TROUBLESHOOTING GUIDE

DOCUMENT VERSION
1.0.0 (2024-05-31)

OVERVIEW

If you've finished building one of our kits and it doesn't work, this document will help in the process of getting it up and running. It contains a basic troubleshooting process as well as descriptions of common problems that we've encountered more than once. These are not be specific to any single kit, but the overall build process that is shared between all of them.

We only sell parts, so we can't guarantee any final outcomes. But we've helped enough people solve build issues that we've noticed common problems that seem to come up more frequently.

TESTING VOLTAGE

The first step in any troubleshooting process is to measure the voltages. All electronic circuits require power, so if for some reason the active components (ICs and transistors) are not receiving it, then either they won't pass any signal at all or the signal will be very weak.

Ensure the circuit is fully installed in the enclosure. With your multimeter, touch the black probe to a ground point for the circuit. It's recommended to use one of the tapped screw holes of the enclosure since it holds the probe in place. Then, with the red probe, touch the pins of each IC and transistor.

At first, you're just checking for any voltage. Probe the following locations in the circuit:

1. First, check the +V pad in the top center of the footswitch board. This is directly connected to the DC jack. This is the full supply voltage, so it should be somewhere between 9V and 10V.
2. Next, check the other +V pad immediately to the left. This is on the other side of the polarity protection diode and (if applicable) a filtering resistor. The voltage here should be anywhere from 0.15V to 1V lower than the main supply voltage depending on the circuit.
3. Move onto the main PCB and test the active components. For 8-pin dual op-amps such as the JRC4558 or TL072, check pin 8 in particular to see if you are getting the full supply (9V or 18V depending on whether there is a charge pump). For transistors and JFETs, check the pad marked "C" or "D". These will typically be the highest voltage of the three pins, but they may still be a few volts below the positive supply depending on how they are used in the circuit.

Beyond that, the individual build documents typically contain voltage measurements for all the active parts. Refer to the document for the target voltages. There will always be some variance, but once you've corrected for any difference in the power supply voltage, typically a discrepancy of more than 0.5V from the listed values would indicate a possible issue.

All of the following troubleshooting instructions assume that the voltages are OK, so make sure this checks out before moving on.

SPECIFIC ISSUES

The LED doesn't light up.

If the LED doesn't light up, first check to see if the pedal sounds right. If you aren't getting any sound, you probably have a power issue with the whole circuit that is not specific to the LED, so you'll want to look elsewhere for the problem instead of focusing on the LED.

If the pedal does pass a signal, it's probably just the LED itself. Is the flat side facing away from the footswitch? If it's reversed, it won't work and you'll have to re-solder it the right way.

If the LED is correct, and the circuit is otherwise getting the correct power, then it's possible that the LEDR resistor is soldered incorrectly or is the wrong value, e.g. 100k instead of 10k. It is also possible that the LED has burned out, which can happen if the LEDR resistor is shorted or if a very low value was mistakenly used, e.g. 100R instead of 10k. This is very unlikely, but has happened before.

There is no sound in effect mode.

If bypass works OK but you get no sound in effect mode, the first thing to check is that the input and output cables are hooked up correctly. This may seem obvious, but it's easier than you might think, especially if you're testing the pedal upside-down with the lid open.

If that's not it, there is probably a broken connection or a short someplace in the circuit that is cutting off or muting the signal. This can be anywhere in the signal path, but the most common cause is solder bridge on the footswitch board, and we can check for that pretty easily.

1. Unplug the wire assembly on the left side of the PCB, the one with pads labeled IN, GND and +V.
2. Using a digital multimeter, touch the black probe to a ground point for the circuit. The easiest spot is inside a tapped screw hole in one of the corners of the enclosure. As long as the I/O jack module is attached to the enclosure, the enclosure itself will share the ground with the main circuit.
3. Set the multimeter to continuity test mode. This is typically the lowest resistance setting where it beeps if resistance is near zero. Set the pedal to effect mode with the LED illuminated.
4. Touch the multimeter's red probe to the center-left pad of the footswitch.

If you register continuity (near zero resistance, often with a beep sound) then you have a short between two pads of the footswitch. This can happen if too much solder is used or if the solder wire is fed to the joint too quickly.

If the short is not visible on the top side, then it's on the underside and will be extremely difficult to get to. If this is the case, and you can't get to it from the bottom, you can contact us for a replacement footswitch assembly for your kit, which is $12 plus shipping.

If the multimeter does not show continuity, then the issue is probably later in the circuit, likely on the main board, and you will need to follow the general troubleshooting procedure later in the document.

There is no sound in bypass mode.

If you have the opposite problem—the effect mode works but bypass mode does not—then it's the same root cause as the previous section, but isolated to a very specific location: the bottom-center and bottom-right pads of the footswitch are bridged. The solution is the same, though: if you can't get it cleared, you will need to contact us for a replacement footswitch assembly.

The components don't measure the correct value.

It is not necessary to measure the components before assembling the kits. However, some people do it out of an abundance of caution.

Many times we've gotten reports of components that test out of spec or non-functional, but in all but two or three confirmed cases (out of many dozens of reports over several years) the testing equipment or methodology has been in error, not the components. We source only top-quality, high-reliability components with an extremely low failure rate. But without the right test procedure, it's much more likely you'll detect false positives.

Nearly every case of reported component failure falls into one of these categories:

- **Improper measurement procedure**, such as measuring the components in-circuit. Components will never measure the correct value if they are connected to other components with any path to the power or ground rails. For resistors, capacitors and diodes, at least one leg must be lifted in order to get a correct measurement.
- **Low-quality test equipment**, such as a $30 automatic transistor tester from Amazon. We've seen cases where these cheap testers misidentify components and try to measure a JFET as a standard BJT transistor or vice versa. In addition, many low-end multimeters have trouble accurately measuring low-value capacitors in particular, and older high-end multimeters may be out of spec in a variety of ways if they haven't ever been recalibrated.
- **Damage from elsewhere**, such as after desoldering from the PCB. Without the right experience and equipment, it's difficult to desolder components from double-layered PCBs without damaging them. Because of this, it's possible that you will end up causing damage in the process of looking for it.
- **Non-repeatable results**, such as a component measuring wrong on one multimeter but not another.
- **Improbable coincidence**, such as two identical components measuring wrong in the same way.

In each of these cases, it's of course possible that the component could be bad—but it's exponentially more likely that it's something else. On some occassions we've had customers send us the components they believe are bad and found that they tested just fine. Or, we've tested replacement components before sending them to verify they were within spec and then the customer got the same test result with the replacement components.

We use Peak Atlas products for all of our component analysis and measurement: the LCR45 for passive components and the DCA75 for transistors and JFETs. They are exceptionally high quality and very affordable for what they do. If you're the type of person who feels better having measured everything yourself, then you should have these in your toolkit.

GENERAL TROUBLESHOOTING PROCESS

If your problem doesn't fall under one of the specific issues listed above, then you'll need to follow the general troubleshooting process. It covers the high-level things that can go wrong in a circuit, and has more to do with general electronics than with our kits specifically.

Visual inspection

Look closely at the PCB, with magnification if possible. Inspect all of the solder joints for errors. Is every pad properly soldered? Do you notice any solder bridging two adjacent pads that should not be connected? If there are any suspect joints, reflow them by heating the joint and applying a small amount of new solder. For help identifying problems with solder joints, see the diagram in Appendix 1 (page 6).

Check to make sure the ICs are seated properly in the sockets with the correct orientation. If one is inserted the wrong way, it typically won't cause permanent damage, so just remove it and put it back in the right way and see if that fixes it.

Double-check the values of all the components. (This is why we recommend in the build documentation to orient all the components so that the values are visible where possible.) Since the kit only includes the necessary parts, there is something of a built-in failsafe where component mistakes must come in pairs—if you use the wrong value early on, you'll likely notice at the end when you can't find the correct value in the remaining parts. But it's still possible to misread a component label and get two types mixed up.

Signal tracing

Signal tracing is much more involved than other types of troubleshooting, but it also gives a lot more useful information. If the problem is that an audio circuit isn't passing audio, or not passing it correctly, then a signal trace is how you tell exactly where the audio signal stops or becomes malformed.

An audio probe is a tool to allow you to hear the audio signal at any location in the circuit. It's a simple enough tool that there aren't really any off-the-shelf options available, so you'll have to build one yourself, but it's very easy to do and the parts only cost a couple of dollars.

The best one we've found is described on the DIY Fever blog. We prefer the version with a jack socket on the end so that you can use a standard instrument cable of any length, which is much more convenient than other types where the probe is integrated directly into the end of a cable.

Using an audio probe does require some knowledge of schematics so you can identify the audio path of the circuit. Many components do not carry any audio, so random probing usually won't tell you very much. We've included an example schematic in Appendix 2 (page 7) where we've highlighted the signal path of a Tube Screamer circuit so you can get a general idea of what you're looking for.

Plug the audio probe into an amplifier. (Keep the volume low, because some of the points of the circuit can be extremely loud.) Then, referencing the schematic, start at the beginning of the audio path and test each connection in sequence from input to output, listening for the point in the circuit where the issue starts to occur.

Signal can still be found in other places on the PCB, but this is the main path that the audio travels from input to output, and any critical issues will be audible along this path. If it stops at any point, then you'll want to focus your efforts in that part of the circuit.

GENERAL TROUBLESHOOTING PROCESS, CONT.

Note that some components have multiple functions. For example, a dual op-amp such as the TL072 might have three pins that are used near the beginning of the audio path and three pins near the end. This is why it's important to understand the schematic so you know how the individual components make up the circuit.

Reflow

If you've done a full signal trace and isolated the issue to a specific point, but visual inspection and voltage measurement doesn't indicate anything specific, it's recommended to try reflowing all the solder joints in that section of the schematic and the physical PCB. You don't need to suck up any of the solder beforehand—just heat up the joint with your soldering iron while applying a small amount of new solder. The flux in the new solder should cause the existing solder to reflow quickly and effectively.

It's possible for there to be shorts that are invisible to the naked eye, or cold solder joints that do not actually make electrical contact with the component being soldered. A reflow will help clear up these type of issues that are otherwise very difficult to detect on their own.

Along with this, we should mention that on more than one occasion, we've been troubleshooting a non-functional build and tried all of the normal steps without success. As a last resort, we tried reflowing every joint on the PCB and it fixed the issue. However, we wouldn't recommend doing this until you've exhausted every other option. The steps above should at least help you isolate the issue to a specific location inside the circuit, and a full reflow is not only time-consuming but also runs the risk of introducing new issues.

WHERE TO GET HELP

If it still doesn't work, we recommend asking the DIY community for help. The two best places are the DIY Stompboxes forum and the DIY Stompboxes Facebook group. Both communities have thousands of members and they are very accommodating to new builders. The DIY Pedals subreddit is another option if that's more your thing.

When posting a troubleshooting request, always include the following:

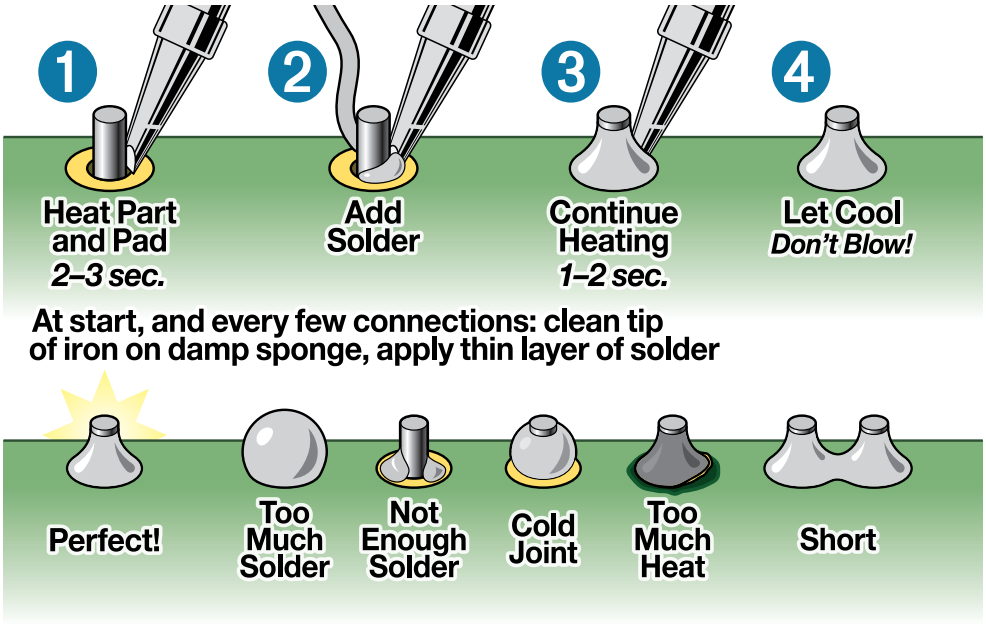
1. A thorough description of the problem you are experiencing
2. A photo of the inside of the pedal
3. A list of all the measured voltages of each of the pins
4. Any other information that you've discovered as a result of the troubleshooting process

It benefits the whole community if the troubleshooting process is public, because then people who have the same issue in the future may come across it when searching.

And if you do get help, remember to pay it forward! The best way to learn new skills is to help others. Even if you've only built one pedal, you have more experience than someone who is brand new, so you have something to offer.

APPENDIX 1: SOLDER TECHNIQUE

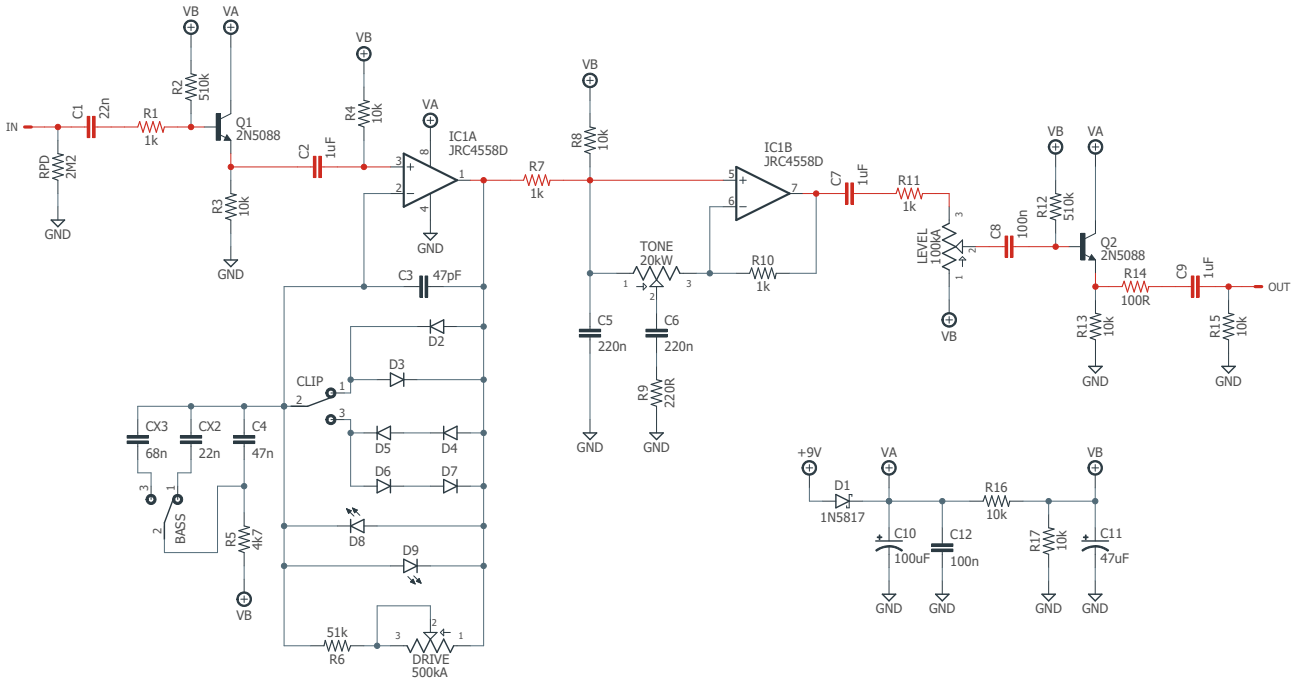
This diagram from Adafruit illustrates proper soldering technique and how to spot a bad solder joint. If you notice anything that looks like one of the improper solder joints from the bottom row, then reflow the pad until it looks right.



If you don't feel like you have it mastered yet, we recommend checking out this video from HackMakeMod, particularly at the 3:53 mark and then again at 9:46. It's by far the best tutorial we've seen on soldering through-hole components, and there's no better way to learn than by seeing someone do it correctly.

APPENDIX 2: IDENTIFYING THE SIGNAL PATH

This schematic shows a Tube Screamer circuit (our Stratus project) with the signal path highlighted in red. This is the main path that the audio signal takes from input to output.



This is a very basic example, and many other circuits have a more complicated audio path. For example, the Klon Centaur and a lot of compressors and modulation effects will have multiple audio paths that split and rejoin later in the circuit.

DOCUMENT REVISIONS

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