

# X4 Teardown

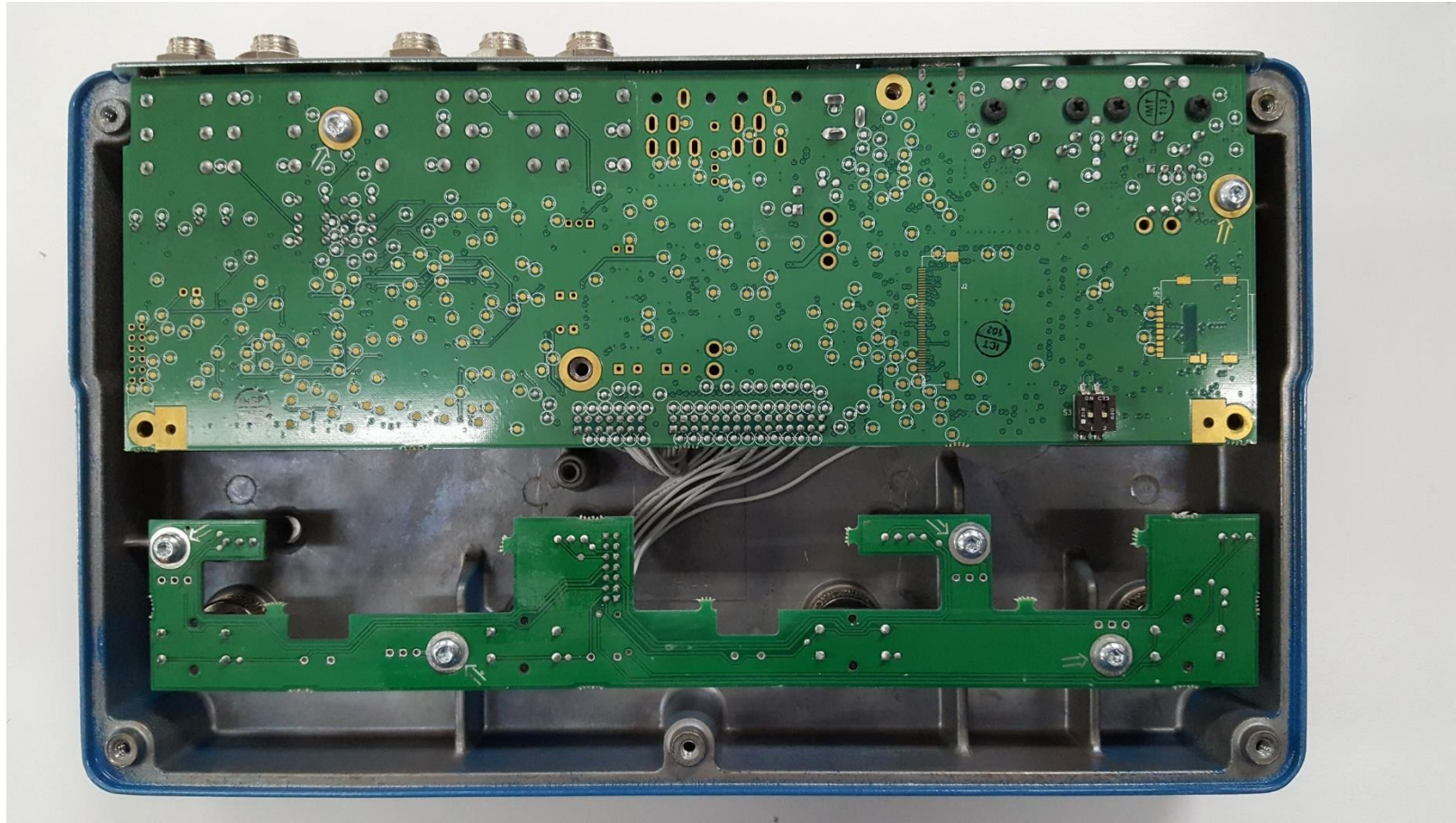
- The X4 is a delay pedal made by TC Electronics.
- There are several features in the following pictures that represent the excellent design process to create a robust product.



- The pedal has a number of features to create different delays (echos), store presets, and modify the sound.
- The Toneprint option allows users to use Bluetooth to modify the sounds or copy other players presets.
- This pedal is also a “looper” which allows recording and playback of music passages.

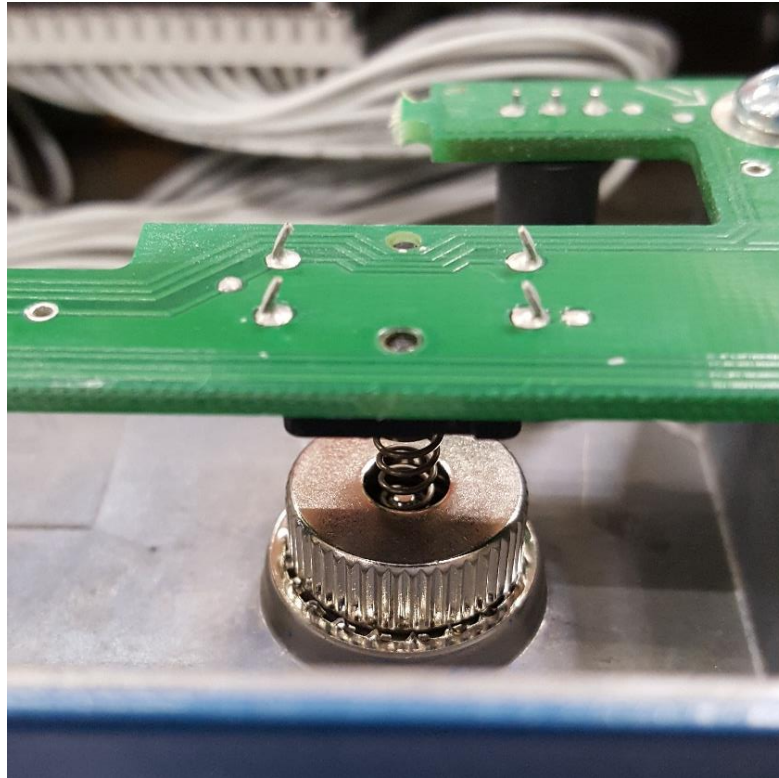


- Most pedals use Phillips head screws, which are OK. However, this pedal uses a type of screwhead called “Torx.” This allows a much greater torque when turning the screw and also prevents tampering as it is a non-typical screwdriver type.



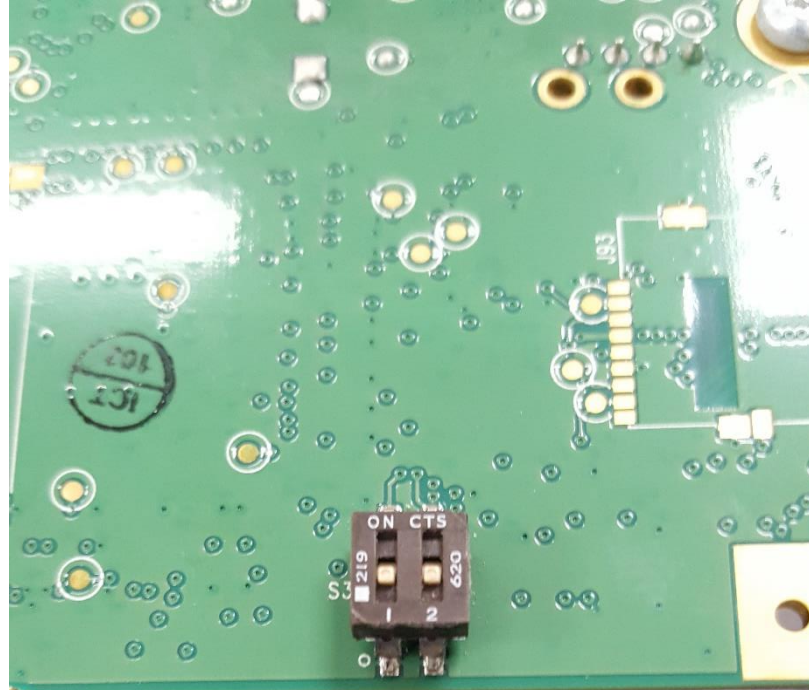
- Opening up the bottom of the enclosure reveals some very well engineered design approaches. You will notice that there are multiple PCBs. Ribbon cables connect the different boards together.

- One of the most expensive parts in a pedal like this, surprisingly, are the footswitches. In this case the engineers saved cost and assembly by using less expensive (but good quality) switches along with a machined actuator.

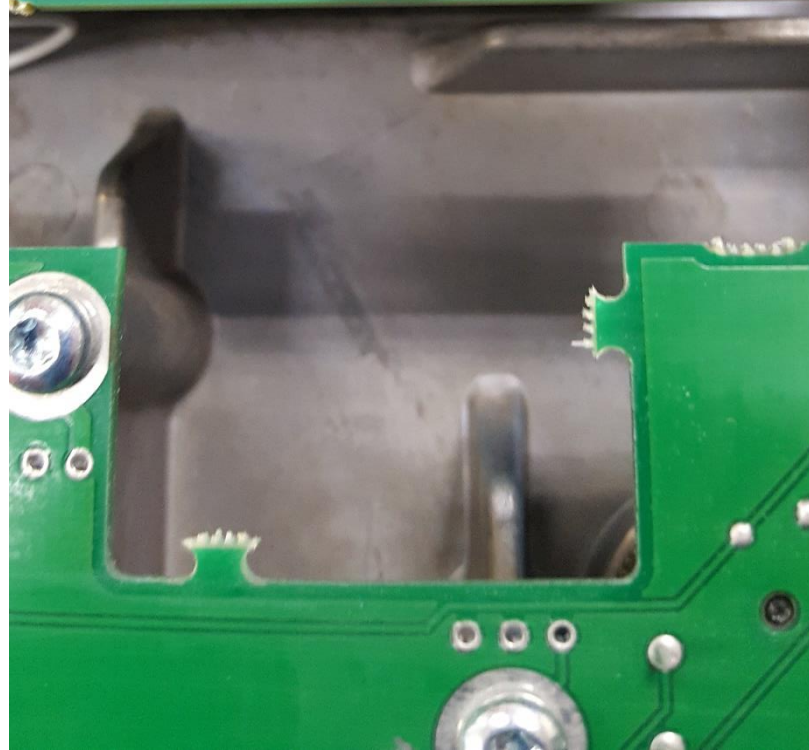


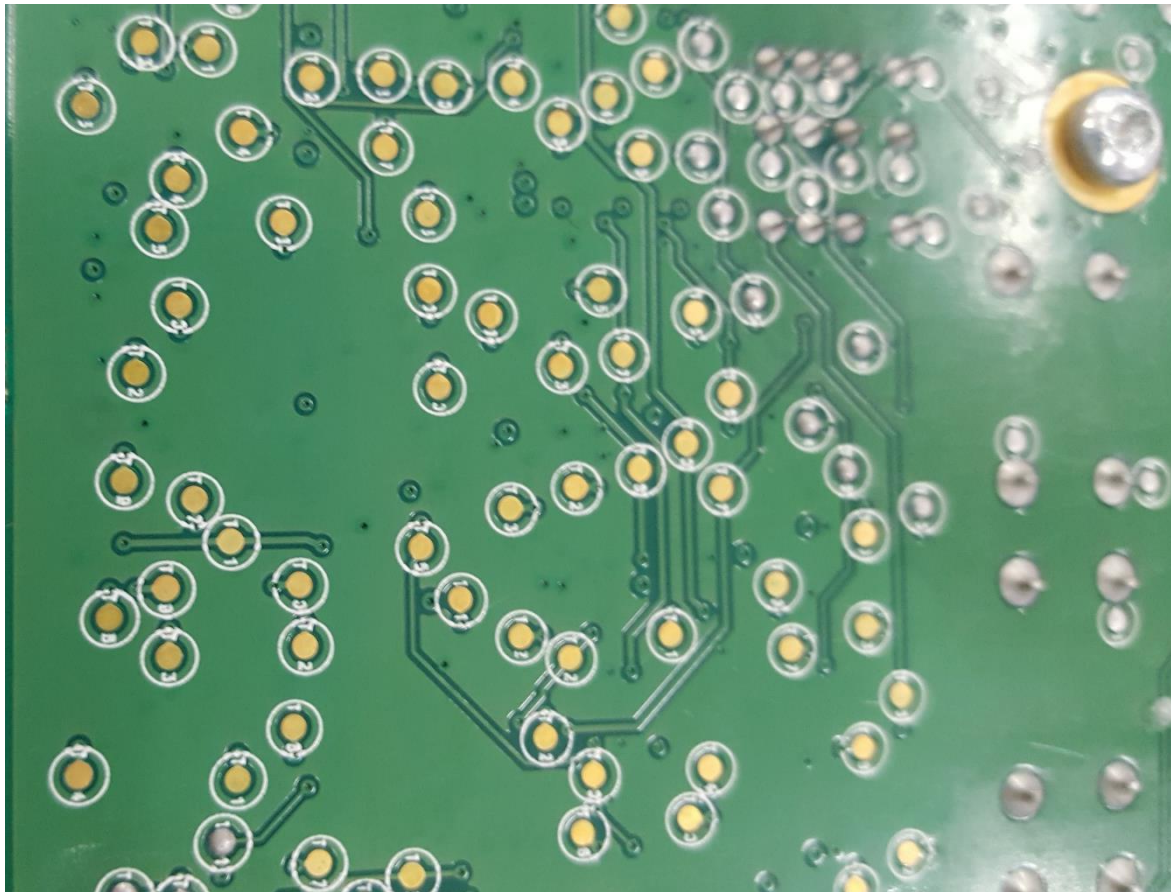
- This switch can cost up to \$7!! The one on the left is closer to \$1!

- The user can change some settings by changing the positions of the DIP switch on the right. It is surface mount (like many of the components) which reduces costs through automated assembly.

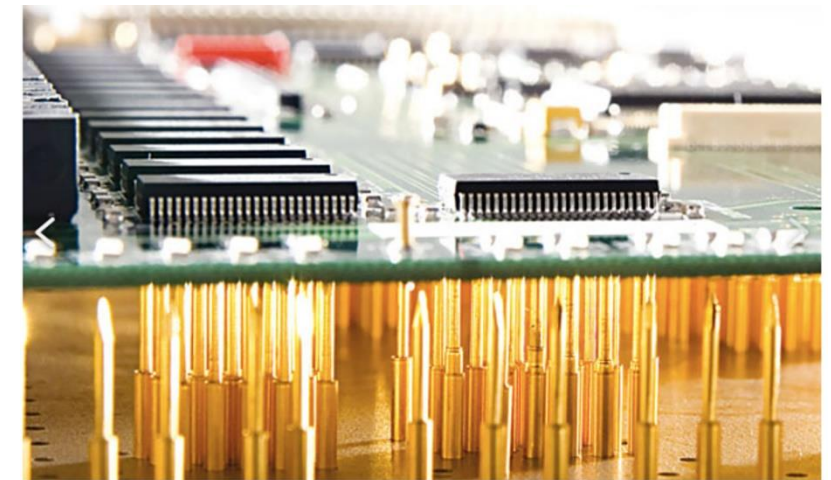
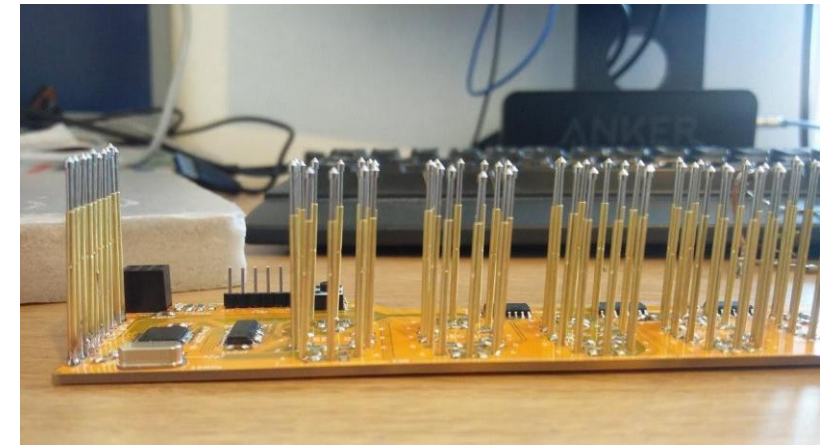


- The PCB to the right has break-away tabs that are actually used with another smaller PCB mounted to the chassis! We'll see that in a bit...



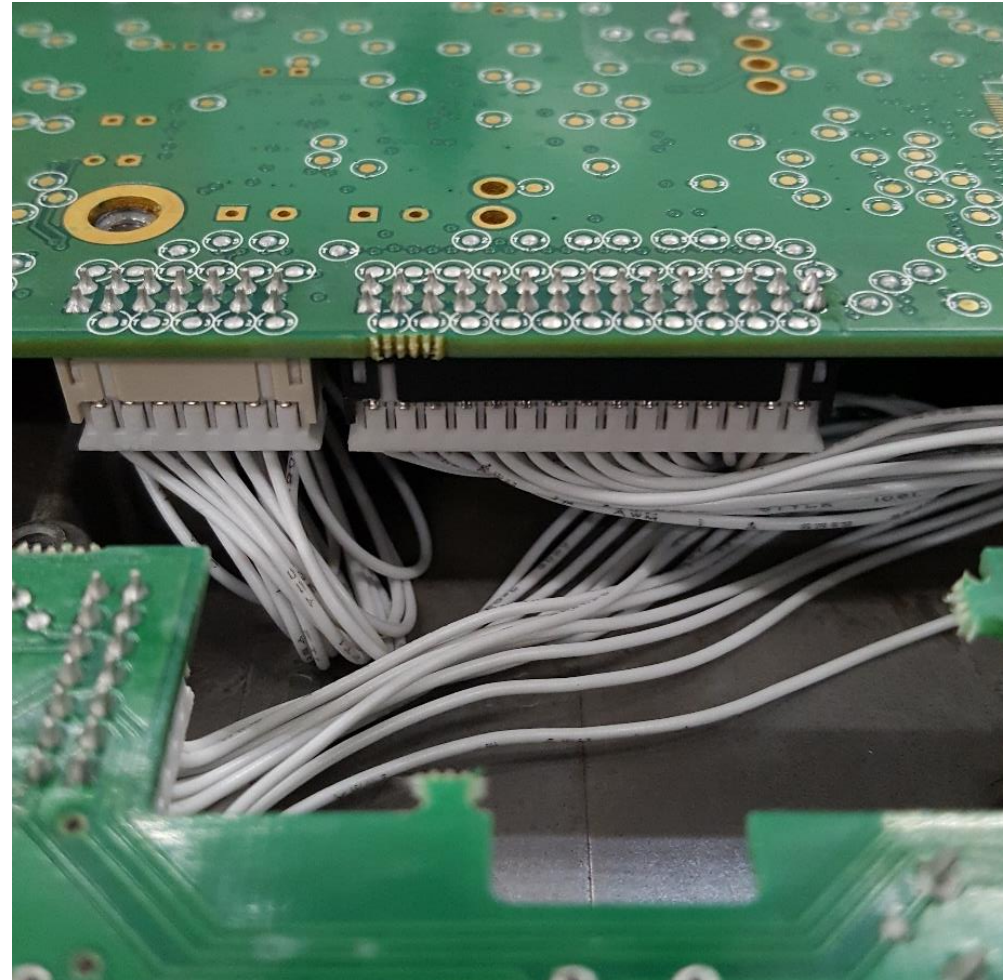


- At first you may not realize what all of these gold pads are. These are actually test points for performing electrical tests (using a bed of nails) and downloading code to the processor prior to assembly! Better to test before putting the whole assembly together...

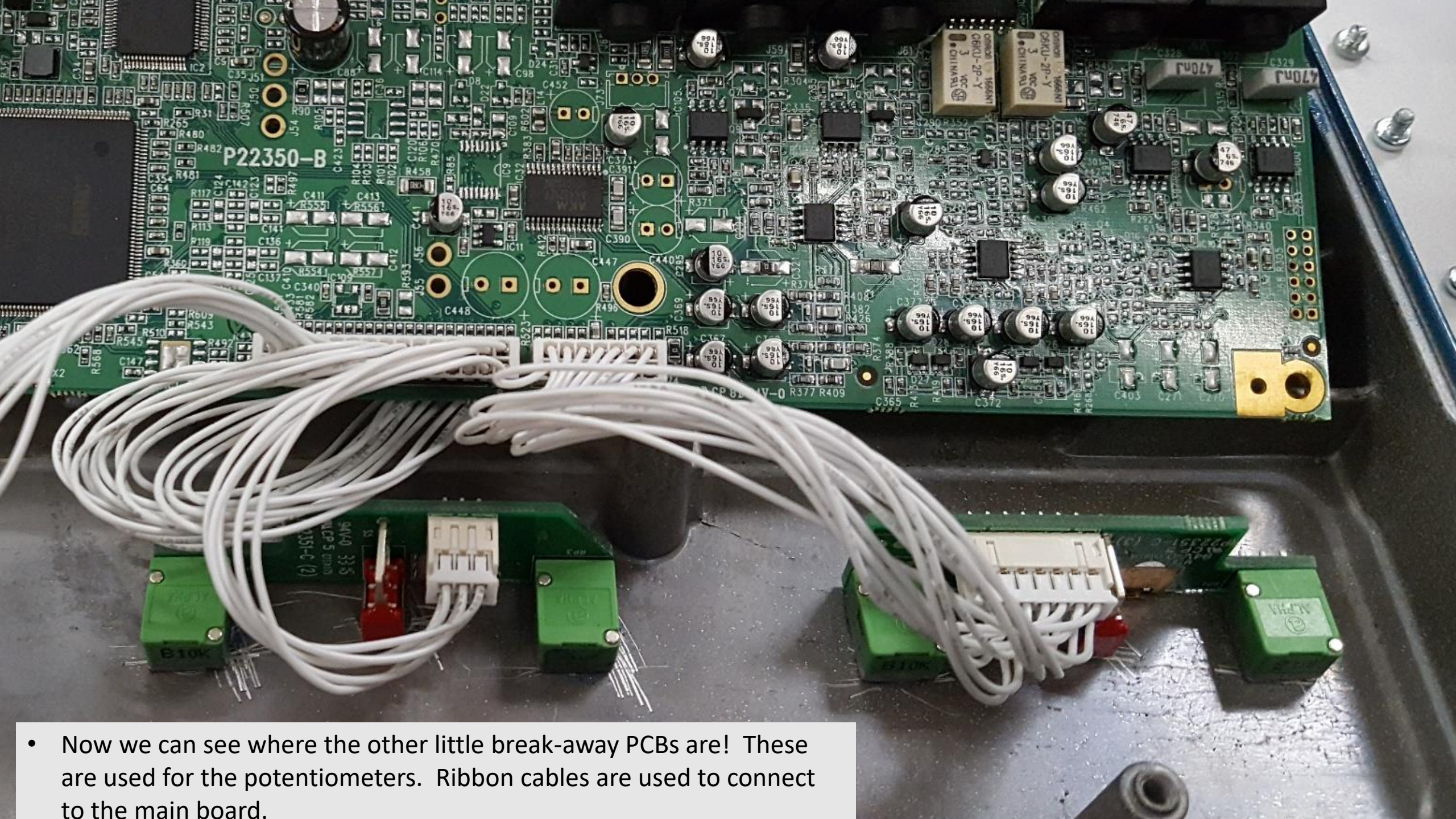


- Bed of nails with and without a PCB mounted. The gold pins are called “pogos” and are spring-loaded contacts to make a non-soldered electrical connection to the board.

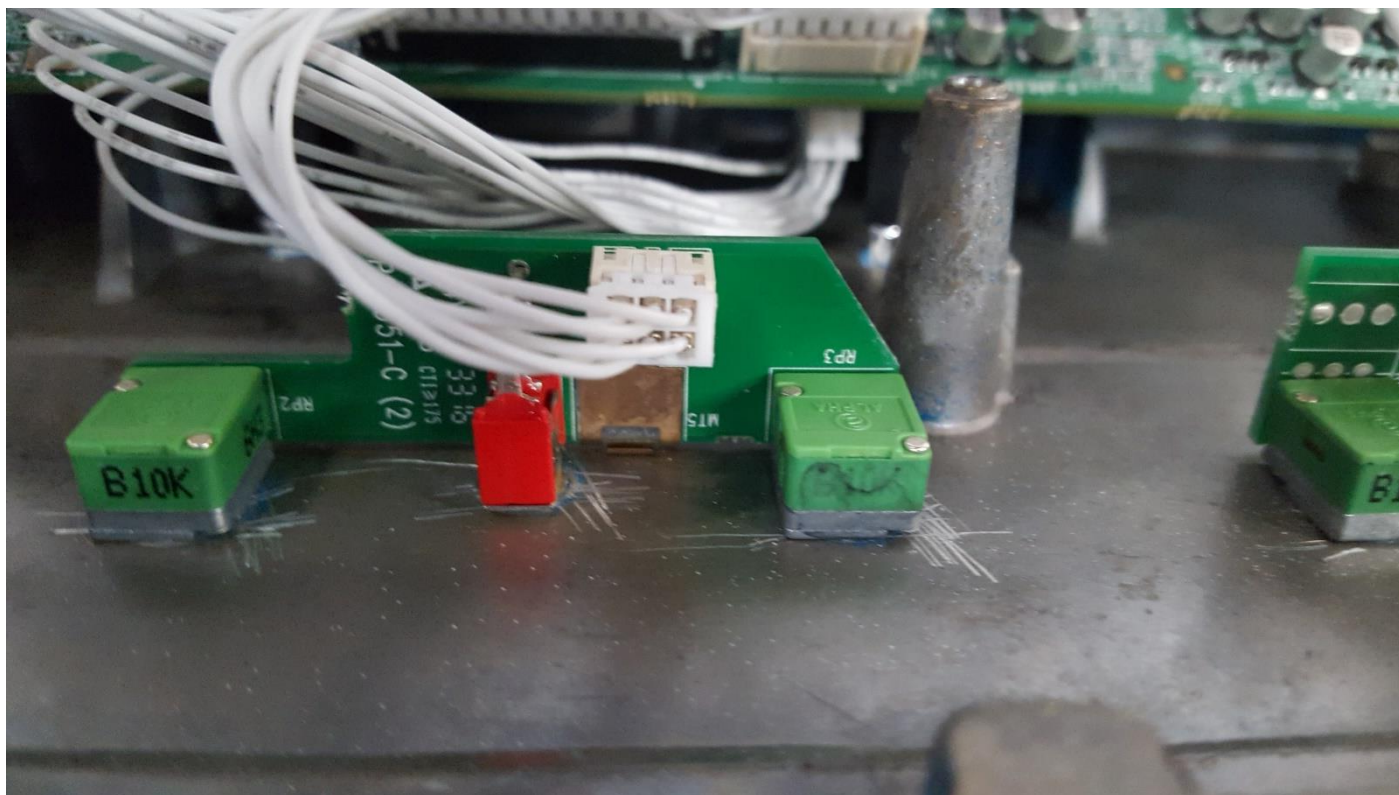
- Electrical connections are made with ribbon cables that allow rapid assembly without extra soldering.







- Now we can see where the other little break-away PCBs are! These are used for the potentiometers. Ribbon cables are used to connect to the main board.



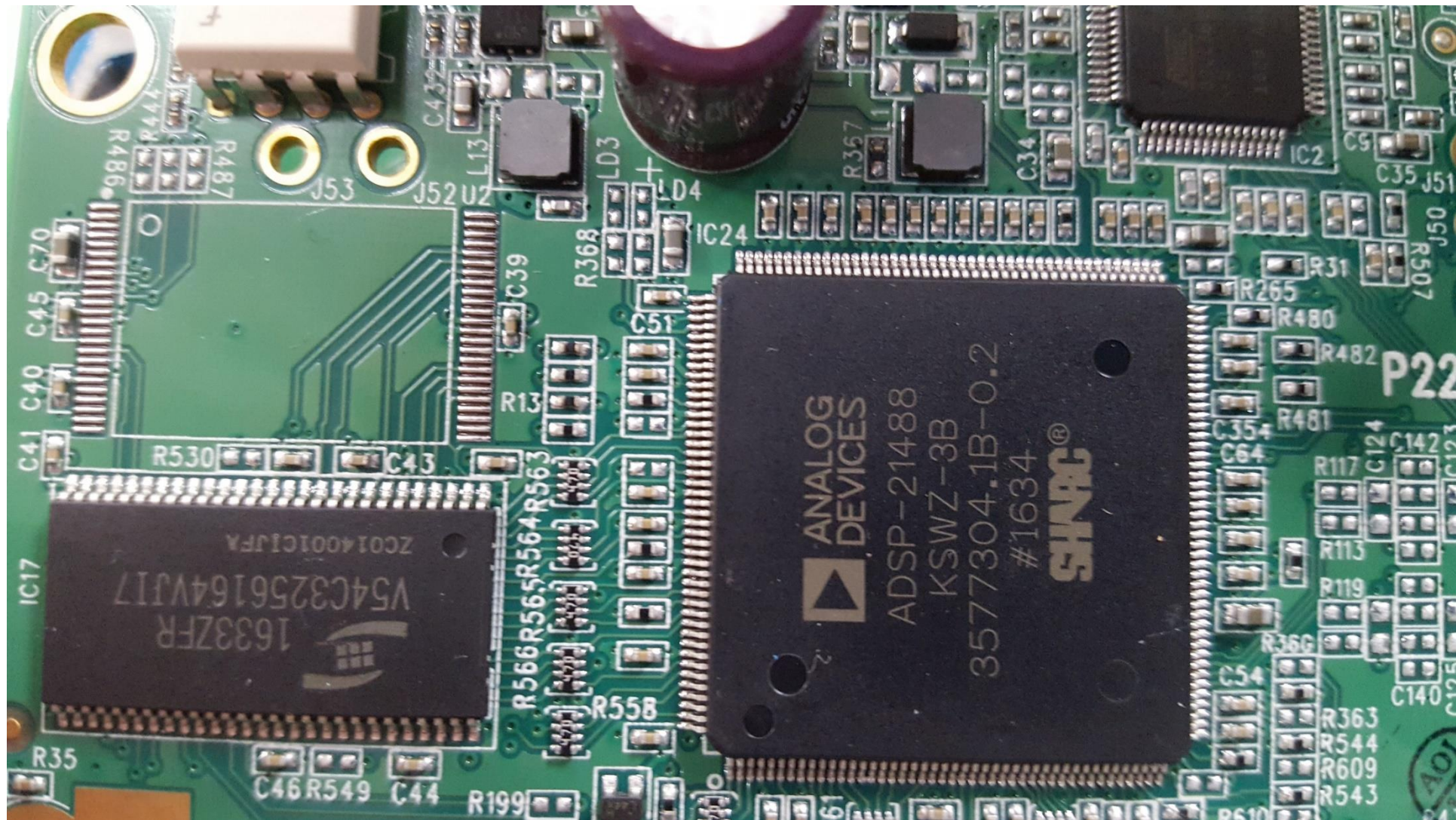
- Close-up view of a PCB that has a square potentiometer and red toggle switch. This takes care of the right angle mounting problem if you tried to mount these parts on the main board.



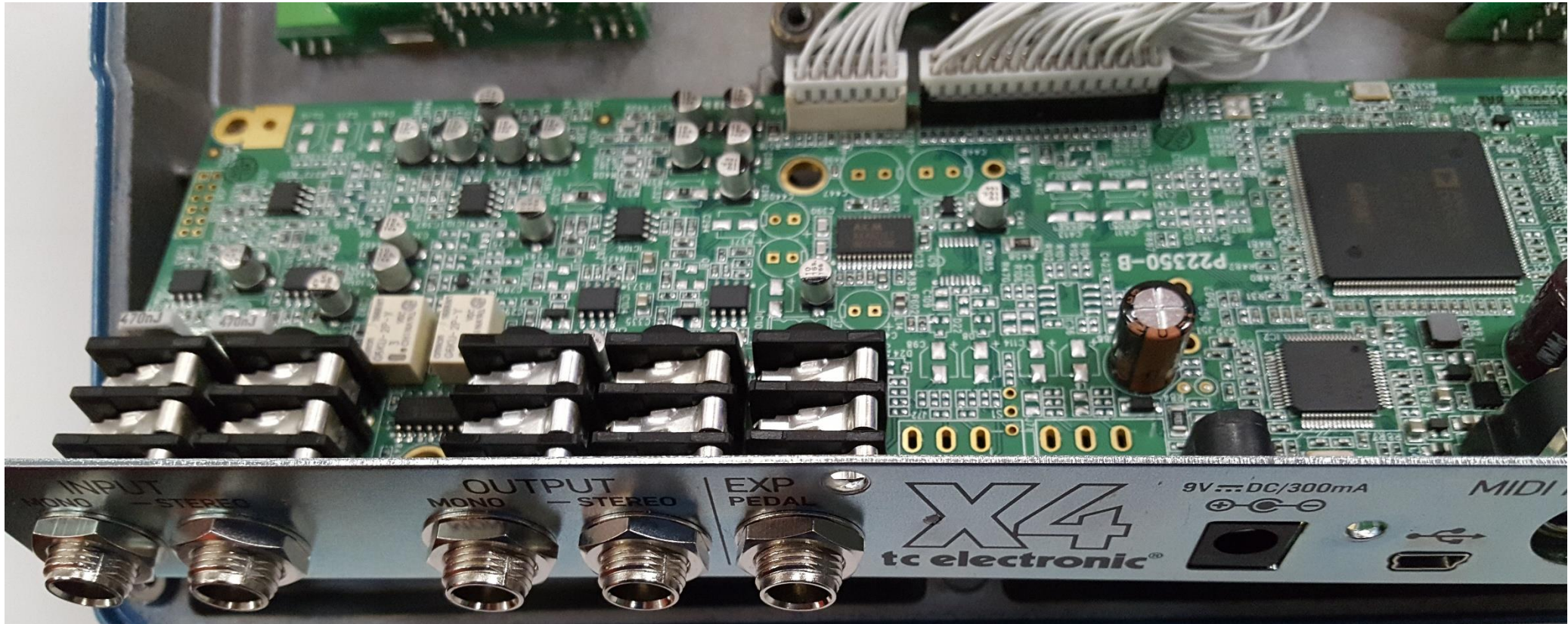
- Top view of the POT with a knob and the toggle switch



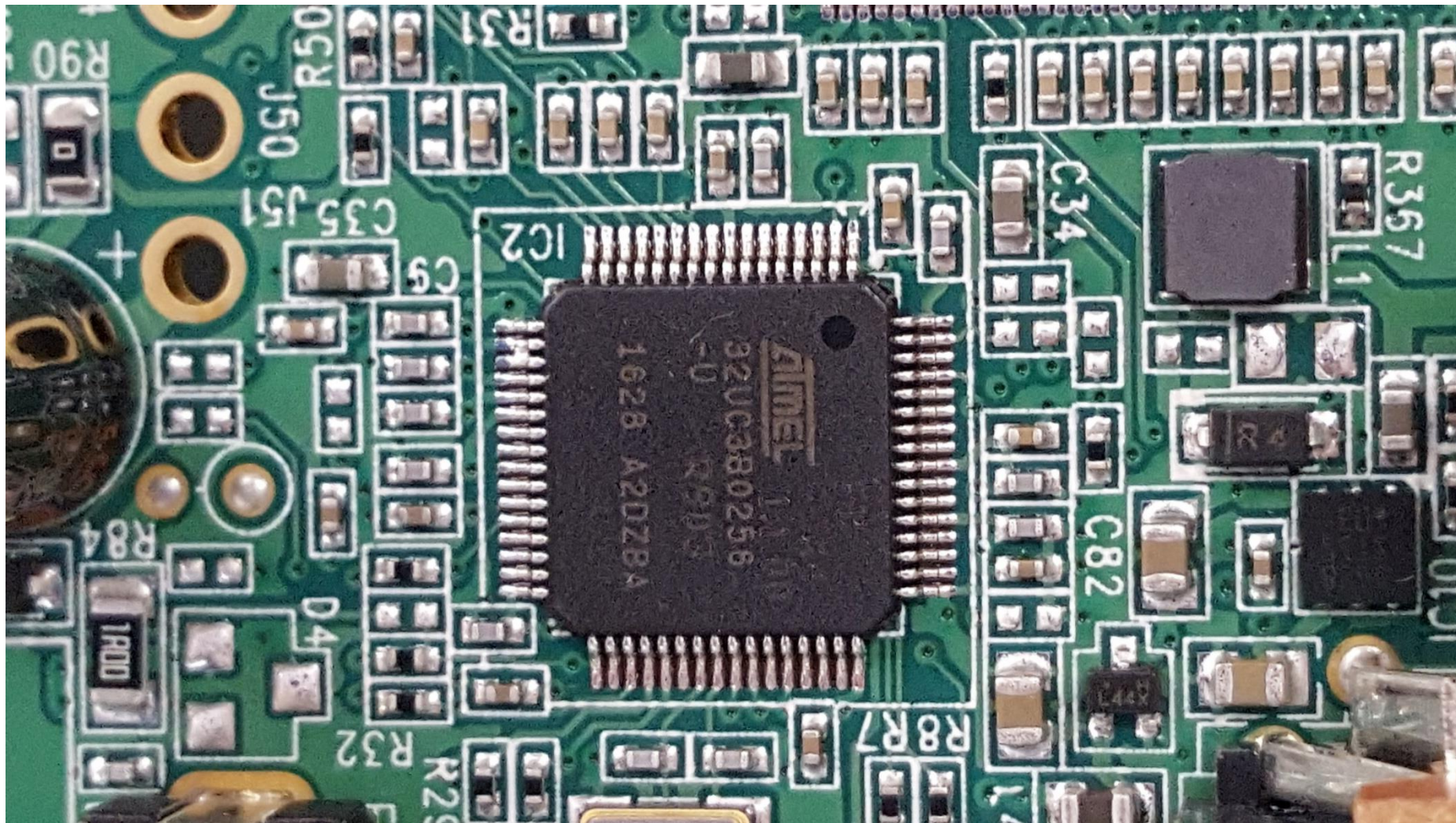
- This is a top view of the knobs and switches. Each of these are connected with the mini-PCBs on the bottom.



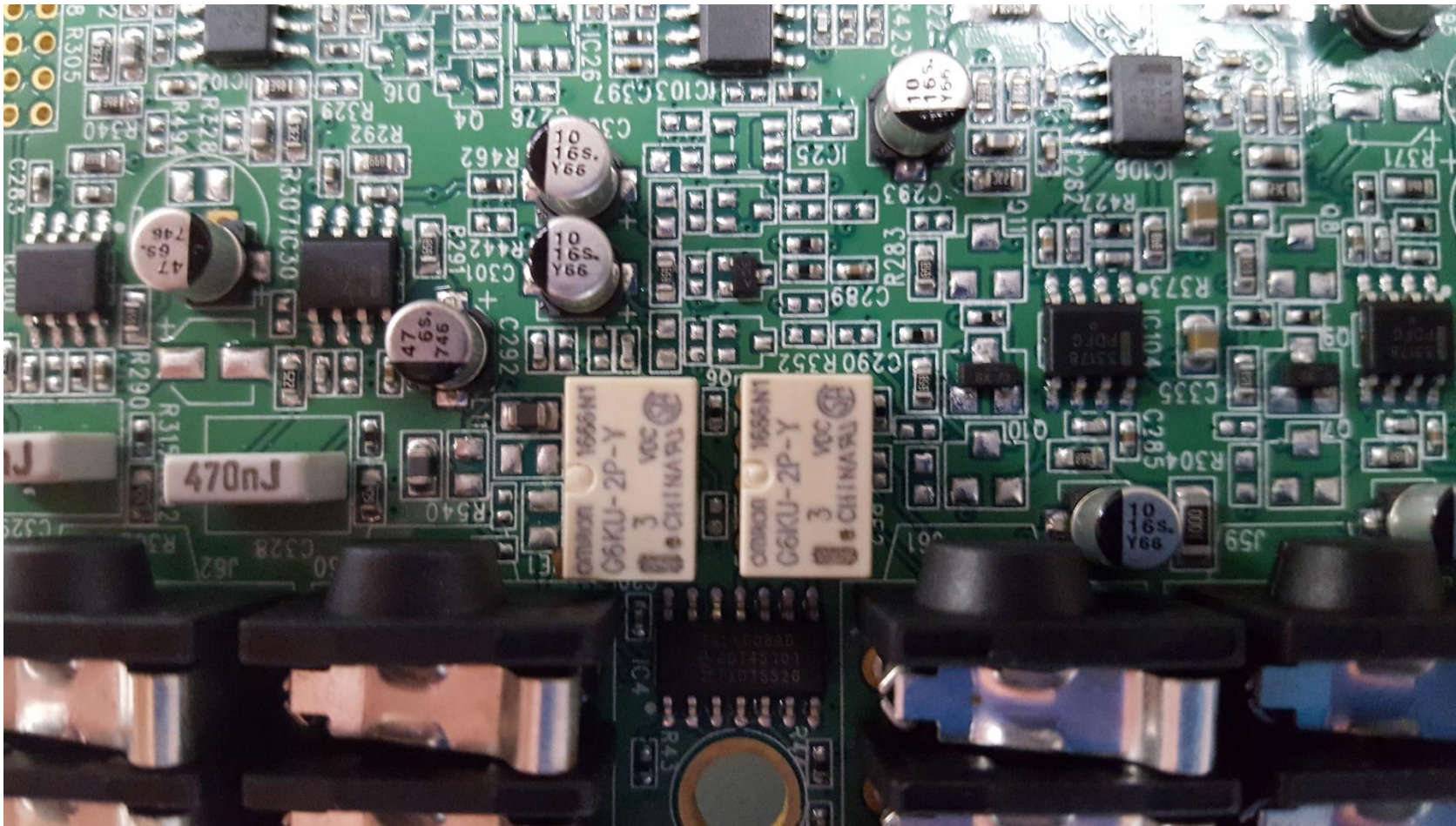
- Surface mount technology (SMT) is used extensively in this design. The IC on the right is a Digital Signal Processor (DSP), often used in Cell Phones and other audio equipment. The I.C. on the left is most likely a memory chip for storing the processed analog signals.



- This view shows how right angle audio connectors are used to connect to the back panel. This allows fast assembly with a number of connectors. Notice the mini-USB connector on the right for downloading different sounds.



- Close up view of the microprocessor – this is similar to the same part used in Arduinos!!



- Although by far the majority of the parts are SMT, there are a few that are through-hole, like these little relays. For larger components, or ones that require more current, you still often need to use through-hole components.