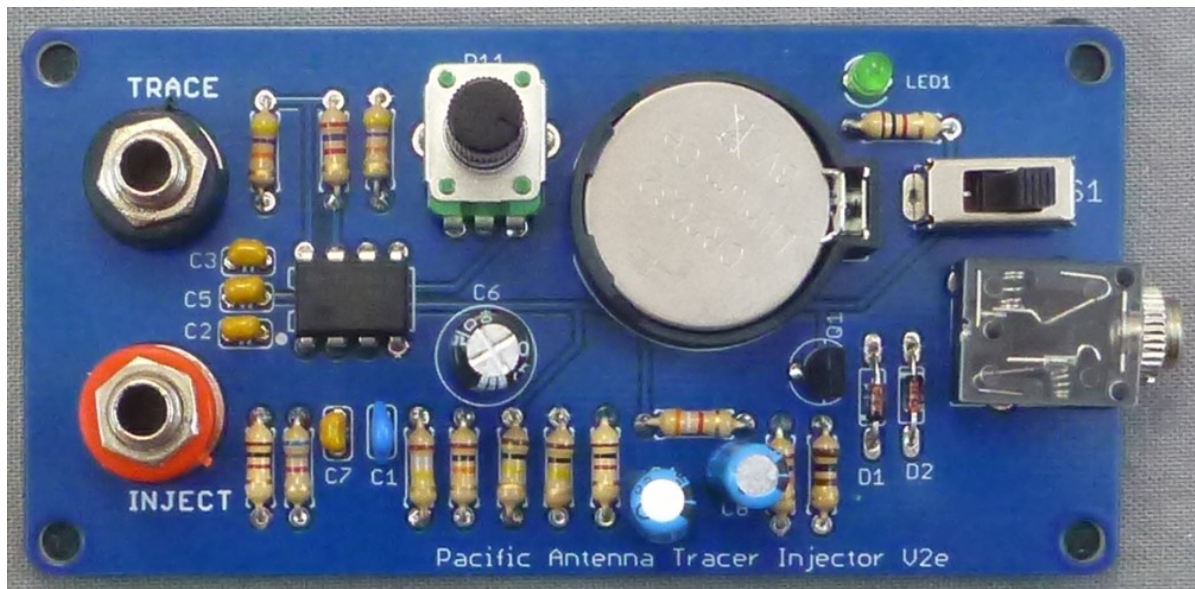


# Pacific Antenna Tracer Injector



## Description

A tracer injector helps determine continuity and map circuit paths by injecting a tone into a circuit and detecting that tone to show connectivity.

Our tracer injector works with resistances far beyond the capability of simple continuity checkers.

It can trace circuits with path resistance greater than 1M Ohm and the detected tone level will increase as resistance decreases.

## Specifications

Integrated signal source and receiver.

Adjustable volume with diode limiter to protect from strong signals.

Tests continuity of circuits, components and cables..

Test circuits with resistance from zero to greater than 1M Ohm.

Detected audio level drops as circuit resistance increases giving audible feedback.

Complete with all components and a set of standard test leads.

Detailed instructions and all through hole components.

Circuit board size: 1.8 x 3.5 Inches (45 x 75 mm)

Powered by one 2032 coin cell battery. (included).

## Recommended Tools

- Temperature Controlled Soldering Station with small tip
- Solder, 60/40 or 63/37 Tin-Lead recommended
- Small Diagonal Cutters
- Small Needle Nose Pliers
- Pencil, Pen, and/or Highlighter
- BRIGHT work light with magnifier
- Meter to measure current and resistance (typical DMM will be ok)
- Frequency counter
- Oscilloscope

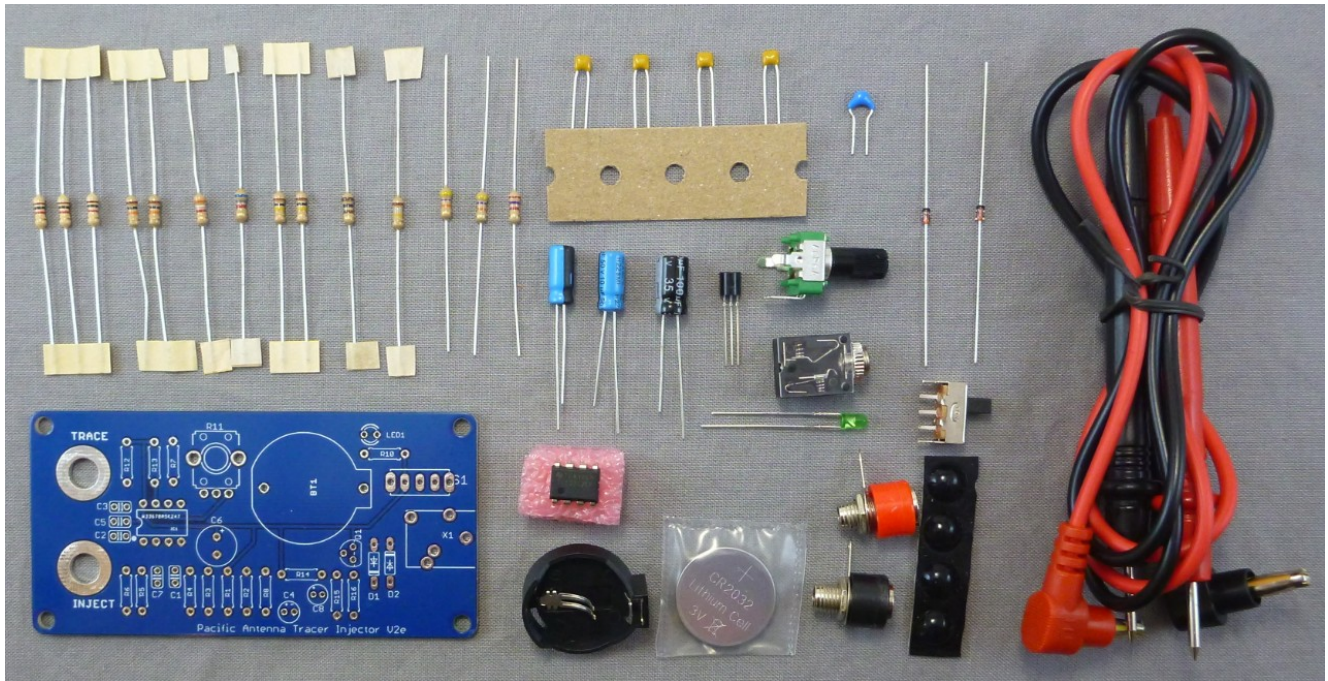
## Optional

- Solder Sucker or Solder Wick
- Knife or Wire Stripper
- Cookie Sheet to build in and keep parts from jumping onto the floor.
- Circuit board stand
- Oscilloscope
- Frequency Counter

## Construction Techniques

- During the build you may find it helpful to print the manual for reference.
- The Parts List has columns for inventory and construction.
  - Use the first column to check the parts as you inventory them.
  - Use the second column to check the parts as you install them.
- Please take time to inventory the parts before starting. Report any shortages to QRPKITS.com for a replacement.
- Pre-sorting and identifying components will speed up the assembly and reduce mistakes.
- If you are a beginner, new to soldering, there are a number of resources on the web to help you get on the right track soldering like a pro. Google Soldering Techniques.
- Use a Temperature Controlled Soldering Station with small tip. Conical or very small screw driver tips are best.
- You can insert several parts at a time onto the board. When you insert a part bend the leads slightly to hold the part in place until it is soldered
- Double check that the parts are in the correct locations then flip the board over and solder all at the same time.
- After soldering, clip the leads close to the board
- Most parts should be mounted as close to the board as possible. Transistors should be mounted about 1/8" above the board.
- Solder one lead on ICs or IC sockets and then check to make sure the component is seated and flush then solder a lead on the opposite end and recheck before soldering the remaining leads.  
If the package is not seated on the board, apply gentle pressure to the IC or socket and heat the lead on the end(s) not seated to the board

## Typical Parts



**Note:** Parts in this photo are representative and may occasionally vary due to supplier and design changes so always verify the part value and type before soldering in place.

## Parts List

Check	Install	Quantity	Part	Value	Description
		1	R16	100 Ohm	1/4W 5% BRN-BLK-BRN-GLD
		3	R6, R8, R10	1K Ohm	1/4W 5% BRN-BLK-RED-GLD
		1	R13	2.7K	1/4W 5 % RED-VIO-RED-GLD
		1	R14	3.9K	1/4W 5% ORN-WHT-RED-GLD
		1	R5	6.8K	1/4W 5% BLU-GRY-RED-GLD
		2	R3, R15	10K	1/4W 5% BRN-BLK-ORN-GLD
		2	R7, R12	47K	1/4W 5% YEL-VIO-ORN-GLD
		2	R1, R2	100K	1/4W 5% BRN-BLK-YEL-GLD
		1	R4	180K	1/4W 5% BRN-GRY-YEL-GLD
		1	R11	100K Pot	A100K Vertical Pot
		1	C1	0.001uF	0.001uF Monolythic capacitor marked 102
		4	C2, C3,C5, C7	0.1uF	0.1uF Monolythic capacitor marked 104
		2	C4, C8	10uF	10uF Electrolytic 16V or higher rating
		1	C6	100uF	100uF Electrolytic 6V or higher rating
		2	D1, D2	1N4148	1N4148 diodes, small glass body
		1	U1	TLC27L2	Op-Amp, 8 pin DIP Labeled TLC27L2CP
		1	Q2	2N3904	Q2 2N3904 Transistor in a T0-92 package
		1	LED1	3mm Green	LED 3 mm, green body
		1	S1	SPDT	SPDT Slide Switch
		1	J1 Phone Jack	3.5mm	Stereo Audio Jack 3.5 mm, 5 pin
		1	Board	PCB	PCB Tracer injector, V2
		1	J1	Red	Through-hole Banana Jack, Red
		1	J2	Black	Through-hole Banana Jack, Black
		1	Probes	Probe Set	Red and Black Test lead set
		1	BT1		Battery holder for 2032 battery
		1	Battery		2032 coin cell battery
		4	Rubber Feet		Rubber feet

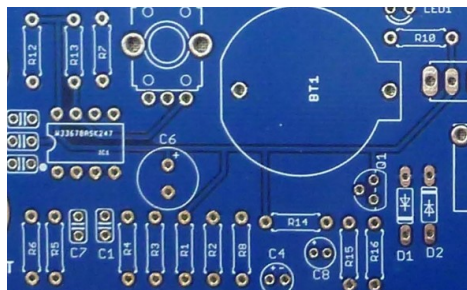
## Assembly

### Resistors

There are a number of resistors in this kit.

Be sure to double check the location and value of each before soldering.

The parts table includes a color code for each value but, it is always a good idea to verify the value with a multi-meter if there is any doubt.



Bend the leads down at each end of the resistor to fit the board holes.

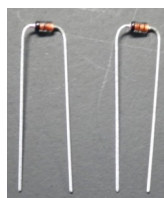
Insert into the board, solder one lead and recheck that the resistor is seated to the board.

If not, reheat the soldered pad and re-seat the resistor before soldering the second lead.

### Diodes:

Install Diodes D1 and D2 in the locations shown on the board.

These are glass packaged diodes with a band on one end that should match the board outline.



Carefully bend the leads as shown, insert into the board and bend the leads on the back to secure in place before soldering.

Double check that the dark band on the diode body is aligned with the white band on the circuit board layout before soldering.

### LED:

Install the power indicator LED in the board location labeled LED1.

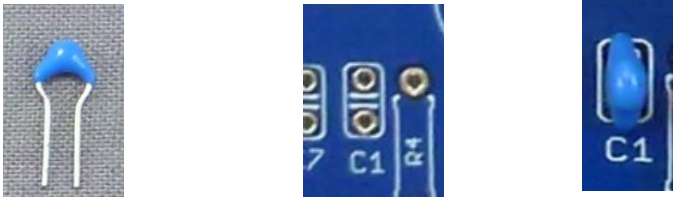
Note that one lead is longer than the other. The shorter lead goes to the pad on the flat side of the layout. This is the side adjacent to the "LED1" label.



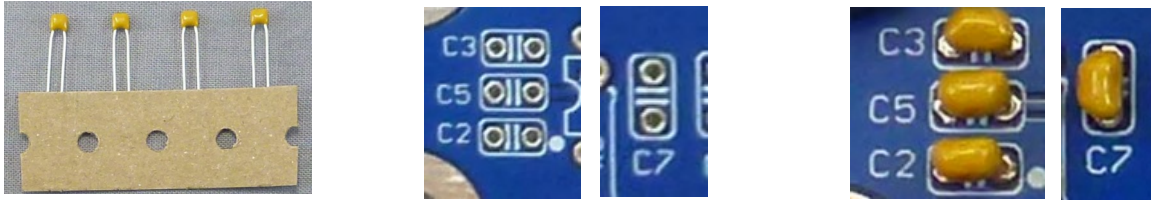
Also, to confirm the LED is inserted correctly, if you look closely at the LED body, the side with the short lead also has a small flat area at the base.

## Capacitors:

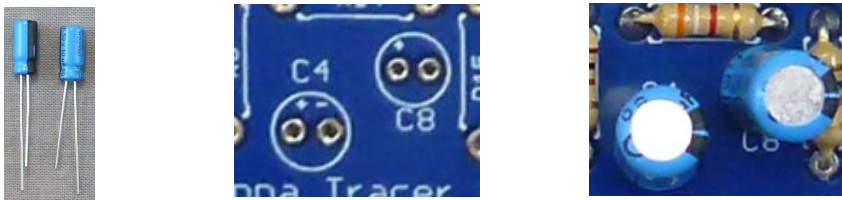
Locate and install the 0.001uF, (1000pF, labeled 102) capacitor in the location marked C1.



Locate and install the 0.1uF capacitors marked 104 in locations C2, C3, C5 and C7.



Next, install the 10uF electrolytic capacitors in locations C4 and C8



Note that there is a + symbol on the layout.

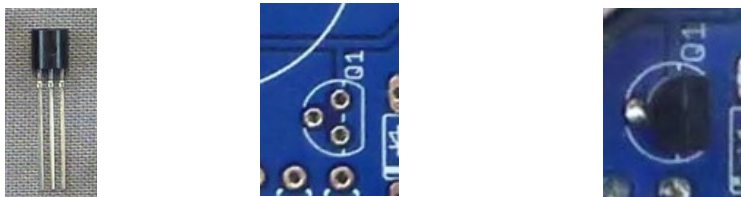
This is the pad for the longer lead on the capacitor. Usually, the – lead is labeled on the capacitor body as well

Now, install the 100uF electrolytic capacitor in location C6



## Transistor

Install the 2N3904 transistor in the location marked Q1 on the circuit board.



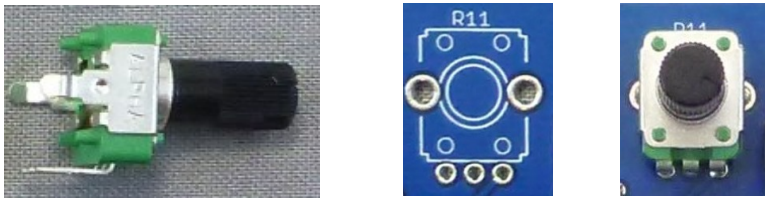
The outline of the package on the board should be used as a guide to orient the transistor.

Match the flat side and place the leads in the holes, bending the center lead back a bit to fit the middle (offset) hole location.

The transistor package does not seat fully to board but sits a bit above.

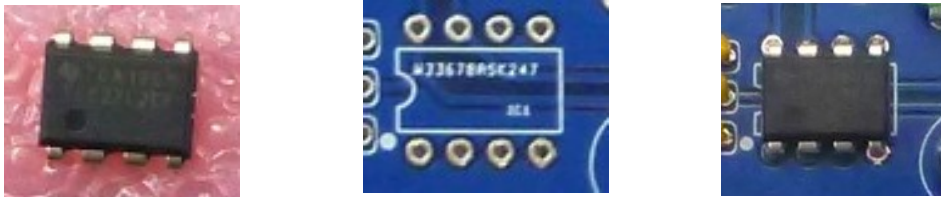
## Potentiometer

Locate and install the 100K potentiometer in the location marked R11.



## IC

Locate and insert the 8 pin opamp IC1 into the marked location on the circuit board taking care to align the end with the dot and/or notch to the layout on the board.



Note that you may need to form the leads on the IC to align with the board holes.

Double check that all leads are fitting into the board and that no leads are folded out or under the IC.

Solder one lead and recheck that the IC is seated in the board. If not, adjust.

When seated, solder the remaining leads.

## Power Switch

Install the power switch S1 into the location on the circuit board.



Solder one lead and if needed, reheat the solder on that pin and adjust so that the switch sits straight on the board.

## Banana Jacks

The banana jacks are installed upside down from how they are typically used.

Remove the nut, solder tab and pull the center metal jack from the plastic housing. The solder tab is not used.

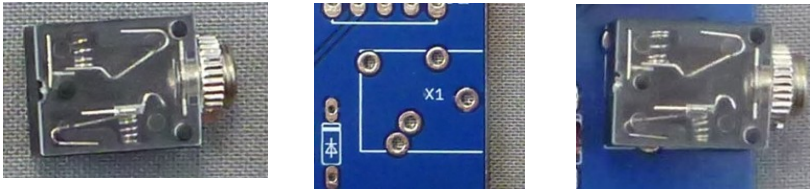
Insert the metal jack through the board from the bottom side, placing the plastic housing and nut on it.



Tighten the nut gently with pliers or a small wrench just enough to hold the jack in place.

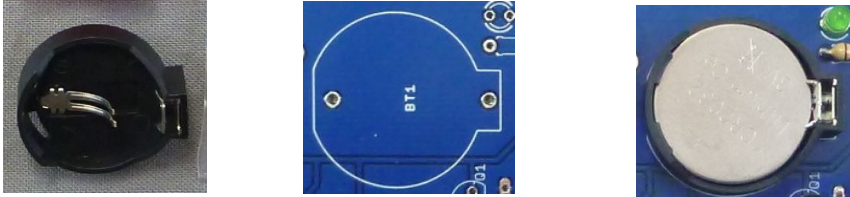
## Audio Jack

Install the 3.5mm audio jack in the location marked J1 on the board.



## Battery Holder

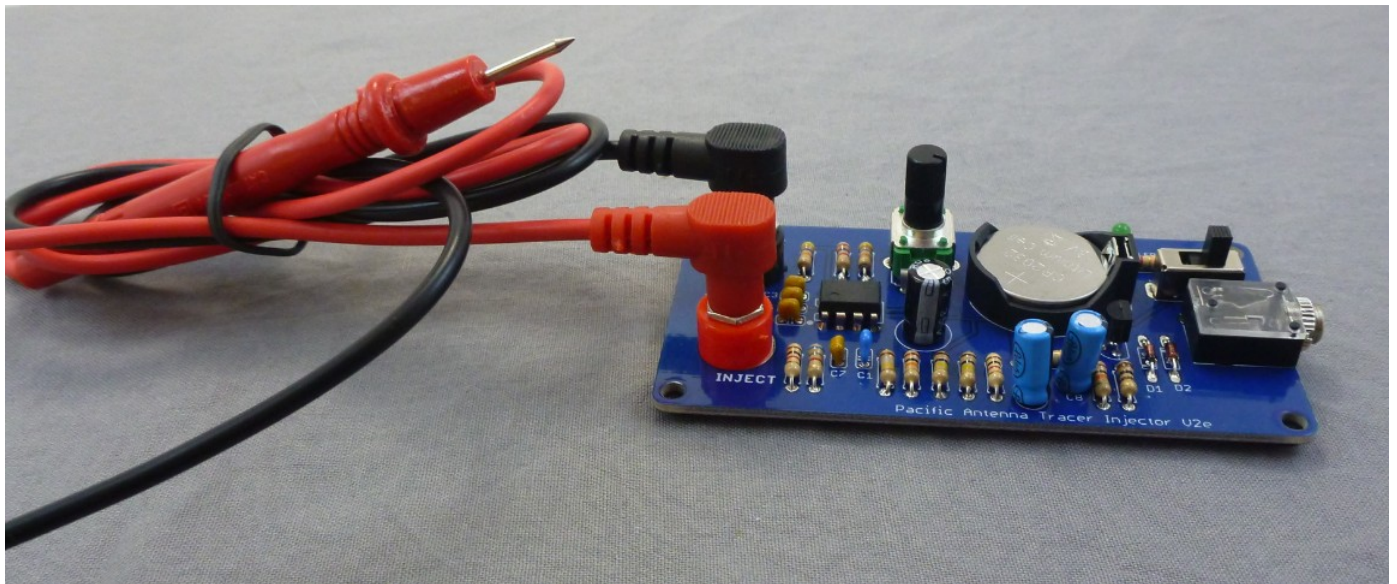
Install the battery holder in the location marked BT1 on the board.



## Completing the Assembly

If the board is not to be placed in a case, we recommend installing the included rubber feet on the bottom of the board to help avoid shorts and damage to the circuit board or tabletop.

**Congratulations!**  
**This completes assembly of your Tracer Injector Kit**



## Checkout

Inspect the board for correct component installation.

Inspect the solder pad side for missed solder joints, or other bad solder joints and shorts and resolder if needed.

Install the included 2032 battery in the battery holder, observing correct polarity.

Turn on the switch S1 and observe that the LED glows.

If not, recheck the battery installation and solder connections and the LED orientation.

The LED has a slightly flat side on the short lead side and the flat should be on the same side as the square pad.

Plug a set of stereo headphones or amplified speaker into the audio Jack X1.

Plug in the supplied test leads and turn on the power switch S1.

By varying the volume control, R11, you can vary the level of the detected signal.

Note: at higher volume settings, it is normal to hear a bit of leak through of the trace signal.

The volume will increase significantly when detecting the signal directly through a circuit however.

Touch the tips of the test leads together and you should hear a tone or significant increase in volume of the background tone depending on the setting of the volume control.

If any tests fail, inspect all solder joints and component locations for problems.

Contact Pacific Antenna at the email below if you have any questions or problems with your kit.

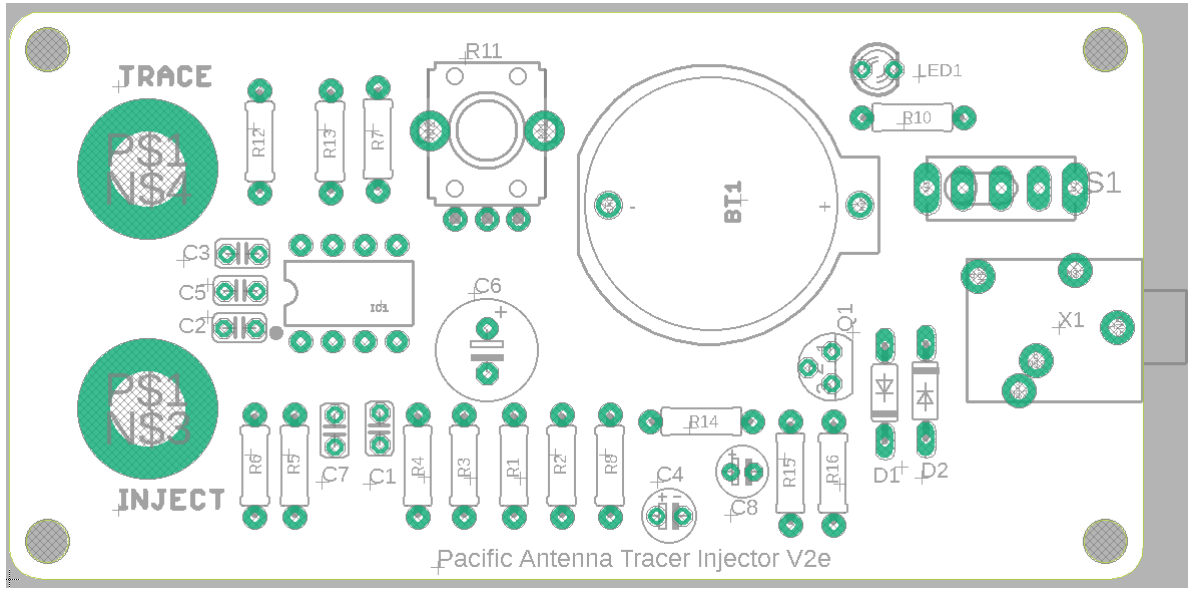
**Thank you for purchasing our Tracer Injector Kit!**

**Support: [qrpkits.com@gmail.com](mailto:qrpkits.com@gmail.com)**

**Note:** The Power switch should be switched to off to prevent battery drain when not in use.



# Board Layout



# Schematic

