

2CV DIM-DIP HEADLIGHTS

Revision 1



Graeme Dennes

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Purpose

This article provides the background, purpose and operation of “dim-dip” vehicle headlights fitted to new UK vehicles during the period 1987-88. It explains in detail the reasons for the possible damage that may occur to the 2CV light switch due to the method chosen by Citroen to implement dim-dip headlights. It also shows how the dim-dip “feature” may be disabled to protect the light switch.

Vehicle Lighting

Previously in the UK, drivers were required to use parkers (front parking lights and rear tail lights) between sunset and sunrise. Drivers were also required to use dipped (low) beam headlights between sunset and sunrise *except* on well-lit roads (built-up areas). Headlights must not cause undue dazzle or discomfort to other road users.

In built-up areas, it was common for drivers to use parkers only, even though the front parking lights could be of insufficient brightness in some conditions, but low-beam (dipped) headlights could sometimes be too glaring for safe use and were not always used.

“Town Beam” Lighting

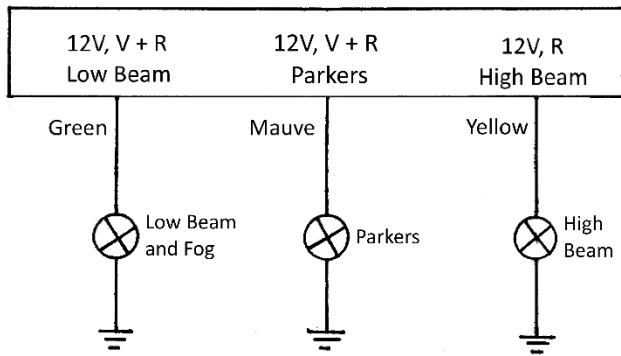
The UK Ministry of Transport (MOT) decided to introduce a vehicle “town beam” which provided greater brightness than the front parking lights but less brightness than the low-beam lights, and believed such a beam would provide conspicuous and glare-free front lighting on vehicles while improving road safety. Subsequently, all vehicles manufactured for the UK market from 1 April 1987 were fitted with “town beam” lighting to meet the *mandatory* MOT regulations. (The UK was the only country to mandate a “town-beam” lighting system.)

The “town beam” was required to provide an intensity between 10 and 20 per cent of low-beam intensity. It was often termed dimmed dipped (low-beam) lighting or “dim-dip” lighting. Most manufacturers chose to operate the low-beam headlights at reduced voltage for the “town beam” lighting, while an alternative approach was to fit a separate pair of front lights. Volvo, for example, employed this option on some of their models, with the “town beam” provided by the brighter of the two filaments in 21W/5W globes.

1987 Standard 2CV Light Circuit

The Haynes 2CV Workshop Manual (1990) shows the standard 1987 2CV electrical wiring diagram on page 198. The light switch assembly consists of three switched circuits which control the three light circuits. The simplified wiring diagram shown below is based on the Haynes Manual and shows the arrangements used in the 2CV. The standard 1987 2CV electrical wiring diagram is shown at the end of this article.

2CV LIGHT SWITCH



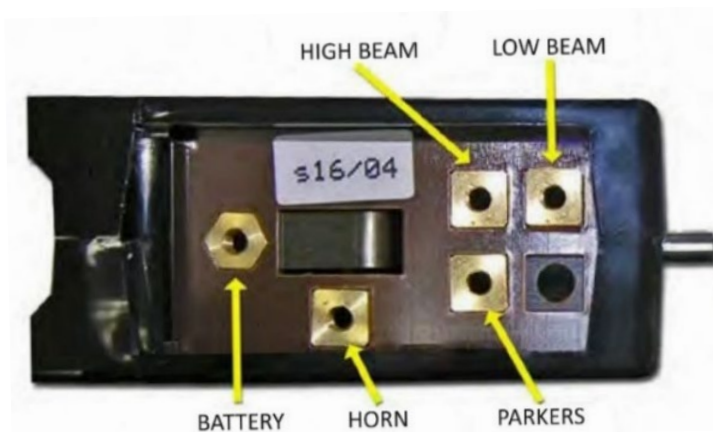
1. The Low Beam switch connects to the Green wire to take power to the low-beam lights (2 x 40W) and fog light (21W), a total of 101W.
2. The Parkers switch connects to the Mauve wire to take power to the parkers (2 x 4W front, 2 x 5W rear) and instrument light (2W), a total of 20W.
3. The High Beam switch connects to the Yellow wire to take power to the high-beam lights (2 x 45W), a total of 90W.

Note: Your wire colours may differ.

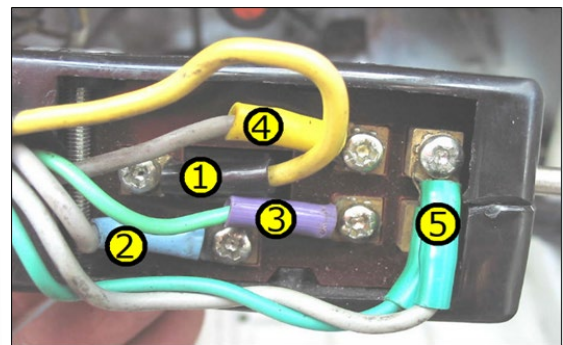
Light Switch Rotary Position Designators:

The “V” and “R” designators in the diagram above refer to the light switch rotary positions. The “V” position is the first clockwise position from the “O” (off) position, while the “R” position is the second clockwise position from “O”. The “V” is for Ville (city) driving and enables low beam lights only, while “R” is for Route (highway) driving and enables low or high beams lights.

Light Switch Wiring Terminals:



Light Switch Wiring:



The photo above left shows the five wiring terminals on the rear of the 2CV light switch.

The photo above right shows one example of the wiring colours used at the light switch terminals. Your colours may differ. The wiring connections numbered 1 to 5 are:

1. To Battery: yellow wire-black sleeve.
2. To Horn: grey wire-blue sleeve.
3. To front/rear Parkers and instrument light: green wire-violet sleeve.
4. To High beam lights: grey wire-yellow sleeve:
5. To Low beam lights and fog light: grey wire-green sleeve and green wire-green sleeve.

Adding Dim-Dip Lighting to the 2CV

For the 2CV “town beam” implementation, Citroen chose to modify the standard lights wiring by connecting a 1-ohm resistor – the dim-dip resistor – in series with the low beam lights. The resistor lowered the voltage to the lights, reducing the brightness and satisfying the “town beam” regulations.

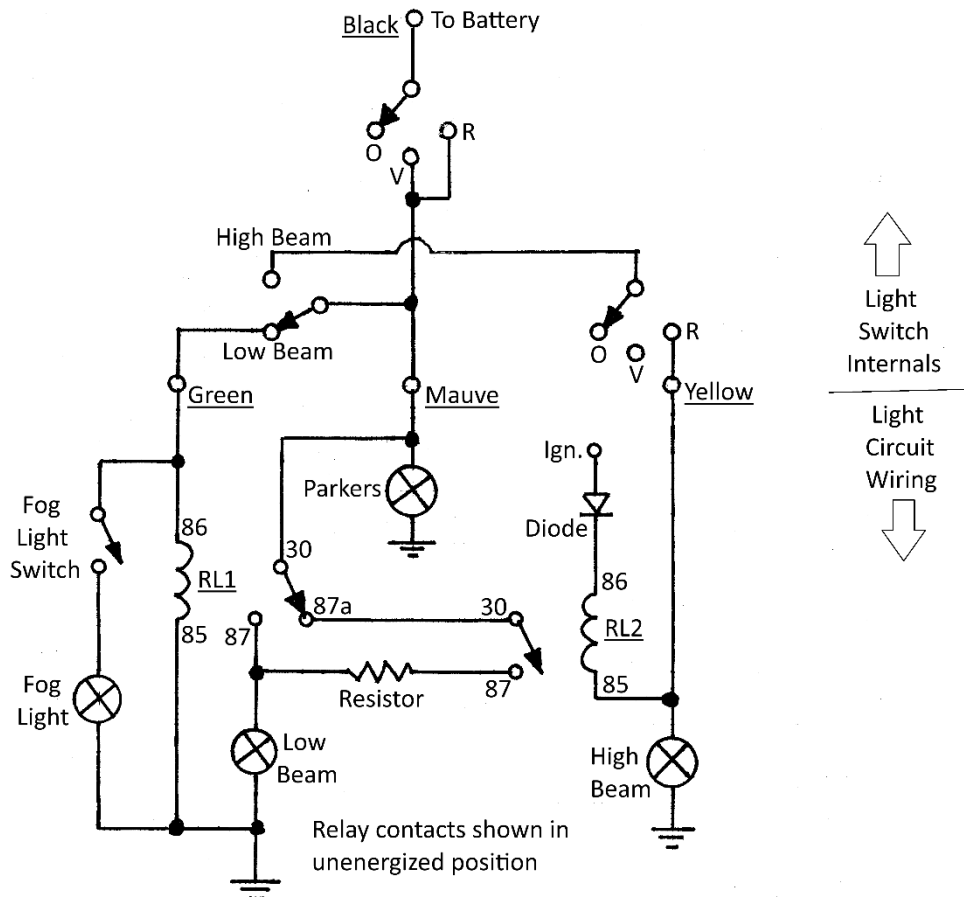
2CV Dim-Dip Lighting Operation

In the 2CV, the dim-dip lighting is activated as follows: *When driving (i.e., ignition on) and the light switch in the “V” position, if low-beam selected, the normal low-beam headlights are operated, while if “high-beam” is selected, the low-beam headlights are operated at reduced brightness – the dim-dip brightness.*

The End is Nigh

In 1988, the European Commission (EC) successfully prosecuted the UK government in the European Court of Justice, arguing that the *mandatory* UK regulations requiring dim-dip headlights were illegal under EC directives which prohibit member states from enacting vehicle lighting requirements which are not contained in Europe-wide EC directives. As a result, the UK regulations mandating dim-dip headlights were quashed in 1988. This decision did not, nor was it intended to, prevent manufacturers from continuing to fit dim-dip lighting, but it was no longer mandatory. Several manufacturers continued to fit dim-dip lighting to their vehicles for several years after.

2CV Dim-Dip Light Circuit



The 2CV dim-dip light wiring diagram above shows the internal connections within the light switch and is based on the diagram on page 199 of the Haynes Manual. The 1987 2CV dim-dip wiring diagram is shown at the end of this article and is a composite of the diagrams shown on pages 198 and 199 of the Haynes Manual.

Although the 2CV's electrical system is quite basic, as well as adding the resistor, the dim-dip feature also added the complication of two relays and a diode. The Haynes Manual refers to relay RL1 as the "Dipped beam" relay and relay RL2 as the "Dim-dip" relay. The two relays and sockets are usually mounted on the firewall near the battery.

The diode ensures the engine is turned off if the ignition switch is turned off while the headlights are switched to high beam. Without the diode, the engine could continue to run, the ignition system drawing its power via the high-beam light switch and relay RL2 coil. The diode is located in the wiring "nest" behind the instrument panel in a small protective holder.

In the dim-dip light circuit above, the Ign. connection at the diode connects to the ignition switch and receives 12V when the ignition key is on.

2CV Dim-Dip Light Switch Positions and Connections

Referring to the 2CV Dim-Dip Lights Wiring diagram above:

Light switch in "O" position:

All lights off.

Light switch in "V" position:

Low beam selected:

Green wire has 12V

Yellow wire has 0V

Relay RL1 activated

Low-beam lights on

High beam selected, *Ignition off*:

Green wire has 0V

Yellow wire has 0V

All lights off

High beam selected, *Ignition on*:

Green wire has 0V

Yellow wire has 0V

Relay RL2 activated via diode and high-beam filaments

Resistor inserted in low-beam circuit

Dimmed low-beam lights on

Light switch in “R” position:

Low beam selected:

Green wire has 12V
Yellow wire has 0V
Relay RL1 activated
Low-beam lights on

High Beam selected:

Green wire has 0V
Yellow wire has 12V
High-beam lights on

2CV Dim-Dip Light Switch Wiring Changes

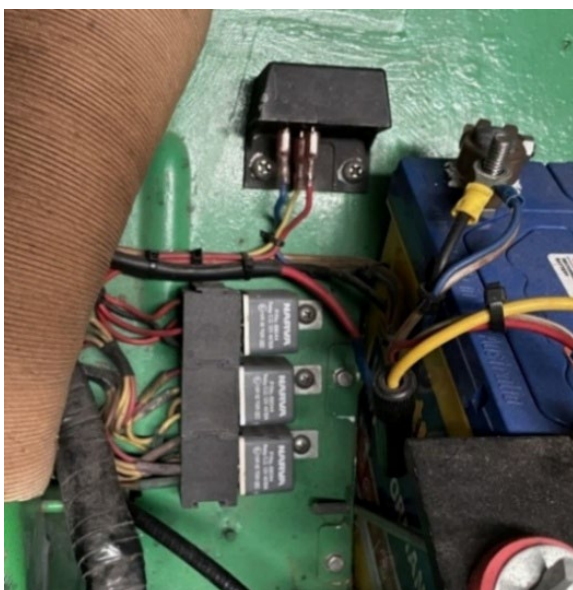
Based on the standard 2CV wiring diagram on page 198 of the Haynes Manual, the dim-dip wiring modification on page 199 made two changes to the light switch wiring:

1. The **green** wire no longer connects to the low beam lights. It connects to the fog light and Dipped-beam relay RL1 coil.
2. The **mauve** wire remains connected to the parkers and instrument light but also connects to the low beam lights and the dim-dip resistor.



2CV Dim-Dip Problem #1

The 2CV dim-dip resistor, shown at left, is encased in a small aluminium cannister, held by a clamp on the left side of the front engine mount cross-member, guaranteeing it receives a good dose of salt, dirt, grit, water, etc. This eventually leads to corrosion of the cannister, rendering the resistor faulty. Its failure (usually by shorting to ground) *will very likely cause the light switch to be damaged beyond repair if it occurs while the low-beam headlights are on.*



In the photo at left from the writer's 1987 2CV, the two lower relays are the dim-dip relays.

The top relay is part of the writer's **Bosch RE57** voltage regulator modification, which locks the battery **terminal** voltage to **exactly** 14.2 volts. Refer to the writer's article, *2CV Battery Problems Solved*.

Note that the three Narva sockets holding the relays are designed to clip neatly together as an assembly.

2CV Dim-Dip Problem #2

When dim-dip lighting is operating in the 2CV, the reduced voltage supplied to the low-beam headlights has the following ramifications:

- a. For standard incandescent headlight globes: No harm is done.
- b. For halogen headlight globes: Under-voltage operation can impair the globes because it interrupts the halogen cycle. The lower voltage reduces the temperature of the glass envelope, preventing the tungsten silvering deposited on the inside of the glass from evaporating and returning to the filament, causing failure of the globes by becoming **too dark to use**. (Halogen globes were available in 1987.)
- c. For LED headlight globes: LED globes will often not tolerate under-voltage operation and it **may cause them to fail**.

2CV Dim-Dip Problem #3

The dim-dip solution chosen by Citroen changes the operational usage of the light switch green and mauve wires. We'll compare the standard 2CV and the dim-dip 2CV light switch wiring shown in the two wiring diagrams above.

Standard 2CV:

- a. The **green** wire operates the low-beam headlights and the fog light. Total power is 101W. At 12V, the current through its switch is $101/12 = 8.4$ **amps**.
- b. The **mauve** wire operates the parking lights (18W) plus the instrument light (2W). Total power is 20W. At 12V, the current through its switch is $20/12 = 1.66$ **amps**.
- c. The **yellow** wire operates the high-beam headlights. Total power is 90W. At 12V, the current through its switch is $90/12 = 7.5$ **amps**.

Dim-Dip 2CV:

- a. The **green** wire operates the fog light (21W) and the 75-ohm coil of relay RL1 (2W). Total power is 23W. At 12V, the current through its switch is $23/12 = 1.9$ **amps**.
- b. The **mauve** wire operates the parking lights (18W), the instruments light (2W) and the low-beam headlights (80W), for a total power of 100W. At 12V, the current through its switch is $100/12 = 8.3$ **amps**.
- c. The **yellow** wire operates the high-beam headlights. Total power of 90W. At 12V, the current through its switch is $90/12 = 7.5$ **amps**.

Analysis

- a. In the standard 2CV, the **green** wire and switch pass **8.4 amps**. In the dim-dip 2CV, they pass **1.9 amps**. Good.
- b. In the standard 2CV, the **mauve** wire and switch pass **1.66 amps**. In the dim-dip 2CV, they pass **8.3 amps**, more than **five** times the standard 2CV current. Not so good!
- c. The **yellow** wire and switch in the standard 2CV and the dim-dip 2CV pass **7.5 amps**. No change.

Using 65W/60W Headlight Globes

The light circuit currents discussed above are based on 45W/40W headlight globes (45W high beam filaments and 40W low beam filaments). In 1987, 65W/60W globes were available for the 2CV and were fitted by many owners to improve headlight brightness.

For 2CVs using 65W/60W globes, the light switch problem is exacerbated by the additional 40W of power or $40 / 12 = 3.3$ **amps** of current being added to the **mauve** wire and switch on low beam and the **yellow** wire and switch on high beam.

And the Problem Is?

With 65W/60W headlight globes, the **Parkers** switch and the **mauve** wire in the dim-dip 2CV pass $8.3 + 3.3 = 11.6$ amps when on low beam, **seven times the standard 2CV Parkers switch current of 1.66 amps**. The Parkers switch contacts were never designed to accommodate a *continual* overload of this magnitude. The excessive current can cause damage to the switch contacts and a strong possibility of complete failure of the light switch.

2CV Light Switch Failure Mode

If the 2CV light switch is disassembled and inspected, it may show signs of arcing between the contacts and the brass tracks on the barrel. Arcing usually results in erosion at the brass track edges, creating poor electrical contact surfaces. This creates increased contact resistance, which produces resistive heating at the contact surfaces, which in turn causes loss of spring tension in the contacts and further heating.

These events form a cycle which ever only worsens over time. The light switch may become luke-warm at first, then warm, then warmer, then much warmer, then hot, as the damage worsens, until such time as the light switch finally throws in the towel. By that stage, the switch may be unrepairable. **The excessive current passing through the Parkers switch accelerates the damage to the light switch.**

In the view of this electronics engineer, the 2CV light switch is under-rated for its task in the standard 2CV, but is greatly under-rated for its task *in the dim-dip 2CV*.

Summary

In the dim-dip 2CV, the Parkers switch contacts are being **hammered** by excessive current whenever **low-beam** headlights are operating because of the fiendish wiring arrangement implemented by Citroen! The life of the light switch is put further in jeopardy if the dim-dip resistor should short to ground while low-beam is selected. And then there's the likely failure of halogen and LED globes from under-voltage operation when dim-dip headlights are operating! Whew!

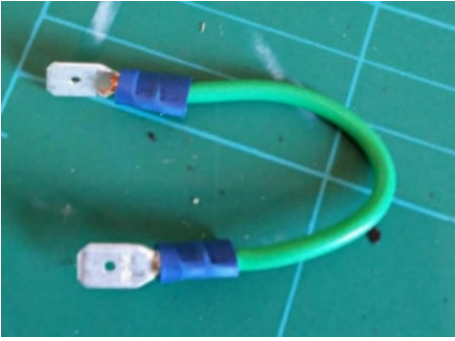
Recommendation

If your 2CV has the dim-dip "feature" fitted – easily identified by the presence of the two relays on the firewall, the writer recommends **urgently** disabling the feature to prevent further harm to the light switch and premature failure of the halogen or LED headlight globes.

The Solution

The following simple (and non-permanent) solution to disabling the dim-dip feature was described by Mike Phelan (2CVGB) to effectively return the dim-dip wiring back to standard (non-dim-dip) wiring.

Disabling the Dim-Dip Feature



*Relay socket numbering from above
(looking directly at the sockets from
above).*

1. Remove both dim-dip relays from their sockets and store in a safe place for another day.
2. Disconnect and remove the dim-dip resistor from the chassis cross-member. Store in a safe place for another day.
3. Create a wire jumper per photo at left. Cut a 50mm length of 1.5mm diameter (copper diameter) multi-stranded insulated copper wire and crimp a blue spade connector at each end.
4. The 5-pin relay socket at lower left is the view seen **when looking directly at the top of the relay socket** after the relay has been unplugged. The socket numbers are shown. Use the wire jumper to join connections 86 and 87 of relay RL1 socket, **the socket with five wires connected to it**.
5. Turn on the low beam headlights. If the lights operate, continue to step 6. If the lights do not operate, move the wire link at connection 86 over to connection 85. The low beam lights should operate.
6. Tie a small polythene bag over the two relay sockets and the wire link to keep water and dirt out, and tape the sockets to the wiring harness in a safe and tidy manner.
7. Tie a small polythene bag over the connector to which the resistor was fitted to keep water out and tape the bag and socket to its wiring loom to secure it.

To reinstate the dim-dip feature, remove the jumper wire from the relay socket, return the two original relays to the sockets, remount the relays to the firewall and refit the dim-dip resistor.

An Option

Another option would be to mount a small plastic box of sufficient size to the firewall near the original mounting position of the two relays. Its job is to contain and protect the two vacant relay sockets and the wire link, keeping them away from harm and from being disturbed. A split rubber grommet could be used to allow the relay wires to pass through the side of the box without chafing the wires. If possible, mount the box with the wiring extending downwards from the bottom of the box to prevent water entry. Finally, disconnect and remove the dim-dip resistor so it can't cause havoc.

To reinstate the dim-dip feature, remove the plastic box and fit the two relays to the sockets, remount the relays to their original positions on the firewall and refit the dim-dip resistor.

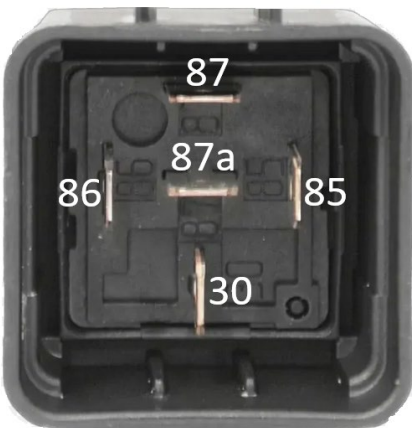
Method Used by the Writer

This option gives the **appearance** of the two original dim-dip relays being fitted to the vehicle in their original positions, but all is not what it seems...!

Repeat steps 1 to 7 on the previous page **except step 6**. Record the two socket connection numbers required to be linked by the jumper wire to enable low-beam lights operation.



Obtain two relays such as Narva PN 68044 (photo at left) to make two *dummy* relays. (The Narva relays can also be used as plug-in replacements for the original dim-dip relays.) We are going to modify the two relays to make two dummy relays as follows. Carefully remove the relay plastic covers, then using a hacksaw, jack hammer, etc, remove sufficient of the relay internals - coils, contacts, structural materials, etc, to achieve *complete electrical isolation between the pins*, so no electrical connection exists between any two of the five pins in each relay. This is important. Confirm with a multimeter. After the completion of this skilled surgery, the internals of the relays may not *look* like new rocket parts, but they will do the job electrically, and they are, after completion of the work, covered by their plastic covers..., so no one needs to know!



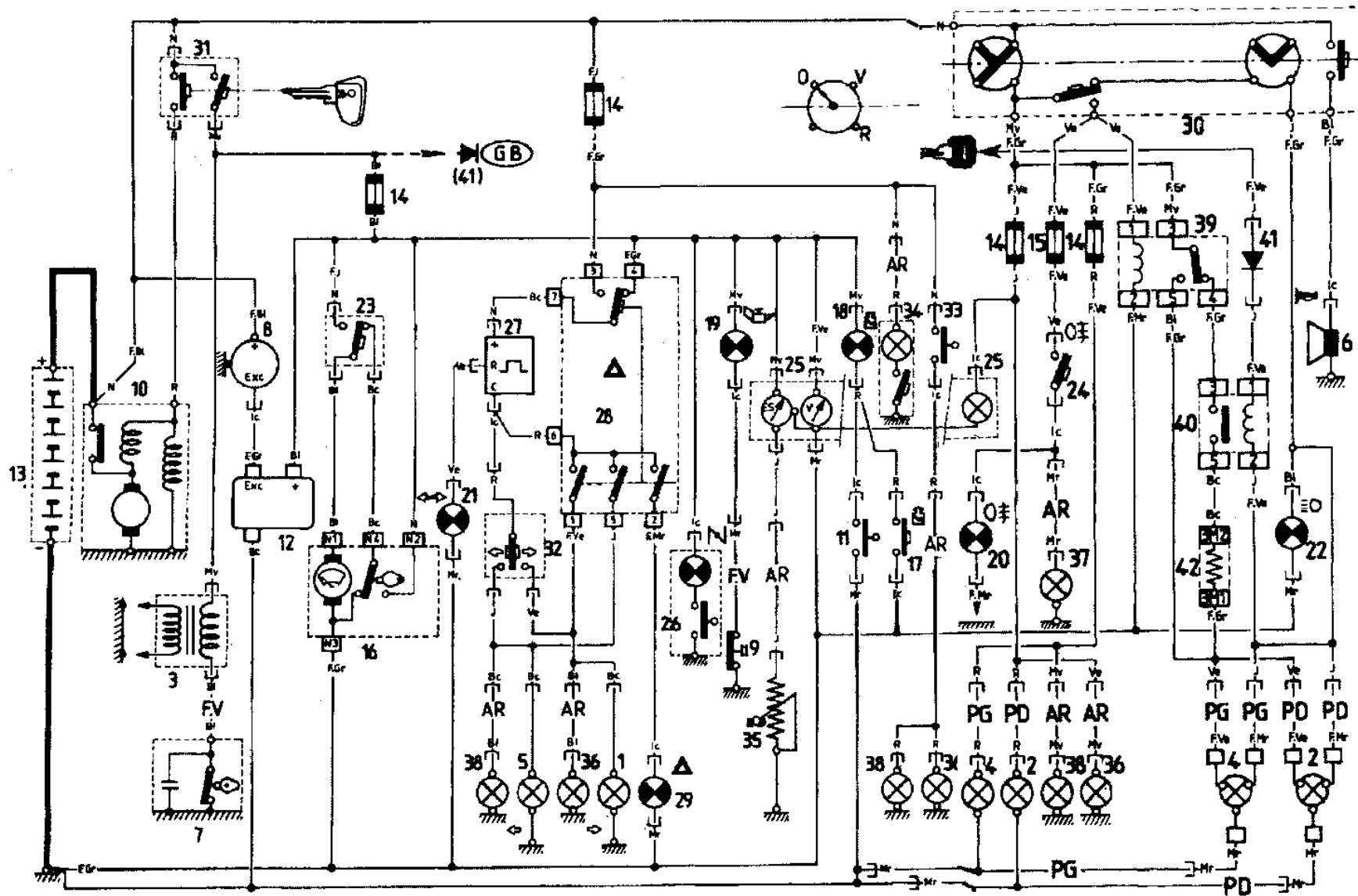
Relay pin numbering from below
(looking directly at the pins)

Solder a 1.5mm diameter solid copper wire link between the identified pair of pins in each dummy relay. The image at left shows the relay pin numbers. Check then double-check that the correct pins in the relays have been linked to correctly match the findings in steps 4 and 5 on the previous page. Fit the dummy relays to the relay sockets and confirm the low beam lights operate correctly when activated. Refit the? plastic covers to the dummy relays. Mount the dummy relays and sockets to the original positions on the firewall. All done.

To reinstate the dim-dip function, simply replace the dummy relays with the original relays and refit the dim-dip resistor. Narva relays PN 68044 can also be used.

One Further Option

There is one further step which could be taken to save the light switch in both dim-dip and non-dim-dip 2CVs. The green, mauve and yellow wire connections from the light switch could be changed so these three wires connect to the coils of three additional relays, such as the relay type mentioned above. The contacts of these relays would take the place of the light switch contacts and do the necessary circuit switching via direct connection from the battery via added fuses. By this means, the green, mauve and yellow wires and their switches would carry only the relay coil currents (0.16 amp), while the contacts of the three relays would do all the heavy lifting of carrying the light circuit currents, taking the electrical load, once and for all, away from the light switch assembly. Ah, utopia!



1987 Dim-Dip 2CV Electrical Wiring Diagram

On the right side, item 39 is the "five-wire" relay RL1, item 40 is the four-wire relay RL2, item 41 is the diode and item 42 is the resistor. Item 30 is the light switch. Items 2 and 4 are the headlights, the next four lights on the left are the parkers, and the next two lights are the brake lights.

LIST OF ARTICLES BY THE WRITER

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Please download the latest revision before using the information in the article.

My acknowledgement and grateful appreciation is given to the web sites from which photos/drawings/diagrams have been sourced for purposes of research and study to assist the reader's understanding of the material discussed in this article.

My acknowledgement and grateful appreciation is given to Haynes Publishing Group for two wiring diagrams drawn from the book, Haynes Citroen 2CV, Ami & Dyane Owners Workshop Manual (1990), ISBN 1-85010-693-2. The diagrams are included for research and study purposes to assist the reader's understanding of the material discussed in this article.

This book is an excellent technical reference for 2CV owners.

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