

## **Solar Switched Portable EVSE**

*Disclaimer: The following is an example of how I wired a photosensor into a portable EVSE. Anyone who attempts to follow this example does so at their own risk and I take no responsibility for any damage caused to equipment by doing so.*

### **Introduction**

Zappi chargers cost anything from £650 to £700+ to buy, and that's before you add on installation costs. For people who already have a home charger and want to take advantage of excess solar generation, the cost can be hard to justify. I came up with the idea of using a light sensitive switch to control the Communication Pilot (CP) signal which in turn would control a portable EVSE (granny charger).

I have a variable current granny charger, and opened it up to have a look inside. Fortunately, the CP lead was labelled and bolted to the circuit board, so it made the modification easy and reversible.

For people who want to build this switch, but don't want to dismantle the MG granny charger, then I thought of buying type 2 male and female plugs, a short length of cable, and hacking into the CP lead on this short extension cable instead. You might be able to come up with a better idea.

### **Parts List**

Type 2 EV Portable Charger 6A - 13A Variable, 3kW, 5 Metre, UK 3 Pin Plug. (This is the one I purchased which has the labelled CP lead bolted to the circuit board)

<https://thirdrockenergy.co.uk/collections/all-type-2-products/products/type-2-to-uk-3-pin-plug-ev-portable-charger-6a-to-13a-variable-3kw-5-metre>

1 Channel Relay Module Board Shield 5V Low Level Trigger.

[https://www.amazon.co.uk/dp/B07V1YQQGL/ref=sspa\\_dk\\_detail\\_4?pd\\_rd\\_i=B07V1YQQGL&pd\\_rd\\_w=McnV&content-id=amzn1.sym.15c0cc83-c6c5-4d44-aa3d-](https://www.amazon.co.uk/dp/B07V1YQQGL/ref=sspa_dk_detail_4?pd_rd_i=B07V1YQQGL&pd_rd_w=McnV&content-id=amzn1.sym.15c0cc83-c6c5-4d44-aa3d-)

[0de17a9f3682&pf\\_rd\\_p=15c0cc83-c6c5-4d44-aa3d0de17a9f3682&pf\\_rd\\_r=J5AXJN1YZKA2W1GQ8NCV&pd\\_rd\\_wg=KQz0e&pd\\_rd\\_r=e42526a1-2411-4c48-b5e1-81ab28cf4c18&s=industrial&sp\\_csd=d2lkZ2V0TmFtZT1zcF9kZXRhaWw&smid=A1X7QLRQH87QA3&th=1](https://www.amazon.co.uk/0de17a9f3682&pf_rd_p=15c0cc83-c6c5-4d44-aa3d0de17a9f3682&pf_rd_r=J5AXJN1YZKA2W1GQ8NCV&pd_rd_wg=KQz0e&pd_rd_r=e42526a1-2411-4c48-b5e1-81ab28cf4c18&s=industrial&sp_csd=d2lkZ2V0TmFtZT1zcF9kZXRhaWw&smid=A1X7QLRQH87QA3&th=1)

Digital Light Intensity Sensor Module Photo Resistor.

[https://www.amazon.co.uk/HALJIA-Digital-Intensity-Resistor-Photoresistor/dp/B01BTGV566/ref=sr\\_1\\_5?crid=2AGTGPOWLIDVC&keywords=Light+Intensity+Sensor+Module+Photo+Resistor+Light+Level+Detection+Photoresistor+3.3V+-+5V+Power&qid=1682183772&srefix=light+intensity+sensor+module+photo+resistor+light+level+detection+photoresistor+3.3v+-+5v+power+%2Caps%2C96&sr=8-5](https://www.amazon.co.uk/HALJIA-Digital-Intensity-Resistor-Photoresistor/dp/B01BTGV566/ref=sr_1_5?crid=2AGTGPOWLIDVC&keywords=Light+Intensity+Sensor+Module+Photo+Resistor+Light+Level+Detection+Photoresistor+3.3V+-+5V+Power&qid=1682183772&srefix=light+intensity+sensor+module+photo+resistor+light+level+detection+photoresistor+3.3v+-+5v+power+%2Caps%2C96&sr=8-5)

UK MAINS POWER DC 5V 1000mA POWER ADAPTER. (Bought locally for £10)

IP65 WATERPROOF JUNCTION BOX ENCLOSURE TERMINAL ELECTRIC CABLE CONNECTOR OUTDOOR 150x150x70.

[https://www.ebay.co.uk/itm/254510997123?hash=item3b42099e83:g:59sAAOSwF1pj6Xc7&amdata=enc%3AAQAIAAAA8NFmg8Om2nDTraORXLdtTxbO4kixxJvXOsS20Zs5%2BMRAA0lw2HNK2U4ljAPqldCOS5l4jd4uUyX1eVKdWCpADww7qJQGdJSxRLEtd1piJQb5Z7E1doyCsDiT6PITm%2F601ZuztRG%2FPYpo5KVFjQQa7V2X5EKdMxAkxVnhUNgmnrroK9cTjDgpnC7PZx4HYv%2F4e8KSjaQ1Jf0JE7LkavjLHVPRiTGXuJTo7hq%2BoGt0SVhK7bYnkaHK9urJj39Pf13%2FFPdBFcGuRxKtiT1LPioT70s51PFdladXatQQ8olrJ7KA9qrNkaZRLRiANE%2BZGuDCg%3D%3D%7Ctkp%3ABFBM-vLhn\\_Vh](https://www.ebay.co.uk/itm/254510997123?hash=item3b42099e83:g:59sAAOSwF1pj6Xc7&amdata=enc%3AAQAIAAAA8NFmg8Om2nDTraORXLdtTxbO4kixxJvXOsS20Zs5%2BMRAA0lw2HNK2U4ljAPqldCOS5l4jd4uUyX1eVKdWCpADww7qJQGdJSxRLEtd1piJQb5Z7E1doyCsDiT6PITm%2F601ZuztRG%2FPYpo5KVFjQQa7V2X5EKdMxAkxVnhUNgmnrroK9cTjDgpnC7PZx4HYv%2F4e8KSjaQ1Jf0JE7LkavjLHVPRiTGXuJTo7hq%2BoGt0SVhK7bYnkaHK9urJj39Pf13%2FFPdBFcGuRxKtiT1LPioT70s51PFdladXatQQ8olrJ7KA9qrNkaZRLRiANE%2BZGuDCg%3D%3D%7Ctkp%3ABFBM-vLhn_Vh)

2Pin 12V Cable Wire Connector Plug Waterproof Sealed For Electrical Car  
W/wire x 2.

[https://www.ebay.co.uk/itm/314084836813?\\_trkparms=amclsrc%3DITM%26aid%3D1110006%26algo%3DHOMESPLICE.SIM%26ao%3D1%26asc%3D20201210111314%26meid%3D60e7add8be814eda9bcd8b5ab377ef1c%26pid%3D101195%26rk%3D5%26rkt%3D12%26sd%3D384786960949%26itm%3D314084836813%26pmt%3D1%26noa%3D0%26pg%3D2047675%26algv%3DSimplAMLv11WebTrimmedV3MskuWithLambda85KnnRecallV1V4V6ItemNrtInQueryAndCassiniVisualRankerAndBertRecall%26brand%3DUnbranded&\\_trksid=p2047675.c101195.m1851&amdata=cksum%3A31408483681360e7add8be814eda9bcd8b5ab377ef1c%7Cenc%3AAQAIAAABkA2rugFIOq3qu1cLac%252F%252Fk6Vp0Oa0HaJlqoXKeliOR%252BTUgsSvHaeyPxKYu6UqHqq7GaGyKVqHQnjeiiXcQpMGw2t3aB%252BssGfjtIWOBj8wExc7oYYP7xGMyQCrHDyDaSaWjB1Cuel3A94n0yxXX5dx5gAmN%252F5WWZXlcnJvc%252BZhm1cYPqVI2vZ3WW%252F4vhXt0PZKxQeAlQCqdAK%252BBp3%252BIVkCG1I%252BSLojwoqDML0yJSf9A8dKqdVYSVss4F1GcMM7w6W3GjAxtT3Ct0Ylg8ssfQMKowupkzR1hS1zfZMPG3PwZ1%252FQuBA4rv4u2Gbq5z96JSUH5%252BGGYPJR4%252BBazpB8mCWzGIIebLTC7dobzFR%252FmXyY9hld3KNLjLIOCLZuFKCFE9MGn3TecuRHHVqB72UGABobYgG42QP8bl%252Bs1P9bBXGryEwYlu%252FBLZI1yye1lOkT8O%252Fn%252FNJSjlfwtQ0SSWUhOJxejcPqzXpqGOJp8l0SBr9CHZZvwuIZDQV0uvcJQsWljwfxPBrD%252Fr8wU1YjcmASt%252FANRK%252Fk%253D%7Campid%3APL\\_CLK%7CcIp%3A2047675](https://www.ebay.co.uk/itm/314084836813?_trkparms=amclsrc%3DITM%26aid%3D1110006%26algo%3DHOMESPLICE.SIM%26ao%3D1%26asc%3D20201210111314%26meid%3D60e7add8be814eda9bcd8b5ab377ef1c%26pid%3D101195%26rk%3D5%26rkt%3D12%26sd%3D384786960949%26itm%3D314084836813%26pmt%3D1%26noa%3D0%26pg%3D2047675%26algv%3DSimplAMLv11WebTrimmedV3MskuWithLambda85KnnRecallV1V4V6ItemNrtInQueryAndCassiniVisualRankerAndBertRecall%26brand%3DUnbranded&_trksid=p2047675.c101195.m1851&amdata=cksum%3A31408483681360e7add8be814eda9bcd8b5ab377ef1c%7Cenc%3AAQAIAAABkA2rugFIOq3qu1cLac%252F%252Fk6Vp0Oa0HaJlqoXKeliOR%252BTUgsSvHaeyPxKYu6UqHqq7GaGyKVqHQnjeiiXcQpMGw2t3aB%252BssGfjtIWOBj8wExc7oYYP7xGMyQCrHDyDaSaWjB1Cuel3A94n0yxXX5dx5gAmN%252F5WWZXlcnJvc%252BZhm1cYPqVI2vZ3WW%252F4vhXt0PZKxQeAlQCqdAK%252BBp3%252BIVkCG1I%252BSLojwoqDML0yJSf9A8dKqdVYSVss4F1GcMM7w6W3GjAxtT3Ct0Ylg8ssfQMKowupkzR1hS1zfZMPG3PwZ1%252FQuBA4rv4u2Gbq5z96JSUH5%252BGGYPJR4%252BBazpB8mCWzGIIebLTC7dobzFR%252FmXyY9hld3KNLjLIOCLZuFKCFE9MGn3TecuRHHVqB72UGABobYgG42QP8bl%252Bs1P9bBXGryEwYlu%252FBLZI1yye1lOkT8O%252Fn%252FNJSjlfwtQ0SSWUhOJxejcPqzXpqGOJp8l0SBr9CHZZvwuIZDQV0uvcJQsWljwfxPBrD%252Fr8wU1YjcmASt%252FANRK%252Fk%253D%7Campid%3APL_CLK%7CcIp%3A2047675)

Lever-Nut Wire Connectors

[https://www.amazon.co.uk/dp/B09XJZ8TRB?psc=1&ref=ppx\\_yo2ov\\_dt\\_b\\_product\\_details](https://www.amazon.co.uk/dp/B09XJZ8TRB?psc=1&ref=ppx_yo2ov_dt_b_product_details)

240 Volt 1 Gang Extension Lead. (For the 5 volt power adapter)

5 Amp 2 core and 3 core cable. (Length depends on where the granny charger and photo sensor are to be situated.

## **Assembly**

Feed the mains cable through one of the seals on the side of the box and connect the wires into the extension socket.



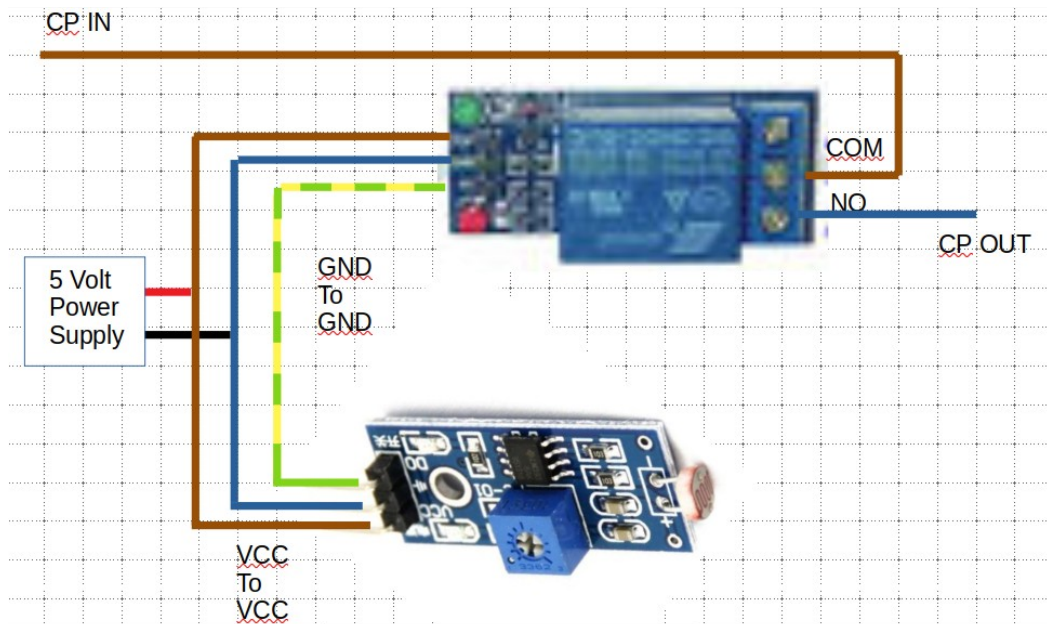
## Relay

Strip small lengths of the live, neutral and earth wires from the 3 core cable, and use 2 of the Lever-Nut Wire Connectors to connect the VCC (brown wire) to the 5 volt DC red wire, and and GND (blue wire) to the black wire. (I used a darning needle to widen the insulation on the end of the wires and pushed them directly onto the connectors of the relay).

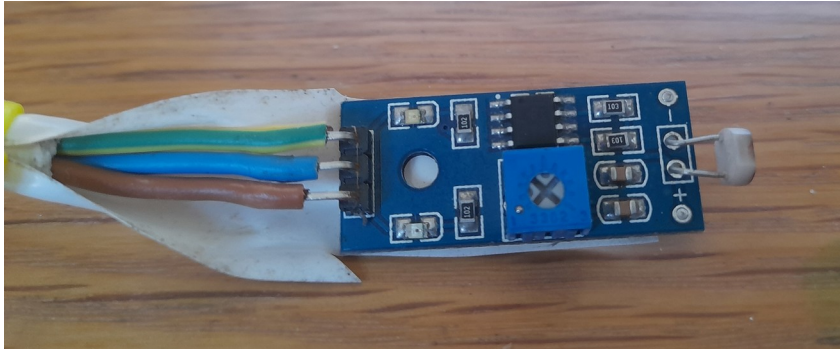


## Photosensor

Taking the 3 core cable, feed it through one of the weatherproof seals of the junction box and connect the live and neutral wires into the same Lever-Nut Wire Connectors used to connect the relay to the 5 volt supply. Using another Lever-Nut Wire Connector, connect the earth wire from the relay to the earth wire in the 3 core cable.



At the other end of the 3 core cable, push the live wire onto the VCC terminal of the photosensor, the neutral wire onto GND, and the earth wire onto DO.



## **Calibration and Testing**

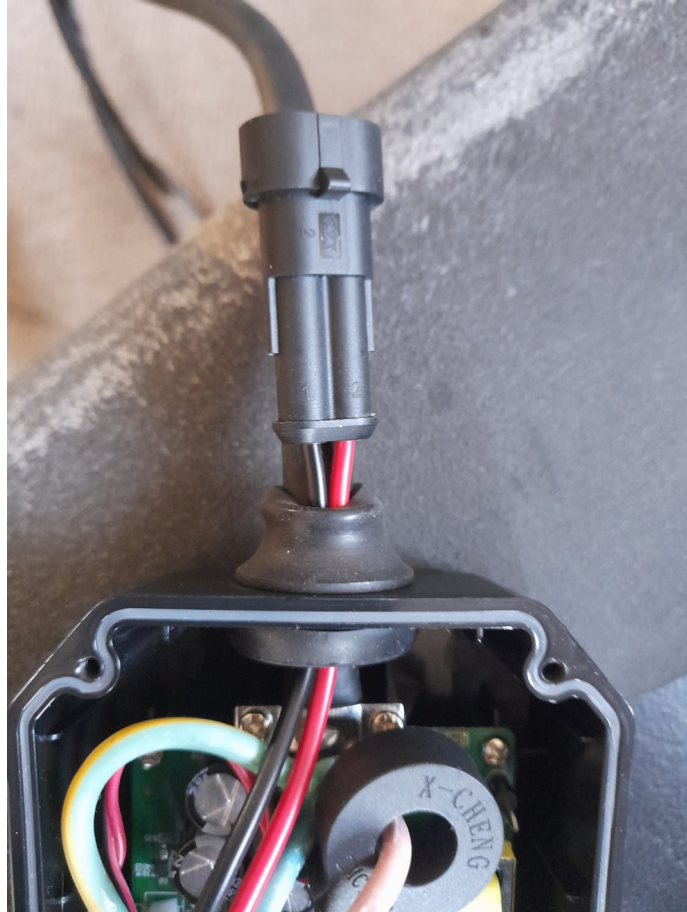
At this stage, the switch will work without being connected to an output and is a good opportunity to set the light level at which the photosensor will trip the relay. Plug the 5 volt adapter into the mains and a red LED should light up on both the photosensor and the relay.

I waited until the solar panels were supplying 2kW so that when the granny charger was connected it would be drawing only solar and no grid electricity. I pointed the photosensor towards the sun at a 45 degree angle and used a small screwdriver to adjust the potentiometer on the photosensor module until the green LED lit up and the relay clicked. I carefully turned the adjuster back and forth to make sure I'd got the threshold point right.



## **Connecting the CP Lead.**

Firstly, I removed the 6 screws from the back cover of the granny charger to get at the internal workings. I took a 12 volt connector socket and gently eased the red and black wires past the weatherproof seal of the mains lead.



This image shows the internal components of a power supply unit. A central transformer is visible, with several colored wires (red, black, blue, yellow, green) connected to it. The wires are bundled together and secured with a black tape. The unit is housed in a black plastic enclosure, and the internal components are mounted on a green printed circuit board (PCB). Various electronic components, including capacitors and resistors, are visible on the PCB. The text 'X-CHENG' is visible on the transformer, and 'ZMP1104' is visible on a component near the bottom right.





The 12 volt connector plug is connected to one end of the 2 core cable, and the other end is fed through a weatherproof seal of the junction box and connected to the relay in the junction box; one wire to COM, and the other to NO (Normally Open).



## **Final Testing**

Put the cover back on the granny charger as that will be carrying 240 volts mains electricity. The CP lead and relay are carrying 12 volts and 5 volts respectively, which is a much safer voltage to work with. Leave the cover off the junction box, plug in the granny charger and 5 volt adapter, and look for the red LED's.

If the sun is shining, point the photosensor at the sun; the green LED's should light and the relay should "click" (If the sun isn't shining, use a torch). After a few seconds, the blue charging lights in the charge port should illuminate. After a few more seconds, you should hear the charging contactor "clunk" and the green charging light should start flashing. If you don't get the LED lights or clicking noises, double check the wiring diagram that each wire is going to the correct connector and is making a good connection.

## **A Final Point**

The granny charger will now only work when the sun is shining, which is a bit inconvenient if you want to use the granny charger overnight. That is why I ordered two, 12 volt connectors. Take the second 12 volt plug and either twist the red and black wires together and wrap them with insulation tape, or use a Lever-Nut Wire Connector. This plug can then be used to replace the photosensor CP lead and give a continuous CP signal to the car.