

FULVIA

2nd SERIES

COUPE
SPORT

**OWNERS NOTES:
1. ELECTRICAL SYSTEMS**

Glyn Williams & Norm Thomas
Oct. 2024

INDEX

- 1.1 Introduction
- 1.2 General Observations
- 1.3 Wire Sizes and Uses for Fulvia S2
- 1.4 Ignition Key Position and Power to Fuses

- 2.1 Fuses and Fuse Holder
- 2.2 Fuse Ratings
- 2.3 Adding Accessories
- 2.4 Fuse Box Refurbishment

- 3.1 Relays
 - 3.1.1 Horns and Radiator Fan Relays
 - 3.1.2 Lighting Relays (sidelights, low-beam and high-beam)
 - 3.1.3 Front Fog Lights & Relay (UK-spec. only)
- 3.2 Fuel Gauge and Sender
- 3.3 Ignition and Charging Circuits
 - 3.3.1 Ignition Circuit & Electronic Rev. Counter
 - 3.3.2 Charging Circuit
- 3.4 Other Electrical Items
 - 3.4.1 Engine Sensors
 - 3.4.2 Cigarette Lighter

- 4.1 Differences from Published (Lancia) Wiring Diagrams
- 4.2 User Accessories and Wiring Modifications
 - 4.2.1 Fulvia Lighting Modifications Described on the Internet
 - 4.2.2 Modifications to this Fulvia S2 1600HF Coupe

APPENDIX 1: 1970 Fulvia Coupe Colour Wiring Diagram (n. DT – Fulv. 14/0130)

*APPENDIX 2: Fulvia Coupe 3 (RHD, with Hazard Signalling) Wiring Diagram
(from the Fulvia 3 Information Book, 2nd Ed.)*

*APPENDIX 3: Fulvia Coupe 3 (RHD, with Hazard Signalling) Wiring Diagram
Showing Locations of (hard-to-find) Electrical Items*

1.1 Introduction

The information in these Owner's Notes was acquired during the restoration and maintenance of two UK-specification (RHD) Lancia Fulvia Coupes: a 1971 S2 1600HF and a 1973 S2. Both cars had previous owners so may have had earlier modifications, but the information here represents over 40 years of combined experience and learning.

While there are some detail differences for the 1600HF when compared to other S2 Coupe types (e.g. deletion of the clock and the addition of an oil temperature gauge) and also to non-UK cars (use of dual filament bulbs in outer headlights and addition of driving/fog lamps in the inner headlight positions), the wiring scheme and wire colours generally match the wiring diagram contained in the official Fulvia 2 serie Coupe/Sport owners handbook. Where differences occur, these are usually minor variations in wire colour or may be the result of later modifications carried out by previous owners.

In these Owner's Notes, numbers in square brackets e.g. [8] correspond to the number of the item in the Coupe Wiring Diagram of the first edition of the Lancia Fulvia 2nd Series Coupe/Sport Instruction Book. The same numbering scheme is also used in a colour version of the Coupe 818.630 wiring diagram from 1970 (Lancia Technical Data n. DT - Fulv. 14/0130). *A copy of this colour diagram is given in Appendix 1, for reference.*

These diagrams were designed to be used for the Italian-market cars with LHD, and probably also for any RHD cars that used the same body shell. RHD cars destined for the UK required modifications to the height of the headlights to satisfy local lighting regulations. This led to the use of dual filament bulbs, for low and high-beam, in the raised outer lights and allowed the fitting of additional driving/fog lights in the inner positions.

The use of the inner positions for driving/fog lights is not reflected in any of the wiring diagrams that are contained in the three editions of the Fulvia Coupe Series 2 Instruction Books. Diagrams which do include driving/fog lights can be found in the first and second editions of the Fulvia 3 Instruction Book, where they are labelled as 'RHD CAR WIRING DIAGRAM (on cars intended for countries where the fitting of hazard signalling is required)'. However, these editions differ from each other in the wiring of the relays for both their inner and outer lights. Since the scheme given in the second edition of the Fulvia S3 Instruction book is closest to that observed for both inner and outer headlights in Series 2 cars, the second edition scheme will be taken as the 'standard' S3 arrangement. Owners of early S3 cars may find differences. Note also that the numbering of S3 electrical items differs from the corresponding S2 items.

Caveat Emptor!

Glyn Williams & Norm Thomas, October 2024

1.2 Wiring Diagrams and General Observations

The Fulvia wiring schemes show a general similarity, from the earliest Berlina saloons to the later Coupes, with the greatest variation between the different Berlina types. By the time the S2 Coupe was built, there was a clear wiring philosophy and some associated rules concerning lighting. Like most rules, they may have been broken by individuals for convenience during assembly or repair, but the intent was clear.

Rule 1: Where identical lights are present on the left and right sides of the car, their wiring is distinguished by the addition of a black stripe to the coloured wire on the left side of the car (for S2). A black stripe is also used to identify wires that connect the sensors for coolant temperature, oil pressure and oil temperature (1600HF) to their gauges.

Rule 2: The left-hand and right-hand low beams, high beams and sidelights are supplied by different fuses (fuses 1 to 6) to ensure that failure of one light/fuse does not affect its twin. In addition the front-right and rear-left sidelights are paired together on fuse 1 while the front-left and rear-right sidelights are paired on fuse 2. With this arrangement, failure of fuse 1 or fuse 2 still leaves a single sidelight on left/right and front/rear.

Rule 3: The standard Fulvia wire has a cross-sectional area of approximately 1.0mm^2 . For items where higher currents and larger loads are expected, this is increased to 2.5mm^2 or 4mm^2 . Current is supplied from the battery, via a terminal on the starter motor, to the live side of fuse 7 (Avvis.) using a single red cable with diameter 6mm^2 . At this point, additional connections are made, including to the ignition switch whose position then determines the status of fuses 8 (Servizi) and fuse 9 (Spie. Acciens). Where wires have cross-sectional areas greater than 1mm^2 , this is recorded on Lancia wiring diagrams (see the Appendix for examples).

Rule 4: Any items which receive their 12V supply from the live (battery) side of a fuse holder (the radiator fan and some aftermarket accessories) should include an in-line 8A fuse, to mitigate the risks of fire in the event of a short circuit.

1.3 Wire Sizes and Uses for Fulvia S2

The Fulvia S2 wiring loom uses wires of five different sizes. Their cross-sectional areas and values for their safe current capacities and power delivery are given in the table below.

Cross Sectional Area (mm ²)	Safe Current Rating (Amps)	Safe Power Rating (Watts)
1	5	60
1.5	8	96
2.5	16	192
4	20	240
6	30	360

Most electrical loads draw significantly less than 5A/60W and can be safely wired using the smallest (1mm², default) wire size. Lancia have chosen to use slightly larger wires (1.5mm²) to supply power to the lighting circuits from their relays. Since separate circuits are used to supply side-lights, low-beam and high-beam bulbs and their left/right sides are supplied separately, this allows typical 60/55W bulbs to be used safely. 1.5mm² wires are also used to supply current to the rear-window heating element, the cigarette lighter, the ignition coil and the radiator fan.

Larger, 2.5mm² wires supply current from fuse 7 to the lighting relays (from where it is distributed to the individual lights) and from the ignition switch to fuse 9 and to the starter solenoid.

Wires up to 2.5mm² can be safely used to supply current to any low/medium power devices on the load-side of the Fulvia 16A fuses. In the event of a failure of the device, currents greater than 16A would cause the fuse to fail before there was significant heating of the connecting wires.

Where more power is required, devices are supplied using 4mm² wires and connected directly or indirectly to the battery, without an intervening fuse. There are only two such cables shown on the Fulvia S2 wiring diagram: one supplies the charging current to the battery from the alternator and the other provides power to the ignition switch for distribution to other loads (fuse 8, fuse 9 and the starter solenoid).

Finally, the wiring loom contains a single 6mm² wire. This is the power supply to all loads* from the battery and joins the live terminal of the starter motor to the live-side (+) of fuse 7. This connection is also used as a distribution point for power to the ignition switch and lighting relays.

**except for any non-standard accessories that have been connected directly to the battery via their own fused circuits.*

1.4 Ignition Key Position and Power to Fuses

The ignition switch [55] fitted to this UK Fulvia was made by SIPEA and controls the connections between four wires: a live feed from the battery and three other wires which provide power to fuse 8, fuse 9 and the starter solenoid. The SIPEA ignition features a 4-position barrel, labelled ST/GAR/MAR/AVV. Alternative ignition switches may have been available in other countries – for example, there is a 3-position ignition switch (ST/MAR/AVV) available from Magnetti Marelli – however the UK Owners Handbook describes a 4-position switch.

Position 1: In the anti-clockwise (ST= Stop) position, with the ignition key fully anti-clockwise, only fuses 7 & 8 are live. Fuse 8 obtains its live from the ignition switch, which is also powered directly from the battery via terminals on the starter and fuse 7. In this position the lighting stalks are fully functional - power can be supplied to sidelights, low- and high-beam and low-beam flasher.

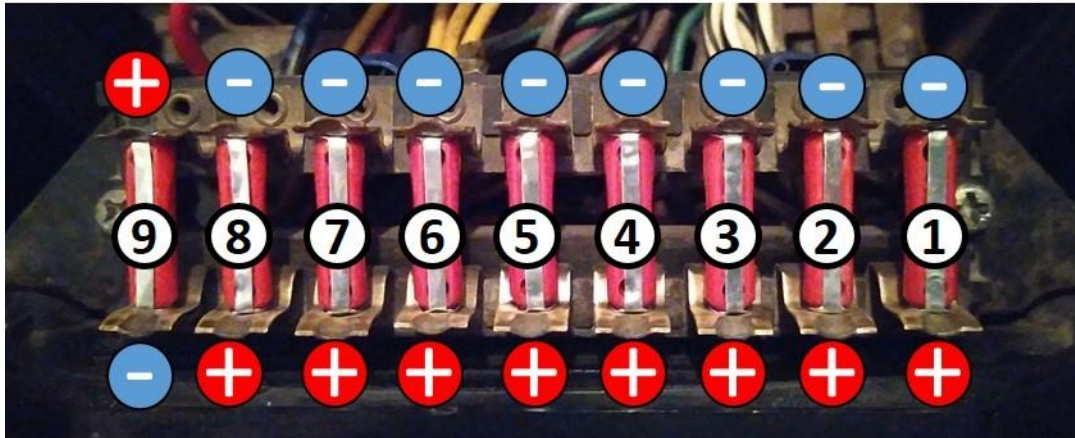
Position 2: If the key is turned 60 degrees from its fully anti-clockwise position (GAR= Garage), power to fuse 8 is lost. At this point only fuse 7 is powered. Withdrawing the key with the ignition in the GAR position leaves the steering lock and the lights, brake lights, windscreen wipers and heater fan disabled.

Position 3: With the ignition key rotated clockwise by 120 degrees (MAR= Drive), fuse 9 becomes live and the associated ignition circuits are also powered (alternator, coil, distributor etc.).

Position 4: Turning the key further against its spring (AVV= Start), activates the starter motor and engages it with the flywheel, via the starter solenoid.

2.1 Fuses & Fuse Holder

Fuses here are numbered according to the Fulvia Instruction Book (S2 Coupe & Sport). Fuse 9 corresponds to the left-hand fuse in the fuse box and Fuse 1 is the right-hand fuse. The lower terminal of each fuse is the live side, *except* for fuse 9 (ignition), where it is the upper terminal.



The fuse holder [29] provides one ignition-controlled fuse (fuse 9), two 'permanently' live fuses (fuses 7 & 8) and six fuses (Fuses 1-6) which are controlled by the lighting stalk, as indicated below:

✓ = Live fuse	Spie Acciens	Servizi	Awis	Proiett. Spa	Proiett.	Anabb S.	Anabb D.	Posiz. Quadro	Posiz
Fuse Number	9	8	7	6	5	4	3	2	1
Lights and Ignition Off	✗	✓	✓	✗	✗	✗	✗	✗	✗
Side-Lights On	✗	✓	✓	✗	✗	✗	✗	✓	✓
Dipped-Beam On	✗	✓	✓	✗	✗	✓	✓	✓	✓
Main Beam On	✗	✓	✓	✓	✓	✗	✗	✓	✓
Ignition On (Lights Off)	✓	✓	✓	✗	✗	✗	✗	✗	✗

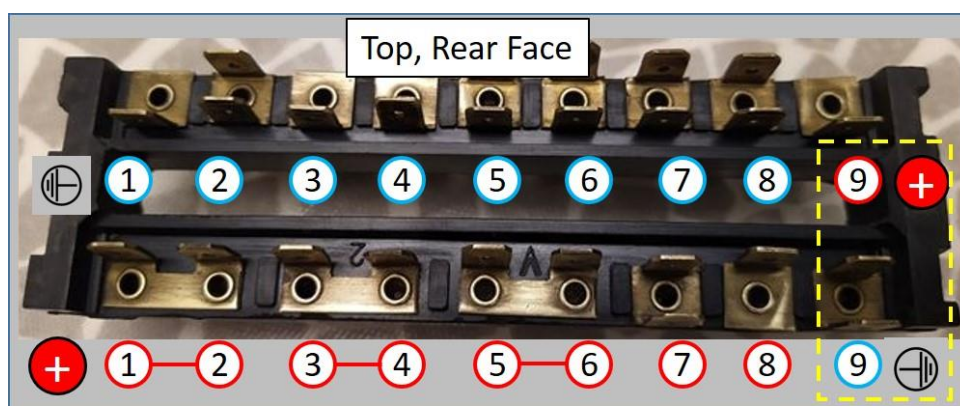
The table below lists the items that are controlled by each fuse i.e. which place a load on the fuse and require it to be intact in order to function.

Fuse Number	Connections to Load-side of Fuse
Fuse 1	Right-hand Front Sidelight; Left-hand Rear Sidelight; Left-hand Number plate Lamp; Reversing Lamps; Under-bonnet/hood lamp
Fuse 2	Left-hand Front Sidelight; Right-hand Rear Sidelight; Right-hand Number plate Lamp; Lights warning lamp; Instrument Panel Illumination lamps; Fuse box lamp; Boot/Trunk lamp
Fuse 3	Right-hand Low Beam (outer headlights)
Fuse 4	Left-hand Low Beam (outer headlights)
Fuse 5	Right-hand High Beam (outer headlights, UK spec.)
Fuse 6	Left-hand High Beam (outer headlights, UK spec.); High Beam Warning lamp
Fuse 7 ^a (ON at all times)	Horn relay [28] load; Radio; Interior Courtesy Light; Door-edge Courtesy Lights; High Beam Headlight Flasher; Clock (not 1600HF); Inner Fog lights (UK)
Fuse 8 ^b (OFF, when key = GAR)	Brake lights; 2-speed Heater Fan; Windscreen Wiper motor; Windscreen Washer motor; Main lights
Fuse 9 (ON when key = MAR or ST)	Coil; Gauges & instrument-panel warning lights (ignition, handbrake/brake fluid & turn); Turn Indicators; Horn relay [28] solenoid; Fan relay [8] solenoid; Inner Fog lights (UK); Heated rear window; Cigarette Lighter

^a. Fuse 7 receives power directly from the battery. Items connected to load-side of fuse 7 can only be disabled by removing fuse 7 or disconnecting the battery.

^b. Fuse 8 receives power from the battery, via the ignition switch. Items connected to fuse 8 can be disabled either by removing the fuse or by putting the ignition key to the GAR position.

Connections are made to the rear of the fuse holder. Note that the live sides of some fuses are bridged together and that each connection is provided with either one or two tags.



Details of connections to each fuse, including colour and destination

Fuse #	TAGS	Polarity	Wire Colour 1	Wire 1 Destination	Wire 1 Load	Wire Colour 2	Wire 2 Destination	Wire 2 Load
1	Upper	Load (-ve)	White	Loom	Sidelight (RH front), Under bonnet light	White	Loom	Sidelight (LH rear), Number plate light (LH)
	Lower	Battery (+ve)	White	Relay 31, Terminal 49	Live from relay 31 (stalk switch on)			
2	Upper	Load (-ve)	Black/White	Loom	Instrument panel lights	Black/White	Loom	Warning light (lights)
	Upper	Load (-ve)	Black/White	Loom	Sidelight (LH front), Fusebox light ^(a)	Black/White	Loom	Sidelight (RH rear), Number plate light (RH), Boot light
3	Lower	Battery (+ve)	Bridged to Fuse 1		Live from relay 31 (stalk switch on)			
	Upper	Load (-ve)	Grey (#)	Loom	Right-hand Low-Beam			
4	Lower	Battery (+ve)	Grey (1.5mm ²)	Relay 30, Terminal 4	Live from relay 30 (stalk down)			
	Upper	Load (-ve)	Grey/Black	Loom	Left-hand Low-Beam			
5	Lower	Battery (+ve)	Bridged to Fuse 3		Live from relay 30 (stalk down)			
	Upper	Load (-ve)	Green#	Loom	Right-hand High-Beam			
6	Lower	Battery (+ve)	Green	Relay 32, Terminal 4	Live from Relay 2 (stalk down & forward)			
	Upper	Load (-ve)	Green/Black	Loom	Left-hand High-Beam			
7	Upper	Load (-ve)	Green/Black	Loom	High-Beam warning light			
	Lower	Battery (+ve)	Bridged to Fuse 5		Live from Relay 32 (stalk down & forward)			
8	Upper	Load (-ve)	Green	Loom	Fog lights (inner)	Brown (4mm2)	Loom	Horn relay
	Upper	Load (-ve)	Red	Loom	Door edge (LH) & interior courtesy lights	Pink	Loom	Door edge (RH) & interior courtesy lights
9	Lower	Battery (+ve)	Red (4mm2)	Relay 31, Terminal 73	Live to Relay 31 (Terminal 73)	Red (6mm2)	Loom (Battery)	Live from starter via junction box
	Lower	Battery (+ve)	Red (4mm2)	Relay 32, Terminal 3	Live to Relay 32, Terminal 3	Brown (6mm2)	Loom	Live to ignition switch
8	Upper	Load (-ve)	Yellow	Loom	Brake lights	Yellow	Loom	2-speed heater fan
	Upper	Load (-ve)	Yellow	Loom	Windscreen wiper motor	Yellow	Loom	Windscreen washer motor
9	Lower	Battery (+ve)	Red	Relay 3, Terminal 1	Live to Relay 31, Terminal 1 (solenoid)	Black	Loom	Live from ignition
	Upper	Battery (+ve)	Blue/Black (4mm2)	Loom	Live from ignition switch	Red ^(c)	Loom (via in-line 8A fuse)	Live to Reversing lights ^(a) , Rear Fog, Aux. Fuel Pump
9	Lower	Load (-ve)	Red (4mm2)	Loom	Alternator (B+)	Red	Loom	Turn indicators
	Lower	Load (-ve)	Brown (4mm2)	Loom	Heated rear window switch	Brown (4mm2)	Loom	Cigar lighter

Relay 30= Low beam solenoid
Relay 32= Main beam solenoid
Relay 31 =Main Lighting Solenoid

(a) Reversing lights moved from Fuse 1 (Upper) to Fuse 9 (Upper)

(b) replaces glove compartment light on wiring diagram

(c) Ignition controlled accessories connected via 'piggy-back' connector

2.2 Fuse ratings

The Fulvia S2 handbook recommends using eight 15A fuses and one 30A fuse for the Coupe, and seven 15A and two 30A for the Sport. The positions of the 30A fuses are not specified, although for the Sport, one is likely to be reserved for the circuit which controls the window lifts.

Fuse 7 (Avvis) is supplied by a large diameter red (6mm²) lead, which is rated to 30A (see Section 1.3). This circuit runs three potentially high-current devices: horns, fog-lights and radio/cassette. This is probably also the intended position for a single 30A fuse, thus allowing the sporting user to safely fit additional loads, such as rally lights, additional fans or other devices as required. If no such accessories are present then a 16A fuse should be retained.

2.3 Adding Accessories

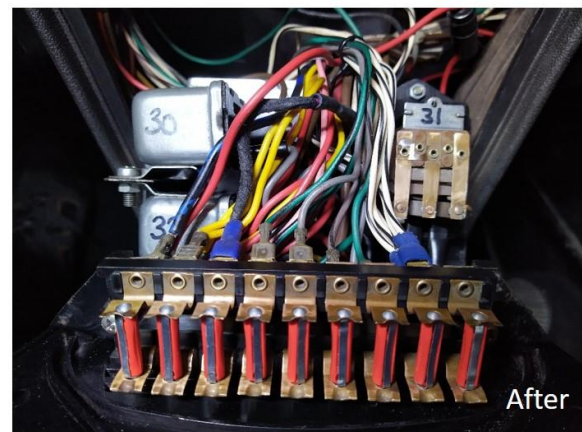
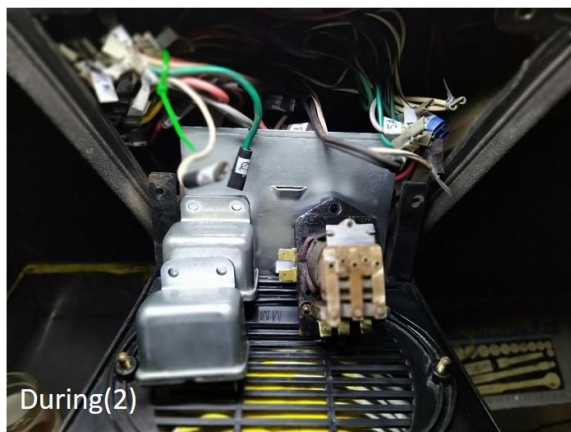
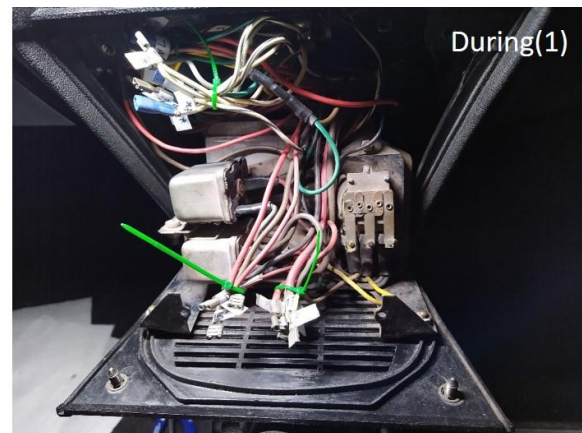
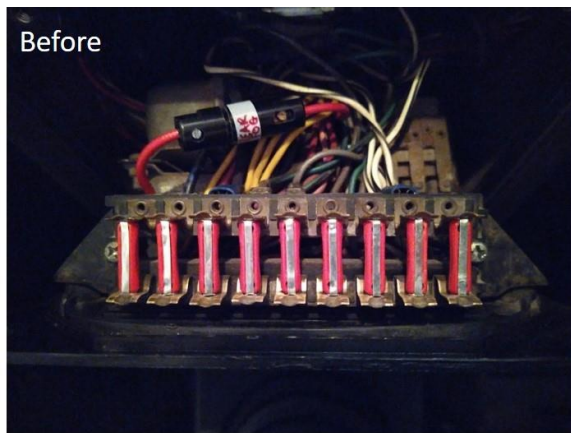
Consideration should be given to the operation, safety and power requirements of the accessory before fitting. Some items (electrical fuel pumps, rear fog-lights etc.) must be isolated from the battery when the ignition is off and therefore are best powered from fuse 9. Other, low current items, can be safely added to either fuses 7 or 8.

Fuse 7, or a separate, fused connection to the battery, should be used if item needs to remain powered at all times (e.g. alarms, trackers). Fuse 8 would be chosen if it is desirable to isolate the device when the car is left with the ignition in the GAR position (e.g. USB charging points).

2.4 Fuse Box Refurbishment

The Fulvia fuse box is easily accessible and relatively straightforward to dismantle. After removing all fuses, the two screws holding the fuse holder can be removed to allow access to the wiring. Care should be taken to note the positions of all wires attached to the fuse block and label them as they during dismantling. These should be grouped and tied together as they are removed in order to facilitate reassembly.

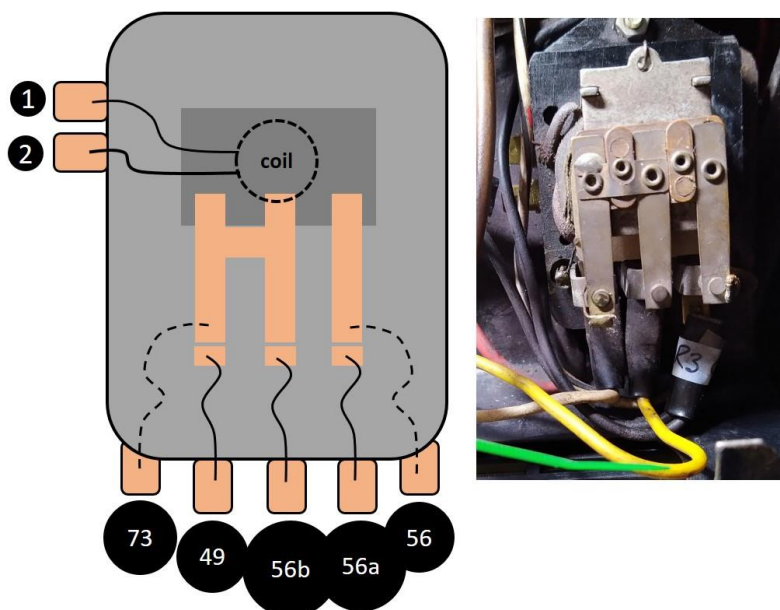
Relays 30 & 32 can be disconnected and removed for cleaning at this stage. Relay 31 is held by two small bolts that pass through a metal frame and are more difficult to access. However, after removal of the ashtray, these bolts, the relay and the metal frame that supports them can be removed using a small socket, spanner and patience.



After disassembly, the fuse holder, relays, contacts and spade connectors can be cleaned with wire wool and fine emery paper. Wires should be cleaned with solvent (isopropanol or white spirit).

A diagram showing the connections to Relay 31, numbered according to the Lancia Fulvia S2 wiring diagram, is given below. This relay lacks its cover and is unmarked, but it is believed to have been supplied by CEAM (and was also fitted to Ferraris, hence expensive to replace).

Fulvia Main Lighting Relay [31]



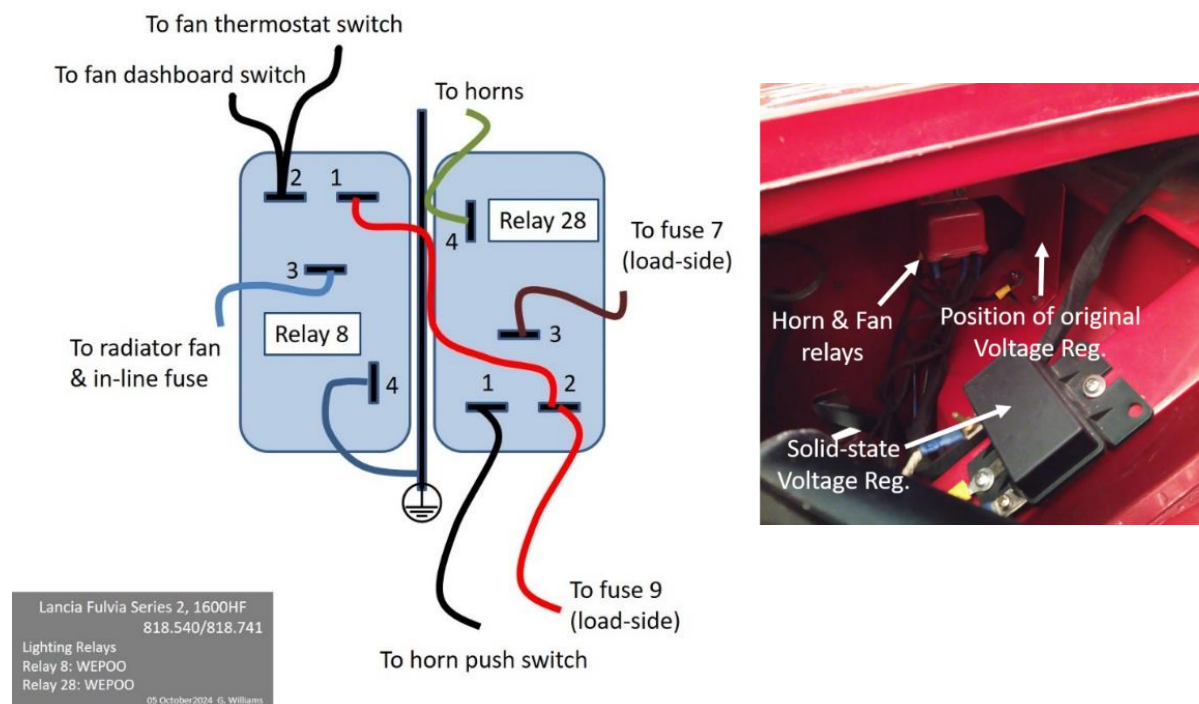
3.1 Relays

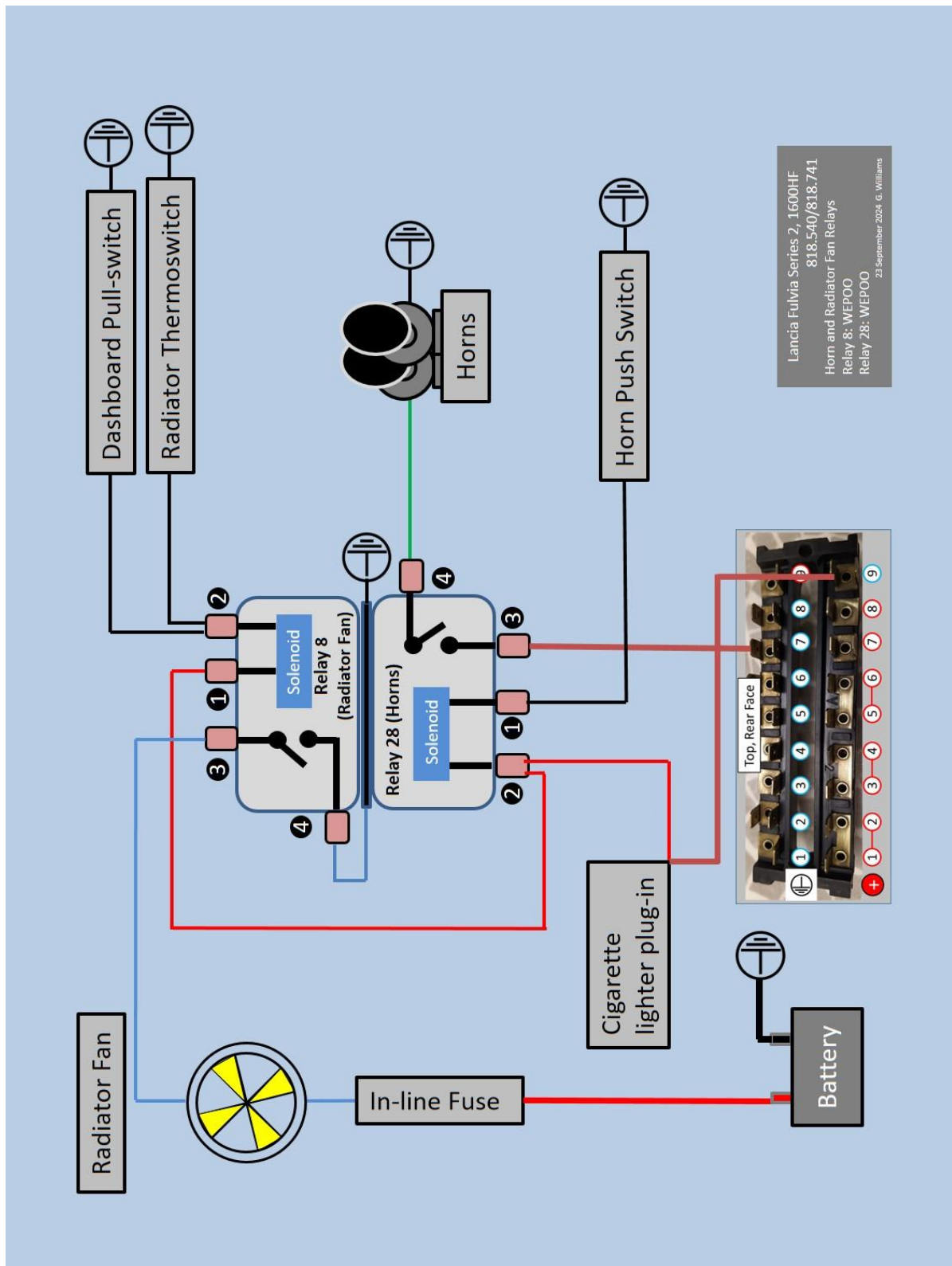
The Fulvia Series 2 Coupe/Sport wiring diagram contains 5 relays, numbered [8], [28], [30], [31] and [32].

3.1.1 Horns and Radiator Fan Relays

Relays [8] and [28] control the operation of the radiator fan [6] and the horns [5] respectively. These devices can generate relatively high peak-currents and the use of a relay allows these loads to be physically separated from their (low-current) switches. On the S2 Fulvia coupe, the horn and fan relays are mounted on a bracket located under the front, right-hand wing and attached to the wheel arch. The relays share a live feed from fuse 9 (ignition-controlled) to their solenoids which are earthed via the radiator thermo-switch (relay [8]) or the horn-push (relay [28]). Current to the horns is supplied by fuse 7, while the radiator fan is supplied from the battery which is protected by an in-line fuse near the radiator.

On some models (e.g the UK 1600HF), an earth can also be supplied to the fan-relay using a manual pull-switch mounted on the dashboard above the fuse box. This switch is not shown on the Lancia 1600HF wiring diagram, but it appears to be a factory fitted item.





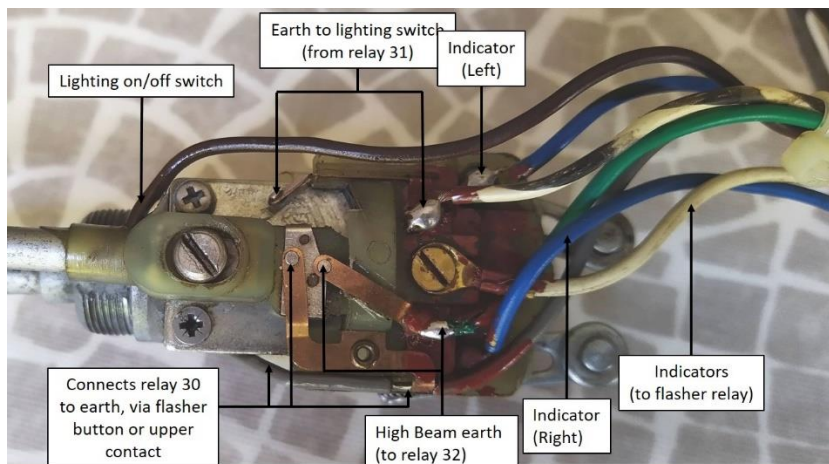
3.1.2 Lighting Relays (sidelights, low-beam and high-beam)

A. Fulvia S2 (from the Fulvia S2 Instruction Book, first edition)

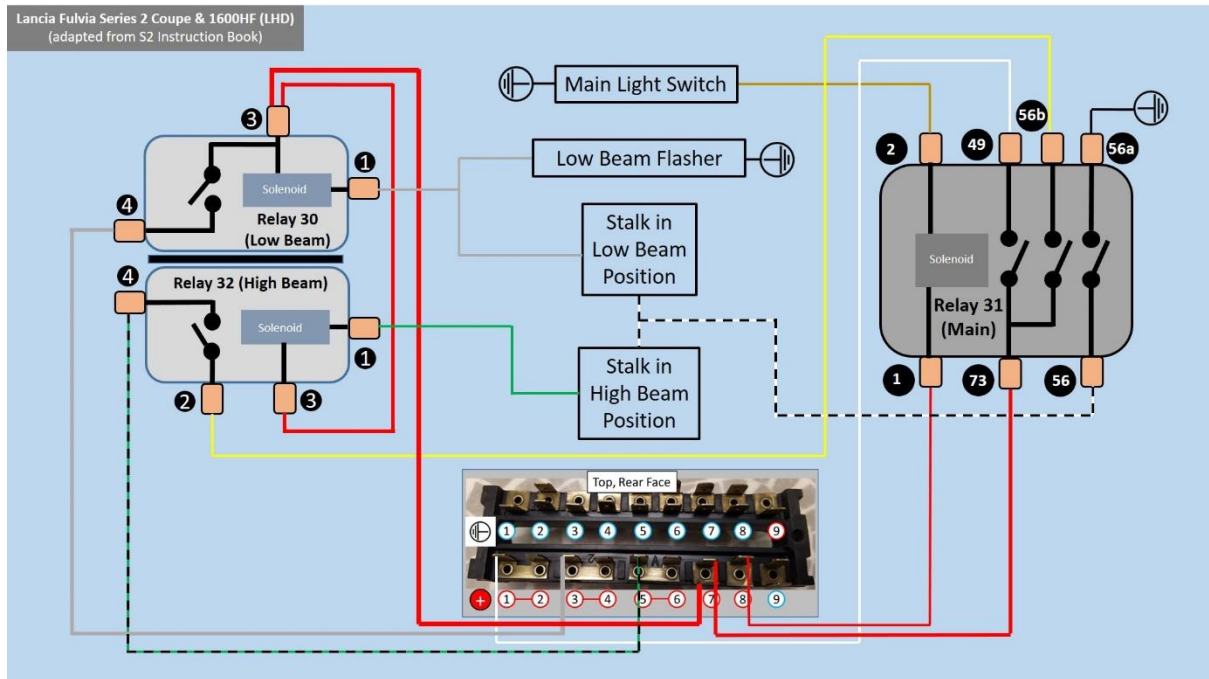
Fulvia lighting is controlled by three relays, numbered [30], [31] and [32] in the Series 2 Instruction Book. Relays [30] and [32] are used to supply power to the low-beam and high-beam headlight filaments respectively. Relay [31] is connected to the main lighting switch and stalk, and is used to supply power to the sidelights and also to control the operation of relays [30] and [32].

Power is supplied to the solenoids of relays [30] and [32] and also load-side of relay [31] from the live-side of fuse 7. Thus, these items are permanently powered, regardless of the position of the ignition key or the integrity of fuse 7. The solenoid of relay [31] is powered from the live-side of fuse 8 and so its power can be withdrawn (the lights are inoperative) when the key is in the GAR position.

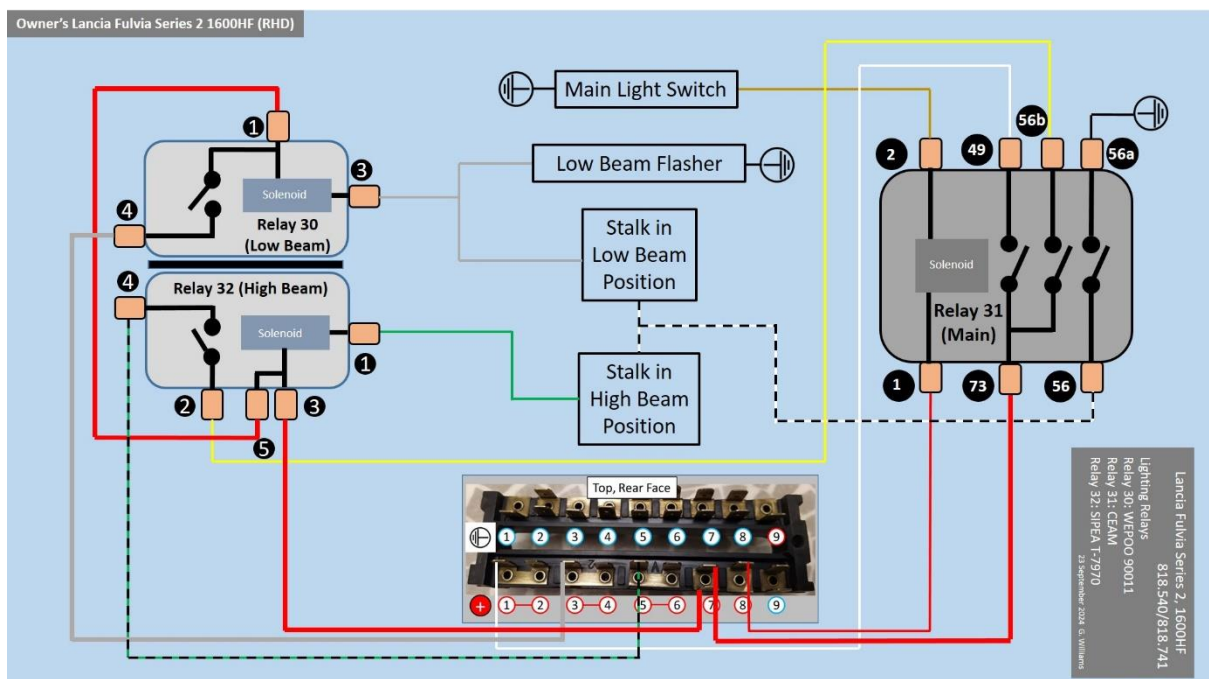
When the main lighting switch (a slider on the lighting stalk) is switched ON, relay [31] closes which provides power to the sidelights and the high-beam load of relay [32], as well as supplying an earth to the lighting stalk. When the stalk is pushed down, this earth is connected to the solenoid of relay 30, activating the low-beam. If the stalk is then pulled forward, an additional earth connection is made to the solenoid of relay [32], thus also activating the high beam.



The solenoid of relay [30] can also be earthed through the steering column, independently of relay [31], by pushing the flasher button on the end of the indicator stalk. This allows flashing of the low-beam lights for signalling during daylight. Connections within the lighting stalk and a schematic diagram showing the connectivity and operation of relays [30], [31] and [32] are given below.



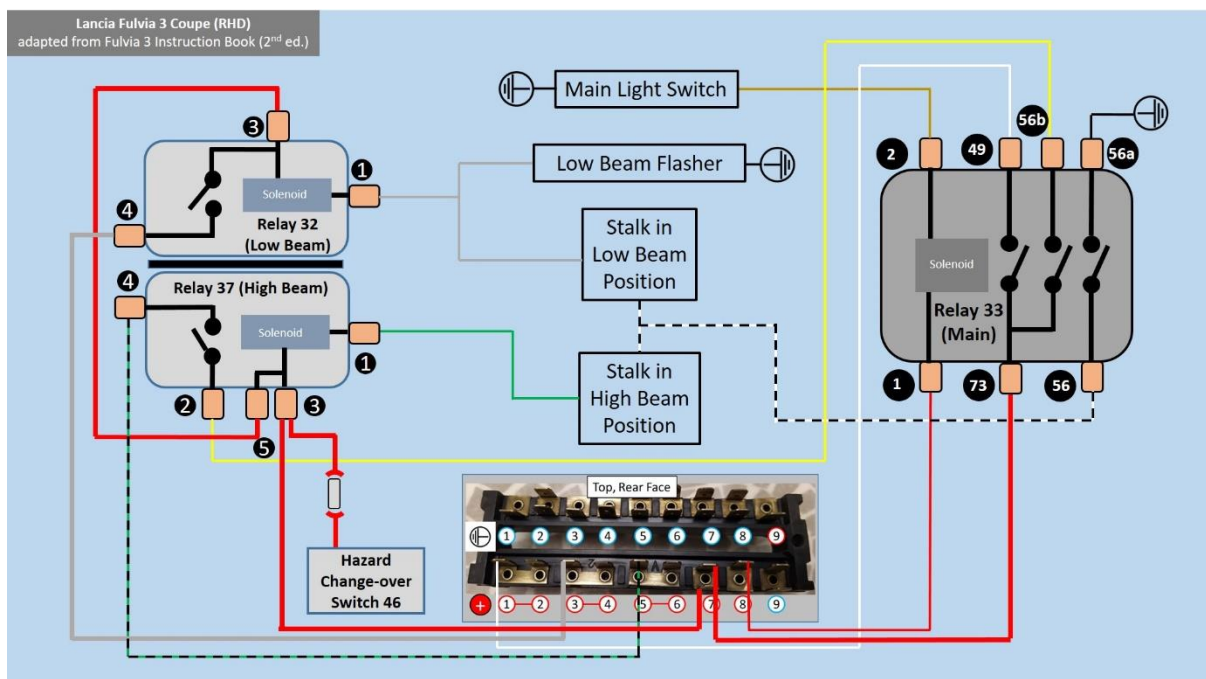
The owner's 1971 Fulvia S2 1600HF (RHD) shows some differences when compared to the standard arrangement described above. Relay [32] has been replaced by a 5-pin SIPEA item. The additional pin (pin 5) is internally connected to pin 3, and is externally connected to the live side of relay [30]. The supply from fuse 7 (+) to both relays is delivered to pin 3 of relay [32]. Despite these differences, the behaviour of these relays and the lights during their operation is unchanged.



B. Fulvia3 (from the Fulvia 3 Instruction Book, second edition)

The wiring diagram for the Fulvia 3 (RHD, with Hazard Signalling) contains an additional relay which controls the inner driving/fog lights, as well as a number of additional modules used for hazard flashing of the indicators. Consequently the relays used for low-beam, high-beam and main lighting are numbered differently; as 32, 37 and 33 respectively. The inner driving/fog lights share no wiring with the outer (main) lights and are described separately, in section 3.1.3.

For the S3 (RHD) main lights, the high beam relay (item [37] for the S3) has 5-pins and all connections between the relays, lighting stalk and fuse block are the same as shown for the S2 1600HF described above. In the Fulvia 3 diagram, pin 3 of relay 37 is also used to supply power from fuse 7 to a Hazard Flasher unit, via an additional, in-line fuse.

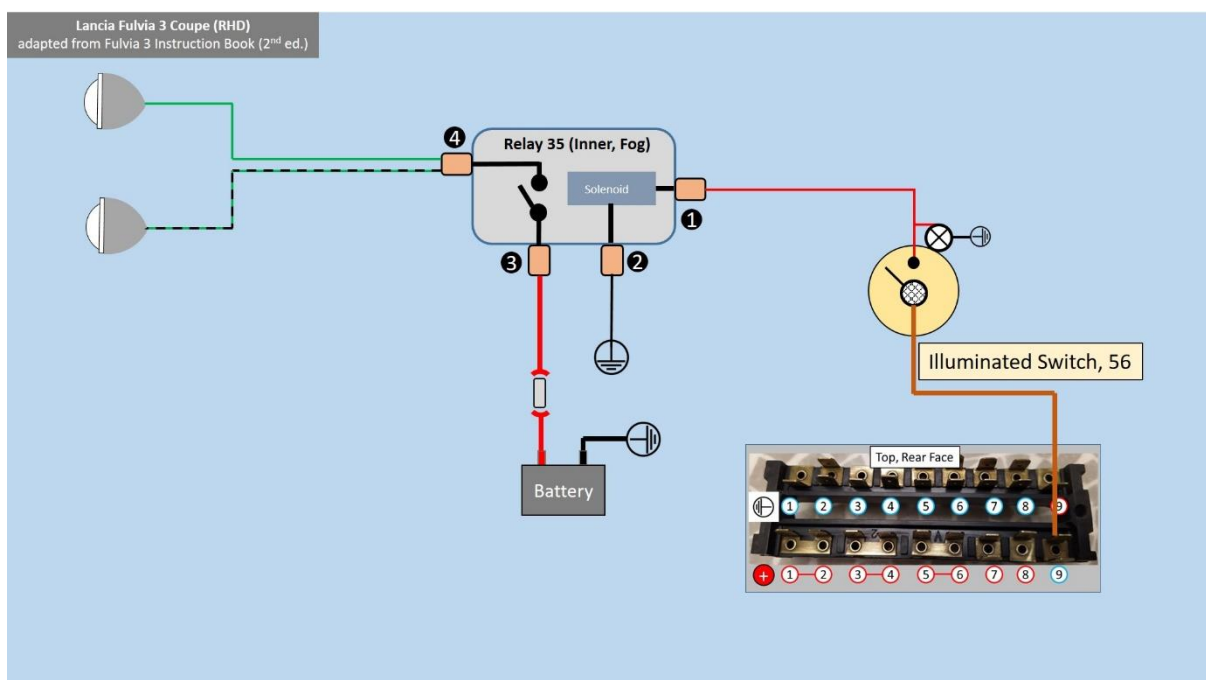


Despite some differences in the number of pins, the low-beam and high-beam relays always perform one function, namely to close a single switch providing power to their respective loads. Any extra pins are used to distribute power to other units, without requiring the use of 'piggy-back' connectors on a single pin. In all cases described here, the dependence of the main lights on the status of fuses 7, 8 and the lighting stalk remains the same.

3.1.3 Front Fog Lights & Relay (UK-spec only)

UK cars with dual-filament bulbs in the outer headlights were fitted with fog lights (also described as driving lights) in the inner headlight positions. These are activated by an illuminated switch mounted on the dashboard, above the fuse box. The switch is labelled 56 or 59 in different versions of the Fulvia S3 wiring diagram (LHD/RHD/1st Ed./2nd Ed.) and described variously as 'Main Beam headlamp switch' or 'Cigarette Lighter Light'.

The schematic below is adapted from the second edition of the Fulvia 3 Coupe Instruction Book. The solenoid of the inner light relay ([35] in the S3 wiring diagram) is controlled by the ignition switch, being connected to the load-side of fuse 9. The inner lights themselves obtain power directly from the battery, via an in-line fuse and the load-side of relay 35. Relay 35 is typically located under the right-hand side of the dashboard (*Appendix 3*).



Additional wiring for these lights is not shown in the Lancia S2 wiring diagrams. However, a similar arrangement was found on the S2 1600HF Coupe (RHD) examined here. In this case, the illuminated pull-switch seems to contain a built-in relay. As with the S3 arrangement above, the solenoid of the built-in relay is powered from fuse 9 although power to the supply side is obtained from the load-side of fuse 7, rather than from the battery. Power from the relay is then distributed to the inner lights via a green-black wire (left-side) or a green wire (right-side). These are the same wire colours that are used for the S3 Coupe (RHD), consistent with this being a factory fitment.

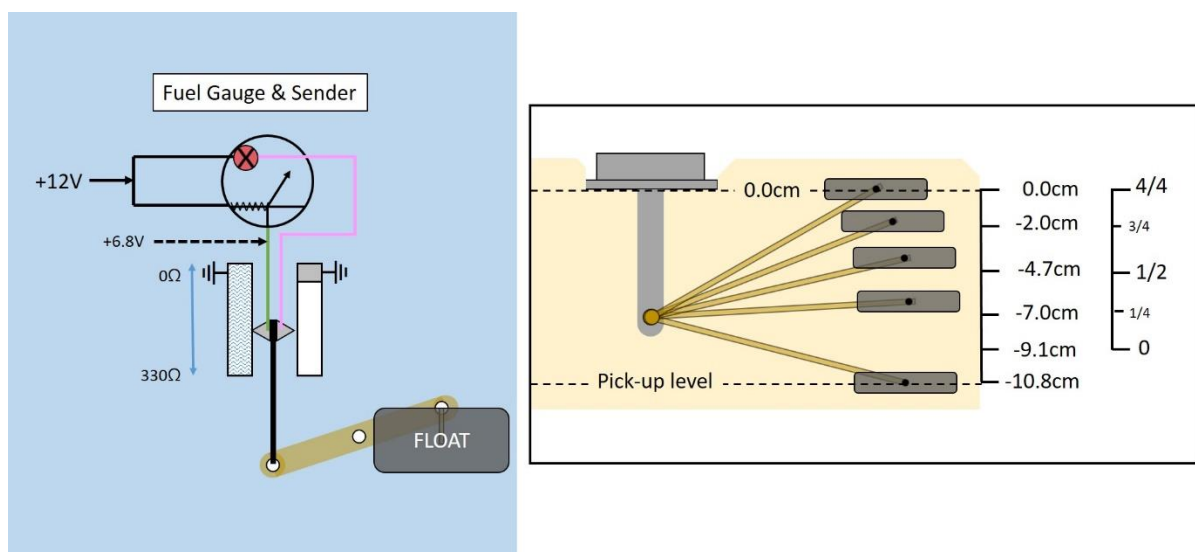
3.2 Fuel Gauge and Sender

From empty, the fuel tank requires approximately 40 litres of fuel to fill completely – this is consistent with its stated capacity of 38 litres, avoiding over-filling. Measurements then suggest that the fuel gauge reads zero when about 9l of fuel has been added to an empty tank. Since the fuel pick-up pipe functions with only about 5l of fuel in the tank, this suggests there is an accessible reserve of around 4l of fuel (~25 miles) remaining once the gauge reads zero.

The operation of the fuel gauge [38], warning light [38] and sender [75] has been deduced from measurements of the resistance between the two terminals of the sender while the float is moved, in conjunction with observations of the apparent fuel level when the sender connected to the fuel gauge.

The sender is connected to the gauge by two wires, brown and green in the Owners Handbook, but pink and green on this UK specification car. The green wire controls the gauge needle via a 0-330 ohm variable resistance, while the pink wire operates the warning light, which goes to earth when the fuel level drops below a set point.

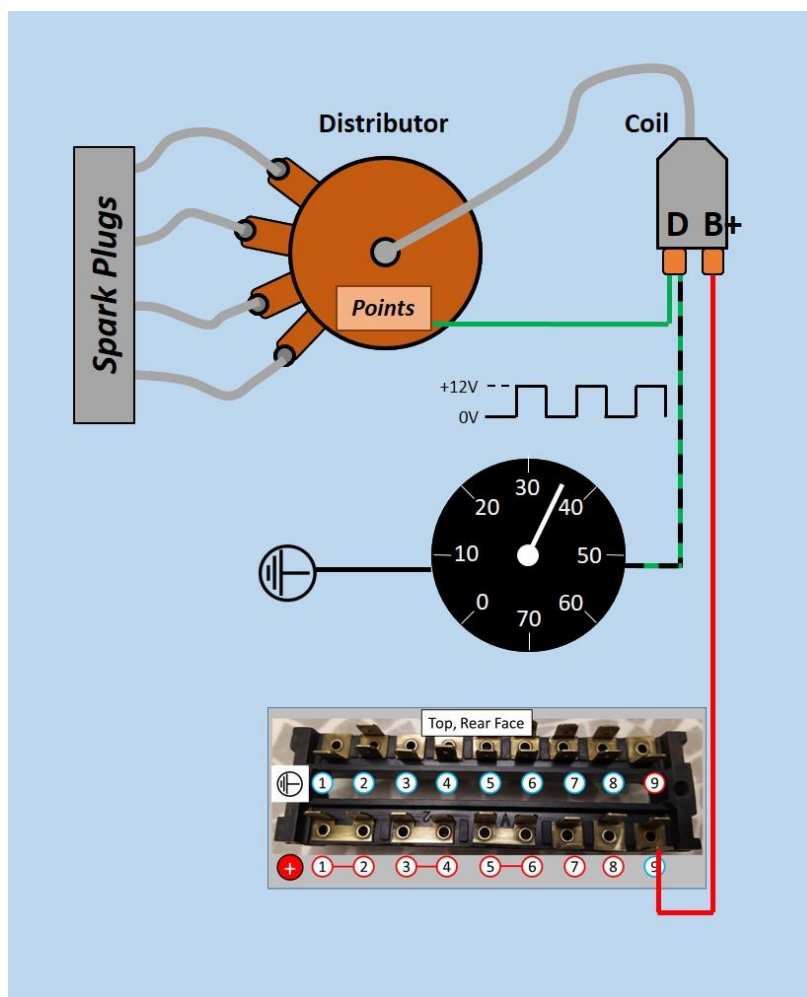
This is shown schematically in the diagram below, along with approximate measurements that relate the position of the float (relative to the bottom of the sender body) to the reading on the fuel gauge.



3.3 Ignition and Charging circuits

3.3.1 Ignition Circuit & Electronic Rev. Counter

The ignition system consists of a distributor [22] and coil [23], which are connected to each other. A single live feed is provided from the load-side of fuse 9 to the coil (B+ terminal). The primary windings of the coil then provide a low voltage from its D terminal to the capacitor and points within the distributor. The secondary windings generate a high voltage (typically 20-40kV) which to the distributor rotor arm via the King Lead. When a spark is created at the points, the capacitor discharges and the voltage at terminal D briefly drops to zero. The variable voltage at the D-terminal is then fed to the rev-counter where it generates a reading.

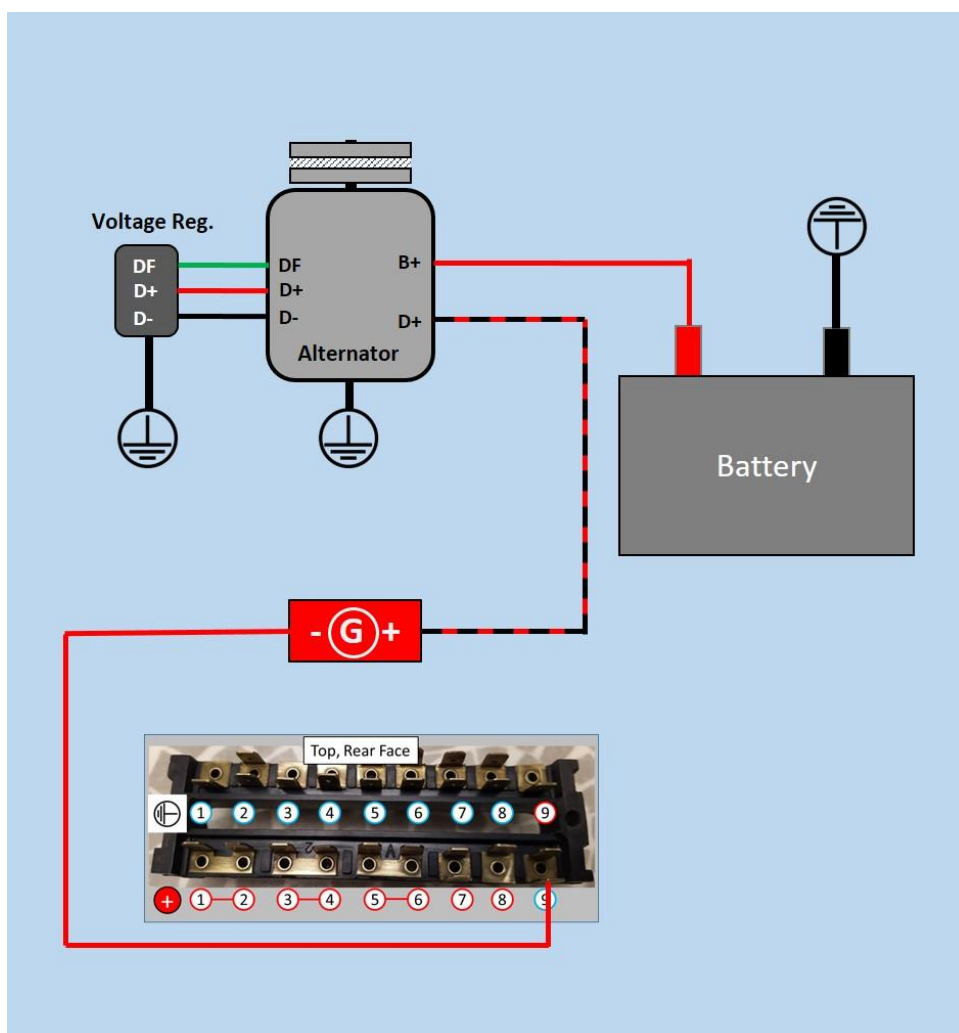


3.3.2 Charging Circuit

The charging circuit consists of an alternator [13] which is connected to a voltage regulator [12]. The job of the latter is to smooth the output of the alternator to a steady +14V which is then used to charge the battery when the engine is running. Both alternator and voltage regulator must be securely earthed to the car (subframe or engine). The only connections from the alternator to the electrical system are to the battery (from alternator B+ terminal), for charging (via a common terminal on the starter), and to the ignition warning light (from alternator D+ terminal), which is extinguished when the output from the alternator matches the voltage supplied to fuse 9 by the battery.

The original, factory-fitted voltage regulator was a Bosch AD 1/14V voltage regulator, located on a bracket under the right-hand front wing. This bracket also supports the horn and fan relays. After 50 years, it is probable that the voltage regulator will have been replaced, possibly by a modern, solid-state device. On this 1600HF a solid-state regulator is present, mounted on the right-hand chassis leg.

While the Fulvia 2 Series Owners Handbook lists the alternator as a Bosch G 1-14V 28A 22 (12/14V, 28Amps) for all S2 Fulvia coupes, this particular car is fitted with a Ducellier 75 53A unit (12/14V, 40Amps). It is likely that this was also a later, post-factory replacement.



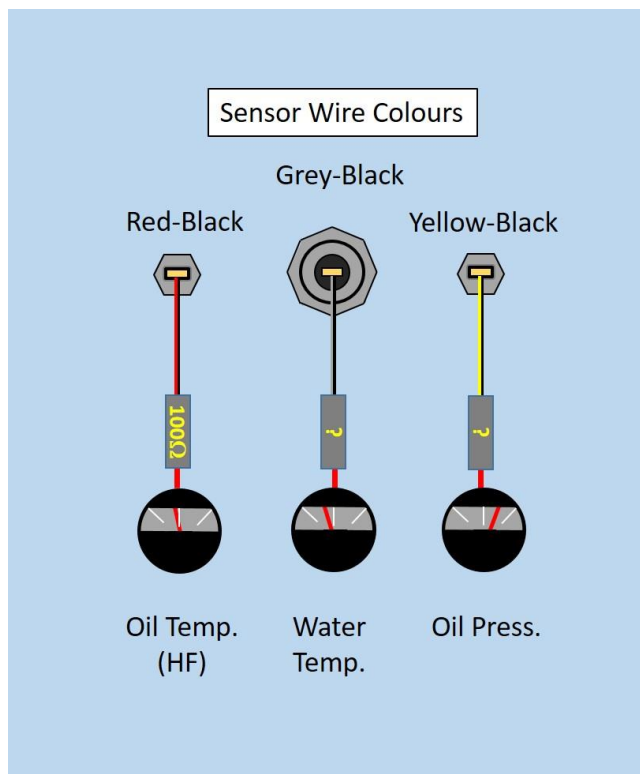
3.4 Other Electrical Items

3.4.1 Engine Sensors

Sensors are connected to their gauges by wires with black stripes. These are grey-black for the coolant temperature, yellow-black for oil pressure and red-black for oil temperature (HF only).

On the UK 1600HF coupe described here, the oil temperature gauge (Veglia) was found to have a fixed 100 ohm resistor near the gauge, wired in series with the sensor. After 50 years, this resistor was extremely fragile and may have been responsible for the apparent failure of the sensor. When the oil temperature sensor is replaced with a Facet 7.3267 M14 x 1.5 item, a 100 ohm resistor is required for correct operation.

It is not known if the other gauges are also fitted with external fixed resistors, but this should be considered in the event of a failure of a gauge which is not due to a faulty sensor.



3.4.2 Cigarette Lighter

The central cylinder of the cigar lighter has a red wire which is supplied by an ignition-controlled live through a plug-in connector within the fuse box (brown in the wiring diagram). Pushing the cigar lighter plug into the cylinder provides an earth to this wire and heats the element. All power to the element is supplied by the ignition circuit (fuse 9); there is no relay involved and the cigar lighter operates even when only fuse 9 is present. The outer sheath of the cigar lighter has two wires attached. One (black) is the earth; the other (yellow) powers a small internal lamp and is connected to the lighting solenoid (red in the wiring diagram).



4.1 Differences from Published (Lancia) Wiring Diagrams

For this Fulvia, there are four minor departures from the S2 1600HF wiring diagram shown in the Owners Handbook. It is not clear if these changes were made at the factory, by the UK supplier or by a previous owner.

One change is to the radio, which is wired to Fuse 7 and not to Fuse 8, possibly to allow for a higher load (in this case it was a radio/cassette, originally fitted with an electric aerial) or to prevent pre-set tunings being lost when using a radio without a flash memory.

The second change is to the Under-dash Plug-In socket which is connected directly to the battery via an in-line (8 amp) fuse, and not to fuse 7 as shown in the standard diagrams. This was intended to be used for Lancia accessories, such as the rechargeable torch.

The third change is the absence of a light in the glovebox.

The fourth change is to the wire colour from the fuel tank sender to the low-level warning light, which has been changed from brown to pink.

4.2 User Accessories & Wiring Modifications

4.2.1 Known Fulvia Lighting Modifications

Modification	Method	Purpose
Inner Lights are switched on with the Low-Beam Outer lights.	Solenoid of relay 35 is powered directly from Fuse 5 (no switch)	For drivers who want to be seen.
Headlight Flasher activates the High-Beam bulbs.	Internal modification to lighting stalk flasher + Supply to High-Beam load (yellow) moved from Relay 31/56b to 31/73	For drivers who want to signal while also using low-beam lights.
Reversing lights operate independently of the main lighting switch.	Live feed to reversing lights (red) moved from fuse 1 to fuse 9	For pedestrian safety in daylight.

4.2.2 Modifications to this Fulvia S2 1600HF Coupe

An additional wire taken from the under-dash charging socket, has been used to power a pair of USB ports (5V, 3.1A), mounted inside the glovebox. These ports incorporate a small, permanently-illuminated LED light. If the car is not run for long periods, the in-line fuse can be removed to reduce losses from the battery.

An additional, ignition-controlled circuit has been created by connecting a separately-fused wire, via an in-line 8A fuse in the fuse compartment, to the live side of fuse 9. From here, power is taken to two switches, mounted either side of the handbrake, which operate a rear fog light and an electronic fuel pump. The latter (a Facet square pump) is mounted under the car, near the fuel tank, and is used to prime the mechanical fuel pump and carburettors before starting.

In another modification to the standard wiring, power to the reversing lights is also supplied by this ignition controlled circuit, using a wire taken from the in-line fuse holder and connected to the reversing light switch via a connector in the engine compartment (near the battery). This replaces the previous connection, to fuse 1, which only becomes live when the main lighting switch is ON.

After a few years of ownership, most electrical problems had been traced to poor earth connections due to corrosion, usually where the electrical item was connected to the bodywork. When two items are earthed at the same point, e.g. indicators and brake lights, this can lead to unexpected consequences, such as indicators failing during braking.

As part of a restoration in the 1990s, efforts were made to improve the reliability of the electrical system. This consisted of the installation of a central, high capacity earthing point, enclosed in a waterproof box under the scuttle in the engine bay, which was connected to the battery earth with a 6mm² wire. From here, additional earth leads have been run into the boot/trunk and used to provide earths to the rear light clusters and number plate bulbs. This could easily be extended into the engine bay to earth the lights etc.

At the same time, the Lancia 4-, 6- and 8-pin connectors in the engine bay that join the engine bay loom to the main loom, were replaced with modern, SuperSeal waterproof connectors (see photo below). After cleaning the fuse box (spade connectors, fuse block and lighting relays) described above, all the lights are bright and there is no glow from the alternator warning light. Electrical failures now seem to arise only from breakages: most recently bulbs, a spade connector on the coil and a resistor attached to the back of the oil pressure gauge.

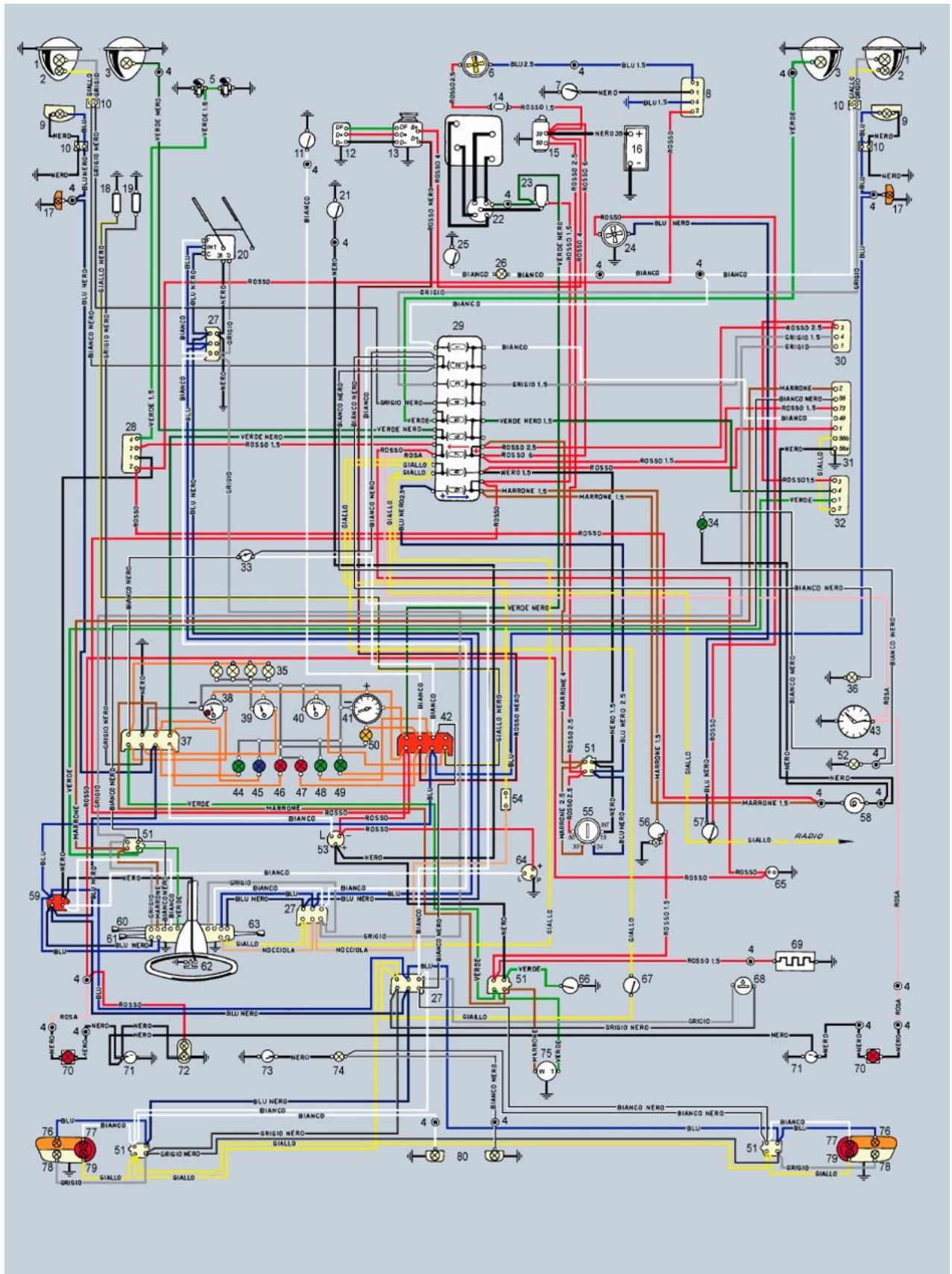


STANDARD DISCLAIMER (borrowed from Fulvia S3 Instructions)

The descriptions, illustrations and specifications contained in this publication are not to be taken as binding; the Company, therefore, reserves the right, the essential characteristics of the types herein described and illustrated still being maintained, to make, whenever it thinks necessary, any changes in units, parts or accessory supply, howsoever arising, without engagement to promptly bring up-to-date this publication.

ENGINEERING DEPARTMENT
Standards and Publications Department
Print No. 88794017 - (X-1973-3000)
Printed in Italy

APPENDIX 1: 1970 Fulvia Coupe Colour Wiring Diagram (n. DT – Fulv. 14/0130)



LANCIA & C.
FABBRICA AUTOMOBILI
TORINO - S.p.A.

VOITURES
CARS
WAGEN **FULVIA**

Groupe INSTALLATION ELECTRIQUE
ELECTRIC SYSTEM Group
Gruppe ELEKTRISCHE ANLAGE

SAT
DONNES TECHNIQUES
TECHNICAL DATA
TECHNISCHE DATEN

Schéma installation électrique Coupé 818.630.

818.630 Coupe Wiring Diagram.

Elektrischer Schaltplan für Fulvia Coupé (818.630).

n. DT - Fulv. 14/0130

29/9/70

2/3

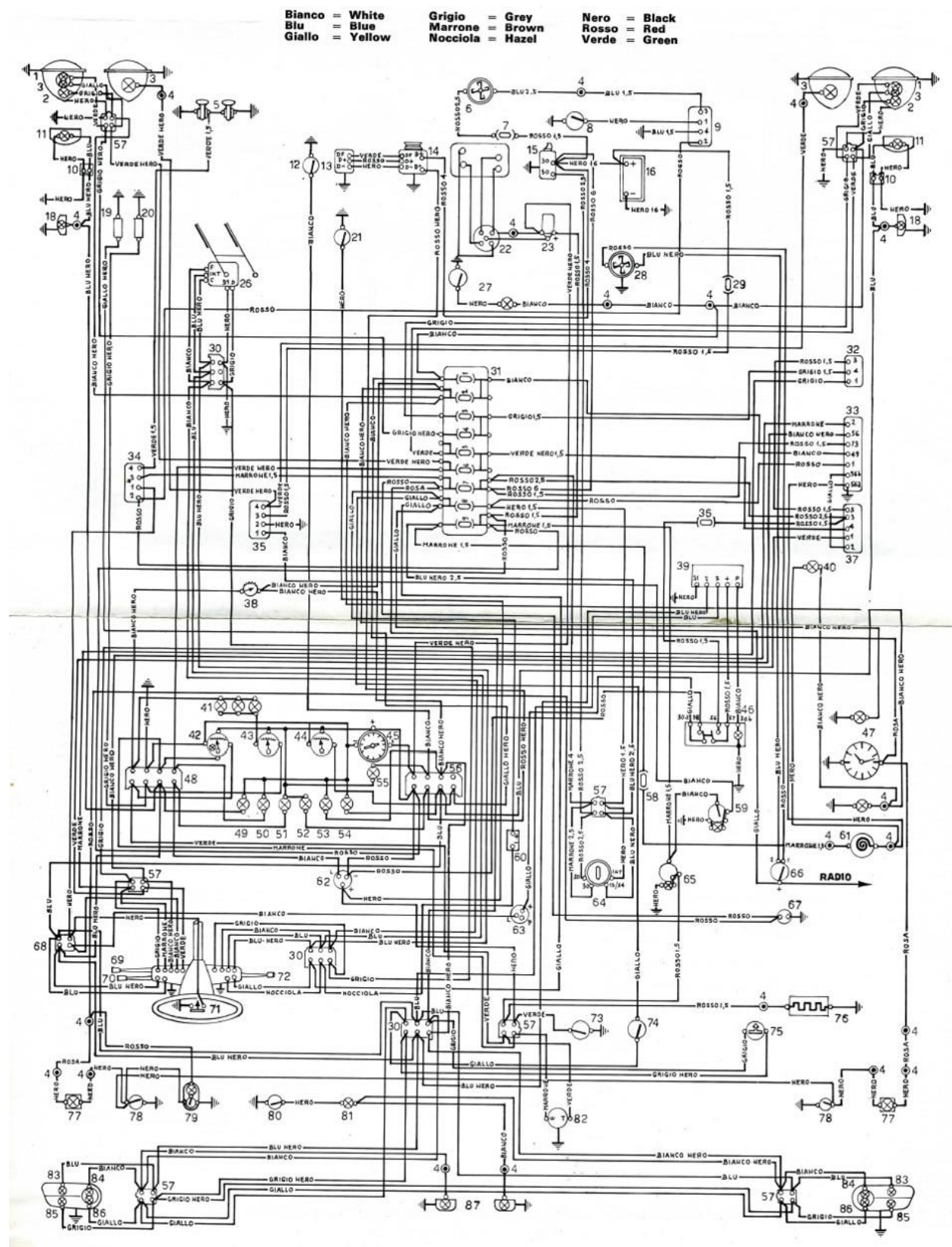
1. Feux code
2. Feux de position AV
3. Feux route
4. Joint à fiche
5. Avertisseurs électro-acoustiques
6. Moteur électrique de ventilateur pour radiateur
7. Thermocontact pour commande moteur ventilateur pour radiateur
8. Relais pour commande moteur ventilateur pour radiateur
9. Clignoteur AV
10. Connecteur à 2 pôles
11. Interrupteur commande voyant starter
12. Régulateur mécanique de tension
13. Alternateur
14. Fusible protection circuit moteur ventilateur pour radiateur (15 A)
15. Démarreur
16. Batterie
17. Clignoteurs latéraux
18. Commande manomètre huile
19. Prise thermomètre liquide réfrigérant
20. Moteur d'essuie-glace à 2 vitesses
21. Interrupteur commande voyant niveau liquide freins
22. Allumeur
23. Bobine d'allumage
24. Moteur électrique
25. Contacteur éclairage compartiment moteur
26. Eclairage compartiment moteur
27. Connecteur à 6 pôles
28. Relais pour avertisseurs électro-acoustiques
29. Boîte à fusibles
30. Relais feux code
31. Relais pour éclairage extérieur
32. Relais feux route
33. Interrupteur avec rhéostat éclairage tableau de bord
34. Eclairage intérieur console centrale
35. Eclairage tableau de bord
36. Eclairage montre électrique
37. Connecteur à 8 pôles pour appareils de bord (blanc)
38. Indicateur niveau carburant avec voyant réserve
39. Thermomètre liquide réfrigérant

40. Manomètre huile
41. Compte-tours électronique
42. Connecteur à 8 pôles pour appareils de bord (rouge)
43. Montre électrique
44. Voyant clignoteur gauche
45. Voyant feux route
46. Voyant frein à main et niveau liquide freins (clignotant)
47. Voyant alternateur
48. Voyant feux de position
49. Voyant clignoteur droit
50. Voyant starter branché
51. Connecteur à 4 pôles (blanc)
52. Eclairage allume-cigarette
53. Centrale clignotante pour voyant frein à main et niveau liquide freins
54. Moteur de lave-glace de pare-brise
55. Contact à clé pour démarrage et services avec antivol
56. Interrupteur pour dégivreur lunette AR
57. Interrupteur pour moteur de ventilateur de climatisation
58. Allume-cigarette électrique
59. Connecteur à 4 pôles (rouge)
60. Commande feux de position, code et route
61. Commande clignoteurs et appel de phares
62. Commande avertisseurs acoustiques
63. Commande moteur d'essuie-glace à 2 vitesses et lave-glace
64. Centrale clignotante
65. Prise de courant
66. Interrupteur commande voyant frein à main
67. Interrupteur pour feux de stop
68. Poussoir pour commande feux de recul
69. Résistance pour dégivreur de lunette AR (en option)
70. Feu indicateur de porte ouverte
71. Contacteur de porte pour éclairage intérieur
72. Plafonnier
73. Contacteur éclairage malle
74. Eclairage malle
75. Commande indicateur niveau carburant
76. Clignoteur AR
77. Feu de position AR
78. Feu de recul
79. Feu de stop
80. Eclairage plaque de police

1. Low beam
2. Front side lamp
3. Main beam
4. Plug-in junction
5. Horn
6. Coolant radiator fan motor
7. Coolant radiator fan motor control thermoswitch
8. Coolant radiator fan motor control solenoid switch
9. Front direction indicator
10. Two-outlet junction block
11. Carburettor choke warning light switch
12. Voltage regulator
13. Alternator
14. Coolant radiator fan motor circuit fuse (15 Amp)
15. Starter motor
16. Battery
17. Direction indicator repeater
18. Oil pressure gauge transmitter
19. Coolant temperature gauge transmitter
20. Two-speed windscreen wiper motor
21. Brake fluid low level warning light switch
22. Ignition distributor
23. Ignition coil
24. Electric motor
25. Engine compartment light press-switch
26. Engine compartment light
27. Six-outlet junction block
28. Horn solenoid switch
29. Fuse box
30. Low beam solenoid switch
31. Lights solenoid switch
32. Main beam solenoid switch
33. Instrument light switch with rheostat
34. Glove locker light
35. Instrument light
36. Clock light
37. Eight-outlet instruments junction block (white)
38. Fuel gauge with reserve warning light
39. Coolant temperature gauge
40. Oil pressure gauge
41. Electronic revolution counter

42. Eight-outlet instruments junction block (red)
43. Clock
44. Left direction indicator warning light
45. Main beam warning light
46. Handbrake and brake fluid low level warning light (flashing)
47. Alternator warning light
48. Side lamp warning light
49. Right direction indicator warning light
50. Carburettor choke warning light
51. Four-outlet junction block (white)
52. Cigarette lighter light
53. Handbrake and brake fluid low level warning light flasher
54. Windscreen washer motor
55. Ignition, starting and accessories key switch with anti-theft device
56. Rear heated window switch
57. Heating and ventilation fan motor switch
58. Cigarette lighter
59. Four-outlet junction block (red)
60. Side light, low beam and main beam switch
61. Direction indicator and headlamp flashing control
62. Horn control
63. Two-speed windscreen wiper and washer motors control
64. Direction indicator flasher
65. Plug-in socket
66. Handbrake warning light switch
67. Stop light switch
68. Reversing light press-switch
69. Rear heated window filament (optional)
70. Open door marker lamp
71. Courtesy light door-operated press-switch
72. Courtesy light
73. Luggage compartment light press-switch
74. Luggage compartment light
75. Fuel gauge transmitter
76. Rear direction indicator
77. Rear side lamp
78. Reversing light
79. Stop light
80. Number plate lamp

APPENDIX 2: Fulvia Coupe 3 (RHD, with Hazard Signalling) Wiring Diagram (from the Fulvia 3 Information Book, 2nd edn.)



RHD CAR WIRING DIAGRAM
(on cars intended for countries where the fitting of hazard signalling is required)

- | | |
|---|--|
| 1. Low beam | 46. Hazard signalling change-over switch with warning light |
| 2. Front side light | 47. Electronic clock with light |
| 3. Main beam | 48. Instruments cluster eight-outlets junction block (white) |
| 4. Plug-in junction | 49. Left-hand turn indicator warning light |
| 5. Air horns | 50. Main beam warning light |
| 6. Coolant radiator electro-fan | 51. Handbrake and brake fluid low level warning light (flashing) |
| 7. Coolant radiator electro-fan circuit fuse | 52. Alternator warning light |
| 8. Coolant radiator electro-fan control thermoswitch | 53. Side lights warning light |
| 9. Coolant radiator electro-fan control solenoid switch | 54. Right-hand turn indicator warning light |
| 10. Two-outlets junction block | 55. Carburettor choke warning light |
| 11. Front turn indicator | 56. Instruments cluster eight-outlets junction block (red) |
| 12. Carburettor choke warning light switch | 57. Four-outlets junction block (white) |
| 13. Voltage regulator | 58. Cigarette lighter fuse |
| 14. Alternator | 59. Main beam headlamp switch with warning light |
| 15. Starter motor | 60. Windscreen washer motor |
| 16. Battery | 61. Cigarette lighter with light |
| 18. Turn indicator repeater | 62. Handbrake and brake fluid low level warning light flasher |
| 19. Oil pressure gauge transmitter | 63. Turn indicators flasher |
| 20. Coolant temperature gauge transmitter | 64. Key switch for ignition, services, anti-theft device |
| 21. Brake fluid low level warning light switch | 65. Rear heated window switch |
| 22. Ignition distributor | 66. Air ventilation and heating fan motor switch |
| 23. Ignition coil | 67. Plug-in socket |
| 26. Two-speed windscreen wiper motor | 68. Four-outlets junction block (red) |
| 27. Engine compartment light and press-switch | 69. Side lights, low beam and main beam control |
| 28. Ventilation and heating fan two-speed motor | 70. Turn indicators and low beam flashing control |
| 29. Main beam headlamp fuse (16 A) | 71. Air horns control |
| 30. Six-outlets junction block | 72. Two-speed windscreen wiper motor and washer control |
| 31. Fuse box | 73. Handbrake warning light switch |
| 32. Low beam solenoid switch | 74. Stop light switch |
| 33. Outside lamps solenoid switch | 75. Reversing light press-switch |
| 34. Horns solenoid switch | 76. Rear heated window filament |
| 35. Main beam headlamp solenoid switch | 77. Door safety light |
| 36. Hazard signalling system fuse (16 A) | 78. Courtesy light door operated press-switch |
| 37. Main beam solenoid switch | 79. Courtesy light |
| 38. Instruments light switch with rheostat | 80. Luggage compartment light switch |
| 39. Hazard signalling light flasher | 81. Luggage compartment light |
| 40. Instruments panel inner light | 82. Fuel gauge sending unit |
| 41. Instrument light | 83. Rear turn indicator |
| 42. Fuel gauge with reserve warning light | 84. Rear-side light |
| 43. Coolant temperature gauge | 85. Reversing light |
| 44. Oil pressure gauge | 86. Stop lights |
| 45. Electronic revolution counter | 87. Number plate light |

APPENDIX 3: Fulvia Coupe 3 (RHD, with Hazard Signalling) Wiring Diagram Showing Locations of (hard-to-find) Electrical Items

