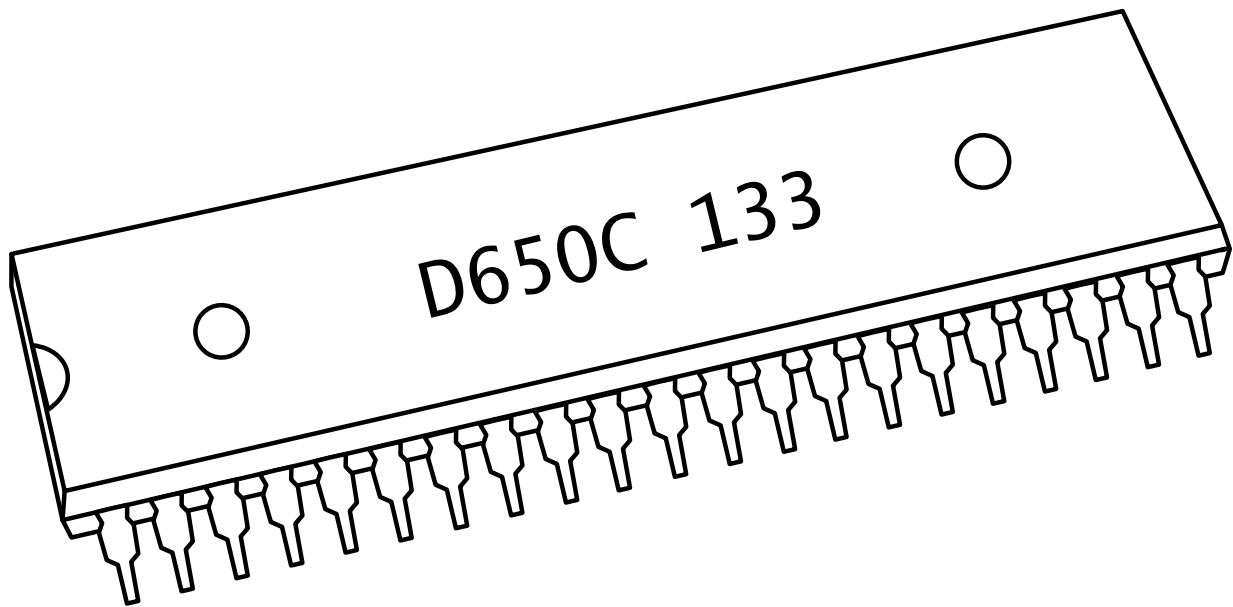


# Quicksilver 303

TB-303 CPU Upgrade



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## Installation Guide

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Social Entropy Electronic Music Instruments

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## WARNINGS

The Quicksilver 303 installation requires the removal of the original NEC uPD-650C. This is a delicate operation and should only be performed by experienced technicians!

Use proper grounding when required.

We cannot be held responsible for any damaged or broken cases as a result of installing sockets in the case. The 303 case is old and fragile and will melt easily or crack if holes are drilled incorrectly!

We are not responsible for any damage to your TB-303.

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# OVERVIEW

The original NEC uPD-650C microprocessor will be removed using a desoldering station.

There are a few optional steps that can be taken as part of the installation, such as removing the old memory chips (and associated circuits) and installing MIDI or USB jacks.

Because the Quicksilver 303 CPU uses an internal EEPROM with a different format, the old patterns stored in the TB-303 memory cannot be used with the new CPU. Old pattern or track information should be saved manually (on paper!) before replacing the CPU. It is also possible to import pattern data from the old memory chips during installation, please see the Tech Notes section of [socialentropy.com](http://socialentropy.com) for more details.

We recommend repairing any outstanding issues with the TB-303 BEFORE installing the new CPU, it will be easier to track down any small repairs before the CPU is installed.



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## WHAT'S IN THE BOX



The Quicksilver 303 upgrade kit consists of a new CPU board in a static sensitive box, a 33k resistor and a USB dongle.



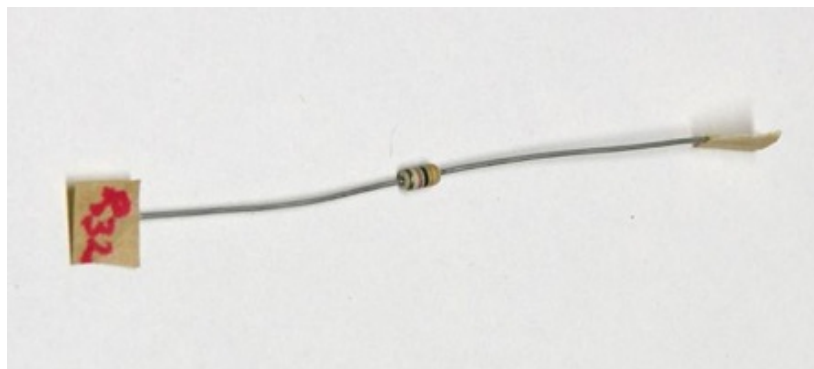
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The USB dongle includes:

- One short USB dongle. Normally we recommend placing this in the battery compartment during installation. USB is used for OS upgrades or USB MIDI communication.



A 33k ohm resistor is also included as a replacement for R32 if needed.



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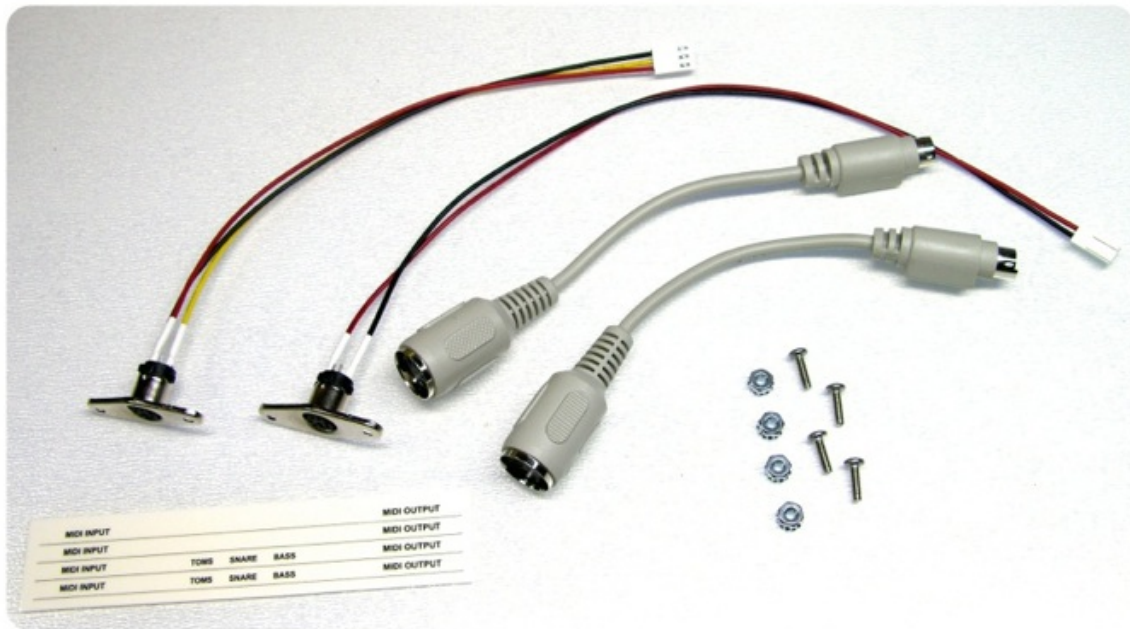
If the MIDI dangle option was selected, there will also be some extra components included.



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The MIDI Option includes:

- Two internal MIDI leads with panel mount mini DIN socket, one 3-pin for MIDI output, one 2-pin for MIDI input
- Two external MIDI converter dongles. These convert from the mini DIN sockets to a standard MIDI port.
- Four Machine screws and lock nuts. For mounting the MIDI mini DIN sockets to the case.
- A sheet of stickers for labeling the MIDI sockets.



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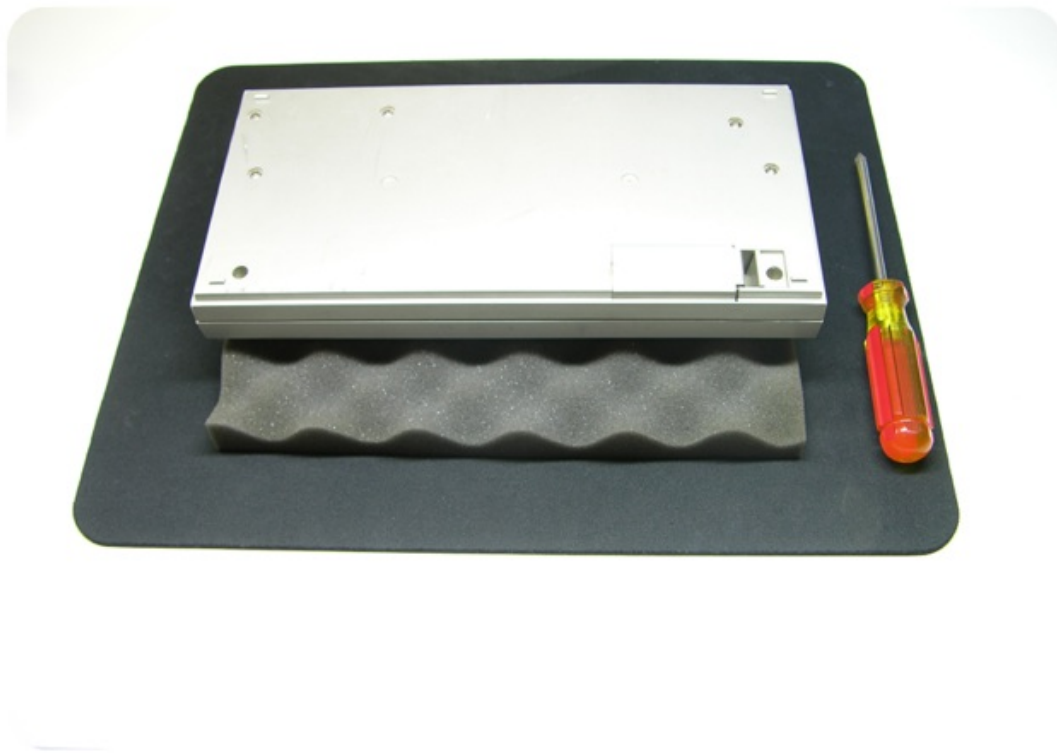
## OPENING THE TB-303 CASE

You should already know how to do this, if you don't, maybe you should stop now!

Anyway, here are a few tips on opening the case.

There are 7 screws holding the bottom of the case.

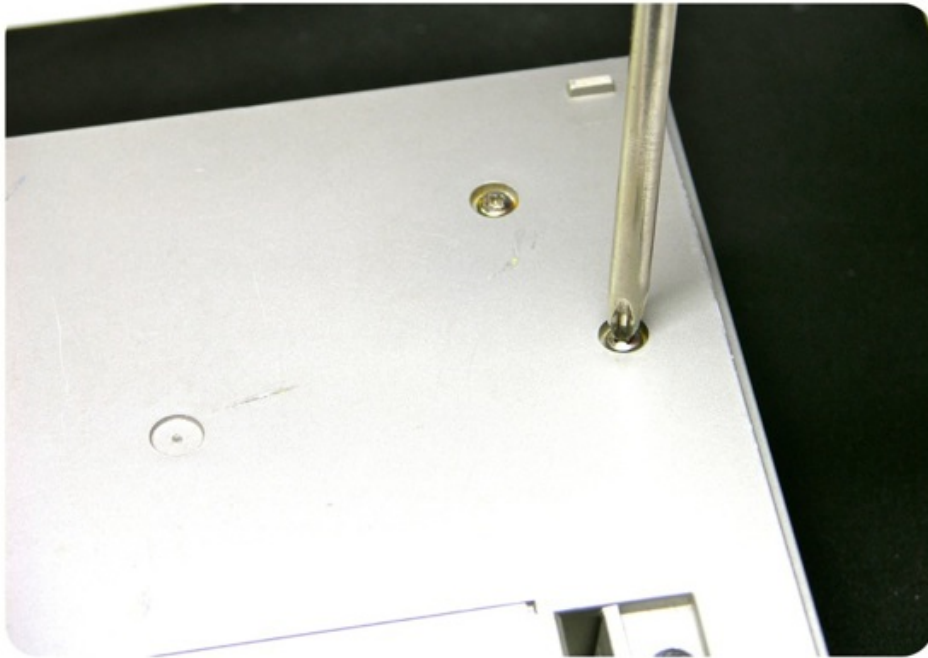
Gently place the TB-303 upside-down onto a soft surface, taking care that there isn't any force pushing on the knobs.



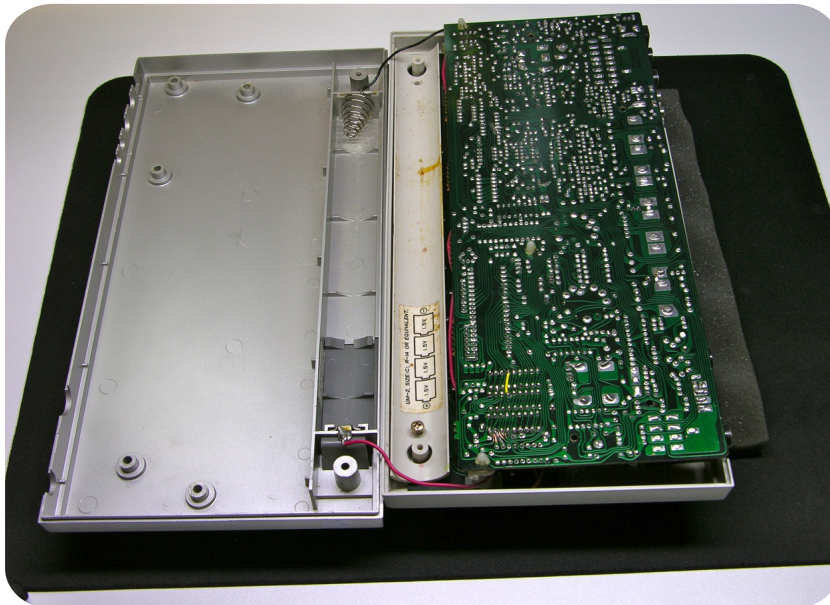


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Loosen the seven case screws (5 long screws, 2 shorter screws).



The case should now open easily by pulling the bottom of the case. Carefully separate the two halves of the case, notice that there are still two wires connected to the battery terminals.



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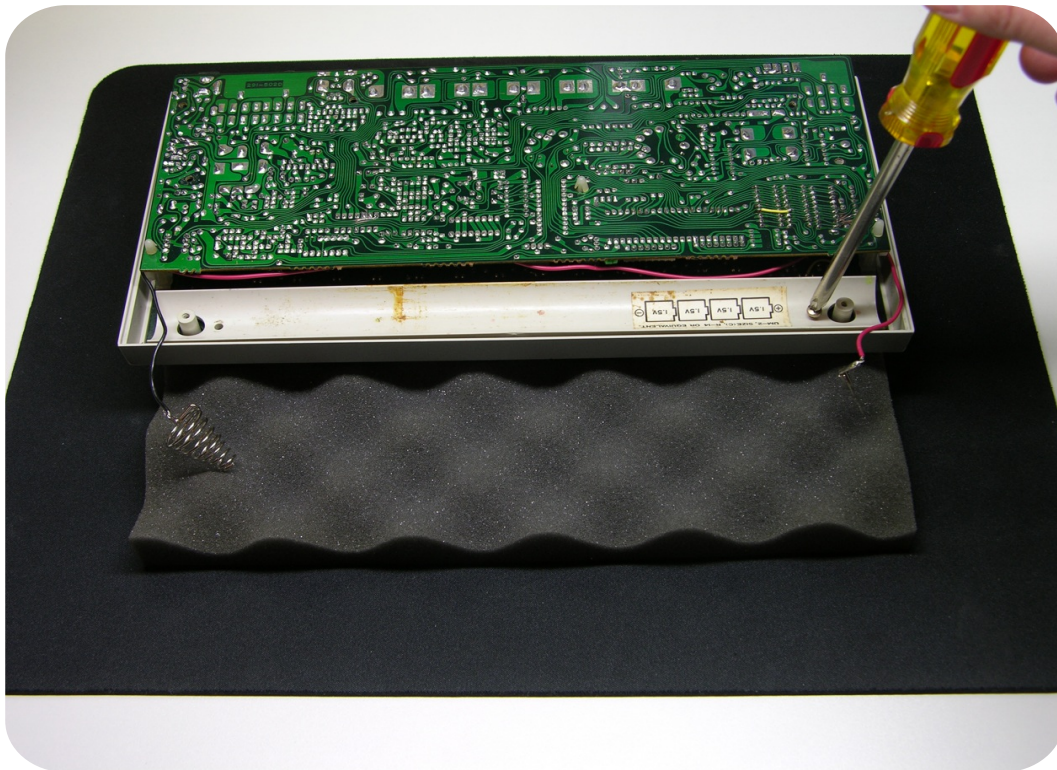
Now carefully flip the case bottom over and then slide the battery terminals up and out of the plastic slots. This allows the battery wires to hang freely and the case bottom can be moved away from main PCB.

This is also a good chance to check the battery wires and re-solder them if needed.

Now the battery gutter will need to be removed before the PCB can be removed from the top cover.

Be careful that the top case is sitting evenly on something, if the knobs are being pressed in from the bottom, there is a lot of force placed on the two plastic mounting posts that the battery gutter attaches to.

Usually the battery gutter uses two short screws that are similar to the ones used on the bottom case, but sometimes they are of a different color.

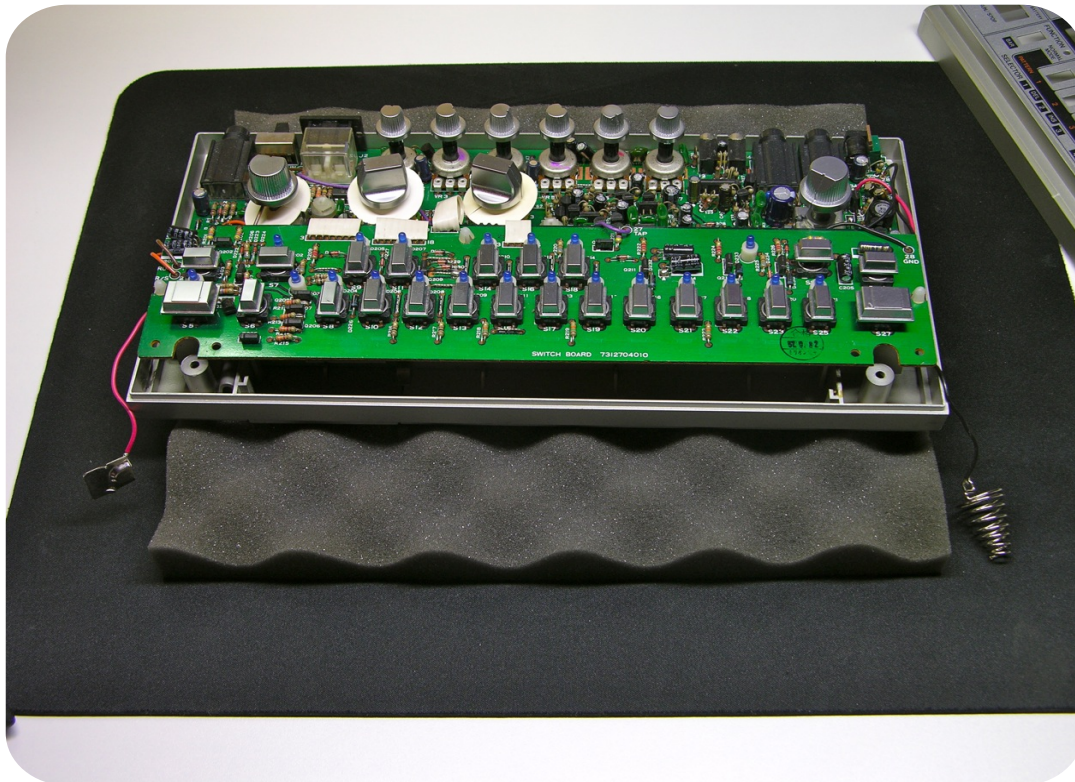


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Once the battery gutter is removed, the entire PCB can be removed from the front cover.

If you have a TB-303 with modifications, there may be wires or jacks attached to the top cover, which need to be dealt with.

You can use the bottom case cover as a tray to place the PCB in also, depending on which side of the PCB you need to access.

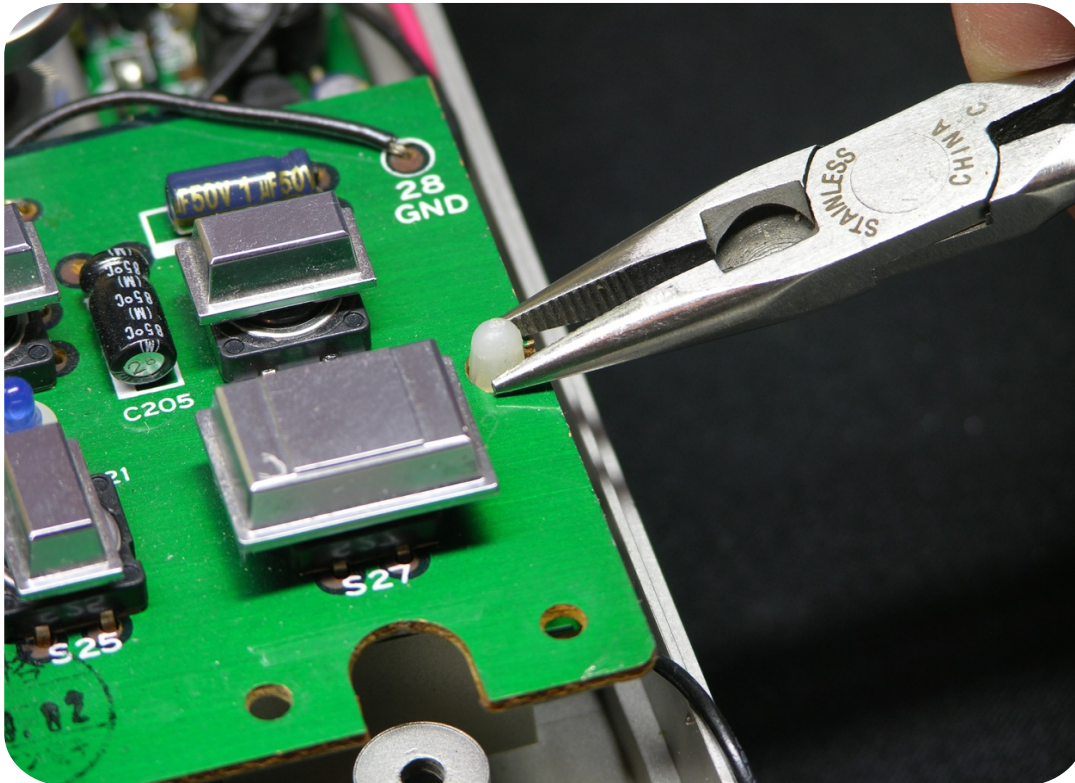




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You will also need to unclip the switchboard PCB from the plastic standoffs to gain access to the CPU.

Carefully pinch the plastic standoff clips with needle nose pliers to remove the PCB. There are three plastic standoffs to unclip.



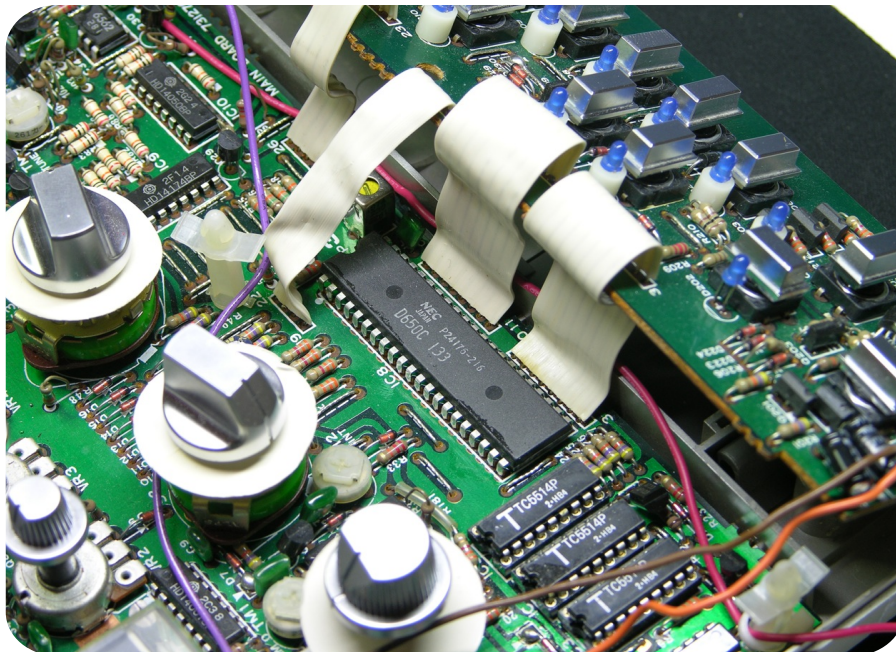
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## DESOLDERING THE CPU

We **STRONGLY** recommend removing the CPU using a proper desoldering station, this will allow the CPU to be removed intact and reinstalled in the future if needed or desired.



The Quicksilver 303 CPU will completely replace the old CPU.

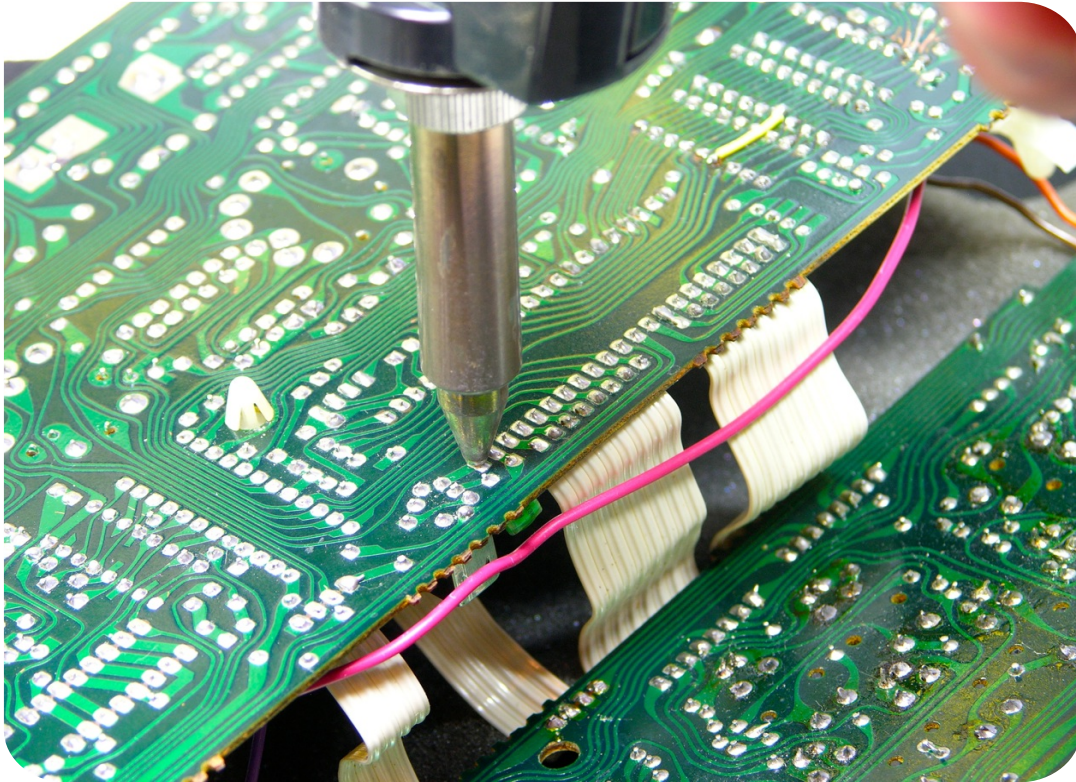




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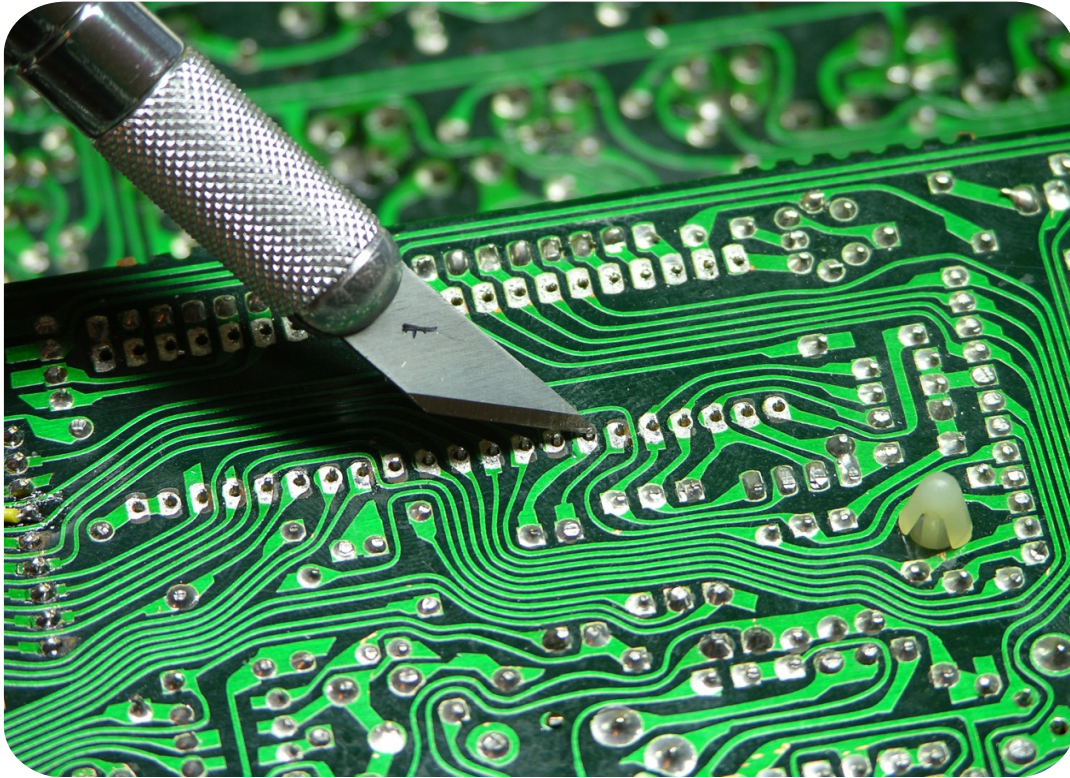
Try to minimize the time the desoldering iron is placed on the CPU pins.

Usually we maintain contact with the pad and wiggle at the same time until the solder is liquid, then vacuum the solder within a couple seconds.



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After desoldering all 42 pins of the CPU, we recommend going around the desoldered pins with a small poking device or knife to verify each pin is now free of solder. The pin should wiggle easily in the PCB pad.



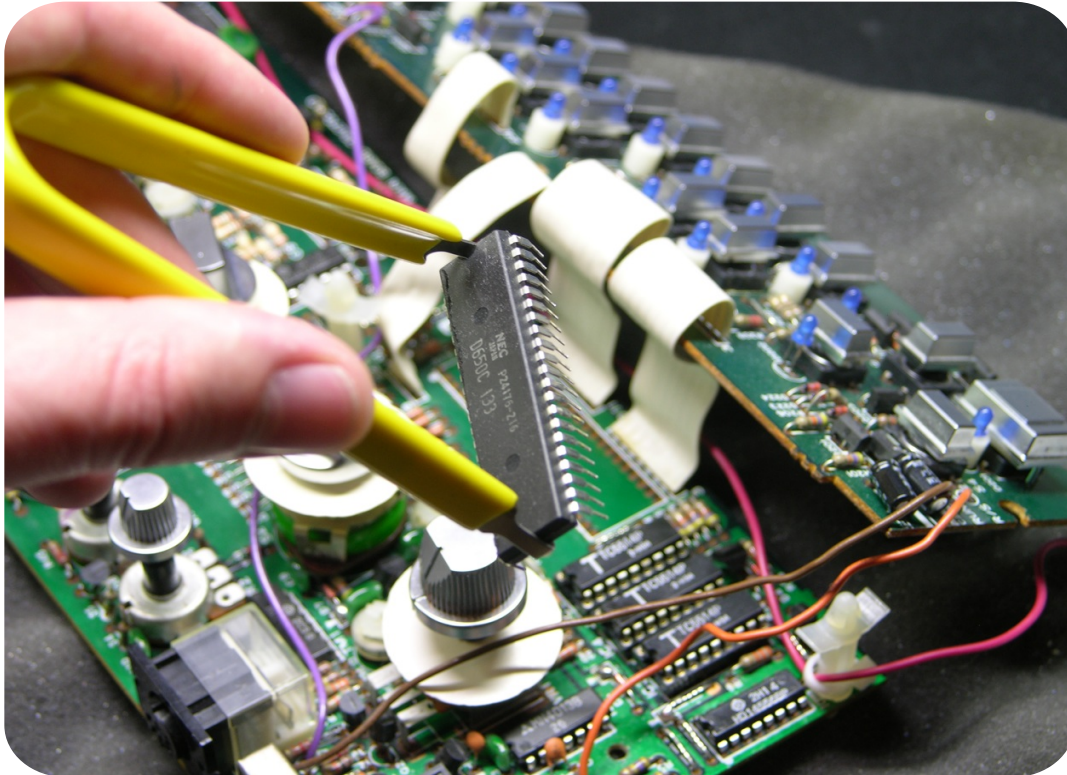


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Now that all pins of the CPU are free, carefully pull out the CPU using an IC extractor. Be careful not to bend any of the pins!

If the CPU does not seem to move easily, check all of the pins again to make sure they are free from the PCB.

The Quicksilver 303 box is a good place to store your original TB-303 CPU in case it is needed in the future.



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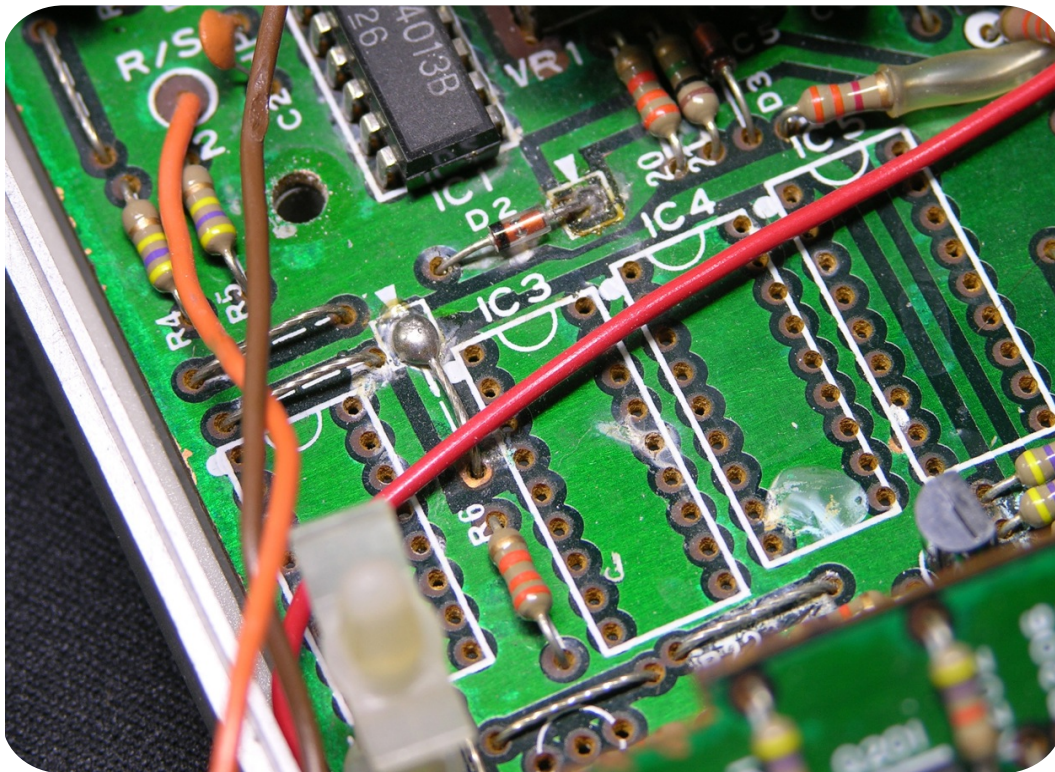
## REMOVING MEMORY CIRCUITS

Because the Quicksilver 303 CPU uses onboard EEPROM for memory storage, the old memory chips are no longer needed. We have removed IC2, IC3, IC4 and IC5 which sometimes become corroded.

Removing the memory chips also gives an easy location to install the wire for filter frequency control.

Use the same desoldering techniques as described for removing the CPU.

Any patterns or tracks stored in the old 303 memory chips will be lost, remember to backup any patterns or tracks you wish to keep!



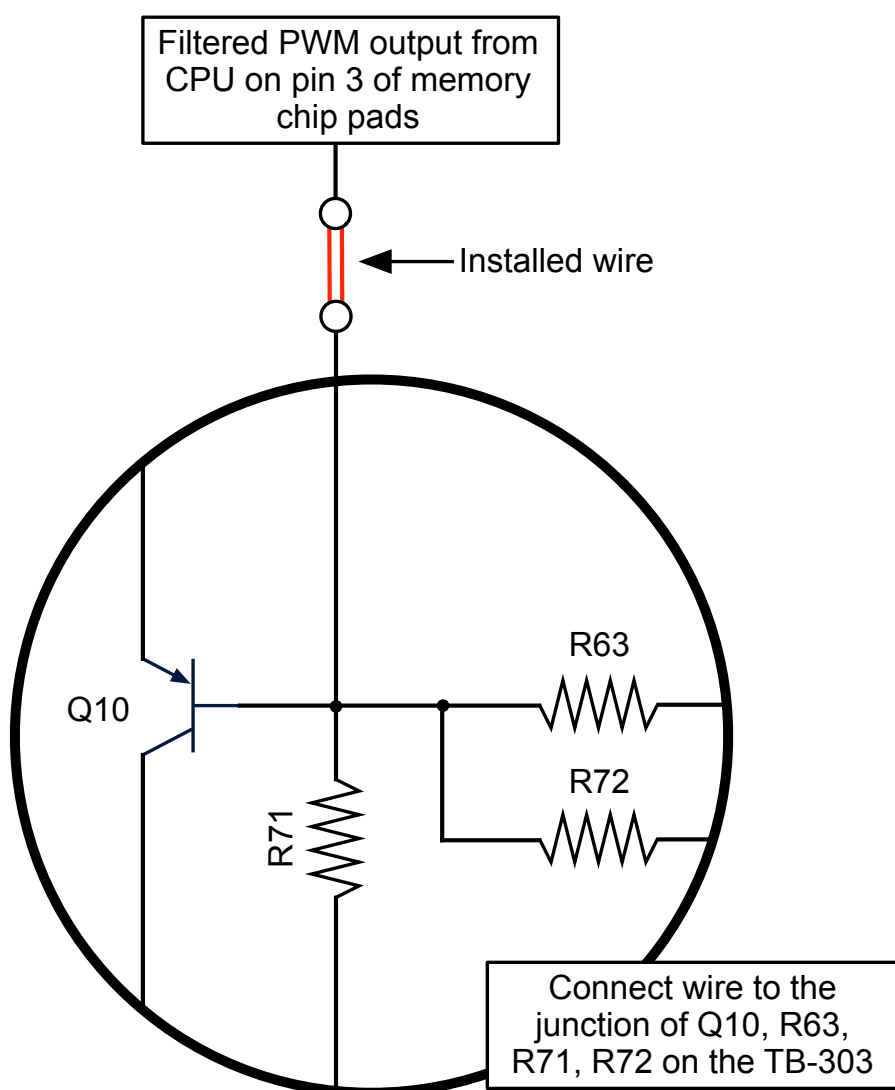
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## OPTIONAL: ADDING FILTER CONTROL

The Quicksilver 303 CPU supports controlling the filter cutoff frequency via MIDI controller messages or from the internal sequencer.

Filter control requires an additional wire to be installed along with the CPU. We recommend installing the wire in the location where the original memory chips were installed, this allows for a clean installation.

The CPU uses a PWM output to generate an analog voltage, which controls the filter cutoff frequency. This PWM output is passed through a simple low pass filter and connected to the base of Q10 in the TB-303 filter circuit.



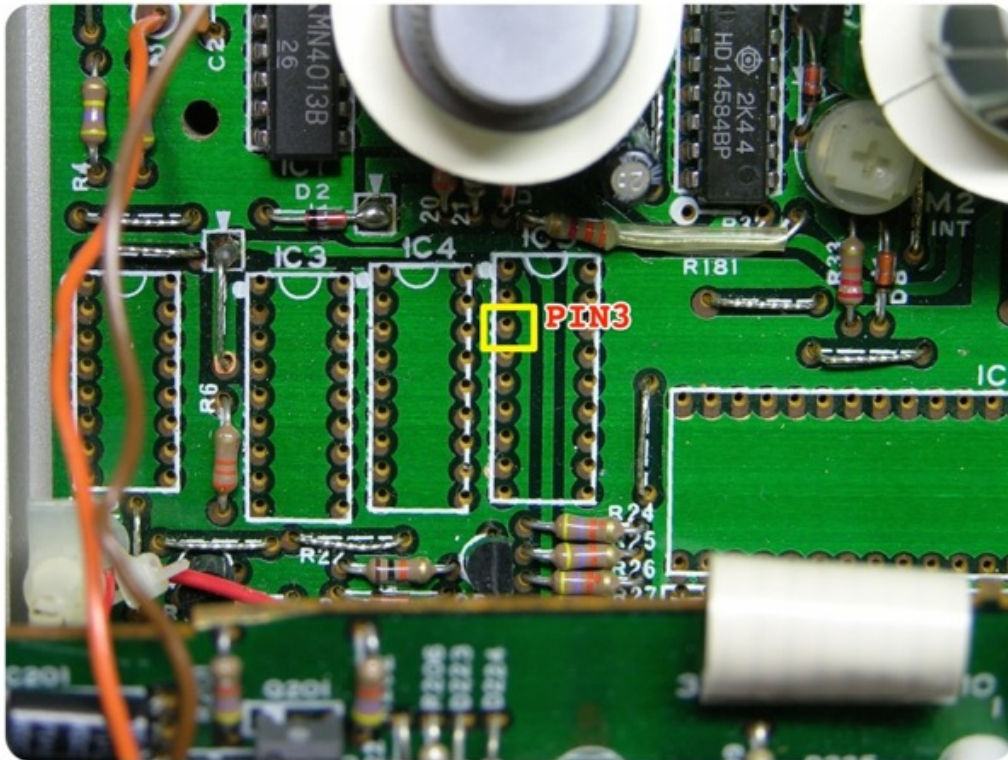


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After removing the memory chips, there is a free pad on the PCB to mount the filter control wire.

The CPU filter control output is available on pin 3 of the memory chip locations (IC3, IC4 or IC5). Run a wire from this pad to Q10.

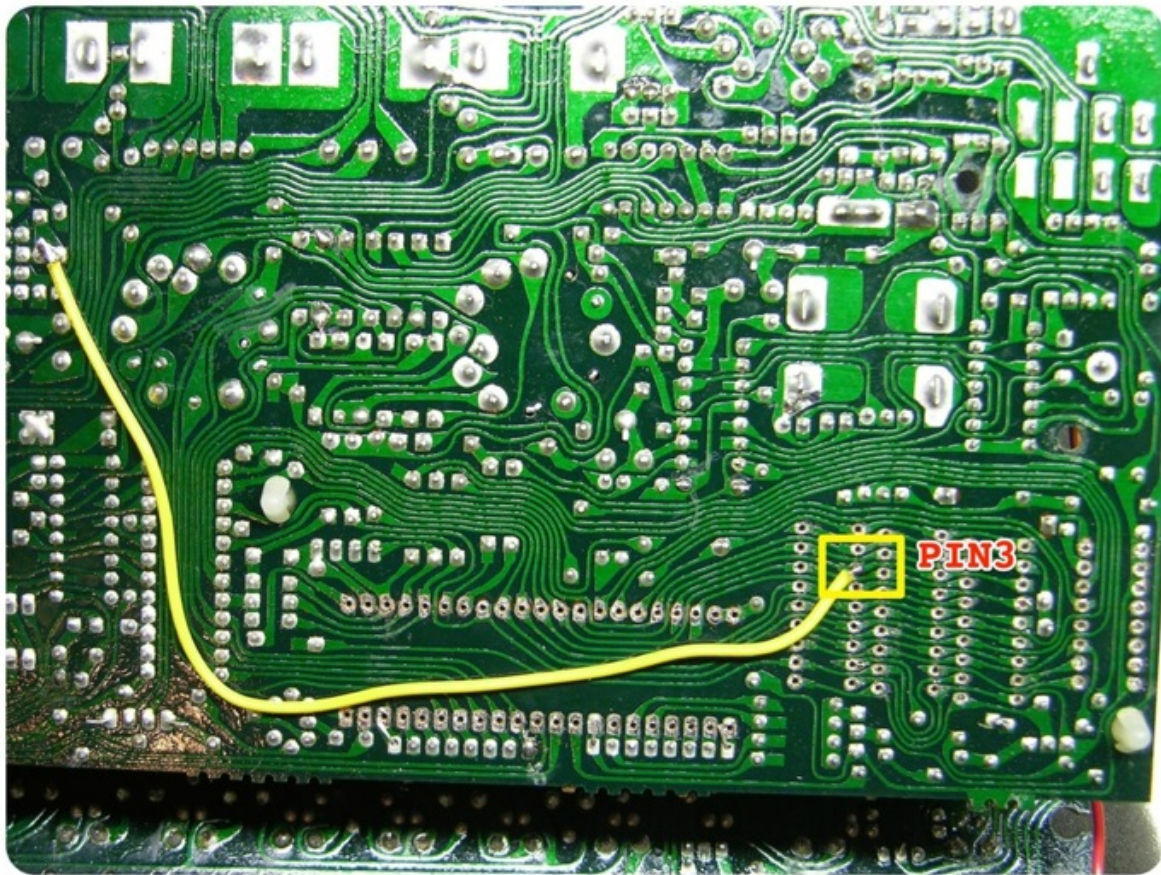
From the component side:





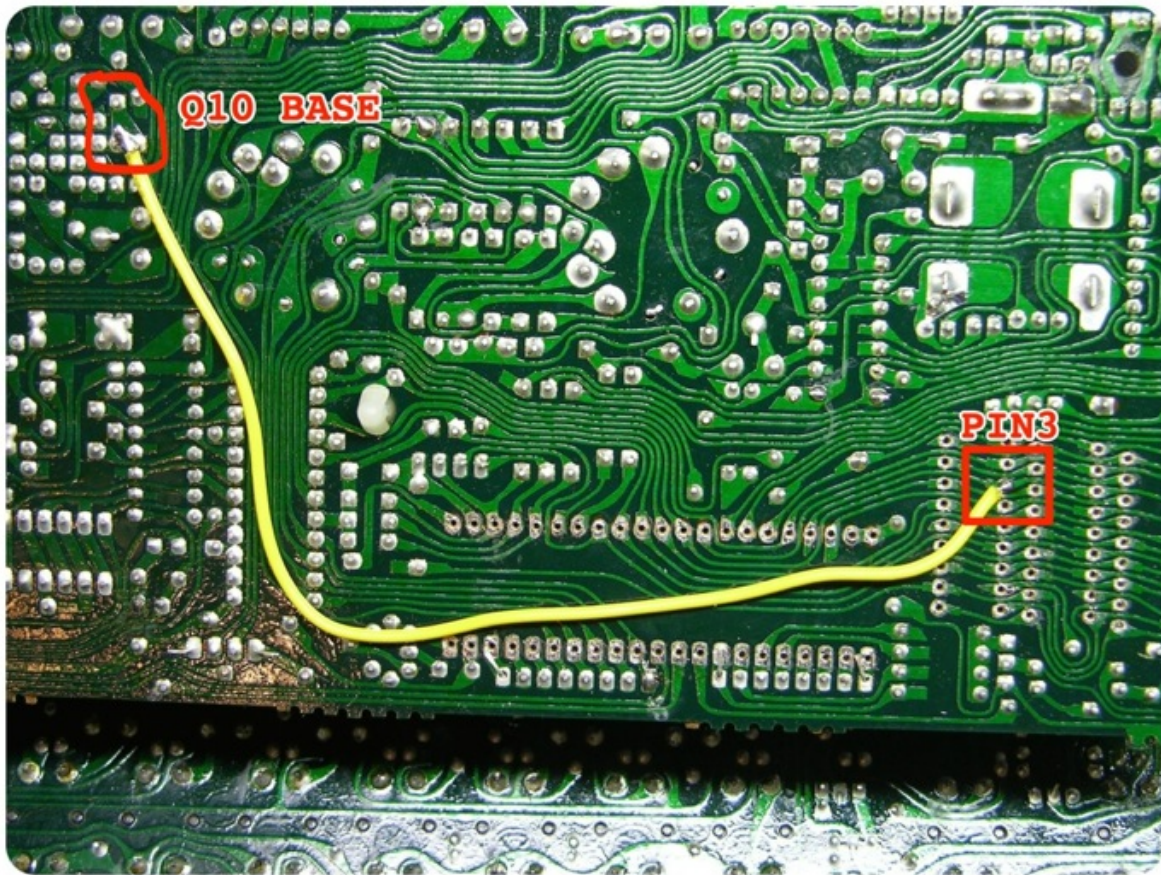
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From the solder side:

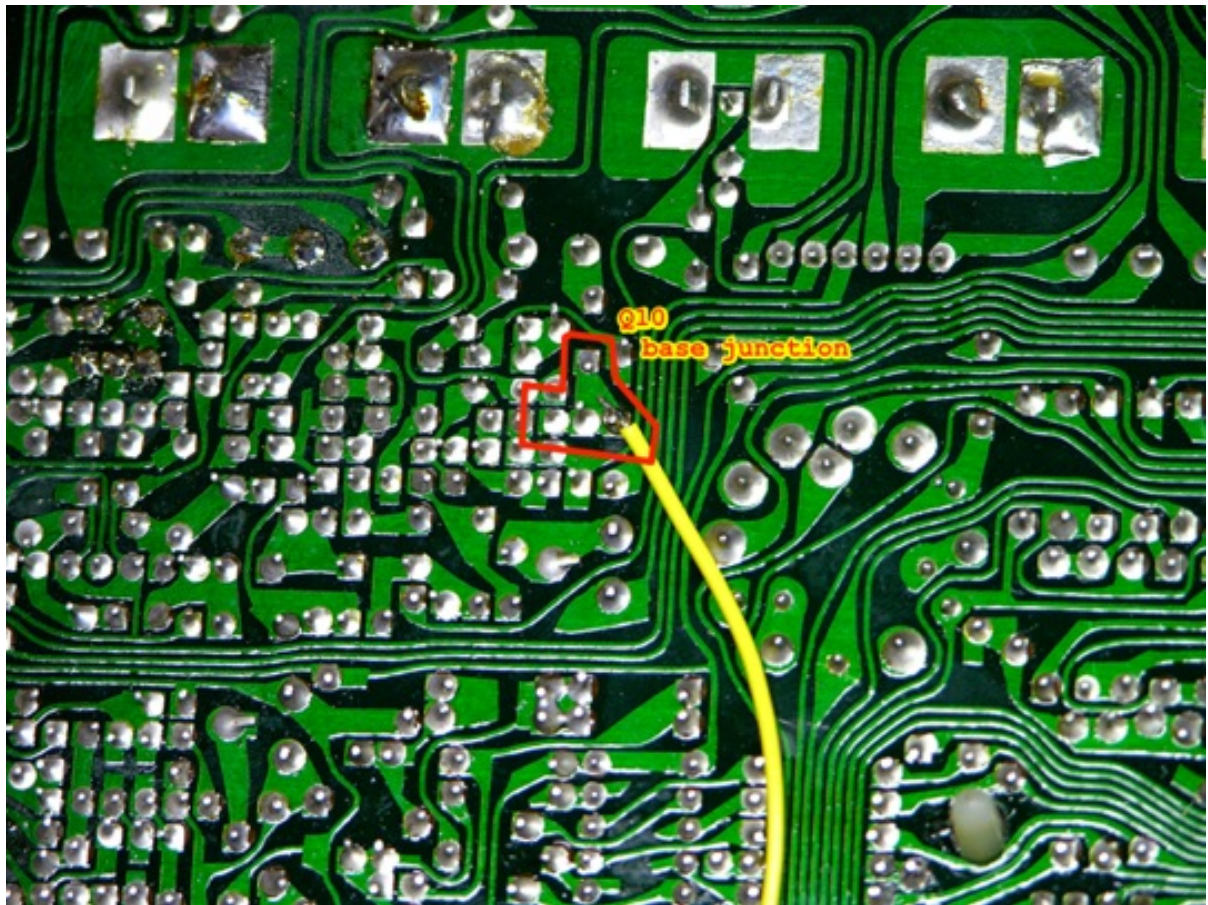


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The filter control wire connected from pin 3 to Q10.







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# INSTALLING THE QUICKSILVER 303 CPU

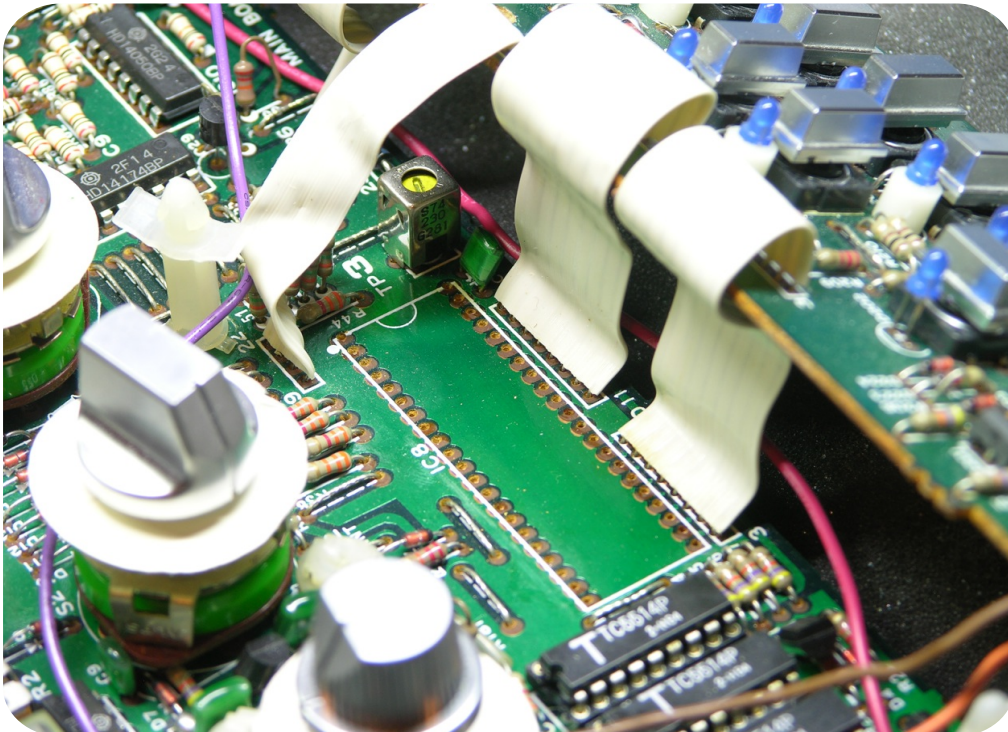
Now that the old CPU has been removed, the new Quicksilver 303 CPU can be soldered into place.

We do not recommend using an IC socket because the Quicksilver 303 CPU has a USB jack that could interfere with the switchboard if it sits too high in the machine (with a socket).

NOTE: We have seen some machines that have replacement switchboards installed that use a socket and header for the switchboard wiring.

This socket does not allow enough room for the Quicksilver 303 CPU to be placed on the PCB.

To install the Quicksilver 303 CPU, the switchboard wiring may need to be replaced with the original ribbon cable connectors or the socket/header removed and the wiring soldered directly to the PCB.

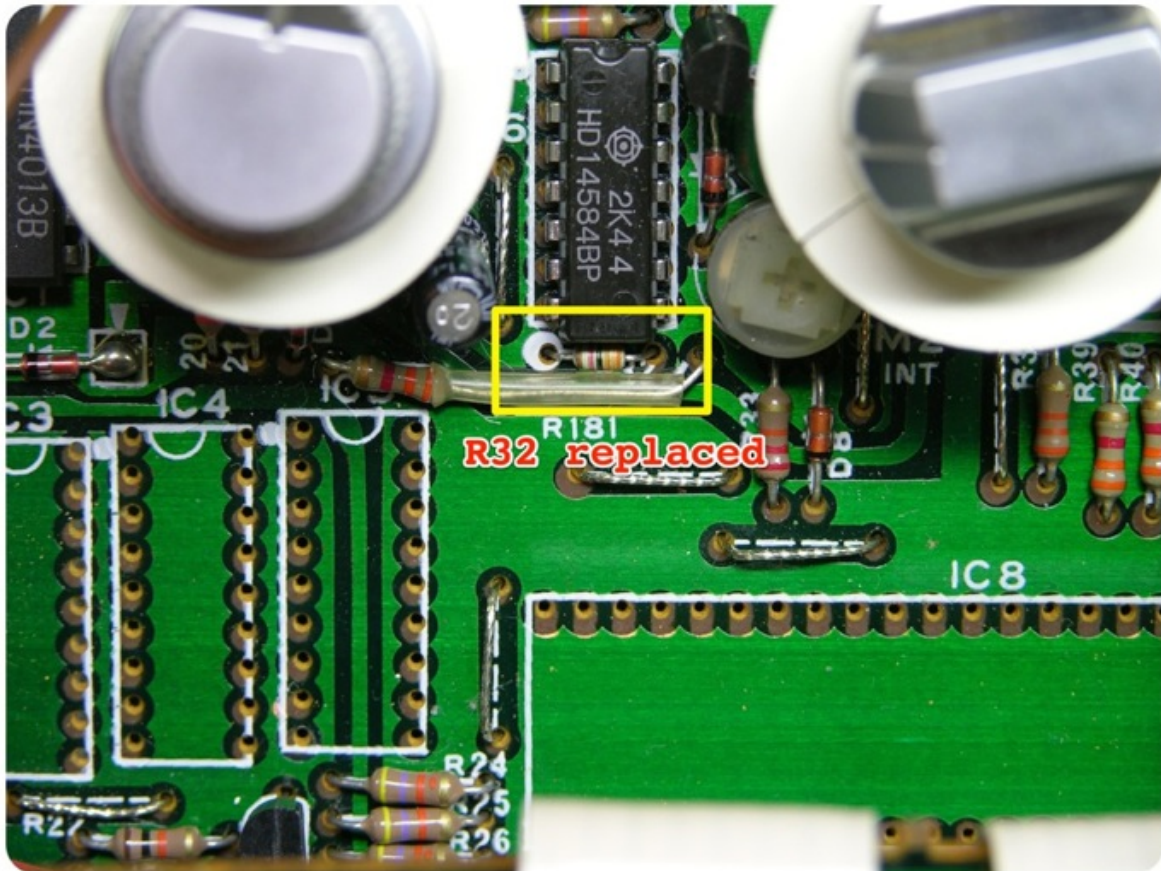




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Before inserting the Quicksilver 303 CPU, the resistor R32 may need to be replaced to allow clearance for the CPU board.

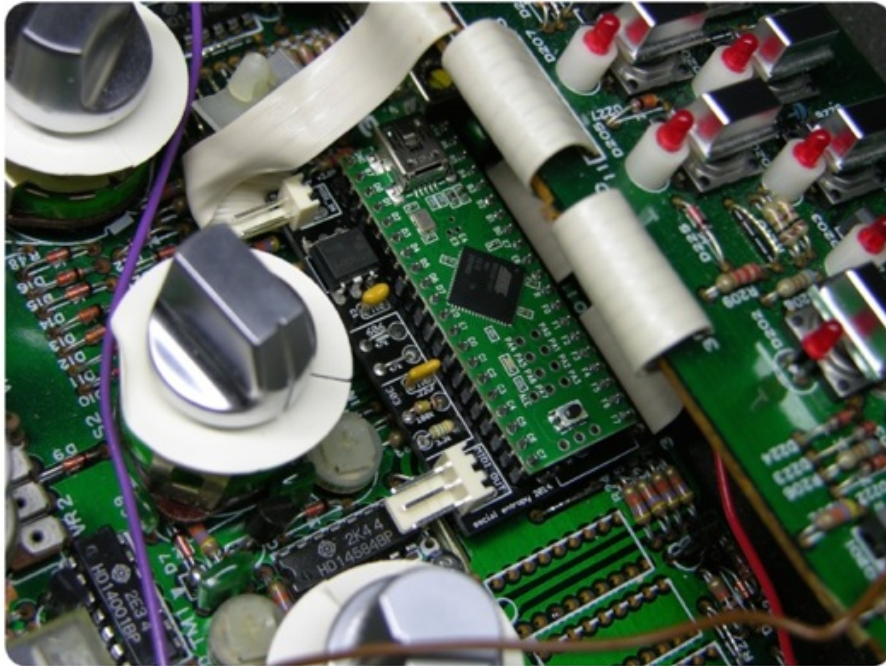
The kit includes a replacement 33k ohm resistor, it is smaller and will fit on the PCB with plenty of extra room.



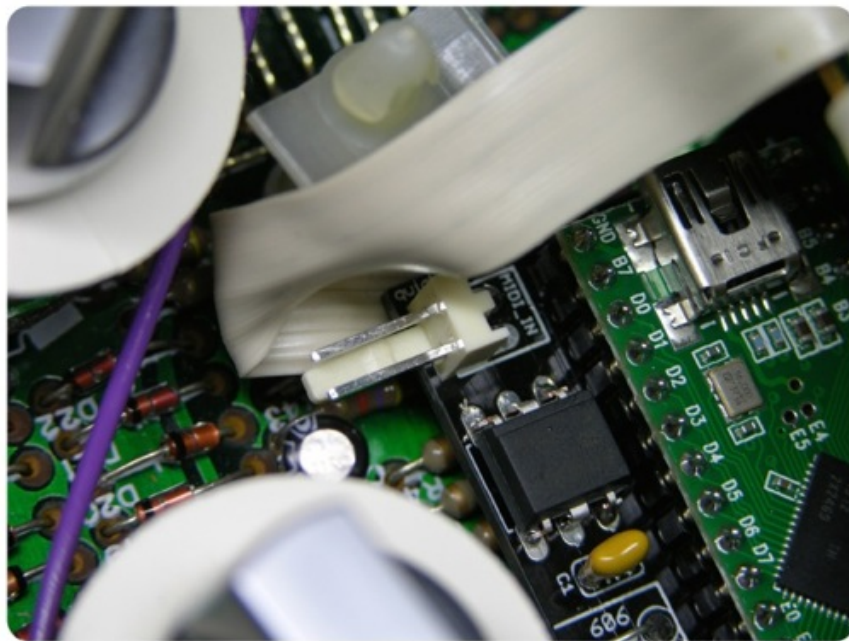
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The Quicksilver 303 CPU should be carefully placed in the location of the old CPU. The right angle headers should point toward the rear of the machine.

Please see the photo for proper orientation.



The four wire switchboard ribbon cable may need to be folded or bent to one side to clear the edge of the new CPU.



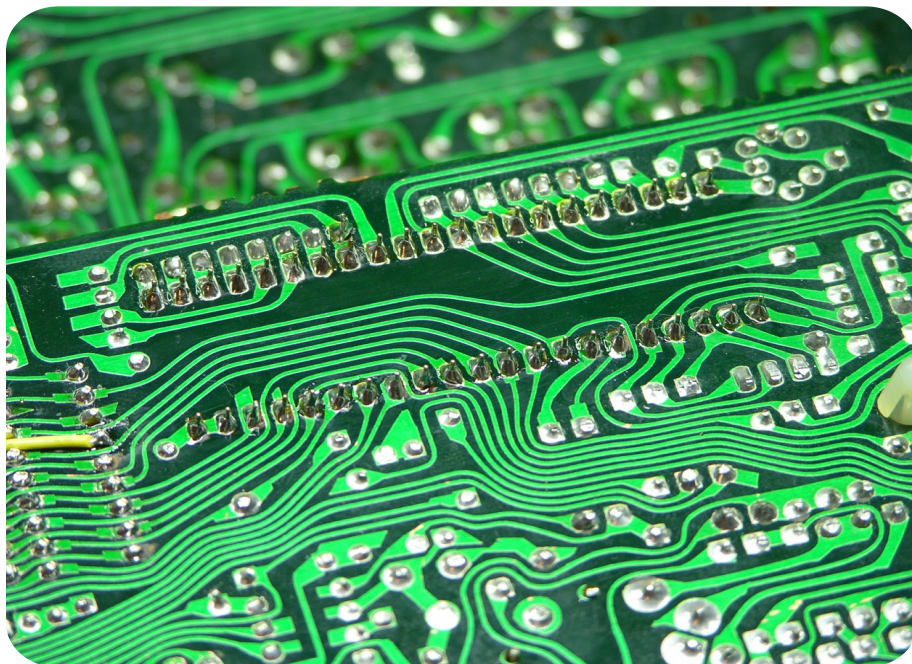
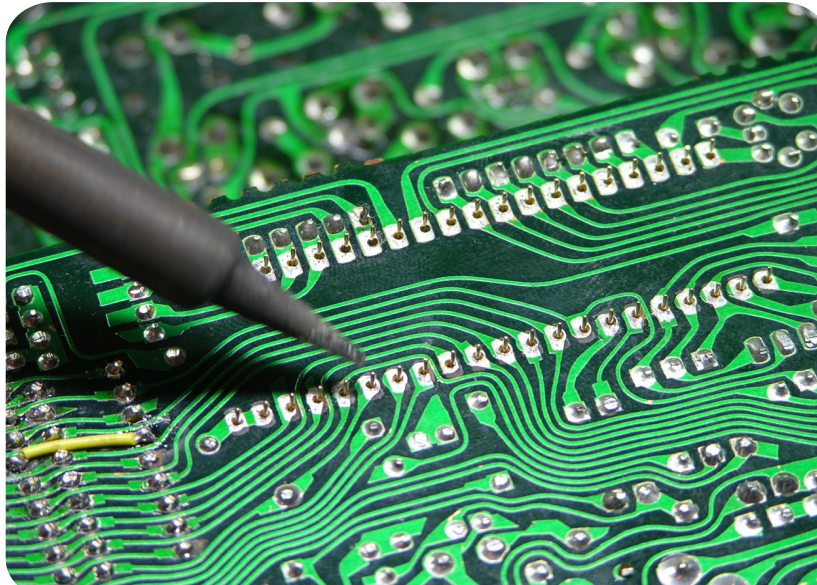


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After verifying that the Quicksilver 303 CPU is properly placed on the PCB, carefully flip the PCB over and solder the CPU into place.

We usually tack one pin on the corner with solder and then check to make sure that the CPU is seated properly on the board before soldering the remaining pins.

Remember to remove any remaining flux after completion.



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If you have not chosen the MIDI or USB options, then you can now jump to the instructions for case reassembly.

## OPTIONAL: MIDI JACK INSTALLATION

If you have chosen to include MIDI input or output, then you will need to mount sockets to the case.

Optionally, the DIN Sync jack can be repurposed as a MIDI input if it is no longer needed. This method does not require any holes to be drilled in the 303 case.

If you choose to use the DIN Sync jack instead of drilling holes in the case, then you can replace DIN sync with a MIDI input, but you will no longer be able to sync to external DIN sync devices. Various other methods of connecting MIDI input or output can be devised and explored by the installer. Please see the MIDI wiring diagram towards the end of this document for details on MIDI input output pins from the CPU.

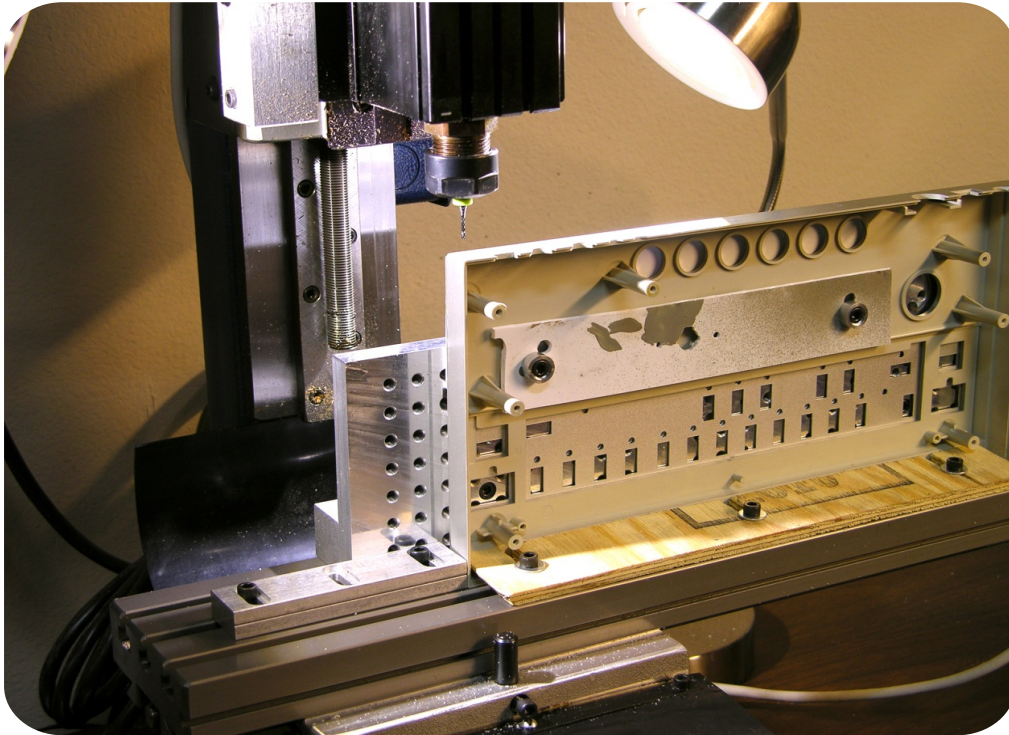
We recommend mounting the mini DIN panel sockets on the back of the machine between the TUNE / CUT OFF FREQ knobs and between the DECAY / ACCENT knobs. See photo for an example of mounting the sockets.

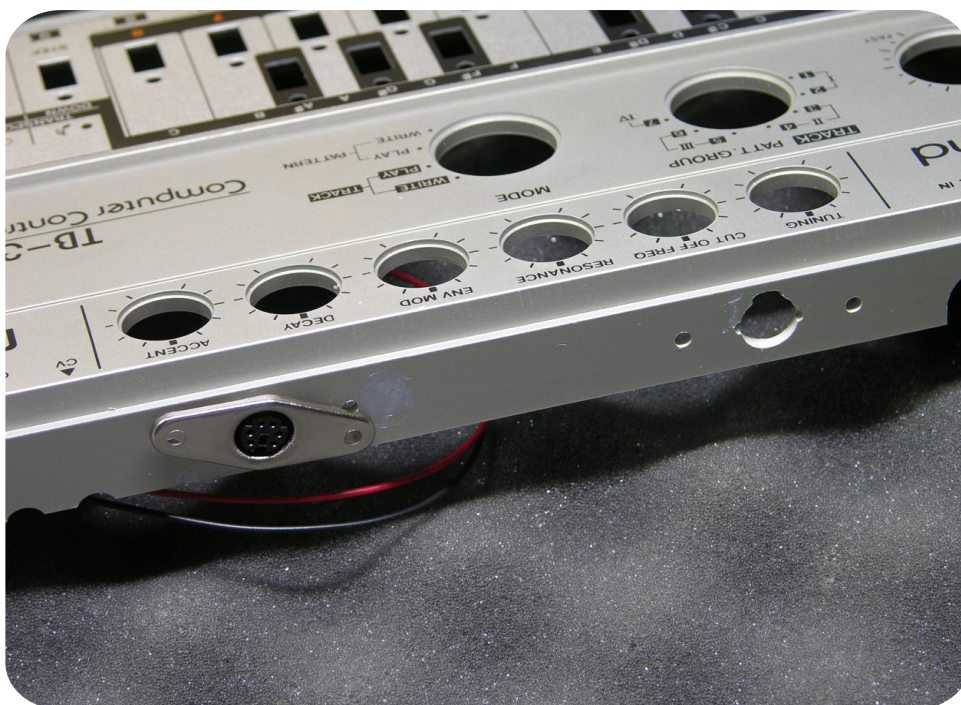




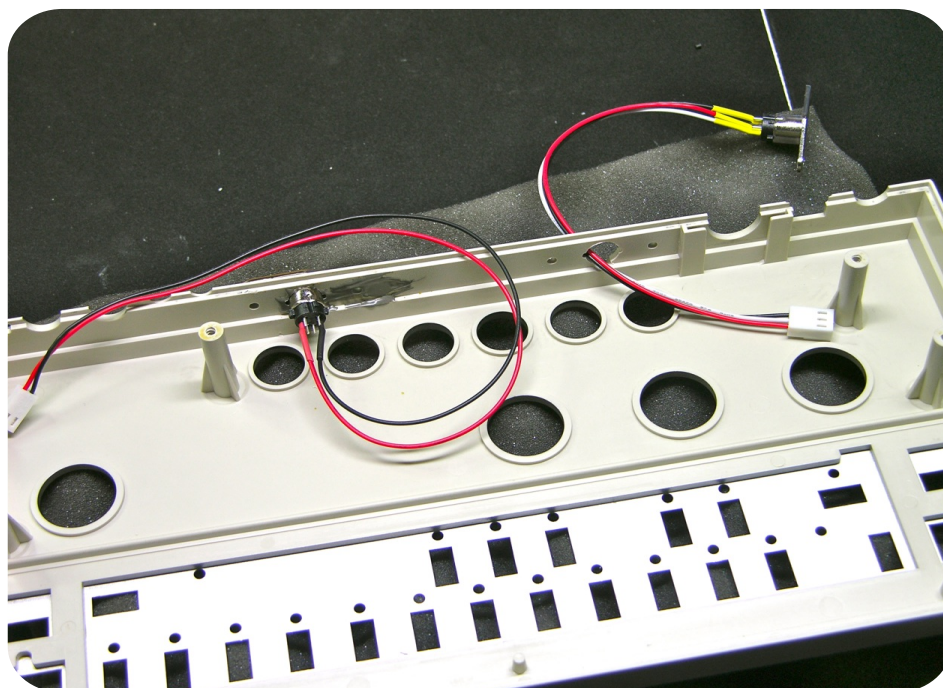
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To cut holes in the back of the case, we use a "computer controlled" milling machine, which gives a precise cut. We have included a template diagram of the hole placement at the end of this document.

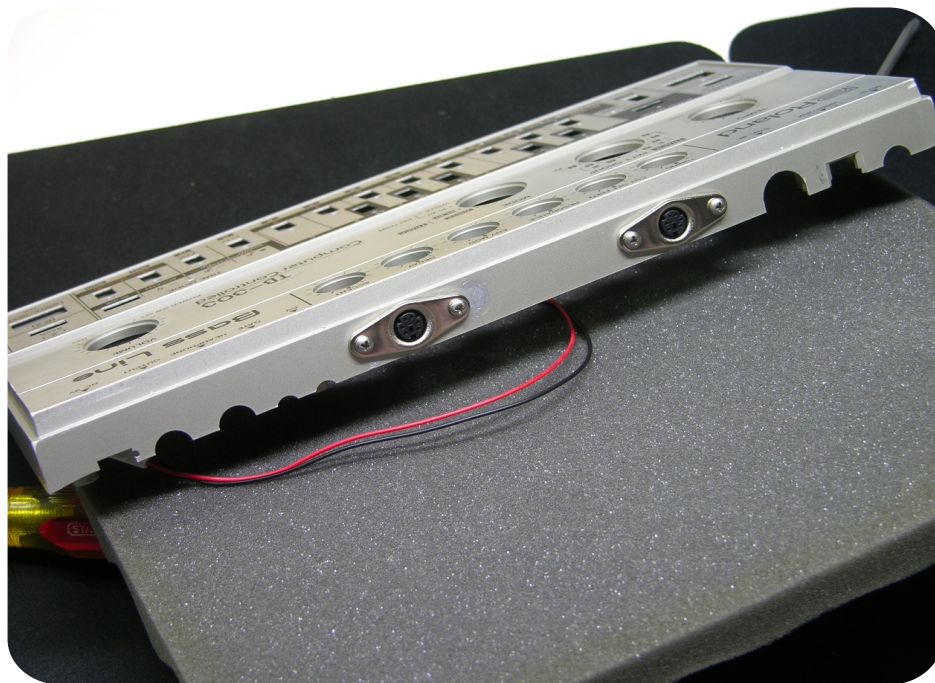




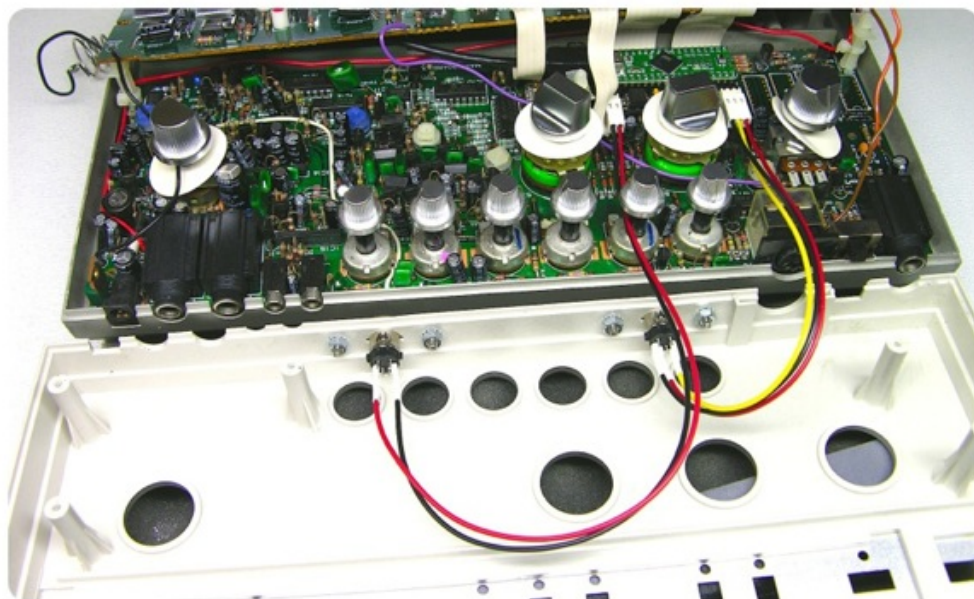
After placing the sockets in the case, secure them using the four included screws and lock nuts.







Plug the two and three wire leads into the corresponding header pins on the Quicksilver 303 CPU before reassembling the case.



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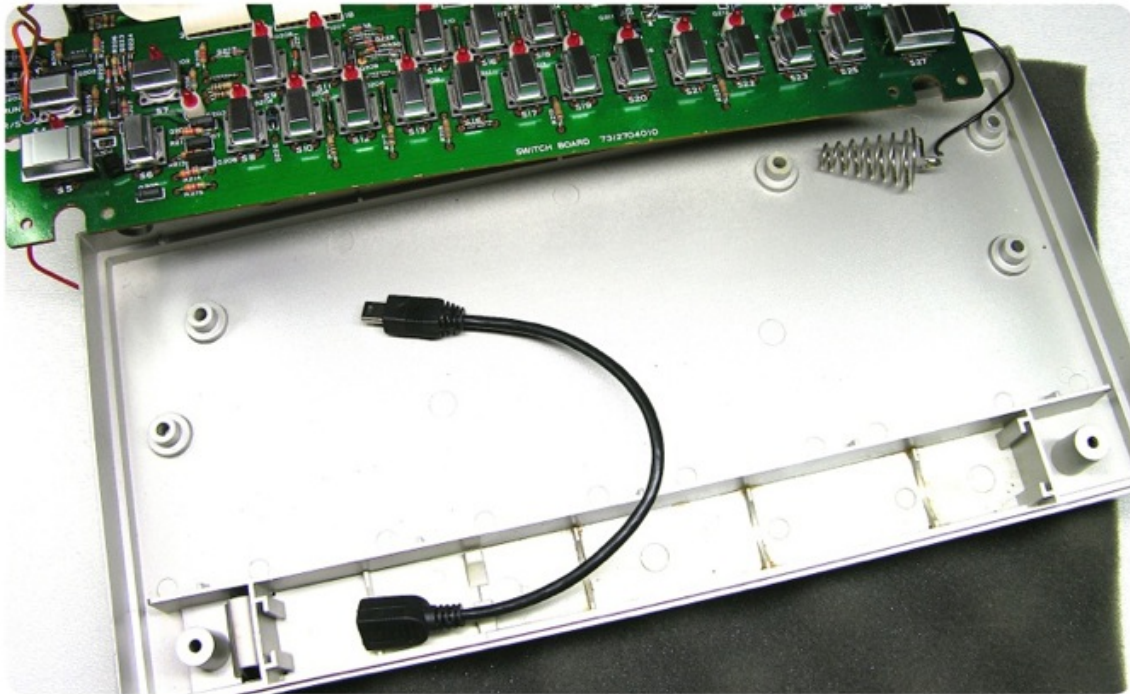
## OPTIONAL: USB JACK INSTALLATION

If you choose to mount the USB dongle, you will need to find a good place to put the USB socket. We recommend placing it inside the battery compartment, that way there isn't a large hole drilled in the case.

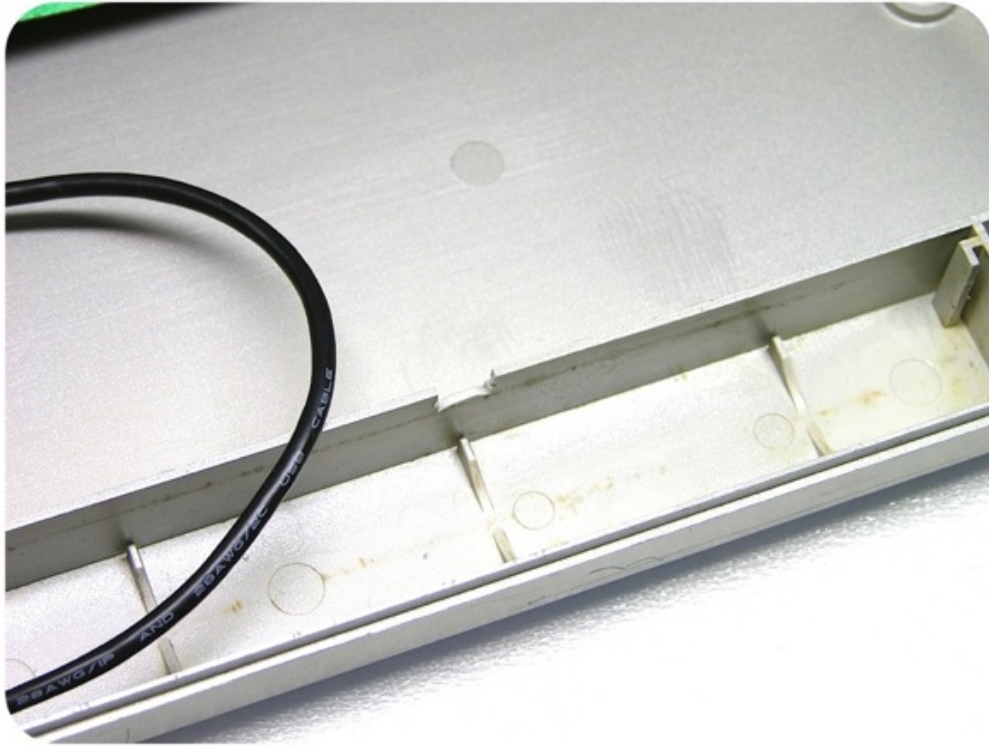
The USB socket is used for USB-MIDI communication and Quicksilver 303 OS updates, which should happen occasionally.

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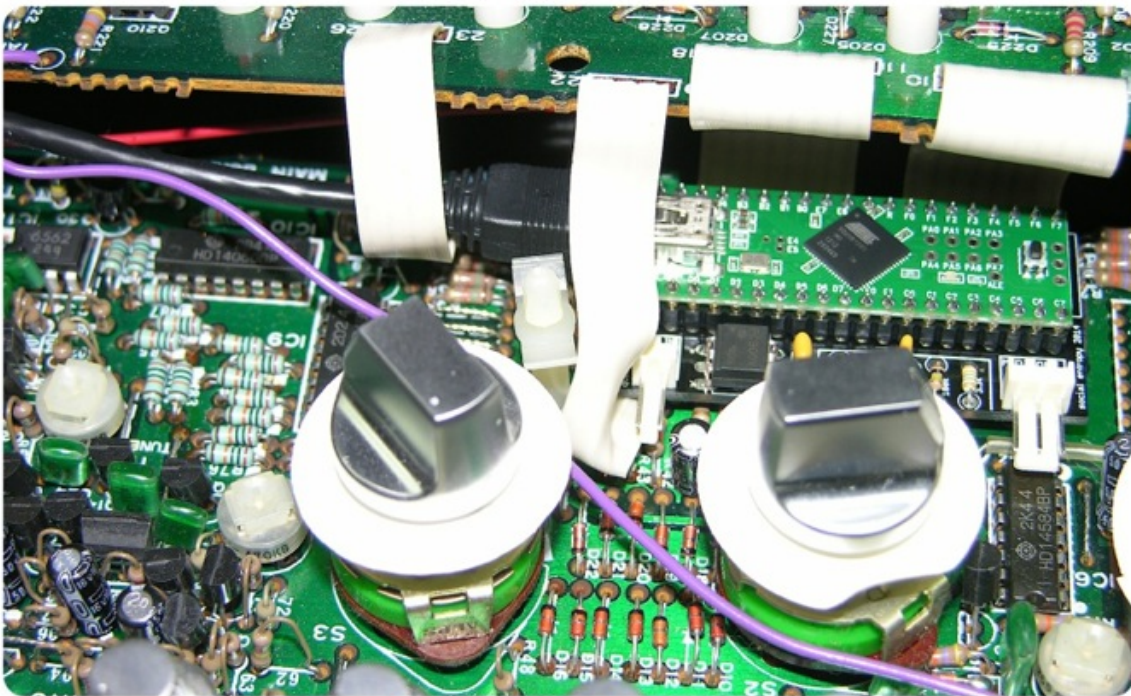
A small opening is needed for the USB wire to enter the battery compartment. We recommend cutting a small notch on the interior wall of the case, rather than in the plastic battery gutter. The gutter plastic is fragile and would lose some structural integrity if cut.







After the creating the opening, plug the USB dongle into the Quicksilver 303 CPU. Be careful to feed the USB cable through the opening before closing the case.

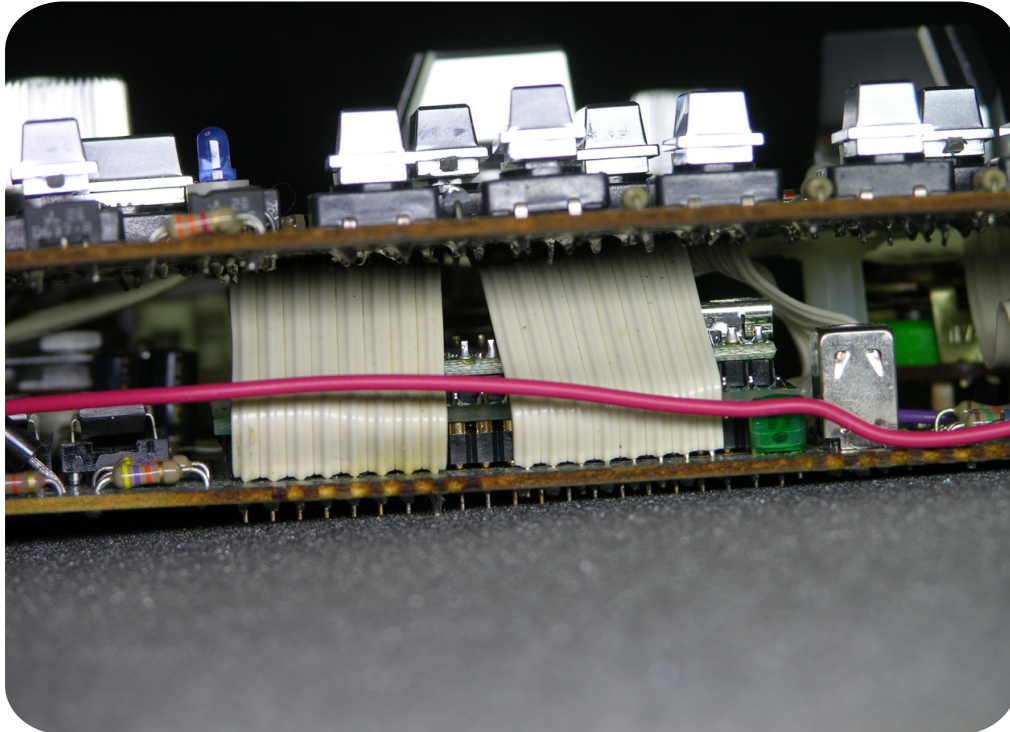


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## REASSEMBLING THE CASE

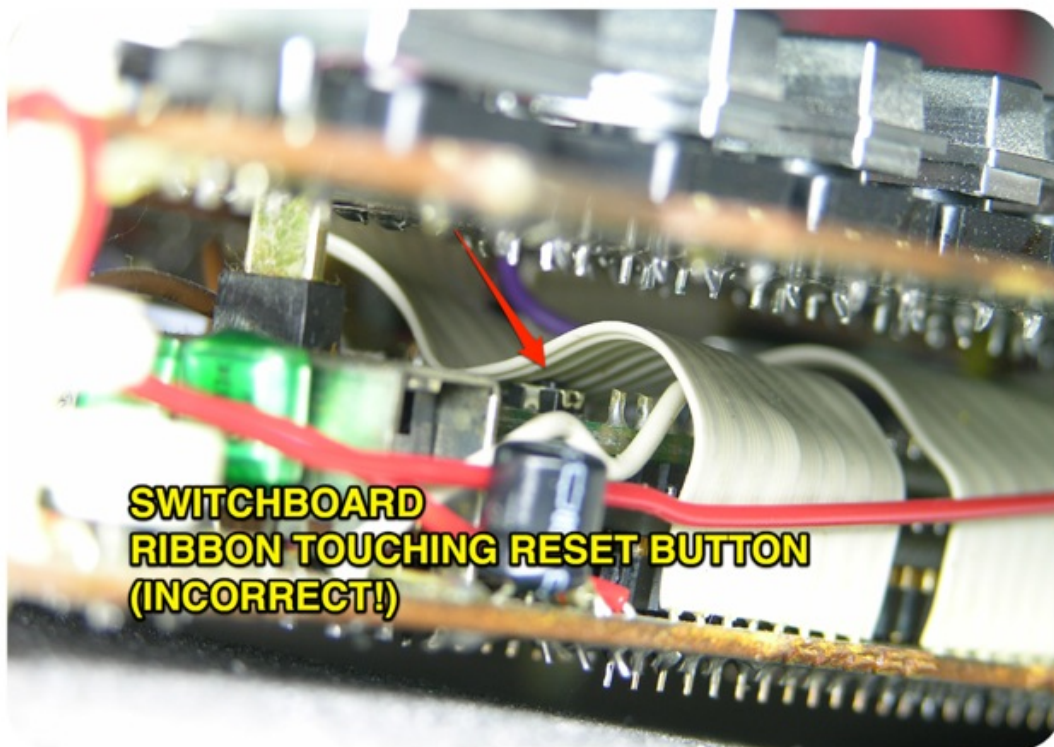
Now that the Quicksilver 303 CPU is installed and all of the additional cables are in place, you will need to carefully route the cables and close the case.

First, replace the switchboard PCB onto the plastic standoffs. Align the switchboard on the three standoffs and push gently on the switchboard PCB until the plastic clips engage on the edge of the holes. Make sure that the switchboard wires are routed neatly over the Quicksilver 303 CPU.



**NOTE:** Check to make sure that the switchboard wiring does not accidentally press down on the small reset switch mounted on the CPU. By default it is likely that the wire touches this switch when the switchboard is placed back on the plastic PCB stands. If the ribbon cable is touching the switch, gently bend the ribbon cable slightly upwards to clear the reset switch. See photos for details.

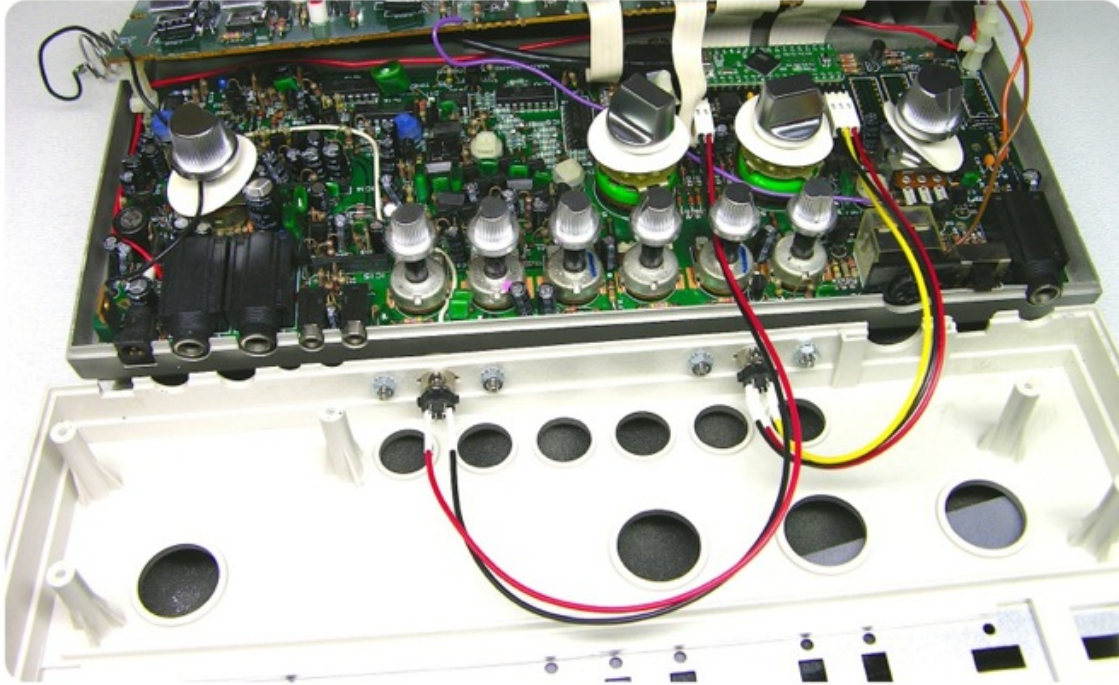






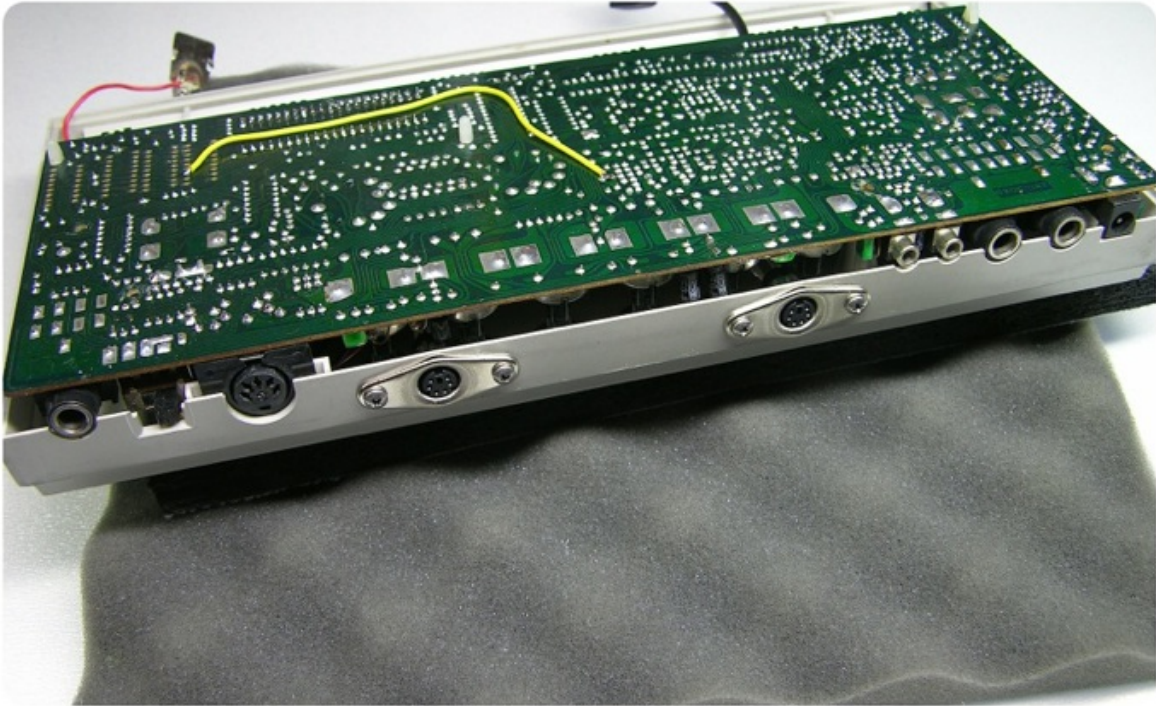
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If installed, the optional MIDI leads will be attached to the top of the case and the CPU. Carefully place the MIDI leads so they do not interfere with any of the knobs and do not get pinched between any of the case mounting posts.



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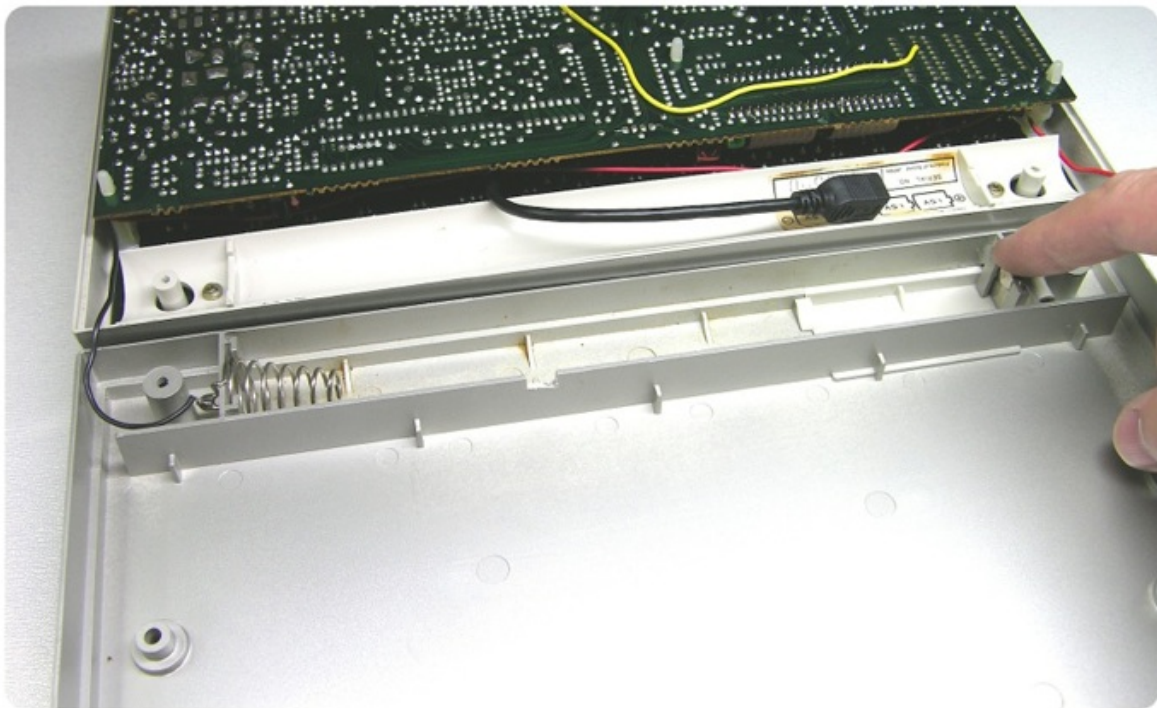
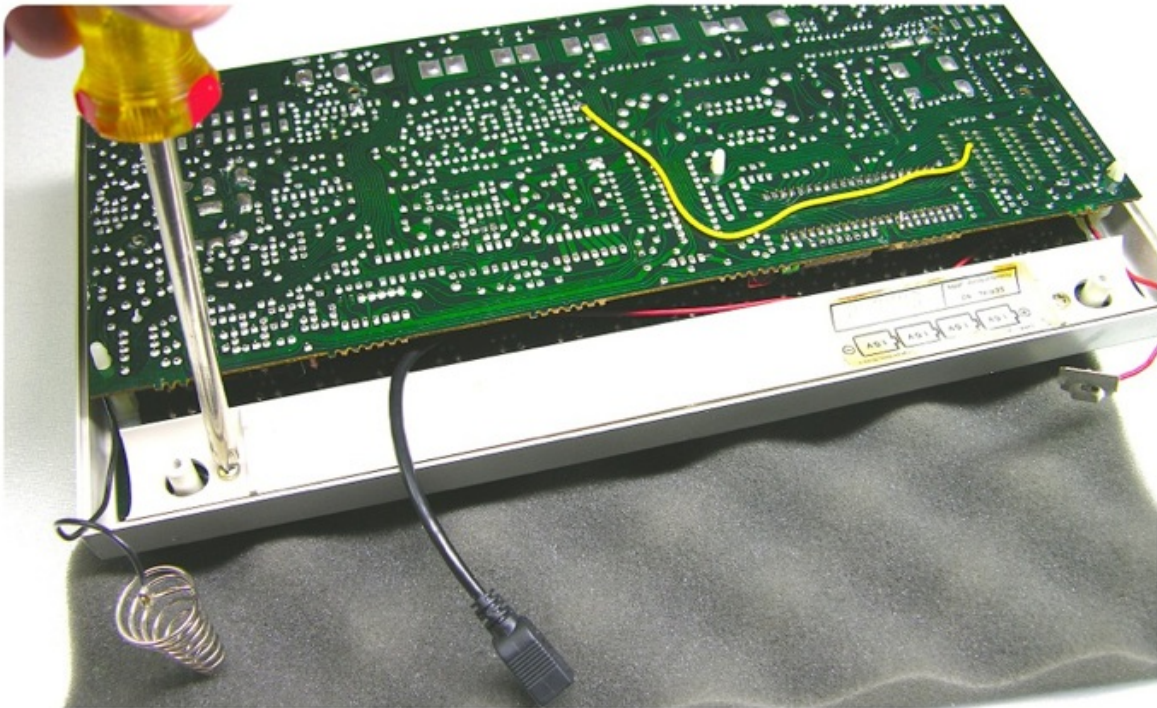
Now place the case top together with the PCB and verify that the MIDI leads are neatly inside the case. If you are having trouble getting the case and PCB together, it sometimes helps to remove the small knobs from the potentiometers so that the MIDI sockets can easily fit between the potentiometer shafts during assembly. They can be put back in place after the case is assembled.





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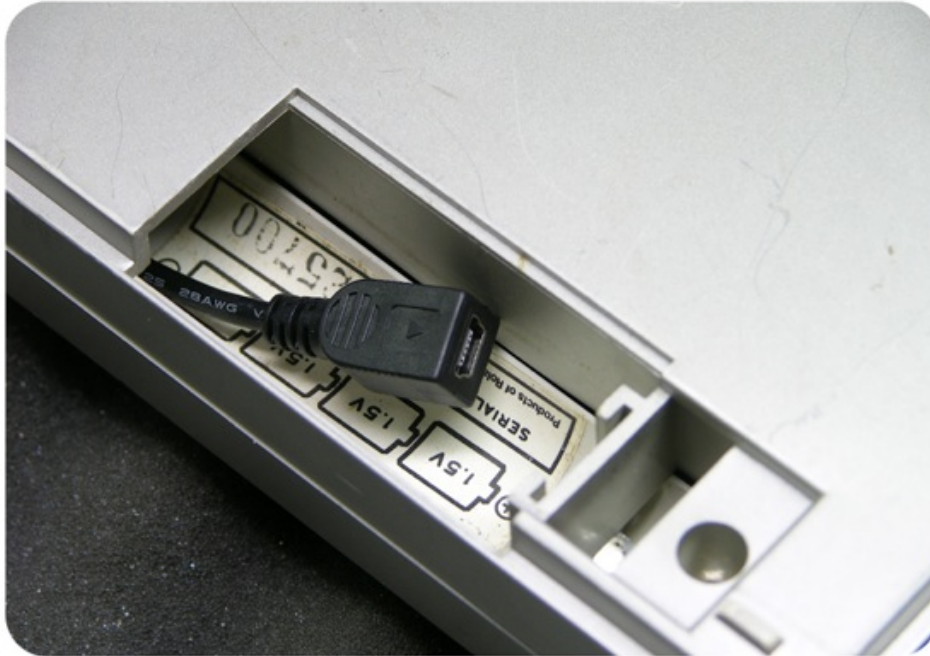
Reattach the battery gutter, which holds the PCB in the top case. If the USB dongle is installed, verify that the dongle is placed correctly in the battery area.





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With the machine facing down, place the case bottom onto the PCB, making sure that the battery wires and USB dongle are located correctly. It is easy to get the battery wires pinched between the case mounting posts, so if the case does not seem to close tightly, check for pinched wires.



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Once the case is together correctly, the screws can be put back in place and tightened.

We do not recommend tightening the screws any more than necessary to hold the case snugly. The plastic screws posts tend to crack with age and over tightening.

Installation is now complete!



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## TESTING THE CPU

To test the Quicksilver 303 CPU for the first time, connect a good regulated 9v power supply and an audio output device. Now, switch on the TB-303 power switch.

The 303 should display a chase LED as the machine boots.

The machine will come with all memory initialized, so all patterns and tracks will contain blank data.

For more in-depth usage instructions, please see the Quicksilver 303 CPU User Guide.

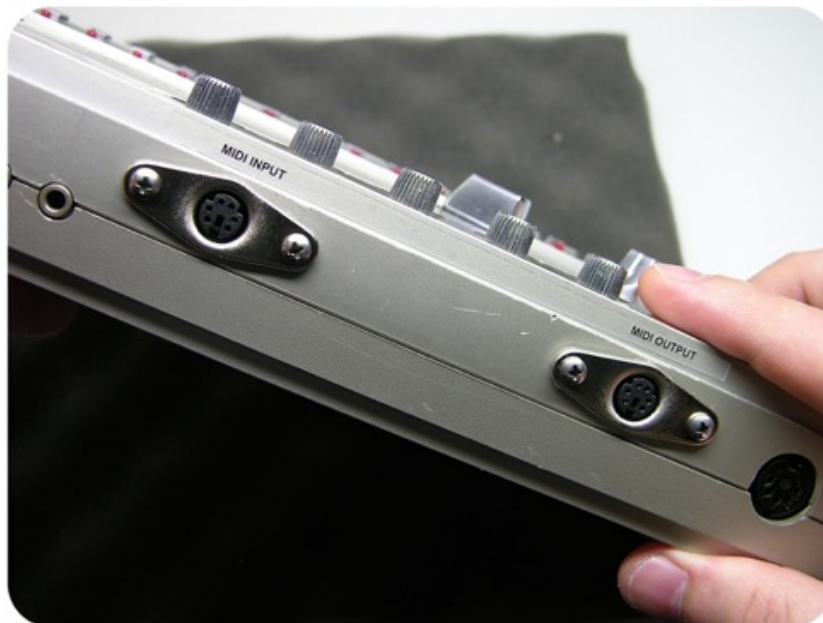
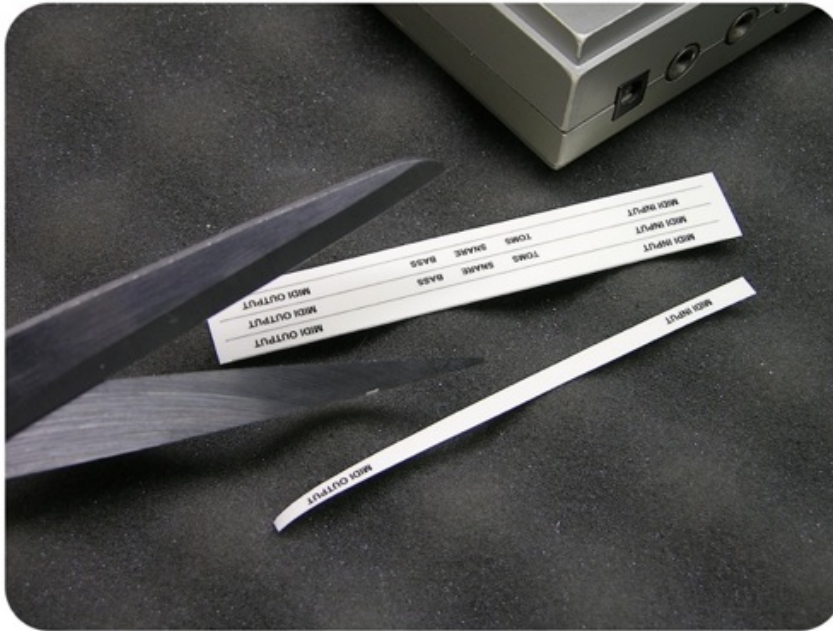


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## MIDI SOCKET LABELS

If you purchased the MIDI dongle option, you should have received a small sticker sheet that has labels for the MIDI INPUT and MIDI OUTPUT sockets.

Use scissors to cut the stickers as desired and place on the case above the MIDI sockets.



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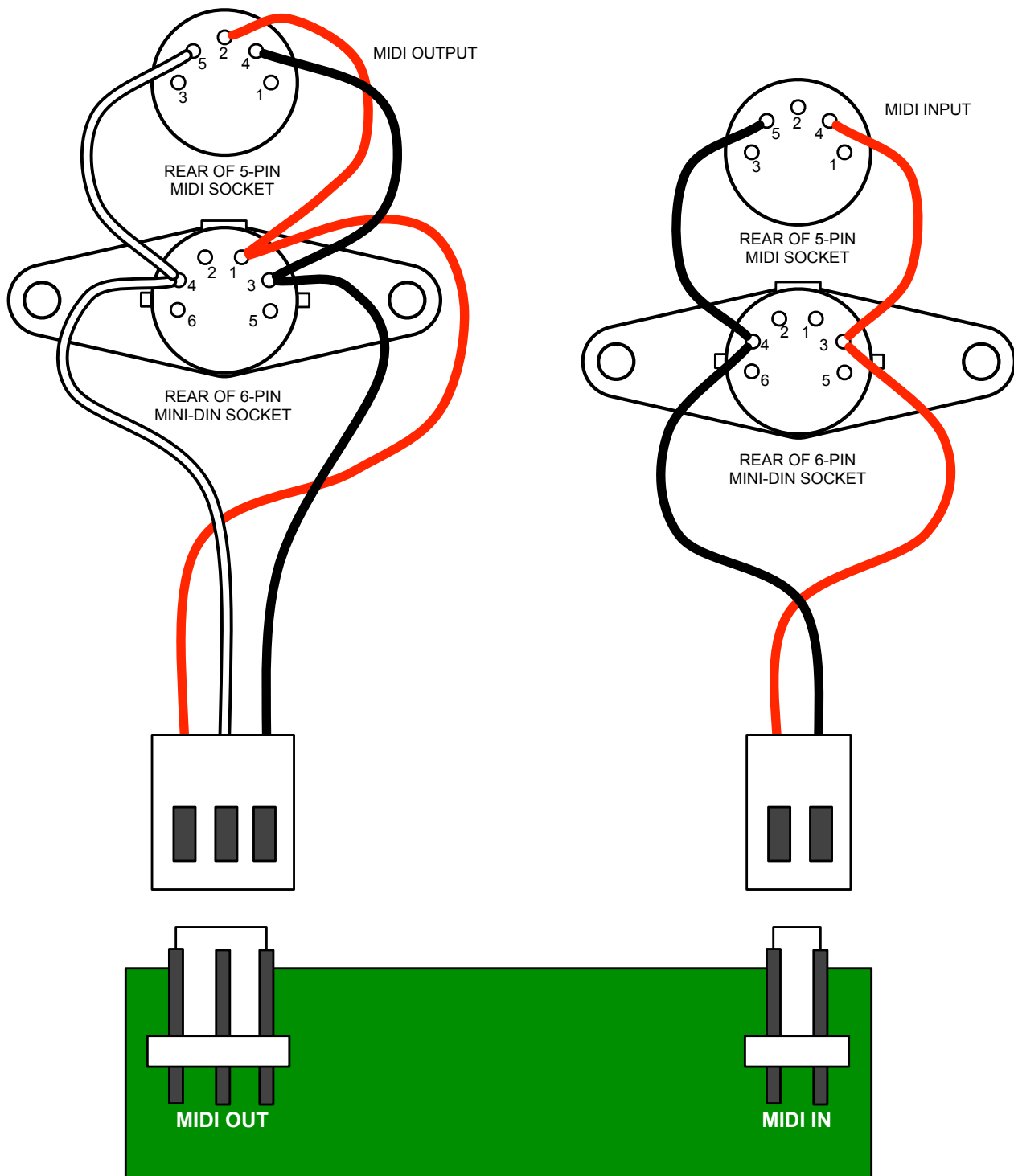
## STORING THE OLD CPU

The shipping box makes a great container for keeping your original CPU safe!

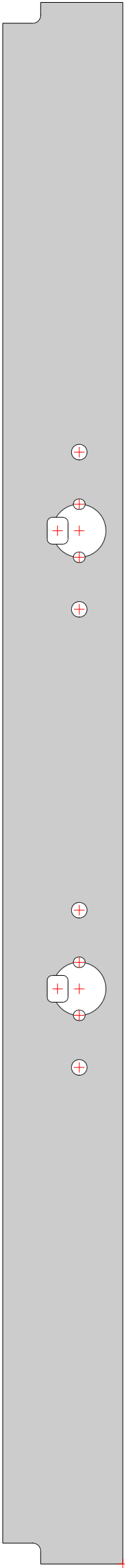


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## MIDI WIRING DIAGRAM







# Quicksilver 303 Installation Guide

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