



## OVERVIEW

For the most recent version of this document please visit [www.thonk.co.uk](http://www.thonk.co.uk)

For all technical support please visit <http://bit.ly/R0nqyt> on Muffwiggler.

The Thonk **AT-AT-AT** Triple Passive Attenuator is a simple module comprised of three identical and separate attenuators. It requires no connection behind the panel to your Eurorack power supply.

The simplest description of an attenuator is a 'volume knob'; you can use an attenuator to control the volume of an oscillator before it is fed to a filter for example. Or, you might use an attenuator to control the depth of LFO modulation patched to filter cutoff CV.



On a modular synthesizer, attenuators are an important building block in pretty much every part of your patch for both CV and audio duties.

Each attenuator has an input jack, a linear potentiometer to control attenuation amount and an output jack. The **AT-AT-AT** is not a mixer.

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## DIY INSTRUCTIONS

This document gives detailed instructions which assume you have purchased a complete kit from [www.thonk.co.uk](http://www.thonk.co.uk). It also assumes no previous knowledge of electronics. To learn to solder try [http://youtu.be/l\\_NU2ruzyc4](http://youtu.be/l_NU2ruzyc4)

All individual components used can be purchased from [www.Mouser.com](http://www.Mouser.com), for specific details see the Bill Of Materials (BOM) overleaf.

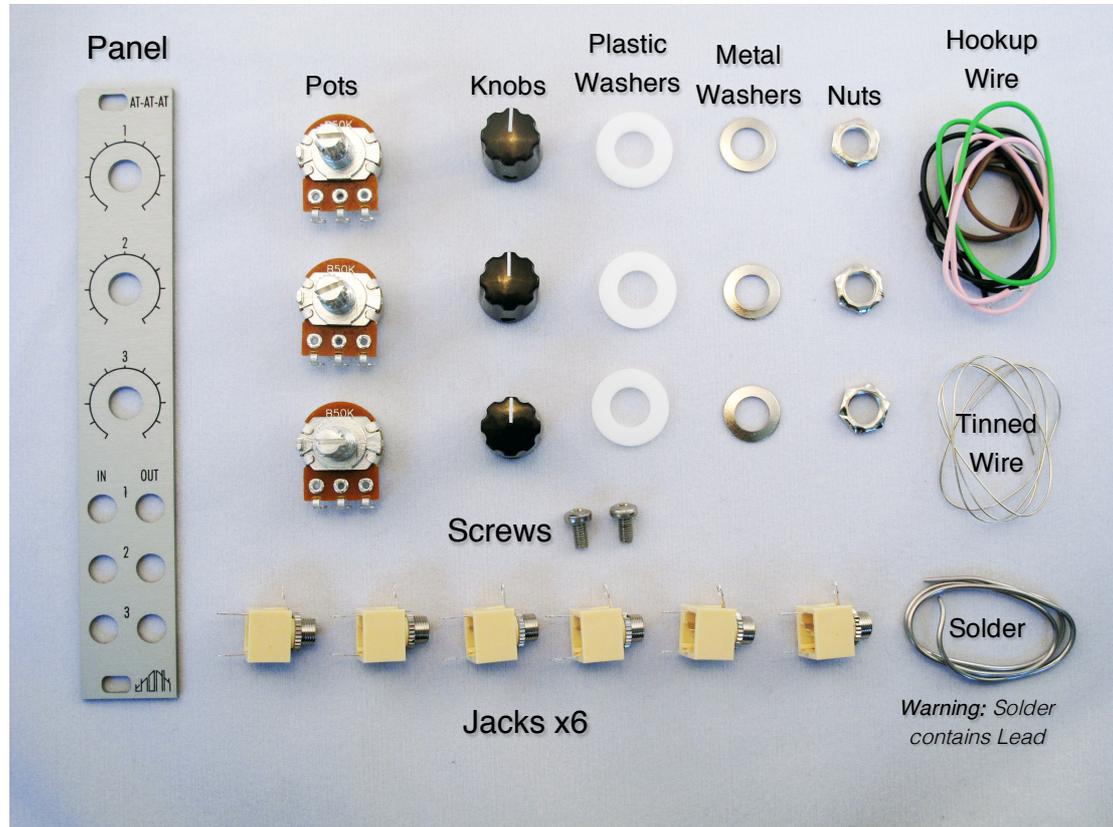
## TOOLS REQUIRED

**Soldering iron, pliers, wire strippers, small flat head screwdriver.**

For this kit you can substitute scissors for wire strippers if you are careful. You are likely to blunt the scissors if you don't take care however.



## BILL OF MATERIALS



# incl'	Description	Info
1	Thonk AT-AT-AT Aluminium Panel	
3	50K Linear Potentiometers (Solder Lug)	P160KNP-0QC15B50K
3	Black 'Davies 1900h' clone knobs	
3	Plastic Washers	Fit behind panel
3	M7 Metal Washers	Fit on front panel
3	M7 Nuts	Fit on front panel
6	3.5mm Jack sockets (Kobiconn)	16PJ138
	Hookup Wire	Var. colours, solid core or stranded
	Tinned Copper Wire	26 SWG
	Solder	18SWG 60/40
	<i>Contains lead – wash hands before eating</i>	

I have provided approx 50% more wire than you should require for a single build. However, do take care to use it efficiently.

PJ-301BM jacks, known also as 'Flight of Harmony' or 'Erthenvar' jacks will also fit this panel. Note that the solder pins have a different configuration.

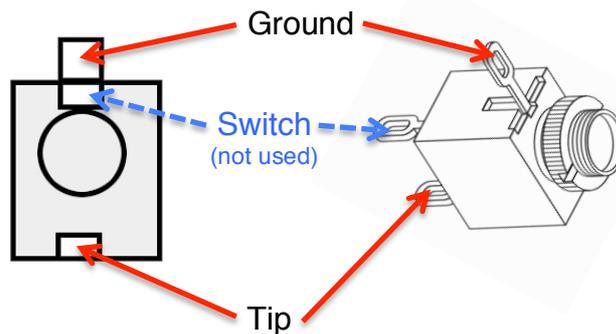
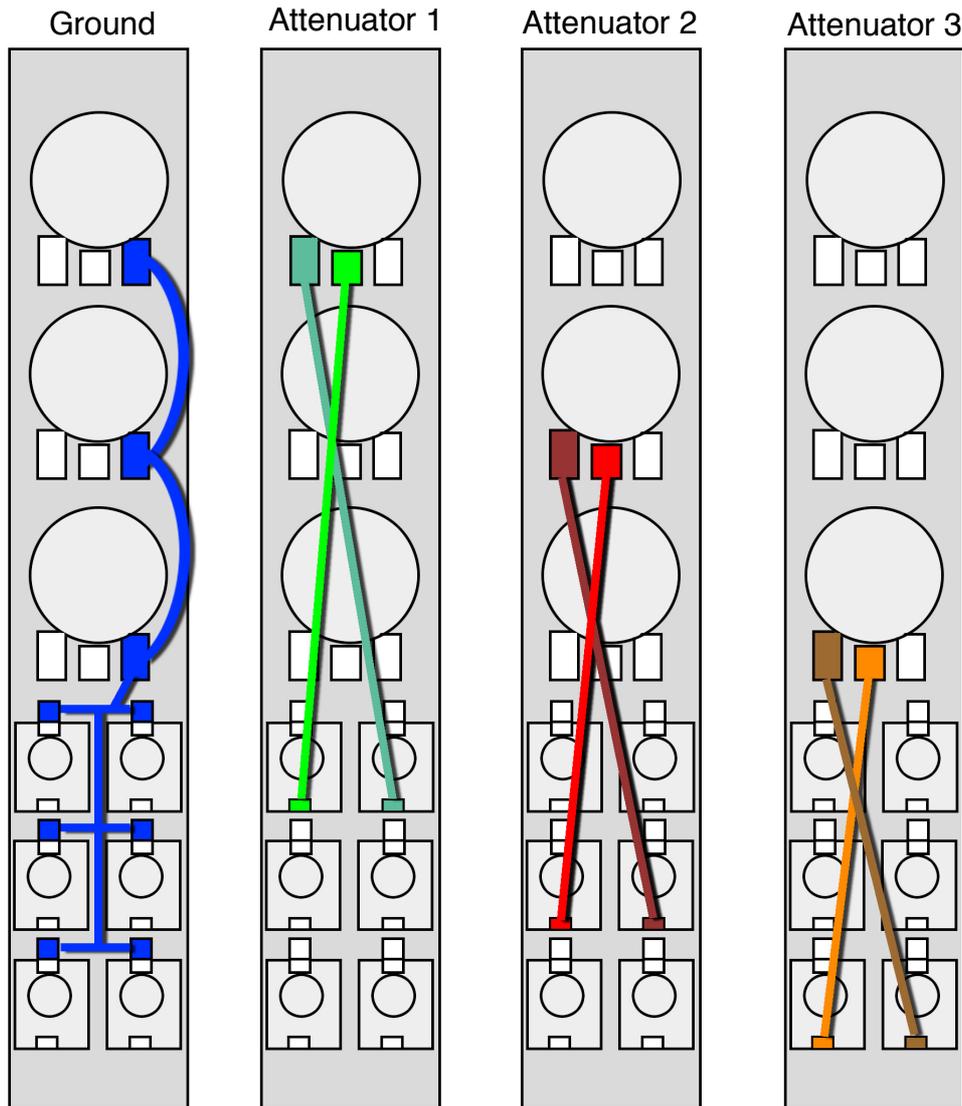
Also, any pot rated 47k-100k will work fine as a direct substitute. You could choose to replace with 'Audio' taper pots.



## WIRING DIAGRAM

If you don't understand this, **DON'T PANIC**  
Continue onto page 4 for beginner friendly instructions.

### VIEW FROM REAR OF PANEL



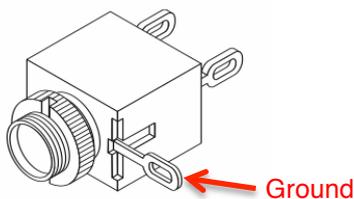


## BUILD INSTRUCTIONS

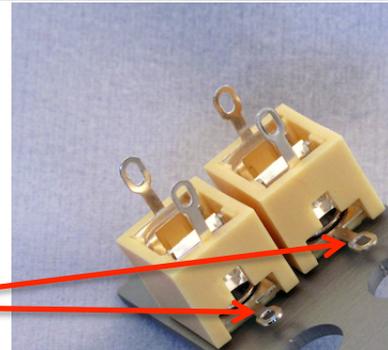
**TIP** – Start by emptying the zip-lock bag into a bowl. This makes it much easier to pick parts as you need them. Keep the zip-lock bag handy for later.

1 - First you need to install the bottom two jacks as shown. Make sure that the ground pins which stick out the side of the jacks are pointing up towards the top of the panel.

Be careful not to scratch the panel when tightening the nuts. Putting insulation or masking tape on the end of the pliers can help stop any scratching.



Ground Pins pointing towards top of panel



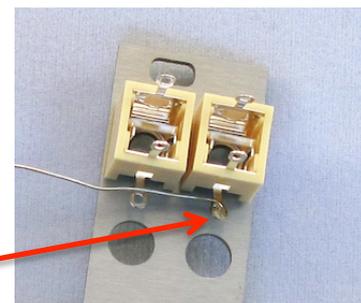
2 – Next, take the Tinned Copper Wire and use pliers to bend one end into a little hook



3 – For this section of the build, rotate the panel so the jacks are at the top.

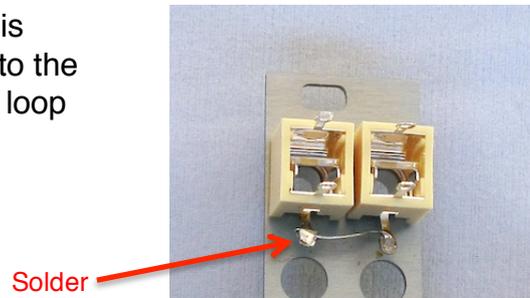
Take the hooked end of the Tinned Wire, secure it in the ground pin indicated and solder (do not cut the wire yet).

Solder





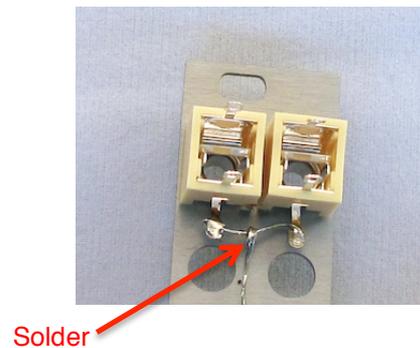
4 - Snip the other end of the wire so it is approx 5mm longer than the distance to the other ground pin, thread it through the loop and solder.



5 – Now hook another piece of tinned wire (do not cut it yet), but hook it onto the centre of the piece you soldered.

Take care to position this accurately in the centre (see step 6, this will need to fit inbetween the next two jacks inserted)

Solder this second wire in place.

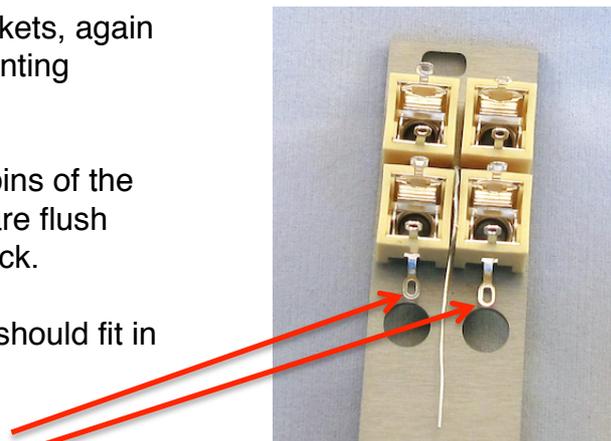


6 – Now fit the next two jack sockets, again ensuring the ground pins are pointing towards the top of the panel.

You'll need to bend the ground pins of the first two jacks upwards so they are flush against the plastic body of the jack.

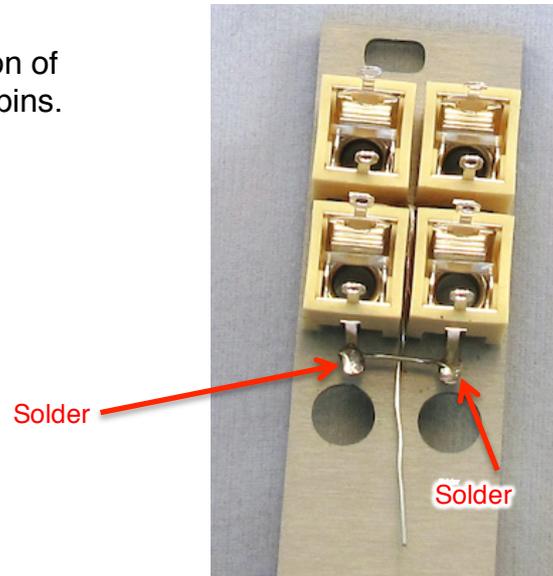
The central piece of tinned wire should fit in the gap between the new jacks.

Ground pins facing top of Panel

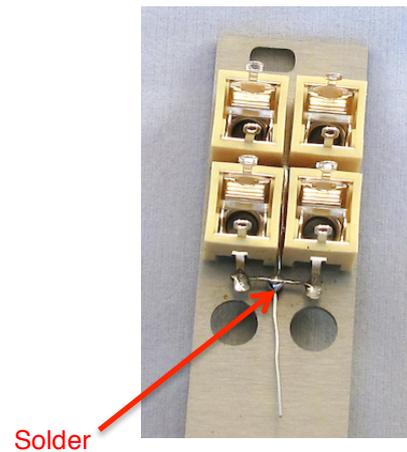




7 – Repeat steps 3 & 4 for the newly installed jacks - Solder a small section of tinned wire between the two ground pins.



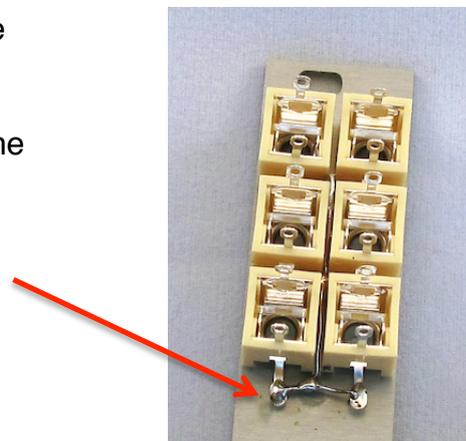
8 – And again solder the middle section of wire to the wire bridging the ground pins.



9 – Insert the final two jacks and repeat the same steps as previously.

Install a bridging section of wire between the two ground pins, and solder to the middle section of wire.

All 6 ground pins on your jacks are now connected together by the tinned wire.





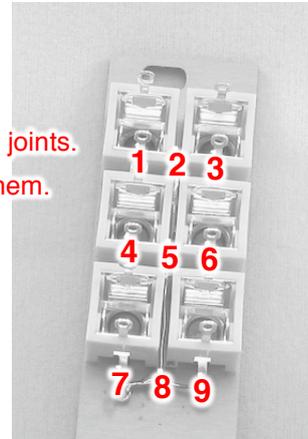
10 - Double check visually that all 6 ground pins on your jacks are now connected together. You could save yourself a lot of hassle later by double checking this now.

If you look in the gaps between the jacks you should be able to see 9 solder joints.

There should be no connections yet to the two jack pins which point directly away from the panel.

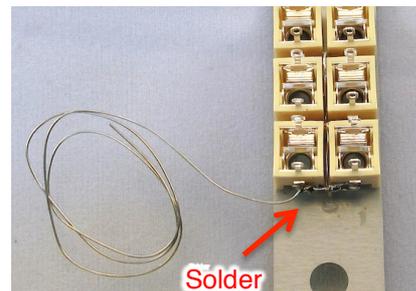
**Note:** it's fine for the tinned wire to touch the front panel, the panel is most likely already grounded through the physical connection with the jacks (and later the pots too).

9 solder joints.  
Count them.



11 – Solder one end of the tinned wire to the left hand ground pin as shown, do not cut the wire to length just yet. You're going to leave that wire hanging for now.

You can put the panel to one side now as it's time to prepare the pots.

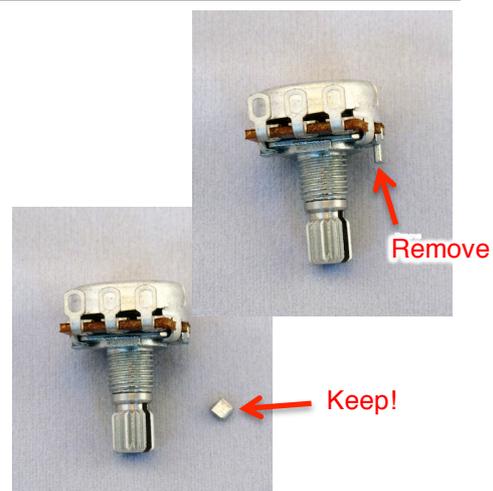


12 – First you need to remove and **KEEP** the little rectangular tab.

They snap off very easily with a pair of pliers.

They are pretty tiny so take care with them. I suggest putting them in the zip-lock bag you emptied as you go.

Why are you keeping them? It's an old synth DIY trick.





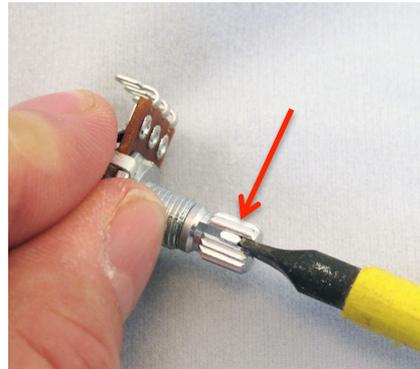
13 – You’re going to push those tiny rectangular tabs into the split in each pot shaft.

This makes the top of the pot shaft flare open slightly. When we finish the module by mounting the knobs you’ll find this gives a much more snug fit. No wobbly knobs here.

Grip the tag halfway with pliers and insert into the split end of the pot.

Use a screwdriver to push the tab about half way down the ‘toothed’ section of the shaft as indicated by the arrow in the second picture.

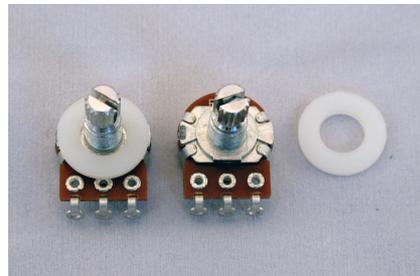
Don’t push it further than this as you WILL snap the shaft if you push the tag right to the bottom of the split.



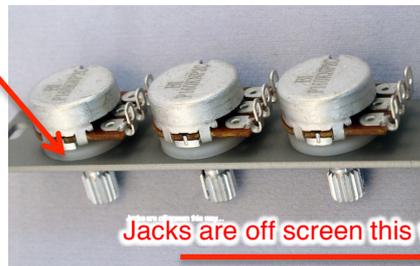
14 – The plastic washers fit between the pot and the rear of the panel.

They are not a tight fit over the pot shaft but centralise themselves when the pots are fastened to the panel.

Plastic Washer



The plastic washers shorten the length of the shaft on the front side of the panel giving a neater looking appearance when you fit the knobs.



Fix the pots using the metal washer and nut on the front of the panel.

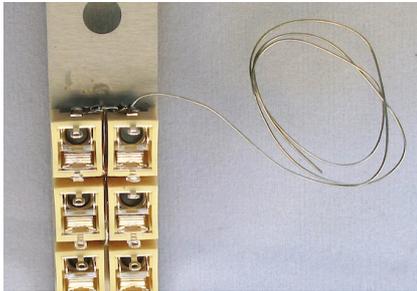
Make sure the solder lugs are pointing towards the jacks as shown in the photo.

Again, take care when tightening the nut that you don’t scratch the panel.





15 – Now you need to solder that wire you still have hanging off the side.



Rotate the Panel so the pots are at the top.

You're going to solder one continuous piece of wire onto the right hand terminal of each pot.

Don't worry about the bare wire touching the metal enclosure of the pot or the front panel - as long as it doesn't touch the other terminals of the pots you are fine.

Now all the jacks and pots share a ground connection. You're ready to move onto the final step and complete the work on the back of the panel.

By this point you've probably realised that you could have achieved this grounding task with a single piece of unbroken tinned wire. After trying both ways I decided they were both equally challenging. The one I chose was much less ambiguous to describe visually in this document



16 – Let's move onto the hookup wire. This is what you will use to make the connections between the pots and jacks.

This wire has plastic shielding as you need to avoid short circuits. This just means the stripped ends of the wire shouldn't touch anything other than the terminals on the pot and jack that I show you to solder

With a passive circuit you are not likely to cause any damage to anything by wiring incorrectly or sloppily – it just won't work.

You will have wire in at least two colours.



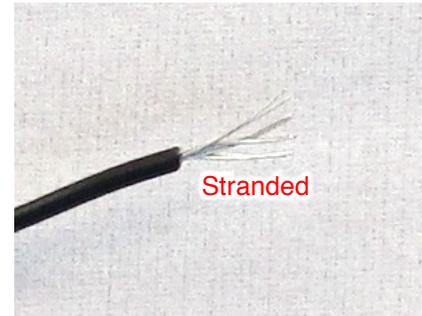
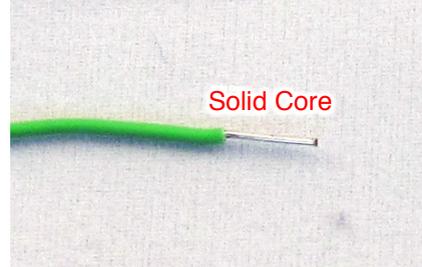


17 – There are two types of wire supplied in the kits, solid core or stranded. Both types work equally well for all applications on this module.

Strip about 5-10mm of the insulation off one end of each piece of wire to check which type you have (don't cut the wire into pieces yet).

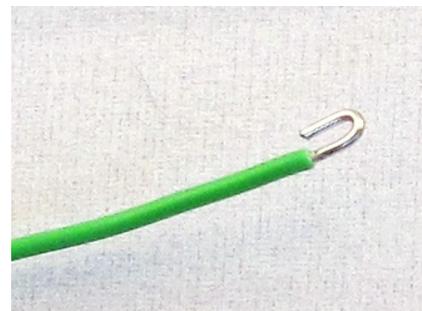
If you are careful you can strip the plastic shielding with scissors or a scalpel, but wire strippers are best.

If you do have stranded wire, twist the strands together between you thumb and forefinger and 'tin' the end. Tinning is applying a small amount of solder to keep the strands together.



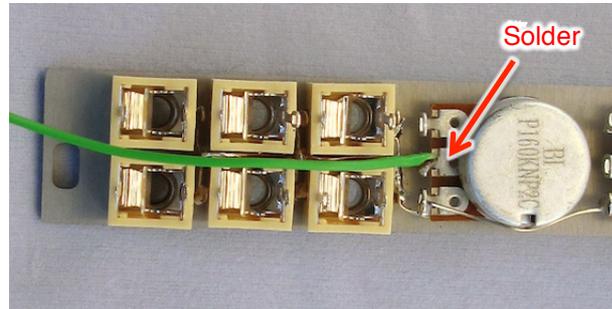
**TIP** - If you move on from this kit to more complex projects where you wire from a PCB to a front panel then I advise using stranded wire as it is more strain resistant. For jobs like the AT-AT-AT where everything is panel mounted, solid core is fine and slightly quicker to work with.

18 – Take one of the stripped ends of your wire and use pliers or your fingers to bend it into a hook like so.

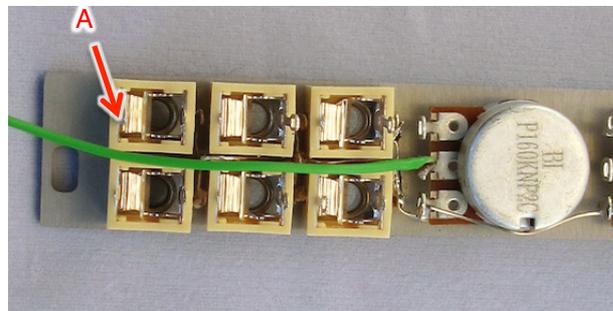




19 – Attach the hook to the middle terminal of the Pot no 3 and solder.

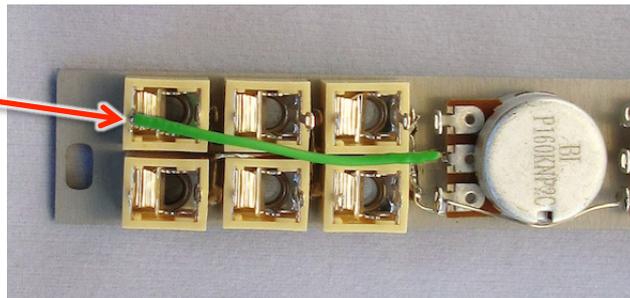


20 – Now extend the wire out to the Jack terminal marked A.

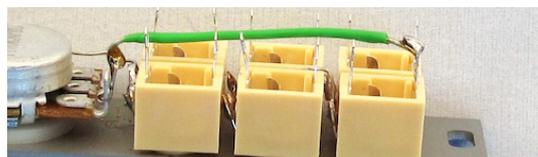


Cut the wire so it is around 10mm longer than the distance to A, then hold the wire gently to terminal A (without bending the pot terminal) and strip the insulation off from this point. You can now pass the bare wire through the hole in Terminal A, bend it round to secure and solder. You can cut off any excess wire after soldering.

Strip wire and  
solder here

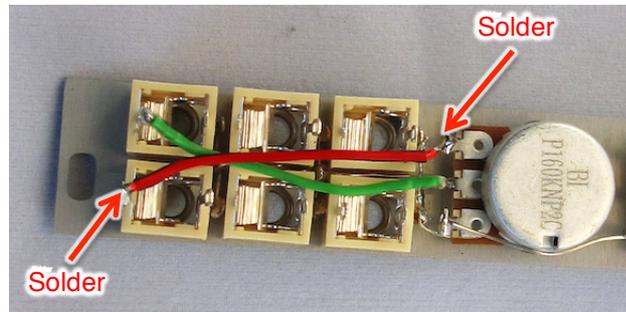


**The wire should not be tight between the two points**, it shouldn't be bending the terminals on either the pot or the jack. If anything it should bulge away so it is a little malleable and you can rearrange its position once soldered.





21 – You are now going to repeat exactly the same process and solder from the remaining empty terminal on Pot 3 to the other bottom row jack as indicated below.



Congratulations. Attenuator 3 is now complete. This would be a good moment to test your work. Mount the panel temporarily in your case to see if attenuator 3 is working. You don't need a knob to try this out quickly. Turn the pot fully off/counter-clockwise first.

Try patching an oscillator or sound source to AT-AT-AT 'In 3', and patch from AT-AT-AT 'Out 3' to your speaker or headphone amp. Pot 3 should now be working as a volume control.

22 – So to finish the final two attenuators, 1 + 2, you just repeat the same wiring job another two times. The photos below are reference for what a complete module should roughly look like.

I do strongly advise following the wiring diagram on page 3 rather than relying solely on these photos.





23 – The final task is fitting the knobs.  
Turn all the pots fully counter-clockwise or fully OFF.

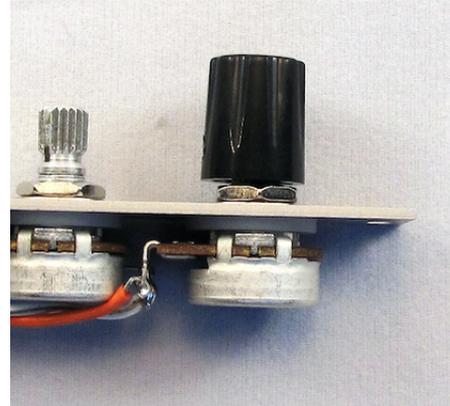
Make sure the set-screw in the knob is loosened just enough to allow the pot to fit fully over the shaft of the pot. Be careful to not loosen the screw so much it falls out.

Once fitted, the bottom of the knob should pretty much be touching the nut.

Make sure the knob is fully counter-clockwise, line the knob pointer up with the first mark on the scale, hold the knob firmly in place with your thumb and tighten the set screw with a screwdriver.

If you find the knob feels a little tight or 'grindy', loosen the set-screw and push some paper or thin card between the base of the knob and the nut. This will just lift the knob away from the nut slightly. Tighten the set-screw and test again.

Repeat for the other two knobs, screw into your Eurorack case and you are...



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# FIN

For technical support please use <http://bit.ly/R0nqyt> on the Muffwiggler forum.