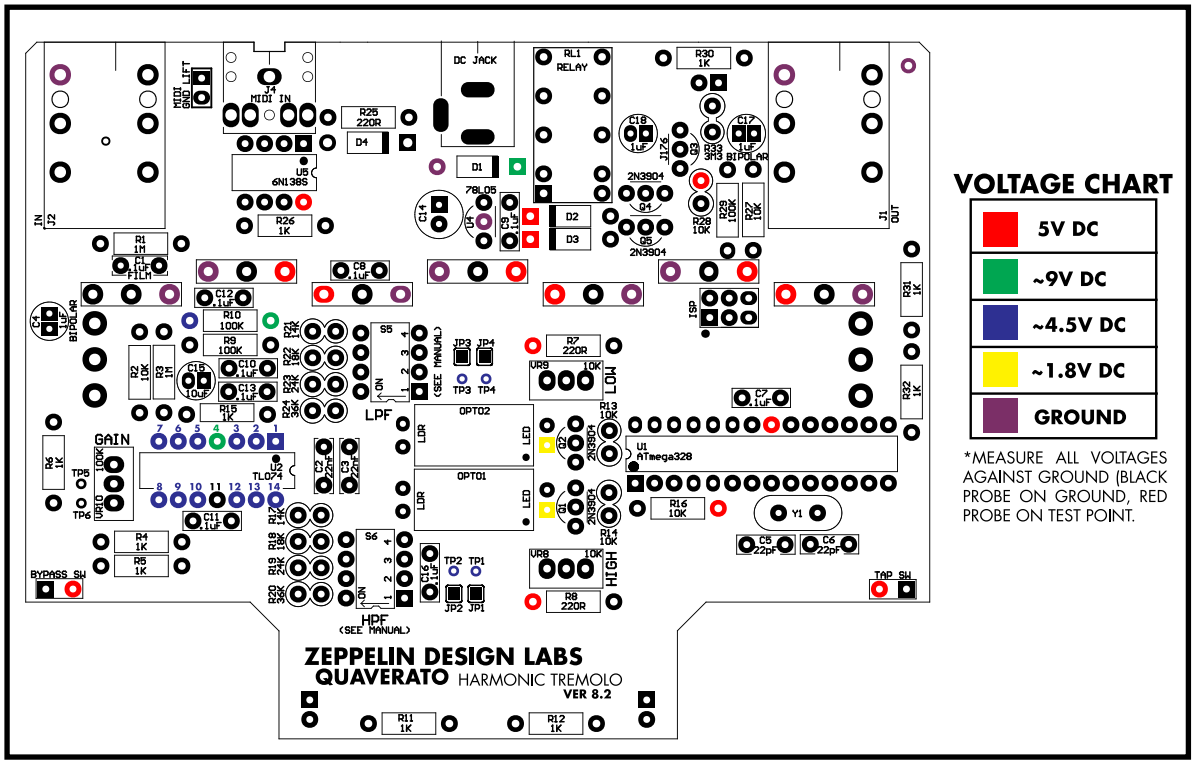
QUAVERATO TROUBLESHOOTING GUIDE

If your Quaverato kit isn't working properly please read through this guide and follow these steps in order. You'll be required to use your multimeter to test DC voltage, resistance, and continuity on various points.



Before we get started with the troubleshooting, the two most common issues that cause trouble with the Quaverato kit builds are 1) bad solder joints and 2) the jumpers not being properly soldered. There's not much that can be done about bad solder joints until you track them down, but if the tremolo effect isn't working at all (the pedal is just acting as a boost) chances are that you soldered the jumpers incorrectly. Check page 48 of the assembly manual.

Please note: The Quaverato should be powered by a 9Vdc power supply that is able to supply at least 100mA of current (the Quaverato will use close to 50mA, but it's important to have head-room). The center of the barrel jack should be negative (as with most pedal power supplies).

Now on to the troubleshooting...

1. Does the power LED come on? If not...

    A. Check for voltage on any of the 9V (green) points (see PCB voltage graphic).

        - Are you using the proper polarity, voltage, and current rating power supply? It should be 9Vdc able to supply 100mA of current. The center of the barrel jack should be negative.

    B. Is the power LED in the correct orientation?

        - Check this with your meter's diode tester. With the red probe on the LED's square pad and the black probe on the round pad, the meter should read around 1.7V (which is the forward voltage drop of the LED). If it reads around 1.5V then reverse the probes and check again. If when reversing the leads (red on round, black on square) it gives a reading of 1.7V, it means the LED is in backwards.

2. Does the tap tempo LED turn on? If not...

    A. Check for voltage on any of the 5V (red) points (see PCB voltage graphic).

    B. Is the microcontroller firmly seated in the socket in it's proper orientation?

    C. Is the tap LED in the correct orientation?

        - Check this with your meter's diode tester. With the red probe on the LED's square pad and the black probe on the round pad, the meter should read around 1.8V (which is the forward voltage drop of the LED). If it reads around 1.5V then reverse the probes and check again. If when reversing the leads (red on round, black on square) it gives a reading of 1.8V, it means the LED is in backwards.

3. Does the tepmo you tap on the tap time foot switch cause the green LED to start blinking (at that tempo)? If not...

   A. Set the DEPTH knob fully clockwise, set the MULTIPLIER knob on 1:1, set the WAVE SHAPE knob fully counter clockwise (on sine wave), and try to tap a tempo again to see if that changed anything.

   B. Is the tap LED flashing the 2-4-2 code (or something similar) and not responding to tapping the foot switch? This is showing the software version number (2.4.2). When the tap foot switch is held down on power up, the pedal enters this mode to display the software version number.

      I. Are the lugs on the taps foot switch shorted (use your continuity tester to see if they are connected when the switch is NOT being pressed)?

         - If they are shorted, (neatly) re-solder the tap foot switch wires to the board.

         - If they are not shorted, this probably means you need a new microcontroller. It was probably damaged by static electricity during assembly. The pin connected to the tap foot switch on the microcontroller seems to be the pin most susceptible to getting damaged by static electricity. This has something to do with the internal architecture of the IC. Email us... info "at" zeppelindesignlabs.com to inquire about getting a new microcontroller. If you have the means to flash your own chips (via a USBTiny ISP), you can just get another ATMega328p and use our updater app to flash it. That might work if the chip wasn't too badly damaged.

4. Does the bypass LED turn on and off as you toggle the bypass foot switch? If not...

   A. Are the lugs on the bypass foot switch shorted (use your continuity tester to see if they are connected when the switch is not being pressed)?

      - If they are shorted, (neatly) re-solder the bypass foot switch wires to the board.

   B. Is the bypass LED in the correct orientation?

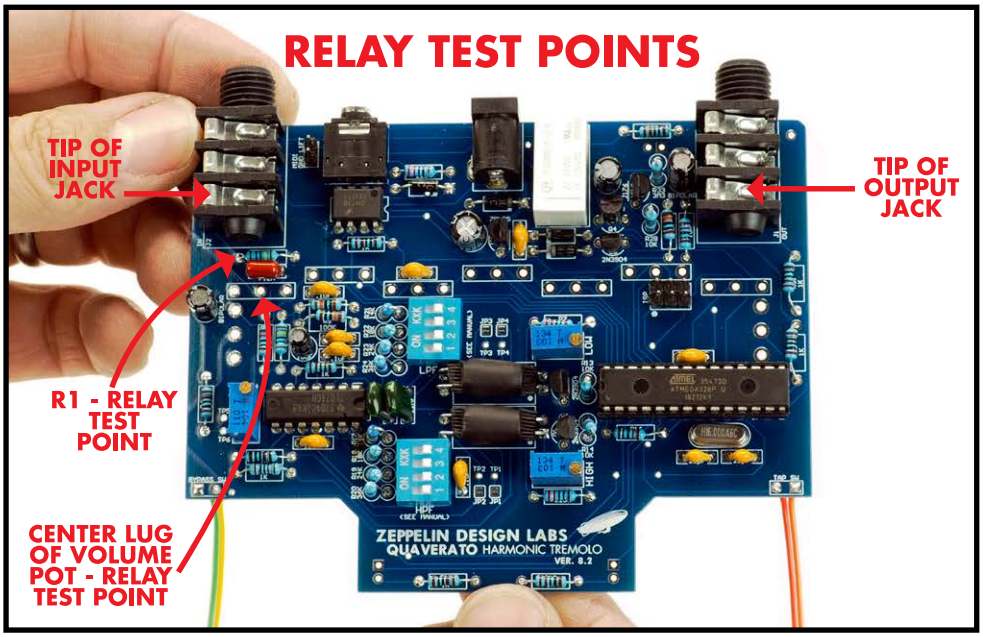
      - Check this with your meter's diode tester. With the red probe on the LED's square pad and the black probe on the round pad, the meter should read around 1.7V (which is the forward voltage drop of the LED). If it reads around 1.5V then reverse the probes and check again. If when reversing the leads (red on round, black on square) it gives a reading of 1.7V, it means the LED is in backwards.

5. Does the pedal pass audio through it (can you play your guitar through it) when the bypass LED is OFF? If not...

   A. Are your instrument cables working properly? I know it's dumb, but this happens more than you'd think it should.

   B. Are the input and output jacks soldered properly?

   C. Is the relay properly switching the signal path?



   I. With the bypass LED OFF, check for continuity between the tip of the input jack and the tip of the output jack.

      - Check for good solder joints on the input and output jacks.
      - Check for good solder connections on all the relay associated components...D1, D2, Q4, Q5, R31, R32, and RL1. Also make sure D1, D2, Q4, and Q5 are installed in the correct orientation.

   II. With the bypass LED ON, check for continuity between the tip of the input jack and R1, and also continuity between the center lug of the VOLUME pot to the tip of the output jack. If you don't have continuity between either of these connections, there is a problem with the relay circuit.

      - Are you able to hear the relay "click" when the bypass foot switch is pressed? If not, check for good solder joints and correct orientation on the relay associated components... D1, D2, Q4, Q5, R31, R32, and RL1.
      - Make sure the microcontroller is seated firmly in it's socket.

D. Is the relay silencing circuit working correctly?

I. Check for 5V on R28 (see PCB voltage graphic)

II. Are the components of this circuit soldered and installed correctly? Check R27, R28, R29, Q3, C18, C17, R33. Make sure that Q3 and C18 are not reversed, and the pads of C17 and C18 are not bridged.

6. Does the pedal pass audio when the bypass LED is ON and the DEPTH knob fully counter clockwise? If not...

A. Are the jumpers soldered correctly, as in the pictures on page 48 of the assembly manual? I can't tell you how many times people solder these wrong or not at all (...are we not communicating something clearly enough?).

B. Are the DIP switches set properly (or at all)?

C. Is the isolation paper is under the pots? Make sure there are not holes in it and nothing is able to poke through to short out against the pots.

D. Are the voltages of U2 correct? ...See the U2 VOLTAGES section.

E. Is the relay silencing circuit working correctly?

I. Check for 5V on R28 (see PCB voltage graphic)

II. Are the components of this circuit soldered and installed correctly? Check R27, R28, R29, Q3, C18, C17, R33. Make sure that Q3 and C18 are not reversed, and the pads of C17 and C18 are not bridged.

7. Can you hear the tremolo effect working when the bypass LED is ON and the DEPTH knob fully clockwise? If not...

A. Are the jumpers soldered correctly, as in the pictures on page 48 of the assembly manual? I can't tell you how many times people solder these wrong or not at all (are we not communicating something clearly enough?...seriously, let us know).

B. Is the optocoupler circuit working correctly and are the optocoupler LEDs flashing correctly? At this point, it's safe to assume that the LED on one or both sides is not working. You can test this by following the steps in Apendix A.

C. Is the relay properly switching the signal path?

I. With the bypass LED OFF, check for continuity between the tip of the input jack and the tip of the output jack.

- Check for good solder joints on the input and output jacks.
- Check for good solder connections on all the relay associated components...D1, D2, Q4, Q5, R31, R32, and RL1. Also make sure D1, D2, Q4, and Q5 are installed in the correct orientation.

II. With the bypass LED ON, check for continuity between the tip of the input jack and R1, and also continuity between the center lug of the VOLUME pot to the tip of the output jack (see "Relay Test Points" graphic in step 5). If you don't have continuity between either of these connections, there is a problem with the relay circuit. Is the tip of the input jack staying connected to the tip of the output jack, depsite the status of the bypass LED? If so this means the relay is not swtiching.

- Are you able to hear the relay "click" when the bypass foot switch is pressed? If not, check for good solder joints and correct orientation on the relay associated components... D1, D2, Q4, Q5, R31, R32, and RL1.
- Make sure the microcontroller is seated firmly in it's socket

8. Does the audio sound right (with the DEPTH knob fully counter clockwise)? If not...

A. Does it sound very muffled or overly bright?

I. Is the HARMONIC MIX knob centered (at 12:00)?

II. Are you able to adjust the HIGH and LOW trim pots (by ear, after calibration) until the audio sounds good to you?

III. Are both the HPF and LPF signal paths working?

- Put the Quaverato in calibration mode (hold down both foot switches upon power up) and test to see if both the high and low frequency paths are working (by using the HARMONIC MIX knob). See page 11 in the Quaverato User's Manual for more information about calibration mode.
- If either one of the signal paths aren't working see APENDIX A: IF ONE OF THE 2 SIDES IS NOT WORKING (EITHER HIGH OR LOW)

B. Does the pedal sound distorted?

I. Often times when an audio signal is distorted it is caused by a bad connection within the circuit...In this case solder joints that don't make a good connection will cause the signal to sound distorted. This type of distortion sounds very knarly and is usually dependent on how hard or loud you play your guitar. Often times the signal is very low until you hit your guitar strings hard and then the signal punches through in a distorted burst. Most of the time bumping or hitting the pedal against something can help you know if the distortion is caused by a bad solder joint. If the distortion improves or if the signal is lost all together, this is a good sign that there is a bad connection somewhere on the board. Re-flow ALL the solder joints on the pedal, particularly in the analog section. If there is one bad solder joint it usually means there are more. Practice good soldering technique!

II. Is the isolation paper under the pots? Make sure there are not holes in it and nothing is able to poke through to short out against the pots. This could cause either no signal to get through, or a distorted signal.

III. Are the trim pots set properly? Depending on the type of distortion you hear, you may need to back off the GAIN trim pot from the suggested setting in the assembly manual if it is set too high. Remember to back off the GAIN turn the trim pot clockwise (opposite from the HIGH and LOW trim pots). ...And/or you may need to back off the HIGH and LOW trim pots so the final gain stage is not over-driven.

IV. Are the voltages of U2 correct? See the APENDIX B: U2 VOLTAGES section.

V. Is the relay silencing circuit working correctly?

- Check for 5V on R28 (see PCB voltage graphic)
- Are the components of this circuit soldered and installed correctly? Check R27, R28, R29, Q3, C18, C17, R33. Make sure that Q3 and C18 are not reversed, and the pads of C17 and C18 are not bridged.

APENDIX A: IF ONE OF THE 2 SIDES IS NOT WORKING (EITHER HIGH OR LOW)

- Make a tiny incision in the heat shrink of the optocoupler (on the side that isn't working). Use your X-acto knife to slice open about 1mm of the back side of the optocoupler's LED (near the LED's leads). The incision just needs to be big enough to see if the LED is lighting up when the DEPTH knob is fully counter clockwise. When you're done with this step, cover up the incision again with something opaque, like fingernail polish, opaque hot glue, or even sticky-tack (poster putty)….just something to keep out the light.

    a. If the optocoupler's LED is NOT lighting up then you know the problem is with the digital part of the circuit.

        i. Check to make sure Q1 and Q2 are soldered and installed properly. Also check the solder joints on R7, R8, R13, R14, VR8, VR9, and, of course, the LED side of the optocouplers.

        ii. Check for 5V on R7 and R8 (note the PCB voltage graphic above).

        iii. Check for around 1.8V on the square pad of the square pad of the optocouplers.

        iv. Is the optocoupler LED in backwards? Check this with your meter's diode tester. With the red probe on the LED's square pad and the black probe on the round pad, the meter should read around 1.8V (which is the forward voltage drop of the LED). If it does not read around 1.8V then reverse the probes and check again. If it gives a reading of 1.8V with the probes reversed, it means the optocoupler is in upside down.

        v. Is there a problem with the trim pot (VR9 or VR8)? With the POWER OFF, measure the resistance between the red pad (on the PCB voltage graphic) of R7 or R8 (the resistor on the side that is not working) and the square pad of the optocoupler; it should be less than 10K ohms (most of the time, much less). When you adjust the trim pot, you should notice this resistance changing. If you can't adjust this resistance, then you may have a problem with the trim pot. Try the "wiggle" test next...

        vi. Turn the pedal on in calibration mode while the pedal is plugged into the guitar and amp. Turn the HARMONIC MIX KNOB to the side that's not working, set the DEPTH KNOB fully counter clockwise. As you strum the guitar, very, very gently wiggle the trim pot on the side that's not working. Does the signal jump or fade in? If so, make sure the bottom trim pot is firmly seated against the PCB...Re-solder it if necessary. See if that helps. If not then you'll need to replace the trim pot.

    b. If the optocoupler's LED is lighting up then you know the problem is with the analog part of the circuit.

i. Make sure the jumpers are soldered properly

ii. Check for bridged or bad solder joints on all the components on the non-working side of the circuit. For the HPF side check: R17-R20, R4, S6, and C2. For the LPF side check: R21-R24, R5, S5, and C3. The PCB gets kind of crowded around the DIP switches and all the stand-up resistors...It's easy to bridge solder joints around this area.

iii. Check TP1-TP4 for ~4.5V.

iv. Check all the pins on U2 for proper voltage...See the U2 VOLTAGES section.

v. Test for continuity across the pins of the individual DIP switches that are turned ON.

APENDIX B: U2 VOLTAGES

The IC U2 is a quad opamp...Meaning there are 4 separate amplifier sections in it. These amplifiers are called "operational amplifiers" or "opamps" for short. Each amplifier section has 3 pins associated with it. Here is a list of the pins in each amplifier section and their associated parts.

Opamp A: Pins 1,2,3; with associated parts C3, R21-24

Opamp B: Pins 5,6,7; with associated parts C1, R2, R3, R15

Opamp C: Pins 8,9,10; with associated parts R4, R5, R6, VR10, C4

Opamp D: Pins 12,13,14; with associated parts C2, R17-R20

Each pin of these individual opamps should be set to the bias voltage (given by R10) which should be about half of the voltage supplied to the pedal (9V)...so the bias voltage should be around 4.5V. If you notice the bias voltage is off by over a volt or 2 then there is a problem somewhere. Most of the time it means there is a short (solder bridge) between 2 pads somewhere causing the bias voltage to get shunted to ground, but on a very rare occasion it could mean that the IC has been damaged. If the voltage of one of the these opamp sections is off, check all of it's associated parts for bad solder joints or bridges. If the bias voltage is off on all of them check the voltages on R10. Keep in mind, opamps A and B share a bias voltage, so if there is a problem with one of those 6 pins, the voltage will probably be off on all of them.

APENDIX C: FIXING BROKEN SOLDER JUMPER PADS

Sometimes, if you apply too much heat to the solder pads they can become damaged. This usually means that one of the pads has lifted off the board and possibly lifted the trace with it. This can easily be fixed by bypassing the solder pads with a jumper wire. Typically you want to use very thin wire for this sort of thing. I use "wire-wrap" wire for these types of jumpers…which is either 28 or 30AWG. You can use the wire found in a CAT5 network cable or wire from an old VGA monitor cable…that stuff is usually thin enough, from what I've seen.

If JP1 is bad run a jumper wire from pin 14 of U2 to TP1.
If JP2 is bad run a jumper wire from R4 (the pin closest to C11) to TP2.
If JP3 is bad run a jumper wire from pin 1 of U2 to TP3.
If JP4 is bad run a jumper wire from R5 (the pin closest to C11) to TP4.

You'll need to tin the ends of the wire first; and if you are soldering to a pin on U2, tin that pin too. For the U2 pins, solder the wire to the pin right as it exits the body of the IC. When you attach the other end of the wire to the test point, try to slide the wire inside the TP hole and then solder it. If you can't fit in in the hole then just lay it across the top of the hole and solder it down…in which case you may want to use a tiny drop of super glue to hold the wire in place on the surface of the board (to keep it from vibrating and eventually breaking the solder joint), but make sure you don't get glue on the solder joint.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