

challenge in itself. Another thing that has to be addressed is the amount of input bias current needed for the new opamp. Opamps require input bias currents when powered from a single sided supply for reasons I won't attempt to discuss here. Suffice it to say each opamp has different bias current requirements, and the replacement will require us to re-bias the circuit before it can operate properly.

The opamp I chose as a replacement is the LM6172. This opamp can operate on a supply voltage as high as 36vdc. It has a slew rate of 3000v/ μ s and bandwidth of 100mhz—faster than most discrete audio circuits.

Let's make the necessary changes needed to implement it, starting with input bias. R2, R34, and R60 are the opamp bias resistors. Their old values were 1M, 10k, and 20k, respectively.

- Replace R2 with a ¼ watt 75k resistor
- Replace R34 with a ¼ watt 75k resistor
- Replace R60 with a ¼ watt 150k resistor

Since this opamp is so fast, its power supply pin (pin 8) needs to be bypassed. The data sheet recommends using a 2.2 μ F tantalum in parallel with a 0.1 μ F ceramic. Twist the leads together and solder them so the two capacitors are in parallel. Remember that tantalum capacitors are polarized. For U1, attach the positive side to pin 8, and the negative side to the anode (unbanded lead) of CR14, which is ground. For U2, attach the positive side to pin 8, and the negative side to the small ground pad between C7 and C18. Leads should be trimmed as short as possible, and pay attention to polarity!

In addition to this, the second half of U1 needs a 2pf capacitor in the feedback loop to reduce overshoot and undershoot. The 2pf cap replaces the 330pf cap that was C31.

Since U2 is configured as a buffer, it requires a 1k RN55D resistor in parallel with a 2pf capacitor in the first feedback loop. Treat the first buffer (pins 1, 2, and 3) just like the bypass capacitors. The leads of the 1k resistor and 2pf capacitor should be twisted together and soldered. Use the exacto knife to cut the trace between pin 1 and pin 2, on the underside of the board. It's very tiny, so be careful, and use your multimeter to test for continuity after you've made the cut to make sure the connection has been severed. Attach the resistor and capacitor network directly to the pin 1 and pin 2 of U2.

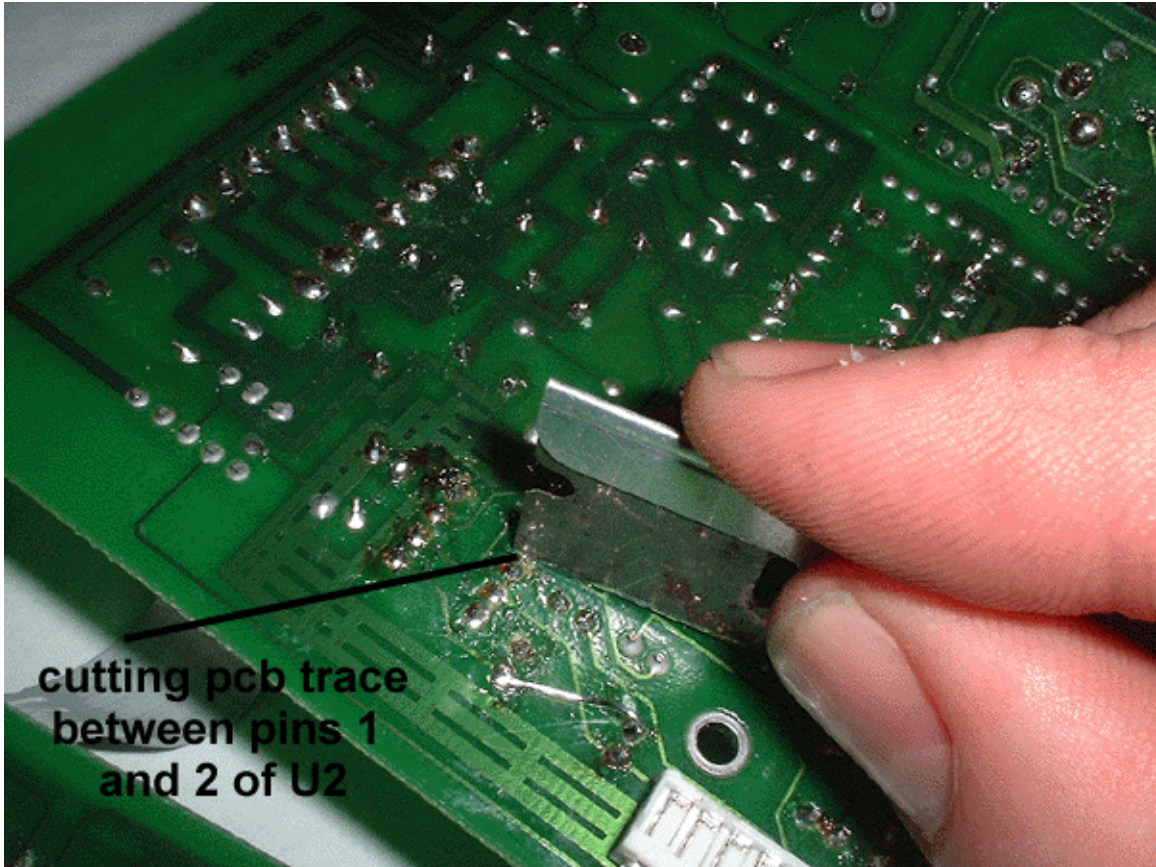
The first half of U1 (pins 1, 2, and 7) also needs the 1k RN55D resistor and 2pf cap. Cut the trace between pins 1 and 2 on the underside of the PCB. Twist the leads of the 1k and the 2pf together, like you did earlier, and solder them. Attach the RC assembly to pins 1 and 2 of U1 (see photos).

Here's what needs to be done, in order:

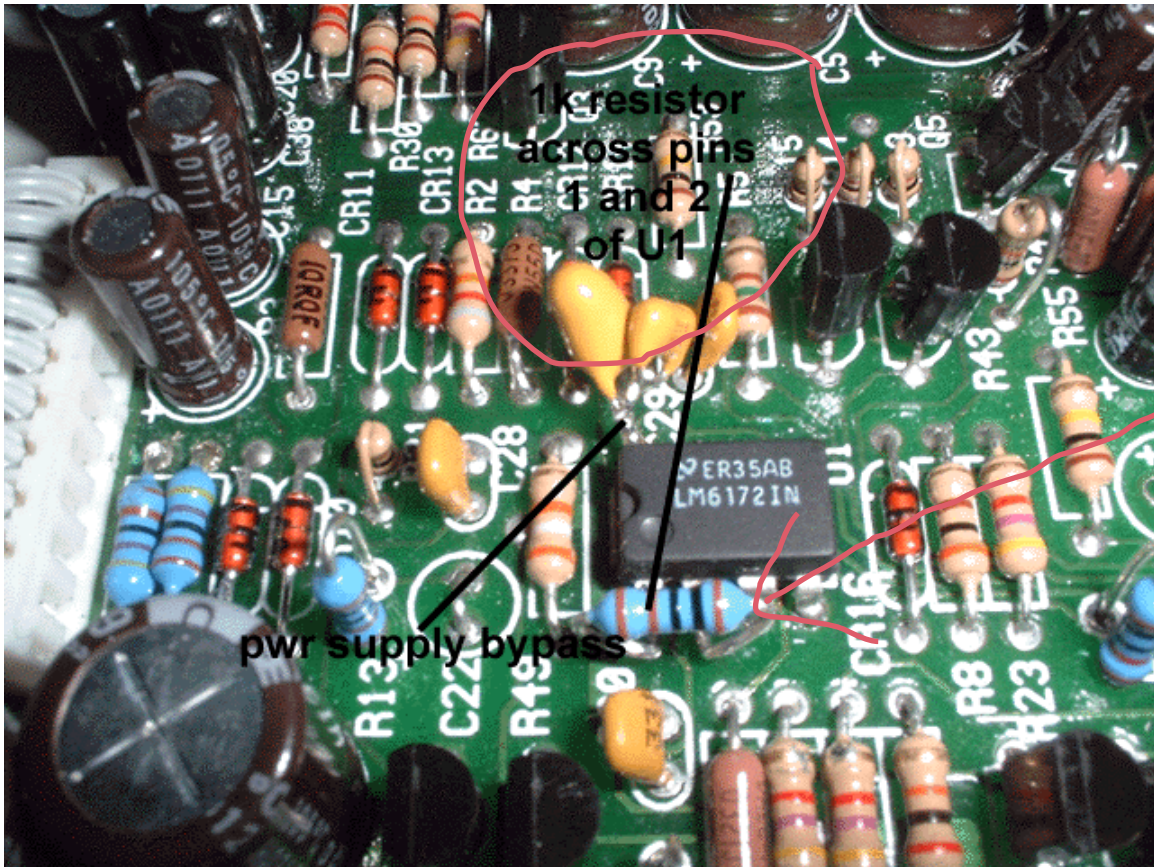
- Sever the trace between pin 1 and pin 2 of U1 and U2 using the exacto knife.
- Install the opamps. **DO NOT SOCKET THEM!** Sockets add extra capacitance, which may cause these opamps to become unstable.
- Solder the bypass capacitors to U1 and U2, make sure the polarity is correct

- Replace C31 with 2pf polystyrene or silver mica
- Solder 1k-2pf RC network to pins 1 and 2 of U2
- Install 1k resistor across pins 1 and 2 of U1
- Upgrade C18 with 47uf 25v Nichicon UPW





cutting pcb trace between pins 1 and 2 of U2



1k resistor across pins 1 and 2 of U1

pwr supply bypass

