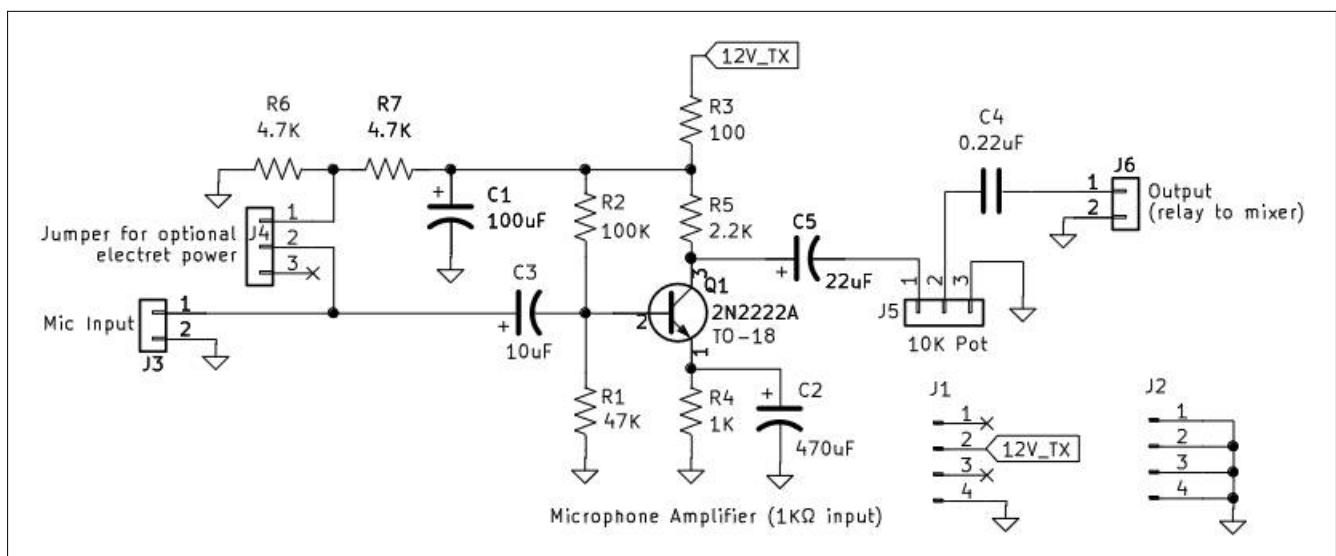


Mostly DIY RF / P3ST Transceiver Kit

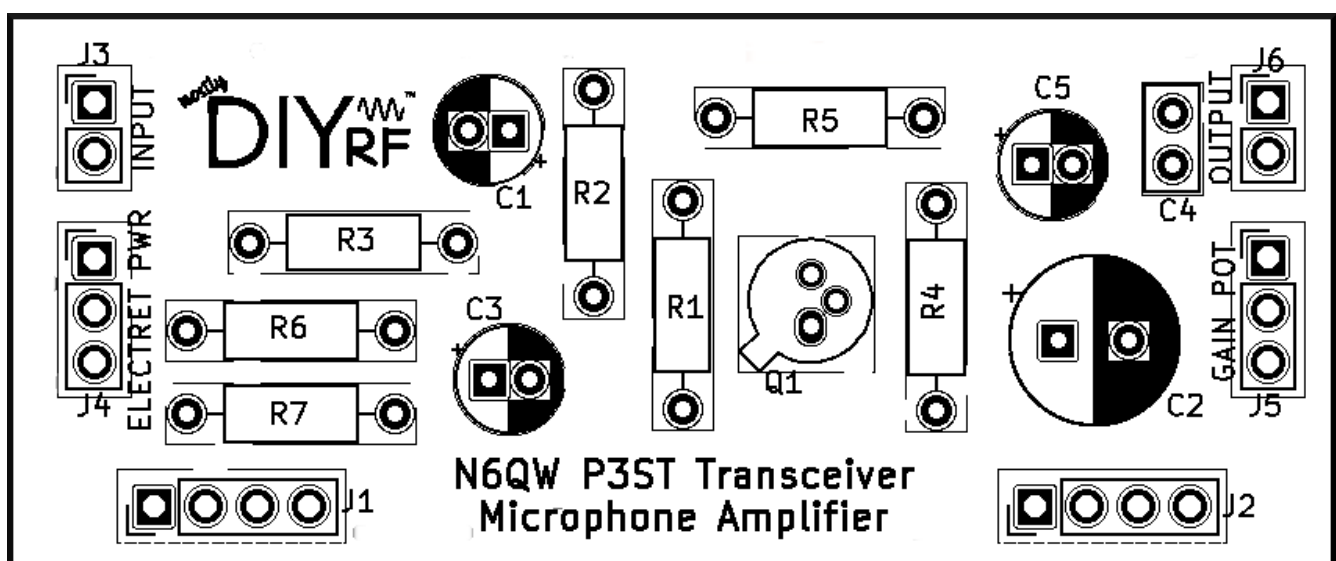
Microphone Amplifier

Assembly and Test Instructions

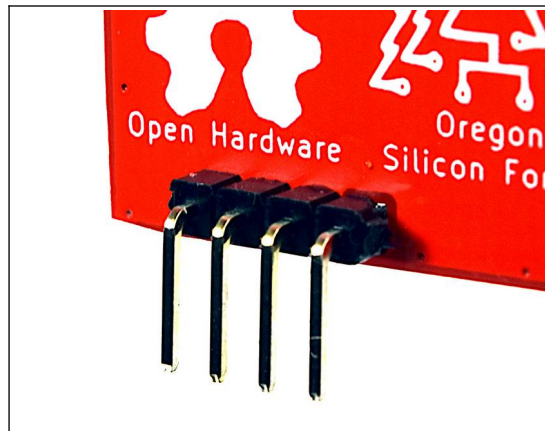
In keeping with the minimal design philosophy employed in the P3ST, the mic amp features a single NPN transistor in common-emitter configuration. It has AC-coupled input and output with the option of applying DC bias for use with an electret mic element. The amplifier's "gain" is controlled via a remote potentiometer (typically installed on the rig's front panel). Like all the P3ST modules, its power and ground connections are made through its 4-pin mounting connectors. The mic-amp power is switched by relay on the motherboard in response to a push-to-talk signal. During receiving, the module is not powered.



Assembly



1. As suggested by **General Tips and Tricks** (see last page), begin installing components (two or three at a time) near the center of the PCB, bending their leads slightly on the underside of the board to hold them until they're soldered. Prior to soldering, though, double-check their values and orientation.
2. As with the 4-pin headers on all the modules, install them with the right-angle pins extending out the back side of the PCB. Also as with all the modules, the input and output pads may be used either to attach board-edge-style SMA connectors or, with the help of the thru-holes in the middle of the pads, directly-soldered connections may be made.

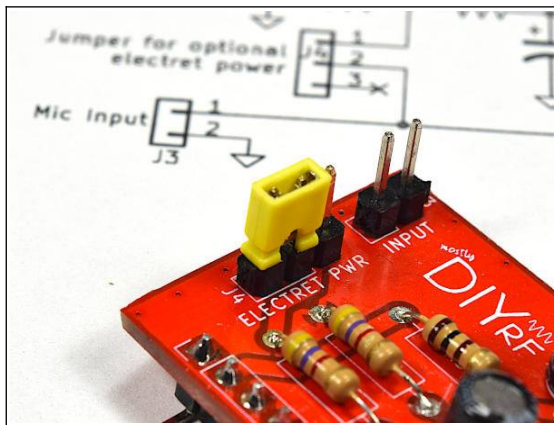


Four-pin right-angle header orientation

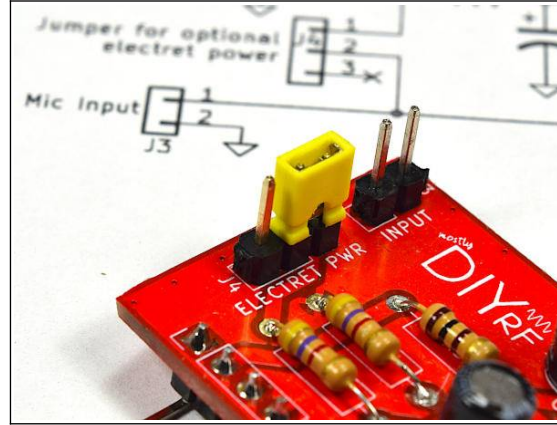
3. When installing the metal-can **2N2222A** transistor, place it so its bottom touches the surface of the PCB. This will allow the top ground-plane of the circuit board to act as a heat sink.
4. To maximize pre-power-up testing opportunities, **do not install R6 at this time.**

Static (Pre-Power-Up) Test Procedure

1. Using magnification, visually inspect both sides of the PCB to look for solder bridging or other conductive debris. It's usually best to clean off flux residue first. Because the power, input, and output pins are closely-spaced, do not use alligator (a.k.a. crocodile) clips for temporary connections. Dupont-style jumper leads, however, are very convenient for this purpose.
2. With the electret-power jumper in the **OFF** position (on the bottom-two pins--see below), connect an ohmmeter to the **+12V input** pin and one to a **GND** pin. After the on-board capacitors charge, the measurement should settle somewhere around **136K Ω** . Anything significantly lower than that means trouble. The three possible culprits could be a leaky or shorted **C1** or **C5**, or a bad (shorted-out) **Q1**. Now engage the electret-power jumper in the **ON** position. There should be no change in the resistance reading. If there is, then **C3** may be bad.



Electret power OFF



Electret power ON

3. Now install **R6** and recheck the resistance across the **+12V** and **GND** pins. After it settles, it should read around **8.8K Ω** .

4. With the electret-power jumper in the **OFF** position, check the resistance across the amp input pins. After it settles, it should read at or near infinity. Now move the jumper to the **ON** position. After settling, it should read near **4.7K Ω** .

5. You must not attempt to power-up the amplifier until you find and correct any problem(s) you found in steps #1 through #4.

Dynamic (Powered-Up) Test Procedure

1. Use a clean and stable power supply (+12 or +13.8V) for all tests. Because there is no reverse-polarity protection at the module level, take extra care when applying power for testing. All of the following tests are with the module powered-up.

2. Read voltage at top of R1. It should be near 3.0V.

3. Read voltage at top of R4. It should be about 0.6V below the reading at R1 (about 2.4V).

4. Ensure there is no DC voltage on any of the gain-pot pins or on the amplifier output.

5. Connect an un-powered electret mic (or just a three-pin electret mic element) to the amp input. Place the electret-power jumper in the **ON** position. Connect the mic-gain pot and adjust to maximum. You can test for proper output in a number of ways.

- a) Use an oscilloscope to observe the signal when speaking or whistling into the mic;
- b) Listen directly to the output with high-impedance headphones;
- c) If you have built the audio-output module first, you can test both by connecting the output of the mic amp to the input of the output amp. Listen on a small speaker or low-impedance headphones.

General Tips and Tricks

■ Save yourself some troubleshooting grief later on: test every part before you install it. Though MDRF uses components only from reputable sources, even those have finite failure rates. Testing is easier than it sounds, and it's quick since you only need to test for part failure.

- Test resistors for continuity and approximate value ($\pm 5\%$)
- Test capacitors for *no* continuity. DC resistance should be infinite or ultra high after they charge up during testing. Note: this may take several seconds since the current an ohmmeter injects is very low.
- Test diodes to ensure no reverse continuity.
- Test transistors for high or infinite collector/drain and emitter/source DC resistance. Use diode test function to test base-emitter junction (base as anode).

■ Double-check component markings and color codes. Pin up a reminder chart nearby. Whether you need it or not, look it over before an assembly session.

■ It's usually easiest to begin stuffing parts in the center of a PCB and work your way out.

■ Insert component leads and bend them about 45 degrees to keep the parts from falling out when you flip the board over to solder on the backside.

■ The PCB holes are "through-plated" (copper plated and solder coated on the insides of the holes) for maximum connectivity and mechanical strength, but this makes rework (removing a part and installing a new one) a little more difficult than with other circuit-board methods. So before soldering, double check the component value and orientation.

■ A good habit is to install components such that they are "right-reading" relative to circuit-board nomenclature. For a resistor, this would mean the color code would read from left to right when the silk-screened legend does. For parts oriented vertically, they should read from top to bottom. For other non-polarized parts (such as ceramic capacitors) it's useful to install so their values can be read at a later time (and not, for instance, obscured by another part).

■ Because the power, input, and output pins are closely-spaced, do not use alligator (a.k.a. crocodile) clips for temporary connections. Dupont-style jumper leads, however, are very convenient for this purpose.