INSTRUCTIONS FOR DETACHABLE TOP / LIGHT PAD

Michael Richards has continued to work on the design of the Cossack light hat. He has designed a detachable top which can also be used as a light pad.

This instruction is to make the detachable top only. You can use it on your current Cossack.

Here is a Cossack with the detatchable top in place.

The value of the detachable top is that it can be used for other parts of the body. For example, on a painful hand:

You can see why gel-covered LEDs are needed.
The gel provides a soft cushion on the skin.

Here it is with lights on.
You can use either side of the detachable top.

The gel-covered LEDs are comfortable placed directly on the skin. They provide warmth without it being too hot. You can use it on painful joints and muscles.

Non-gel-covered LEDs are very uncomfortable and should not be used. LEDs without gel-covering both scratch and burn the skin.

Use **ONLY** gel-covered 12V DC LED strip if you want to use this as a light pad.

You will need:

Wire Mesh

Available at garden centres or hardware stores.
It is basically plastic coated wire.

The plastic mesh isn't strong enough – stick with the plastic-coated wire.

2 or 2.5 metres of red LED strip, 8mm wide.

It must be 12V DC and gel-covered.

If you can find 670nm (a deep red), then grab it. If not, **any red 12V DC LED strip** will do. Look for the darkest red you can find.

Don't buy strips with lots of colours – you just want red.

The best prices are available from online stores like eBay, Aliexpress.

Look for waterproof LED strip with DC supply wires at either end of the strip. This avoids using the white LED strip connectors and makes wiring easier and you connect the wires directly into the Female DC 12v plug.

12V DC power plug connector / adaptor female

- External diameter 5.5mm
- Internal diameter 2.1mm
- Dimensions 38mm x 14mm x 10mm
- Make sure you buy the one that uses screws

Available from electronics or online stores.

Note: you might be lucky and purchase LED strip that comes with the built-in connector. If so, ignore this item and the item below.

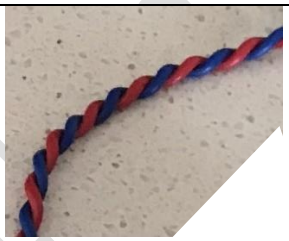
If you want to connect your pre-existing Cossack to the new top and use them together with one power supply only, then you will need a Male DC 12v power plug connector/adaptor.

- External diameter 5.5mm
- Internal diameter 2.1mm
- Make sure you buy the one that uses screws

Available from electronics or online stores.

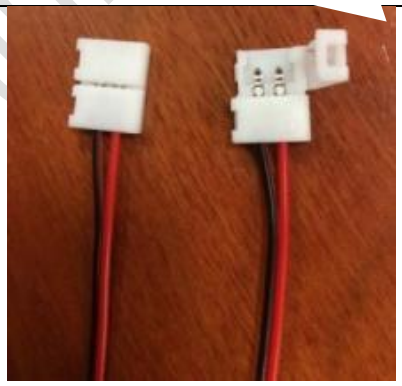
If you plan to use two power supplies, then ignore this item.

If you want to connect your pre-existing Cossack to the new top and use them together with one power supply only, then you will need a length of thin red & black cable about 20cm (8") long.



If you plan to use two power supplies, then ignore this item.

LED strip connector – 8mm wide



Available from electronics or online stores.

Note: you might be lucky and purchase LED strip that comes with the built-in connector. If so, ignore this item and the item below.

Cable ties – small

Available from hardware stores and garden centres

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12 Volt DC power plug

1.5-2 amps or more.

Available from electronics or online stores.

If you don't want to make wiring modifications to your pre-existing Cossack to use both devices together with one power supply only, then you will need two separate power supplies, one for the Cossack and one for the new top.

Tools

Protective gloves
Remember that you are playing with cut wire and the ends can be annoyingly sharp.

Wire cutters
If you don't have wire cutters, get them. Or tinsnips (the ancient blue things on the right).

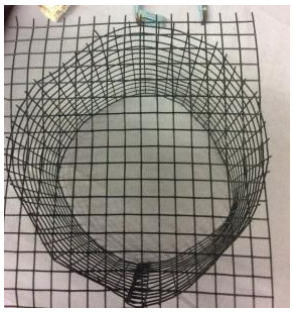
Pliers
Small
Snub nosed is handy

Wire strippers.
If you don't have a tool to strip wire then do yourself a huge favour and get one. They make life so much easier.

Small screwdrivers.
Have a small Phillips head screwdriver and a small flat head screwdriver available as they are useful for some of the fiddly LED connections.

1. Cut the top / light pad

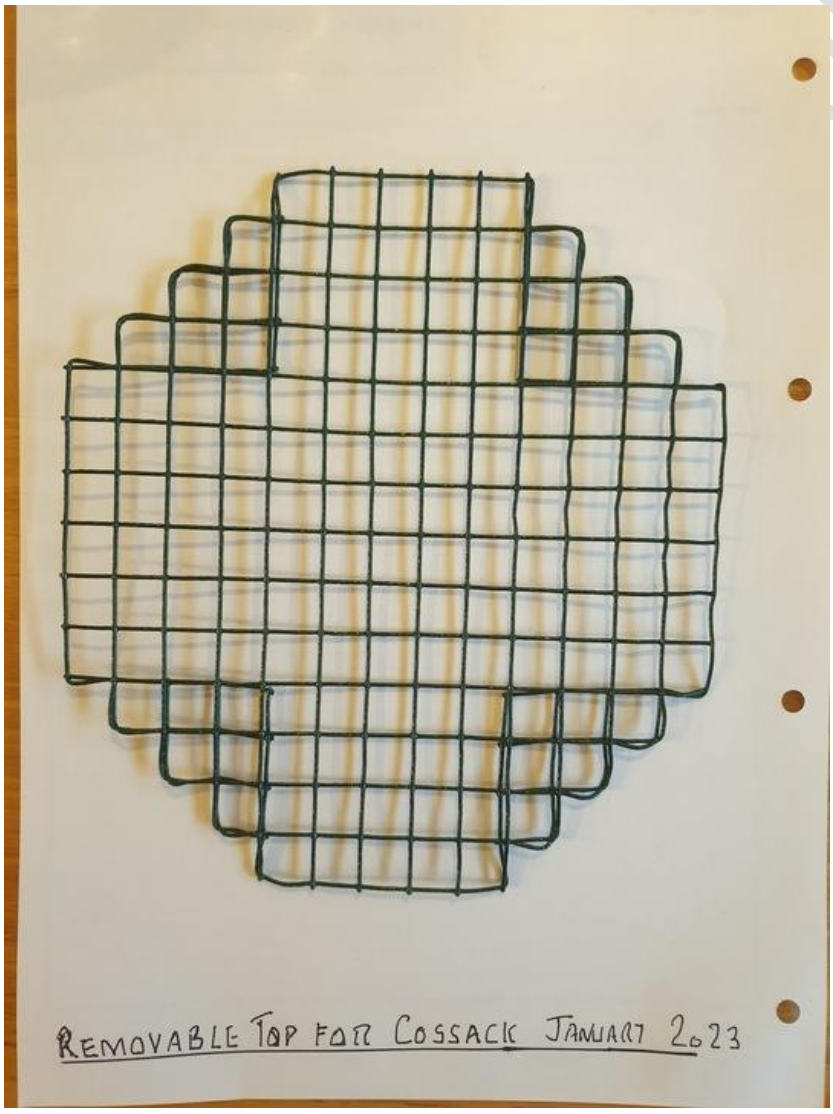
Assuming that you are making this to go on your Cossack, use your existing Cossack (or work-in-progress) to measure out the wire mesh.



Make sure it is a larger than your Cossack mesh tube at the front and the back.

Trim it so that there are no raw edges.

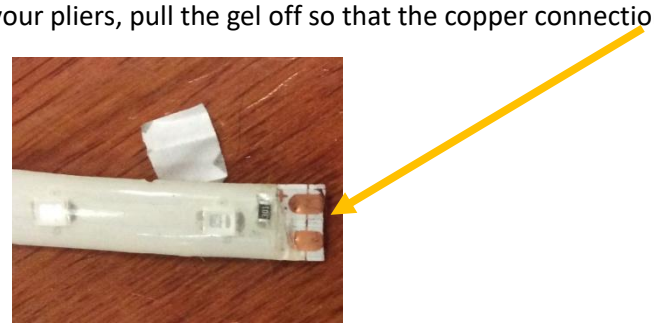
Start folding it as shown in Michael's photo below.



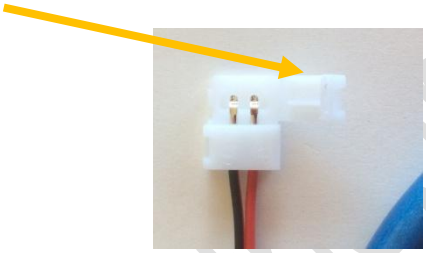
2. Prepare your red LED strip

If your LED strip is covered with gel, then you will need to carefully remove a small amount of gel covering a connection point. Place the strip on a cutting board, and using a sharp knife held horizontally, carefully slice the gel so that the knife goes through the gel, but not into the underlying strip.

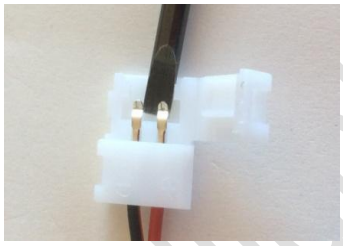
Using your pliers, pull the gel off so that the copper connections are completely uncovered.



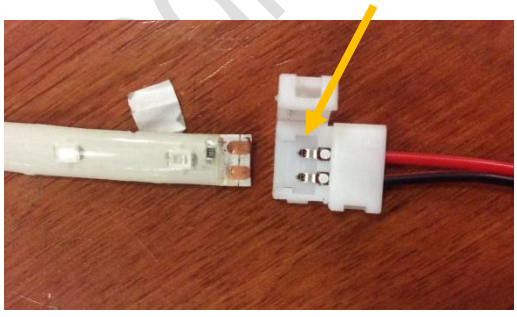
Once you have the end of the LED strip clean, take the LED strip connector, and using your pliers, flick open the little white lid on the non-wire side of the connector.



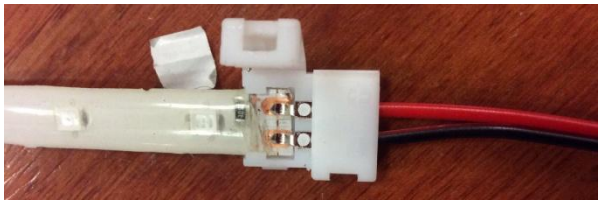
Using your small screwdriver, gently lift up the two metal connectors – do this carefully. You don't need to lift them much, just enough to make it easy to slide in the LED strip.



Now slide the LED strip in, **underneath** the two metal bits.



Once you have the copper dots lined up under the metal connectors, squash the metal connectors down onto the copper blobs. I use the pliers, held vertically to squish the two together.



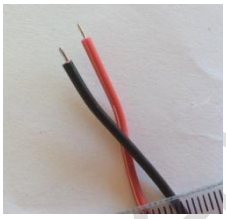
This is the most vulnerable part of the whole assembly. If you have someone who can solder, ask them to solder these two connections.

Another idea is, **only** when you are totally sure that the connections all work, to dob on some superglue.

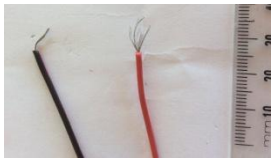
Once you have fixed the LED, flick the plastic cover back and click it into place.

3. Prepare the wires

The wires are visible, but I've found that they are not quite long enough to fit securely into the connector.



Using your wire strippers, carefully strip the wires so that you reveal 1-1.5cm of bare wire.



Now put your wires into the connector.

Match the (+) on the strip with the (+) on the connector. Thread the wire in, pushing it as far into the slot as possible. Using your small Phillips head screwdriver, screw down and you should find that your wires are securely attached. Give them a gentle tug to see if you can pull them out. If they resist a gentle tug, you have a secure connection.

You might have to loosen the screws to get the wire into the slot. Hold it all carefully and screw the wire into place – at times it might feel like you need a few extra fingers.

Now, test it out. And cross those fingers.

If it doesn't work, then check all the connections you have made. If these seem sound, then unscrew the wires and switch them so that the red wire goes into the negative side of the connector, and the black wire into the positive. It sounds ridiculous but sometimes it just works.

4. Connect the LED strip to the frame

Select a spot on one of the corners of your pad. This is where you want the connector to be placed.

Holding the connector carefully, use as many cable ties as you need to secure it to the **corner spot** as above.

You really do want to keep the wire connections absolutely stable. Any wobble will guarantee that the wires work loose. Place and tighten the cable ties so that the connector is almost concreted in.

5. Start winding the LED strip around the frame.

You have connected your LED connector to the exterior of Cossack, and now you start carefully wrapping the LED strip around the exterior, making sure that the lights shine **outwards**! (The Cossack LEDs shine inwards, but the Cossack top/light pad LEDs shine outwards).

You don't need to stick the LED strip onto anything, so don't worry about the white tape on the back of the LED strip. Just leave it there.

As you wrap the LED strip around and around, you might need to use your small cable ties to fasten the LED strip to a piece of wire mesh. If yes, don't make the fastening tight. Always leave a bit of space. Just make it secure enough to hold.

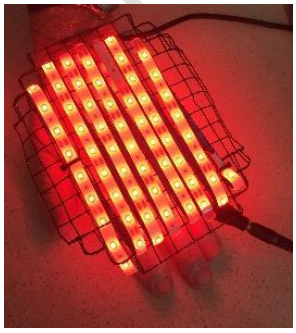
Be gentle with the LED strip. Don't pull them tight – it needs to be a little bit loose especially when you make the U-turns at the pad ends.

See how Michael has wound the LED strip through the last mesh square on the top and bottom? This makes a neater job and helps keep the LED strips in place.

When you get to the end of the LED strip, just tuck it in through the mesh squares. Use a loose cable tie if you think it is needed. Remember, it doesn't need to be perfect.

6. Plug it in and test out it

You can now connect it to your power cable and see it shine.



Congratulate yourself! This top section can now be used as a light pad for hands, between knees, under arms etc. If you find that the pad gets too warm on your body just bend the edges over to form the light pad into an arch shape. That will distance the LEDs from the skin.

This detachable top is part of the updated Cossack please see the latest construction instructions.

7. Connecting top to your pre-existing Cossack

Michael has discovered some excellent clips to hold the Cossack and the top together. If you don't have these, you can improvise

Mini jaw clips.

Used in hair styling! Yes, these look very odd, but they are really useful and allow you to attach and detach the top from the rest of the Cossack.

Option 1 – separate power supplies:

If you want to connect your newly-made top to your pre-existing Cossack, it might be easiest to use two separate power supplies, one for the Cossack and one for the top.

Option 2 – make some modification to your pre-existing Cossack:

You can connect your pre-existing Cossack to the new top so that only one power supply is needed.

To do this, a small wiring modification has to be made.

For this you will need:

- mating DC Male connector to plug into the power Female connector of the top, and
- a length of thin red & black cable about 20cm (8") long.
  (see the list of ingredients at the beginning of this instruction).

Modifications:

a. Connect one end of the red and black twin cable to the Male connector.
Make sure that you match positive and negative ends.
Red positive (+) connects to red positive (+)
Black negative (–) connects to black negative (–)

b. Attach the cable to top of the Cossack frame

Allowing a gentle loop to connect to the top, attach this cable to the top of the Cossack frame with a cable tie.

Don't pull it tightly. Cables don't like making sharp bends, so make sure there is a gentle loop.

c. Thread the cable downwards through gaps in the Cossack frame

Allowing a gentle loop to connect to the top, attach this cable to the top of the Cossack frame with a cable tie.

Thread the cable downwards through gaps in the frame to the existing Female at the bottom of the Cossack.

Here's a photo of the female connector firmly attached to the Cossack rim by nice tight cable ties.

d. Add the new wires to the female connector at the bottom of the Cossack

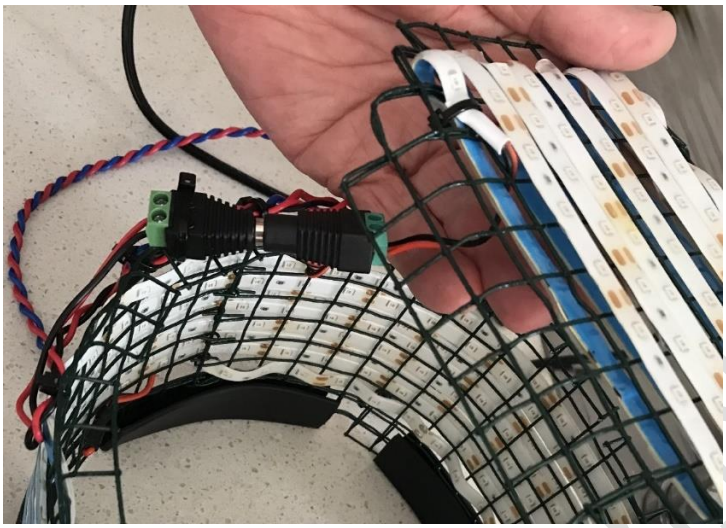
Don't undo the cable ties – keep the connector in place!

Gently unscrew the connector screws and release the wires that had previously been inserted.

Take the red positive wire that you have just released and the red positive wire from the cable you have threaded down. Squash them firmly together (it helps to roll them between your fingers to get a tight wire) and insert into the positive side of the above connector. Screw them tightly in place.

Similarly, take the black negative wire that you have just released, and the black positive wire from the cable you have just threaded down. Screw them tightly in place.

e. Clip the top onto the Cossack and plug the new Male connector into the Female connector



Clip the top back into place, plug in the new Male connector.

Plug your power supply into the connector at the bottom of your Cossack. If all your work has gone well, your Cossack and the top should light up together.

Options:
Michael's diagram shows two options for making the connection between the top and the Cossack.