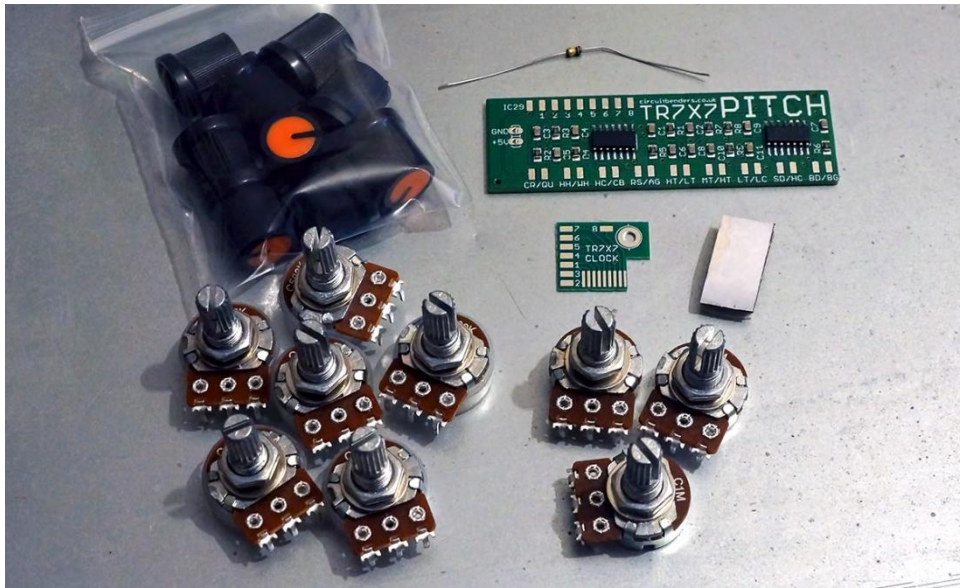


## circuitbenders.co.uk Roland TR7X7 individual pitch mod:

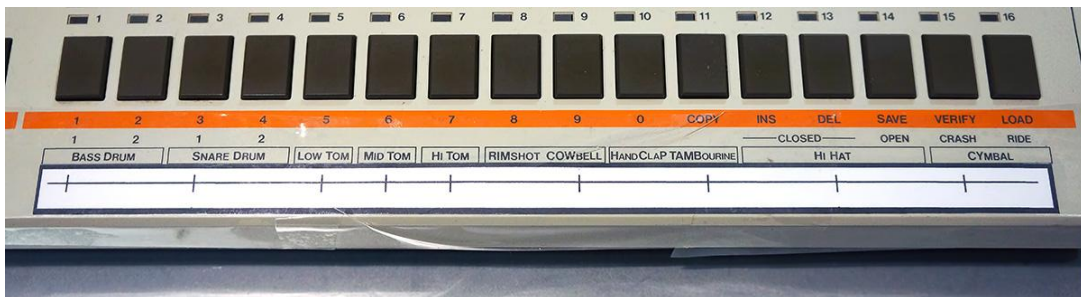
**WARNING: There are parts of this mod that can severely damage your drum machine if performed incorrectly, and repair would be either very difficult or impossible. Before attempting this mod read this entire guide, and if you have doubts or are not 100% confident of your abilities then DO NOT ATTEMPT THE MOD. Really, we aren't joking about this. We can't be held responsible if you mess this up, and theres not a lot we can do to help. Proceed at your own risk.**

This mod kit adds nine pitch controls to either the TR707 or the TR727 drum machine. You get one pitch control for each sound group, i.e. the two 707 snares share the same control, the rimshot and cowbell share the same control, as do the clap and tambourine etc. The only exception to this are the crash and ride cymbals that share a pitch control despite having separate volume faders.

In the kit you should have a 'TR7X7 PITCH' board, a 'TR7X7 CLOCK' board, a resistor, a small piece of double sided adhesive foam, 3 x C1M potentiometers, 6 x C500K potentiometers, and 9 knobs.



It doesn't matter where you chose to mount the pots as long as there's space for them on the panel, but if you want to mount them along the bottom of the panel under the step buttons like we do, the first thing you'll want to do is print the drilling template at the end of this guide, then cut it out (around the outside of the frame) and stick it to the panel in the position shown below using some kind of clear tape. **Make sure you check the printing instructions on the template.** Verify that you have it the right size and the right way up with the drill positions for the Bass and Snare drums lined up with the 1's above the sound names on the TR707, or the 1 and 3 above the Bongos and Hi-Conga on the TR727. The outside of the black frame should be positioned up against the bottom of the boxes around the sound names as shown. Careful positioning is important as it can affect how easy it'll be to mount the pots..



Now you can go ahead and drill the holes for the pots. For better accuracy we usually drill a pilot hole with a small bit in a hobby drill at the centre of each drill position, and then use a proper drill with a 7mm bit to actually drill the full size holes.

Take the tape and drill template off and it should look like this.

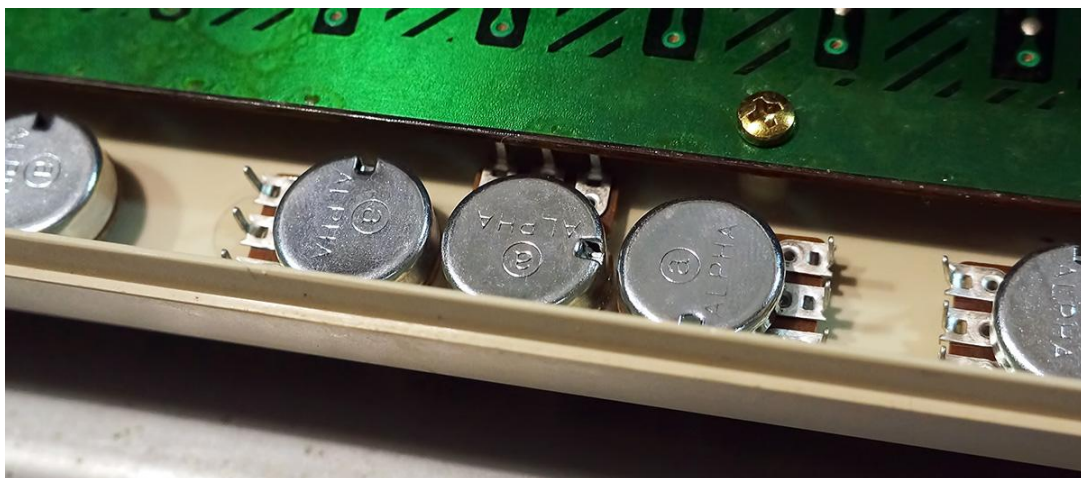


If you haven't already, now is the time to take the back off the casing. It's probably a good idea to desolder the wires to the battery compartment rather than have the back of the case flapping around on the end of them, but make sure you mark which wire went to which terminal so it's easy to resolder them then you close the case up again. Doing this will delete any stored patterns, so if you want them back then up.

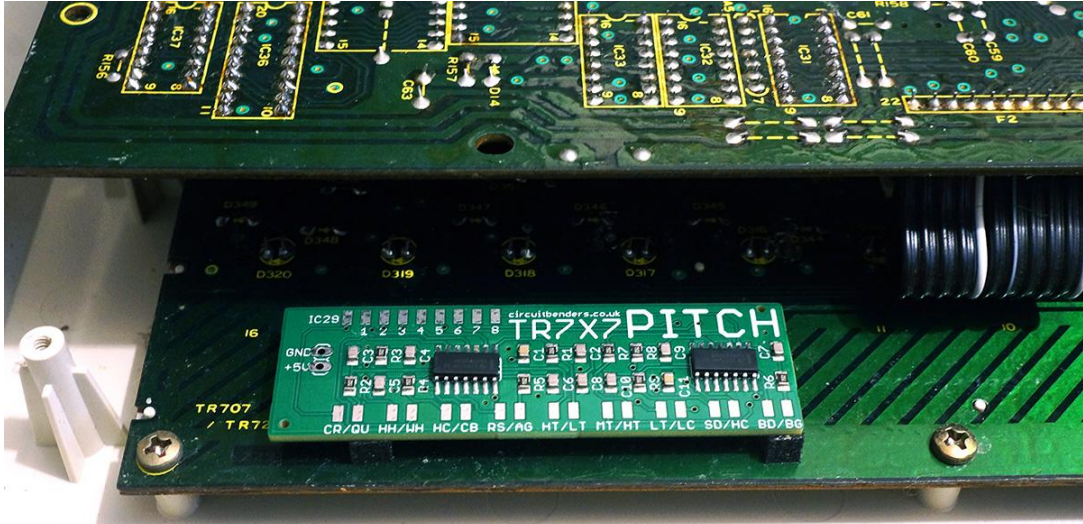
Now you need to mount the pots. On the TR707 the three tom sounds all use C1M pots and the rest of the sounds use C500K. On the TR727 it's the low-conga, hi-timbale and low-timbale that use the C1M pots, but the layout is the same. Place the pots as shown below, but remember that you've turned the thing over so now the bass drum or bongos are on the right.



Try to get the pots positioned as parallel to the casing edge and each other as possible, as otherwise the knobs may point at different angles when you push them on later. Note that the three C1M pots have to be positioned at the angles shown or there won't be enough room for them to all fit in. If you don't have a very thin soldering iron tip you might want to tin the pins of the middle C1M pot with solder before mounting it, as it could prove difficult to get at once it's in place with the pins slightly under the board.



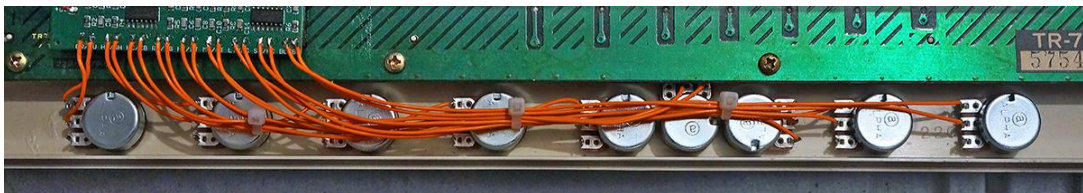
Next, carefully cut the adhesive foam mounting pad lengthways into two halves with some scissors, and stick the two pieces to the underside of the TR707 PITCH board. Make sure you don't stick the mounting pad over the solder points for the GND and +5v connections. Now you can mount the pitch board to the left of the TR's button board in roughly the position shown below. For the sake of neatness later on it's probably a good idea to roughly line up the GND and +5v solder pads on the pitch board with the right hand pins of IC36 on the board above, but it's not 100% necessary.



Now solder wires from each pair of terminals on the front edge of the board to the corresponding pots. The terminals are labelled with abbreviations for the appropriate TR707 sound, and then the TR727 one, so the pair of terminals labelled SD/HC is Snare Drum on the TR707 and Hi-Conga on the TR727. The best way to solder to the pitch pads is to prepare each pad by heating it with the tip of your iron and quickly flowing some solder onto it, then you can just reflow the solder and push the tinned end of a wire into it. Use pins 2 and 3 of each pot, as shown below.

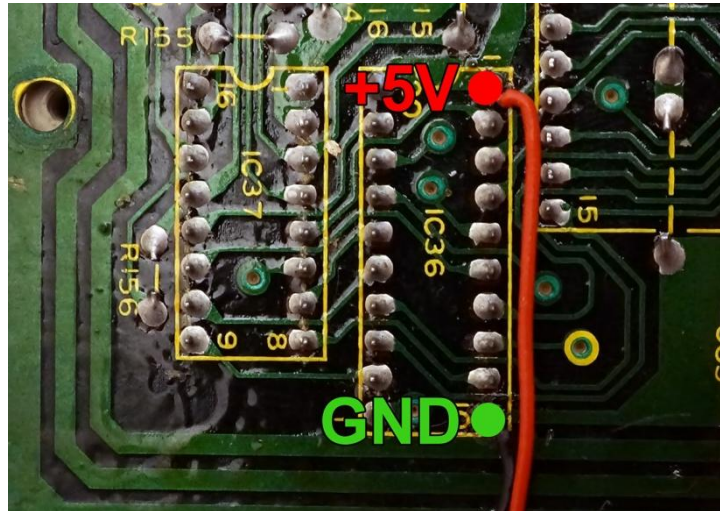


You should end up with something looking like this.



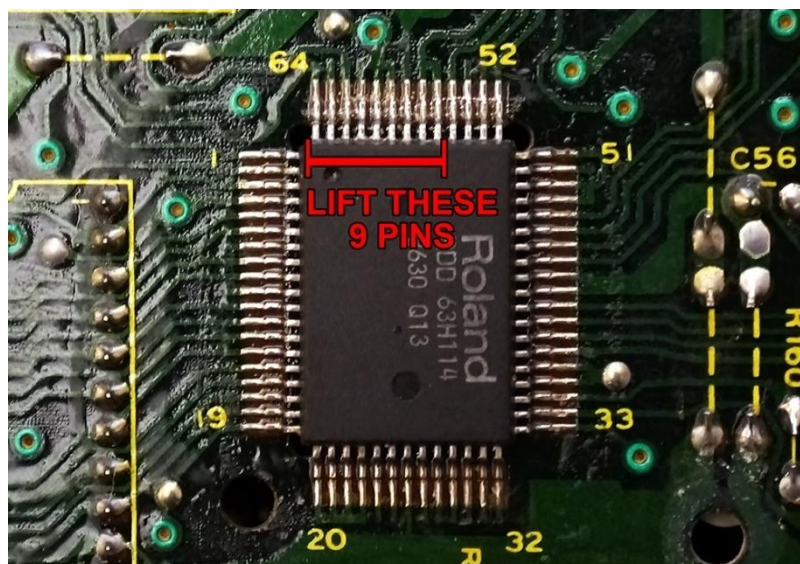
Obviously the cables ties are optional, but it does tend to make things easier now, and especially at later stages of the mod if you don't have a load of loose wires getting in the way.

The next step is to connect up the power to the pitch board. To do this you need to take wires from the +5V and the GND solder pads to the left of the pitch board, to the solder points on IC36 as shown below. IC36 can be found just above the pitch board, on the bottom left of the TR's main board.



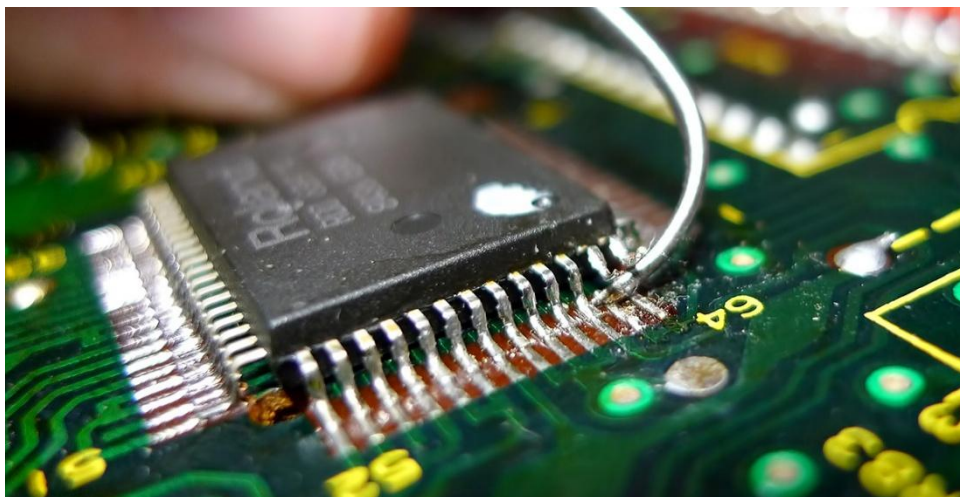
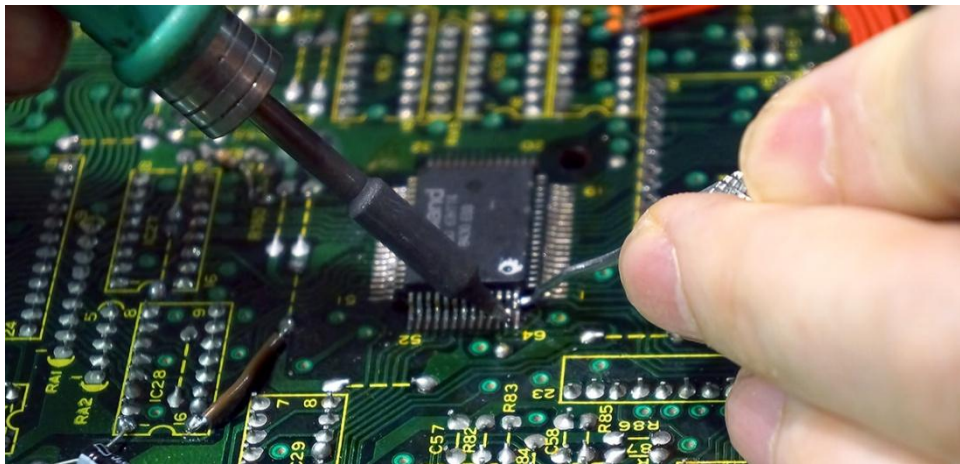
The next section is where things start getting a little more scary. To the right of IC36 you can see the two sound ROM's at IC35 and IC34, and then a rectangular surface mount chip with Roland printed on it. This is the custom gate array IC that controls the playback of the sounds, and its completely irreplaceable. If its damaged then its game over.

What you need to do now is carefully desolder, disconnect and lever up nine of the pins of this surface mount chip without overheating the chip, breaking off or damaging any pins, or lifting any of the solder pads underneath from the board. Each one of the pins represents a digital clock signal for one of the sound groups, and if you snap off a pin then those sounds are gone, probably forever. This part is perfectly doable if you're very careful and proceed with caution, but if you are at all doubtful of your ability to do it properly then we'd urge you to get someone with more confidence or experience to attempt it. That way at least you can blame them!



The best way that we've found to do this part is to get a thin pointed tool like a dental pick and hook just the tip underneath the furthest left pin. Then use the tip of your soldering iron to melt the solder on that pins pad while gently pulling away from the IC body with the pick. If it's not moving, then don't force it, but you should find that when the solder melts, with a little outward pressure the pick will lift the pin as it pulls free. Once you have the first pin free, VERY gently bend it upwards just enough to allow the pick access to the next pin, and repeat the process. It will get a little more awkward as you go further in, but with a bit of patience it shouldn't be too problematic. Again, if you can't get the pick to move don't force it, and never pull the pin upwards, Always pull the pick away horizontally along the plane of the board so the pin slips up and over the pick as you pull it out.

Below are some pictures of this procedure, although it's extremely difficult to take a decent photo showing exactly how to go about it.

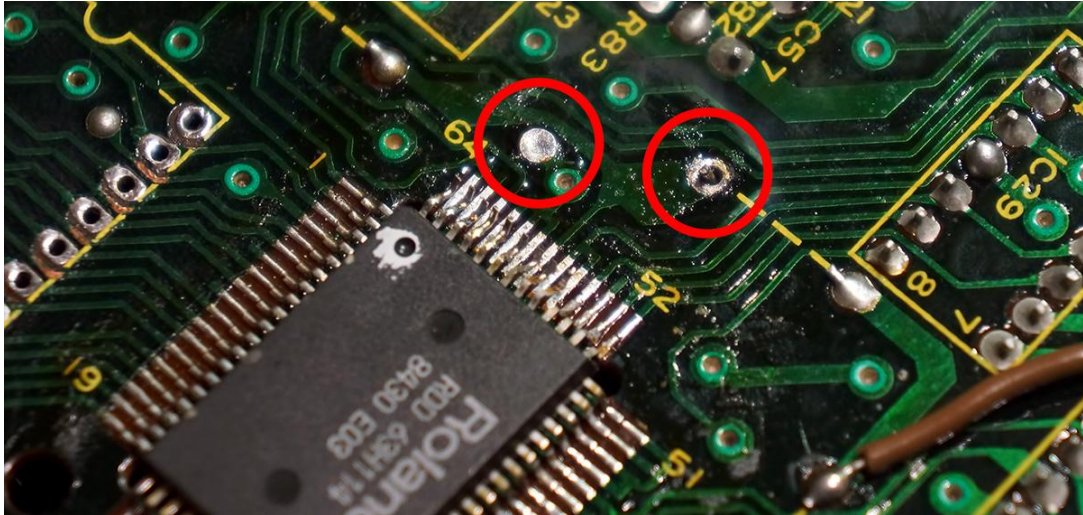


We should have a video of somewhat dubious quality on youtube [HERE](#).

Any additional images or ideas on how to do this safely will be added in updates to this guide, so if you have any tips, let us know!

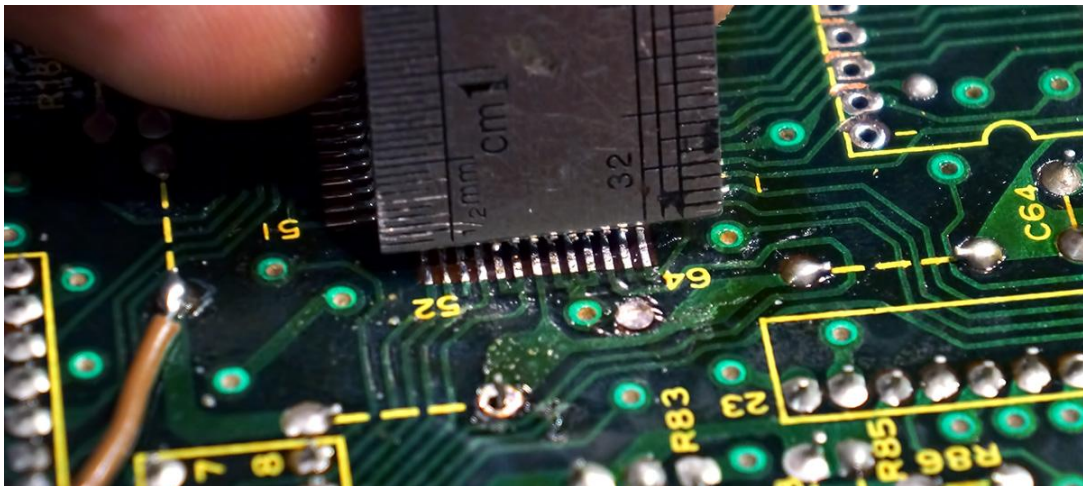
Once you have lifted all nine pins its usually a good idea to use some thin solder wick to remove any remaining solder from the pads under the pins. Again, be very careful as you do this. Don't push the soldering iron under the pins themselves. It's better to stick the solder wick as far under as you can go without bending the pins upwards and let it suck any solder from the pad. If you can't get all the solder off then it's probably better to leave it rather than risking damaging the pins or the pads, but make sure there are no solder bridges between pads.

You now need to remove the solder from two other solder pads shown on the image below.



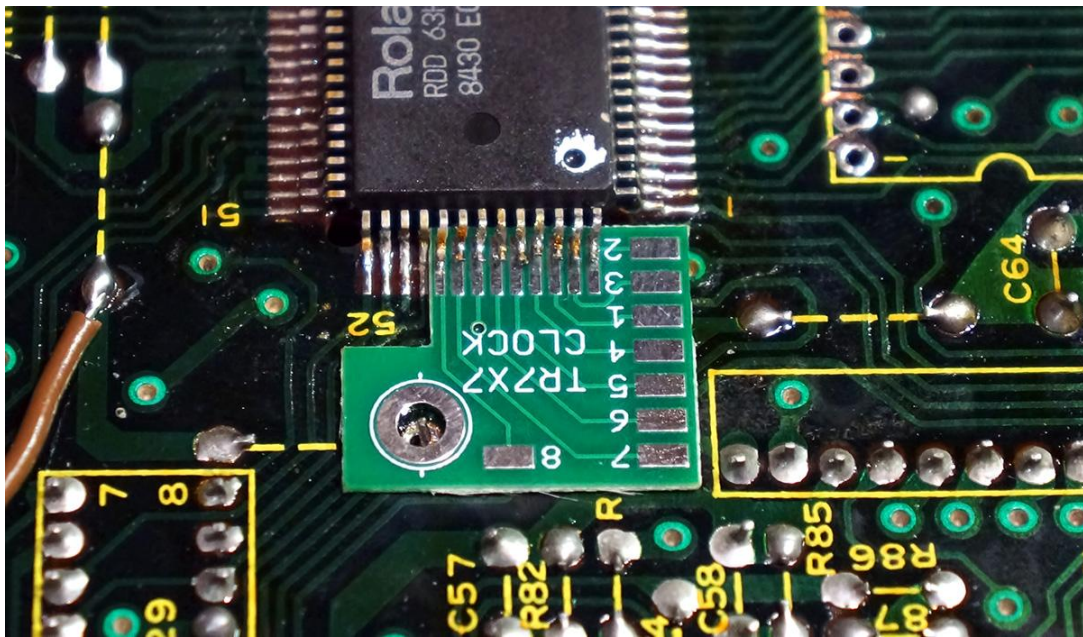
The one on the right will have a jumper leg sticking through the hole. DO NOT push this through the board as you will need to resolder it in place in a minute.

It is usually a good idea at this point to use something like the end of a steel ruler and some gentle pressure to make sure all of the lifted IC pins are the same height, preferably with their lowest point about 1mm off the board.



Now take your TR7X7 CLOCK board and gently slide it under the lifted pins so each pin lines up exactly with one of the pads on the edge of the board. The plated hole in the board should fit around the protruding jumper leg where you removed the solder earlier. If this goes perfectly the pins will have been positioned at the exactly right height so that as you push the board underneath them it gently pushes them up and they are left sitting directly on the pads. Realistically it's probably not going to go perfectly, so again, don't force the board in if its reluctant. If the pins aren't allowing the board to go underneath just take it out and use something like a thin ruler to very gently bend them upwards a tiny and equal amount, then try again. The pins probably don't have to be actually touching the board with any actual pressure, but the next step will be easier if they are.

It should now look something like this.

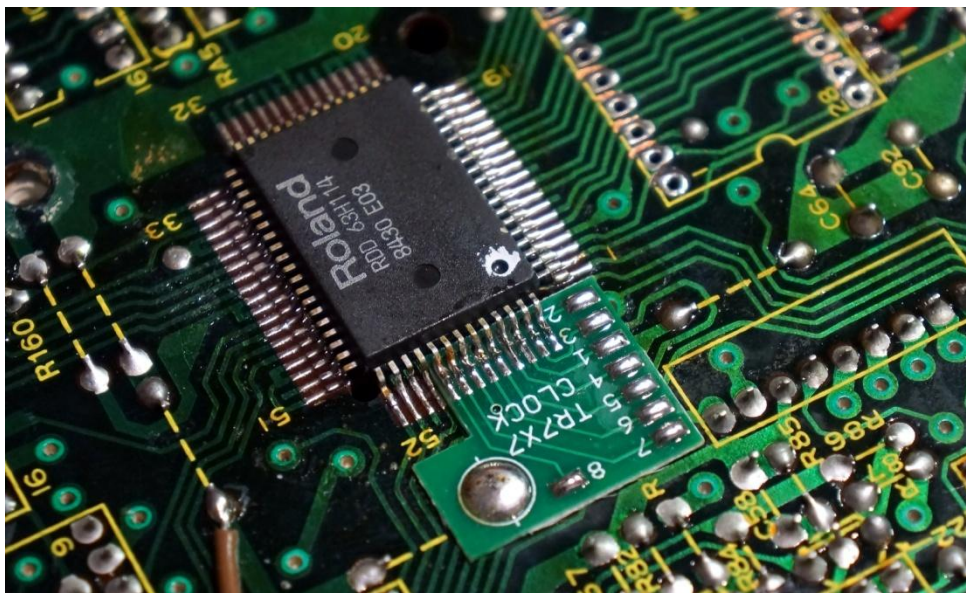


You can take this opportunity to use the pick to gently pressure back into place any pins that have bent off to one side, as a couple have on the image above.

Once you're satisfied you have everything lined up as good as you can possibly get it, you can heat the plated hole with your iron and melt some solder into it so that the clock board is soldered into place around the protruding jumper wire and its pad.

How you solder the pins to the clock board is a matter of personal preference. We usually flood the pins with liquid flux and then solder them as if we were hand soldering the pins on a normal surface mount IC. If the pins are actually touching, or are very close to the clock board then if you have enough flux you should be able to just very quickly heat the pad and pin simultaneously for a second or less, then apply a tiny amount of solder to the join and it should pretty much solder itself. One thing to look out for is applying too much solder and bridging the pins. If that happens you can probably remove the bridge by heating the solder at the end of the pins in question, and dragging the tip of your pick away from the IC between the pins and through the bridge, but it's better to not have to do it in the first place.

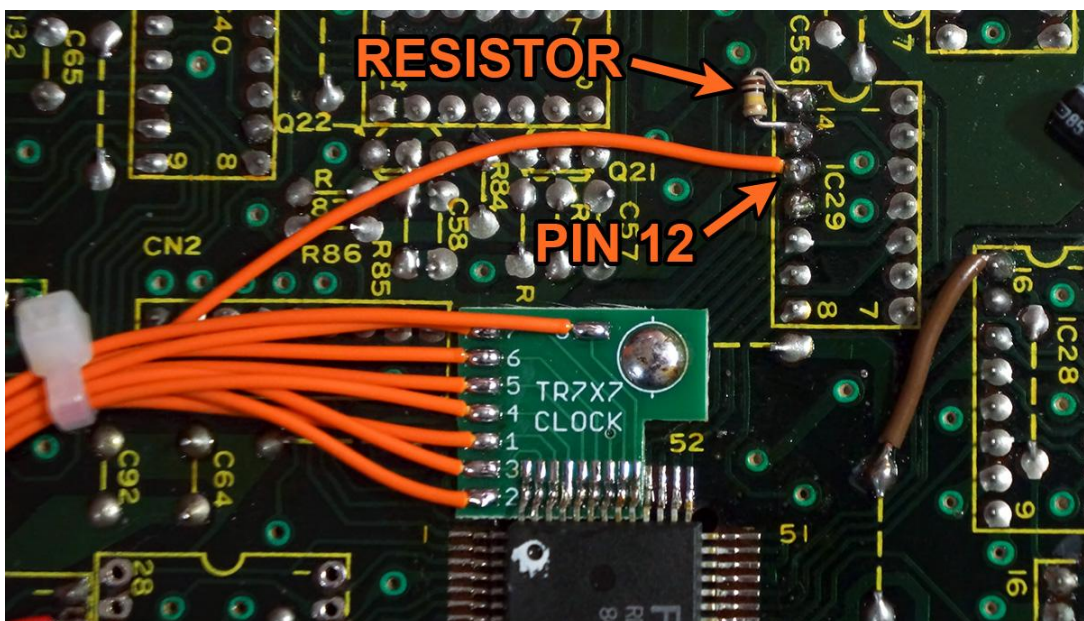
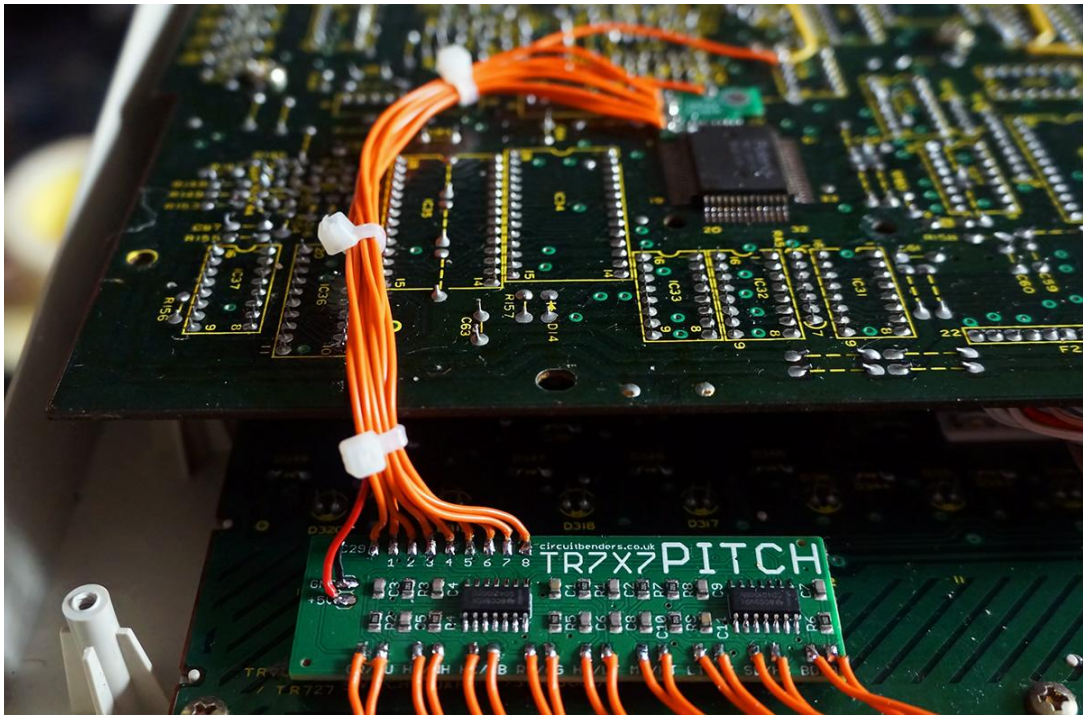
You can now melt a little solder onto the pads labelled 1 to 8, and it should look something like the image below.



That's the most terrifying bit over with. If you've got this far then hopefully nothing has gone hideously wrong!

Next you need to wire from the clock output terminals of the TR7X7 PITCH board to the inputs of the TR7X7 CLOCK board. The output terminals on the pitch board are the ones at the back. They are numbered to coincide with the inputs on the clock board. Note that the input numbering on the clock board goes 2-3-1-4 at the bottom and not 1-2-3-4. If you wire them up as 1-2-3-4 then some of the panel pots will control the wrong sounds.

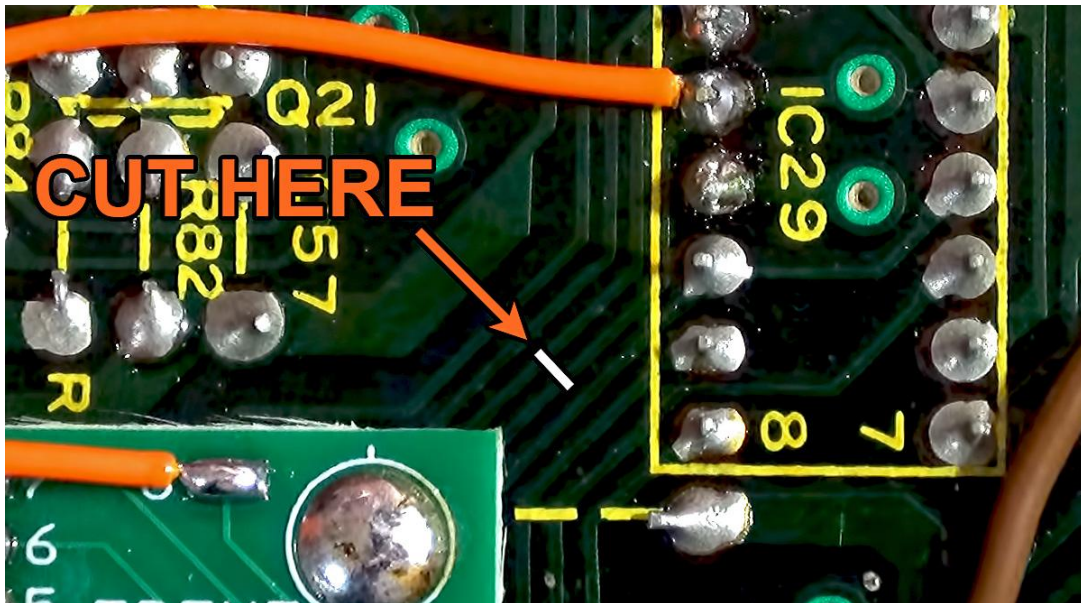
The first output labelled IC29 on the left of the clock board should be wired to pin 12 of IC29. You will also need to cut the legs of the supplied resistor very short, and wire it between pins 14 and 13 of IC29. Both of these positions are shown in the images below. Don't forget to add this resistor.





The final part of this mod is another scary moment for which you're going to need a very steady hand and some good eyesight! If in doubt use some decent lighting and some kind of hands free magnifying glass.

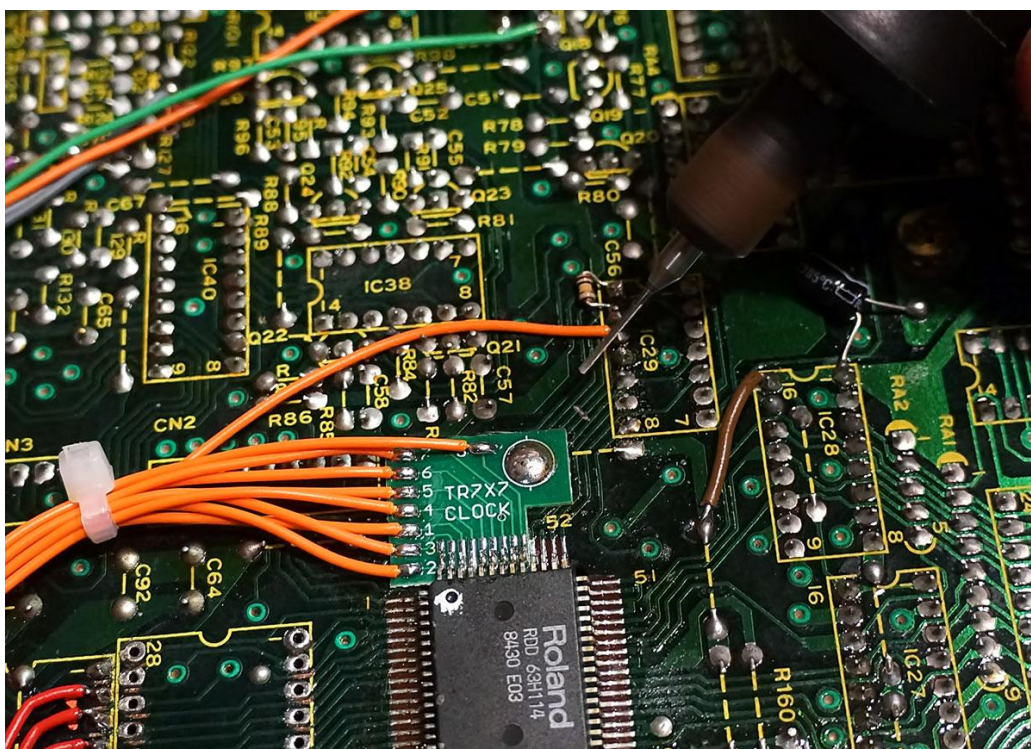
To do this part you're going to have to cut two very thin and difficult to see circuit traces between IC29 and the Roland gate array. The traces you need to cut are shown by the white line on the image below.

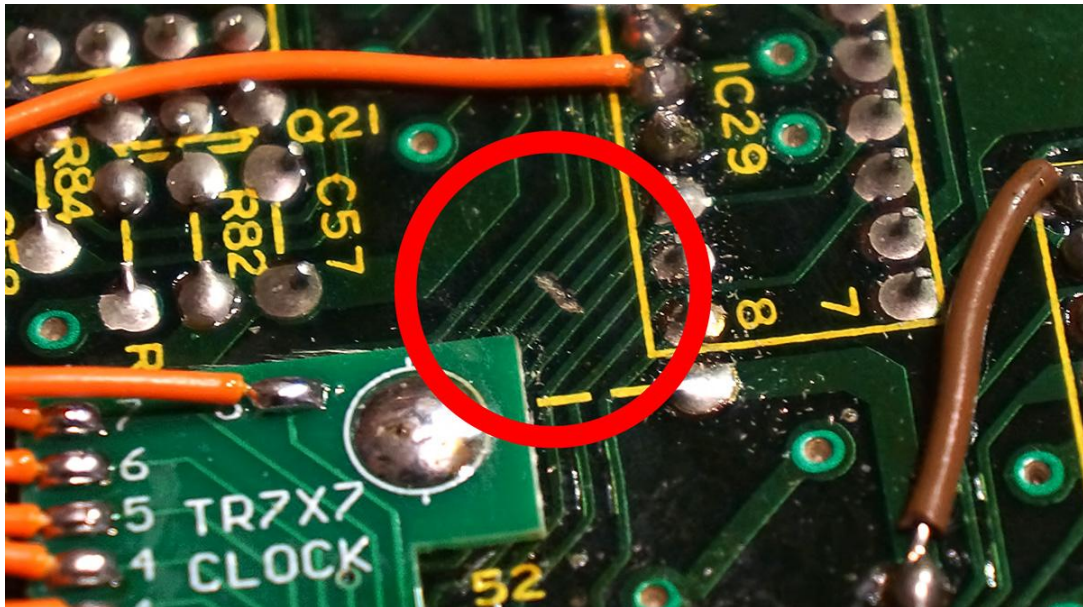


You can do this with the point of a sharp craft knife if you are very careful, but it is very easy to accidentally slip when applying pressure and cut through the adjacent traces. If you do this then you're going to have to do some fiddly repair work scratching off the solder resist on the circuit trace either side of an accidental cut to expose the copper, and then bridging the gap with some solder or a very thin piece of bare wire.

A better way to do this is to use a hobby drill with a very small drill bit at an angle as a kind of milling tool to cut away the trace. This gives you a very accurate and controllable cut, but maybe test it on a blank bit of PCB first.

However you do it, check to see you have the right traces, and then check again! Take your time and be careful.





Put the back of the casing back on, remembering to wire up the battery compartment again, push the supplied knobs onto the pots, and if nothing has gone wrong you should hopefully have a TR with individual pitch controls!

There are some basic trouble shooting tips below:

- If a knob controls the wrong sound then you've either wired the wrong pot to the wrong terminals on the front edge of the pitch board, or you've got the wiring between the pitch board and the clock board mixed up. Check the wiring and swap over anything wired incorrectly.
- If one knob controls more than one sound, or more than one knob controls one sound, or both, then you've probably got a short between two of the lifted pins on the gate array chip. Check your soldering with a magnifying glass.
- If one sound doesn't sound at all then it is possible that you haven't actually soldered one of the lifted gate array pins to the clock board. It can be deceptive and may look soldered when it isn't. Check to see that all the pins are firmly held in place and check the soldering with a magnifying glass. Also, if you have an oscilloscope you can check that you are seeing a clock signal at each of the lifted pins and at the outputs on the pitch board.
- If you're getting no sound at all, check for +5v at the power connection of the pitch board.
- The toms on the TR707 should all have a roughly equivalent pitch range. If one has a much wider pitch range then you've used the wrong pot value for that one. The same goes for the low-conga, hi-timbale and low-timbale on the TR727, but inevitably it's a bit more difficult to tell as the sounds are different.
- The sounds will pitch A LOT further down from normal than they will go up. This is normal.
- The HiHats on the TR707 are going to sound a bit strange when you pitch them up, Again, this normal. It appears that this is something to do with sample aliasing in the higher frequencies, but there can be some very weird 'in between' stages to the sounds as you move the knob.
- If everything is fine before you close the case, but as soon as you screw the back on everything goes a bit strange, then it's entirely possible that the bundle of wiring between the pitch board and the clock board is being squashed against a sharp solder joint and something is shorting, especially if you've used cable ties. Open the casing and move the wiring around a bit. At a last resort you can always cut the points from any suspect looking solder joints with some sharp wire cutters.
- If you are also planning on installing the [HKA sound ROM expansion mod](#), then it's going to be a hell of a lot easier to install the HKA mod first, and then our pitch mods afterwards. The pitch mods work fine with the HKA mod and will pitch the new sounds just the same as the original ones.

**BASS DRUM / BONGOS END**

**PITCH POT DRILL TEMPLATE**

**PRINT AT 100% NOT 'FIT TO PAGE'**

**OUTER FRAME SHOULD BE **286mm** WIDE**

