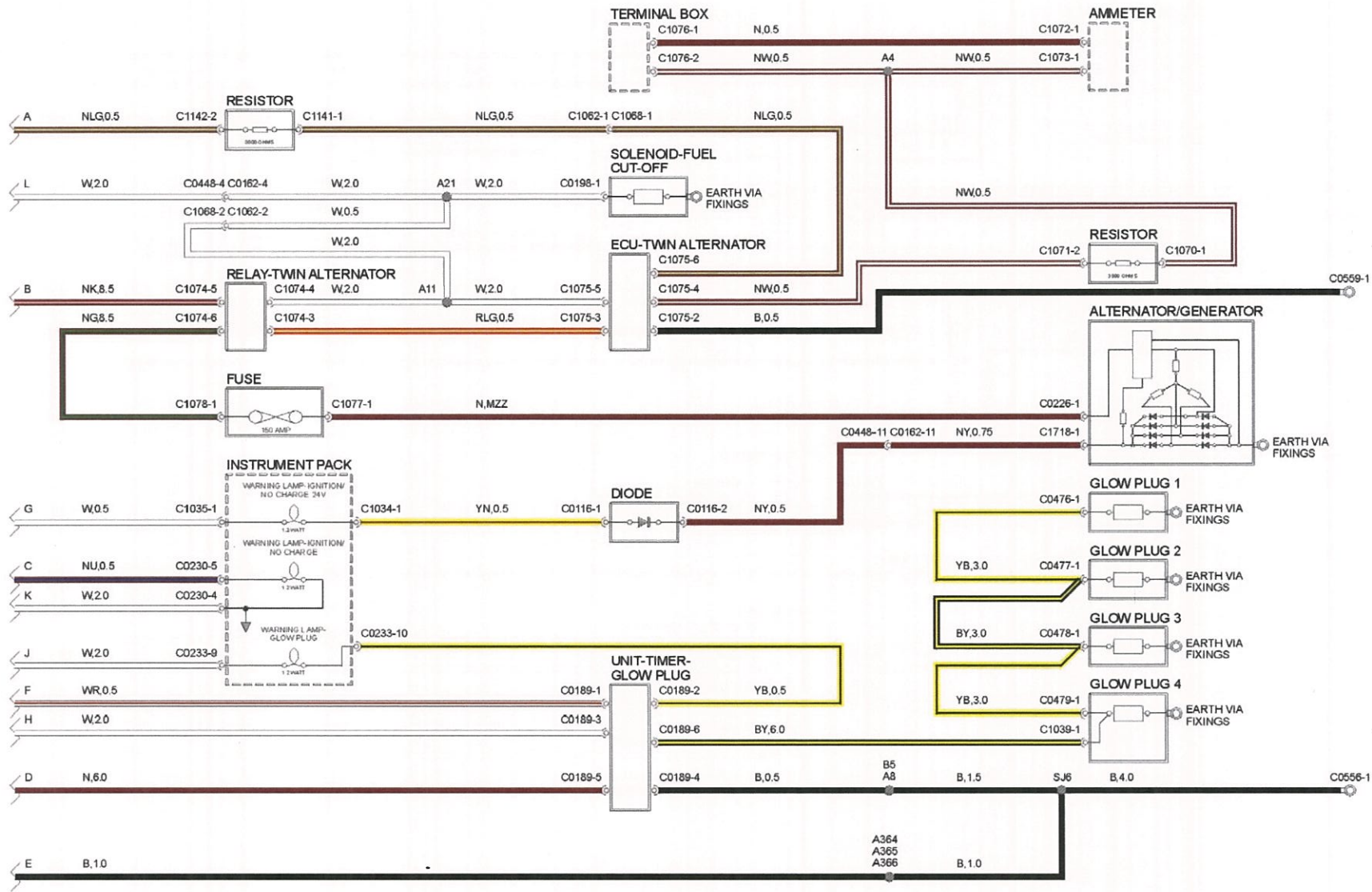


Fig 54 Starting and Charging II - FFR