

I. Introduction.

Thank you for purchasing the Scotty's Sled Shed Component Kit for EICO 150 Signal Tracer.

This kit was developed to reduce the frustration of trying to source replacement components that sometimes are not available from one location. Forcing the customer to purchase a single component from a source where the shipping costs more than the component.

There are multiple obsolete components that require substitution to bring the EICO 150 back to specs.

The original GE transistors are NLA (no longer available). Suitable substitutions are included in this kit in case you need them.

NOTE: There are **two circuit board versions** known at the time of this document. Both versions used the exact same components and are labeled the same: D1 in Version 1 (V1) is D1 in Version 2 (V2). Early version has the power supply capacitors mounted underneath going to terminal strips. Later version all components mount to the circuit board.

Before you get started there is a list of items to be aware of.

1. Due to constant supply chain challenges, Scotty's Sled Shed reserves the right to substitute component OEMs. If there is an orange bodied resistor in installation guide images and you receive a blue bodied resistor, it is due to component substitutions. The OEM component list is 1/2watt for all resistors. There may be a mix of ½ and 1watt resistors in your kit depending on supply chain. If the price was same or less for 1 watt, then we will supply a 1watt resistor.
2. Capacitors may vary between radial and Axial. The attempt will be to include all Axial style capacitors as the leads are long enough to be mounted vertically and horizontally. Both have been tested.
3. Note the transistor pin outs in the guide for proper installation.
4. Scotty's Sled Shed LLC is only providing you with components for a DIY installation.
5. The following instructions are only a guide and may contain some errors. Experienced users may have a preferred method of installation.
6. **CAUTION: Lethal voltages are present in these devices.** If you are not aware of that by now, you should NOT be performing this upgrade.
7. Scotty's Sled Shed LLC is NOT liable for any damage caused to your equipment, bench, house, Power supply or that your wife is mad at you for working on this 40-year-old piece of equipment. You are ON YOUR OWN.
8. Customer assumes all responsibilities and agrees to check all resistances, capacitance, and voltages before and after installation.
9. Customer assumes all responsibility to know how to read a schematic and perform the task this kit requires.
10. Customer assumes all responsibility to SAFELY perform procedures following the EICO 150 Owner's Manual.
11. You get the point; you are responsible for yourself.
12. Please be sure to download the manual if you do not have it. They are readily available online at: <https://bama.edebris.com/manuals/eico/150>

II. Component list:

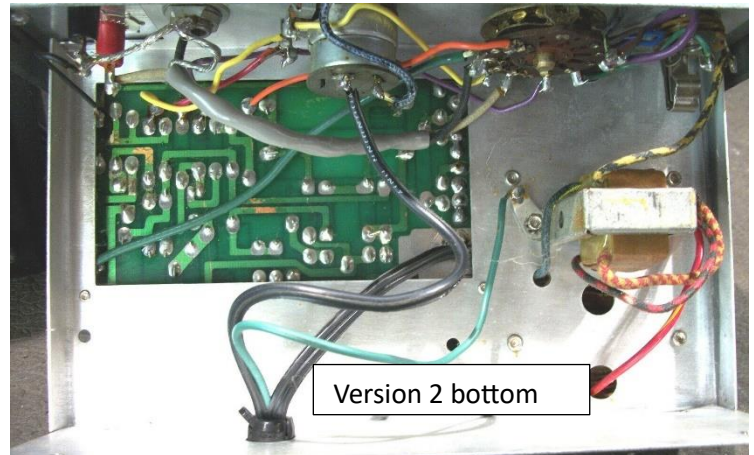
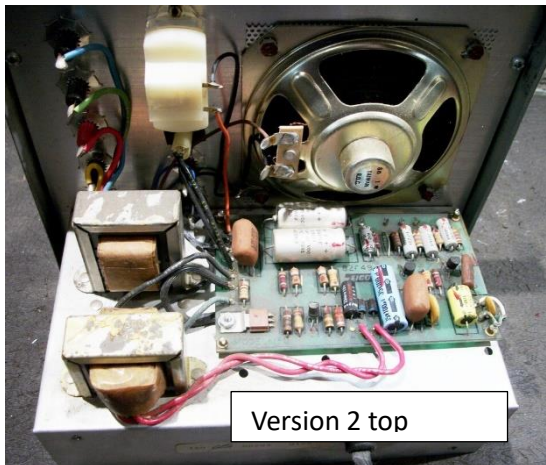
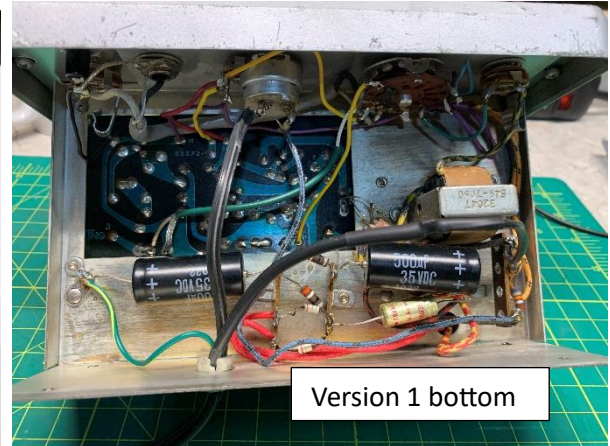
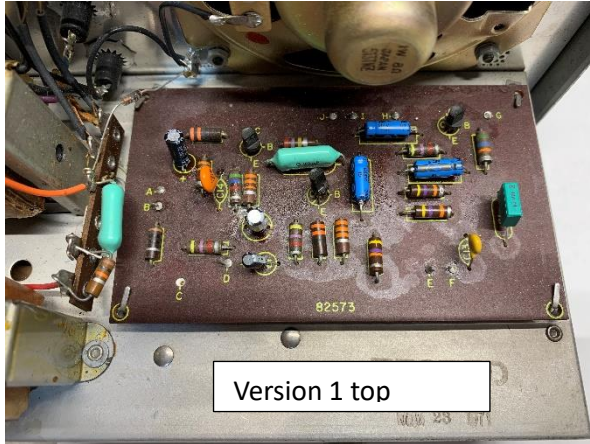
Component list will be as follows below:

QTY 2: 33 ohm ½ watt resistor (R10,14)
QTY 1: 10k ohm ½ watt resistor (R17)
QTY 1: 1.0M ohm ½ watt resistor (R1)
QTY 1: 270k ohm ½ watt resistor (R12)
QTY 1: 3.3k ohm ½ watt resistor (R15)
QTY 1: 68k ohm ½ watt resistor (R21)
QTY 1: 56k ohm ½ watt resistor (R3)
QTY 1: 33k ohm ½ watt resistor (R13)
QTY 4: 47k ohm ½ watt resistor (R2,4,7,8)
QTY 3: 4.7k ohm ½ watt resistor (R5, 11,18)
QTY 1: 5.6k ohm ½ watt resistor (R9)
QTY 1: 10 ohm ½ watt resistor (R16)
QTY 2: 39 ohm ½ watt resistor (R19,20)
QTY 1: 1200pF 1kv ceramic disc capacitor (C14)
QTY 1: 25pf 1kv ceramic disc capacitor (C13)
QTY 2: 0.22uF 400V film capacitor (C6, C8)
QTY 1: 0.01uF 630V film capacitor (C1)
QTY 3: 1uf 50v electrolytic capacitor (C2, C3, C4)
QTY 2: 500uF 50V electrolytic capacitor (C10, C11)
QTY 1: 10uF 35V electrolytic capacitor (C5)
QTY 1: 100uF 50v electrolytic capacitor (C12)
QTY 1: 100uF 25v electrolytic capacitor (C9)
QTY 1: 22uF (or 25uF) 35V electrolytic capacitor (C7)
QTY 2: 1N34A diode (crystal diode-probe) (D3, D4)
QTY 2: 1n4004 Rectifier Diode (D1, D2)
QTY 2: 2n3391A transistor (Q1, Q2)
QTY 1: 2n3906 transistor (Q3)
QTY 1: NTE 152 Transistor (Q4)

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III. Board Versions.

Please see the below pictures for the two different versions of the circuit board.
All the components are the same value and same number, it is just the difference where they are installed.



IV. Installation

This kit includes all the necessary components to replace every resistor, capacitor, diode, and transistor. You may not need to replace all the components. It is highly recommended to replace, at minimum, all electrolytic capacitors.

Locate electrolytic capacitors.

- a. On Version 1 there are three capacitors installed on the bottom side.
- b. Note the orientation of the + and – leads of each capacitor.
- c. C10, C11, C12 all have positive leads going to chassis ground. Those are the main power supply capacitors.
- d. C7 and C9 also have + side connected to chassis ground.
- e. On Version 2 all components mount on the top side of the board.
- f. Version 1 you can access all the solder joints without removing the board.
- g. Version 2, you will need to desolder the 4 corner posts to lift the board up to access solder joints.



Replace electrolytic capacitors.

Depending on your technique and experience, replace the electrolytic capacitors, one at a time.

I find it easier to cut the leads off at the mounting location, leaving just enough to grab with a set of hemostats.

- a. Remove capacitor.
- b. Desolder the joint and remove old lead.
- c. Install new capacitor (note the polarity orientation).
- d. Double check your work and ensure the solder joint is secure.

Replacing non polarized capacitors (optional).

You are provided replacement capacitors and encourage you to replace the capacitors now to ensure a long life of your signal tracer.

- a. If you prefer, mark the foil side of the film capacitor to orientate same as original (several YouTube videos about finding the foil side of a film capacitor).
- b. Desolder the joint and remove the old capacitor.
- c. Install new capacitor and double check your work.

Replacing rectifier Diodes.

The rectifier diodes are positioned so the cathode side faces the transformer.

- a. Note orientation of the D1 and D2.
- b. On version 2 the orientation of the diode is marked. You will need to lift the board to access the solder joints.
- c. On version 1, D1 and D2 are mounted on the underside of the chassis and connect the anodes to the (-) side of C12.
- d. Remove D1 and D2 and replace with the new 1N4004 rectifier diodes.
- e. D3 is the Germanium diode in the probe.
- f. D4 is the Germanium diode on the top left board in Version 2 and on top left above the board on Version 1.
- g. Replace D3 and D4 with the 1N34A Xtal diode. Be careful of dwell time with soldering iron. The 1N34A Xtal diode is susceptible to failure with excessive heat.

Replacing resistors

Replacing the resistors is simpler than diodes or capacitors. There is no polarity, therefore can be installed in both orientations. Resistors can be damaged by excessive heat.

- a. Remove failed resistor.
- b. Verify the value of the new resistor out of circuit with multi-meter before installing.
- c. 1M ohm resistors on a DMM may show less than 1M ohm due to the impedance of the DMM.
- d. Install and solder the new resistor.
- e. Verify the value of resistor post installation.

Replacing transistors.

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Note the orientation of the Emitter Base and Collector for each transistor below.

For **Q1 and Q 2** the orientation is E-C-B for the replacement 2N3391A. No change from original.


For **Q3** the orientation is E-B-C for the replacement 2N3906. No change from original.

For **Q4** the orientation is B-C-E for the replacement NTE152. Original GED28A9 was E-B-C

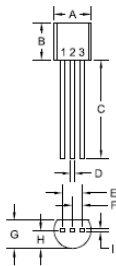
Replacement of Q1, Q2, Q3 is simple replacement. The Emitter, Base and Collector are marked E B C on the circuit board.

2N3391A
2N3392
2N3393

SILICON
NPN TRANSISTORS



TO-92 CASE - MECHANICAL OUTLINE



SYMBOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A (DIA)	0.175	0.205	4.45	5.21
B	0.170	0.210	4.32	5.33
C	0.500	-	12.70	-
D	0.016	0.022	0.41	0.56
E	0.100	-	2.54	-
F	0.050	-	1.27	-
G	0.125	0.165	3.18	4.19
H	0.080	0.105	2.03	2.67
I	0.015	-	0.38	-

TO-92 (REV: R1)

LEAD CODE:
1) Emitter
2) Collector
3) Base

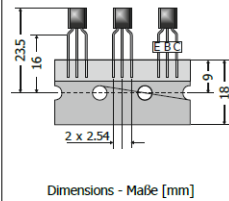
MARKING:
FULL PART NUMBER

2N3906
General Purpose PNP Transistors
Universal-PNP-Transistoren

Version 2017-12-08

$I_C = -200 \text{ mA}$ $V_{CE0} = -40 \text{ V}$
 $h_{FE1} \sim 200$ $P_{tot} = 625 \text{ mW}$
 $T_{jmax} = 150^\circ\text{C}$

TO-92 (10D3)



Dimensions - Maße [mm]

Typical Applications
Signal processing,
Switching, Amplification
Commercial grade ¹⁾

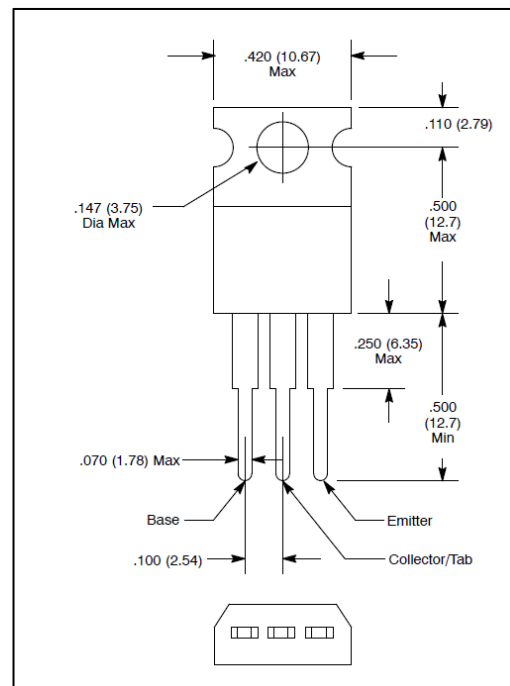
Features
General Purpose
Three current gain groups
Compliant to RoHS, REACH,
Conflict Minerals ¹⁾

Mechanical Data ¹⁾
Taped in ammo pack
(Raster 2.54) 4000
Weight approx. 0.18 g
Case material UL 94V-0 Gehäusematerial
Solder & assembly conditions 260°C/10s Löt- und Einbaubedingungen
MSL N/A

Typische Anwendungen
Signalverarbeitung,
Schalten, Verstärken
Standardausführung ¹⁾

Besonderheiten
Universell anwendbar
Drei Stromverstärkungsklassen
Konform zu RoHS, REACH,
Konfliktmineralien ¹⁾

Mechanische Daten ¹⁾
Gegurtet in Ammo-Pack
(Raster 2.54)
Gewicht ca.



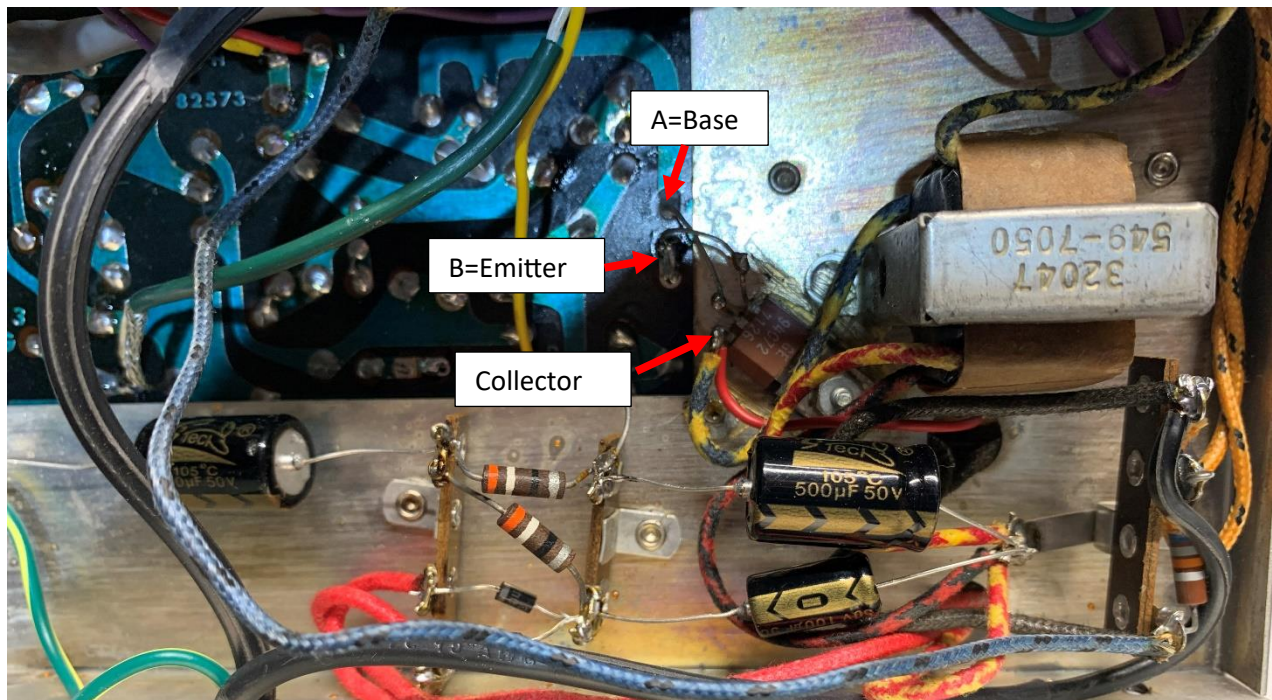
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If replacing Q4 with the NTE152, please note the specific instructions below. The circuit configuration is the same for Version 1 and Version 2 boards. The mounting locations are different. The Collector connects to R17, The Base connects to Collector of Q3, and the Emitter connects to R16.

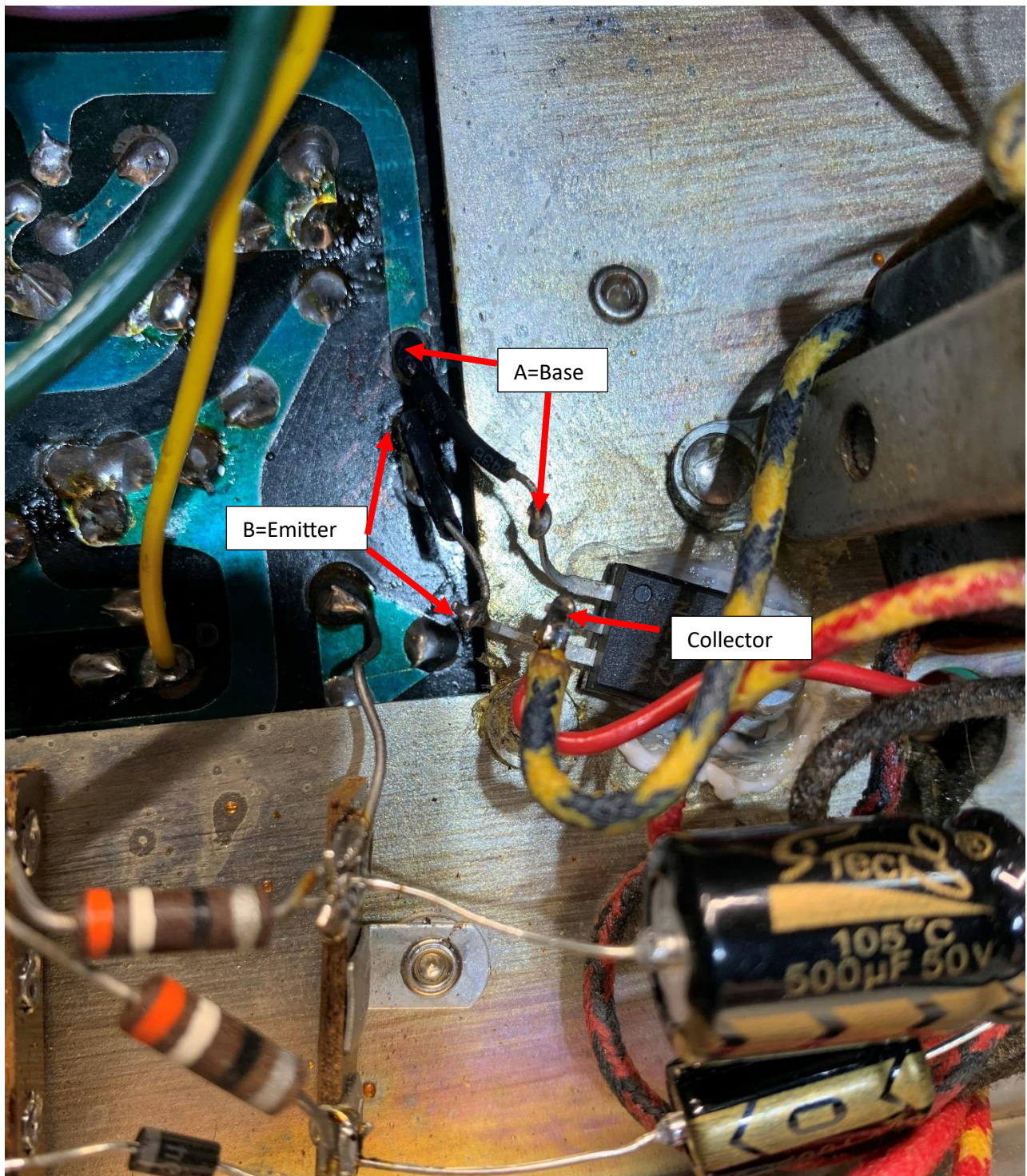
Note: Collector is common with the mounting Tab. DO NOT CONNECT TAB TO GROUND! You will need to use the insulators that come with the transistor.

Version 1 Q4 Replacement:

1. Locate the transistor on the bottom side of the chassis near the transformer T2.
2. Note that on the circuit board there are leads from A and B to the Base and Emitter of Q4, respectively. (A=Base, B=Emitter). The Collector will be tied to a lead from the transformer and a wire that leads to R17 on the main board.



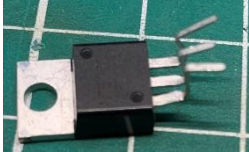
3. To replace the transistor, unsolder the leads to the Emitter Base and Collector.
4. Remove the nut, nut washer, bolt, bolt washer and insulator plate (save the hardware).
5. Clean the surface, add heatsink compound to the insulator and transistor and bolt in place.
6. Before continuing, use your multi meter to ensure the Collector is not shorted to the chassis.
7. Solder the wires from T2 and wire to R17 to the Collector of the new Q4 NTE152 transistor.
8. Install some tubing (optional) and solder jumper from point A to the Base of Q4 NTE152.
9. Install some tubing (optional) and solder jumper from point B to the Emitter of Q4 NTE152.



Version 2 Q4 Replacement.

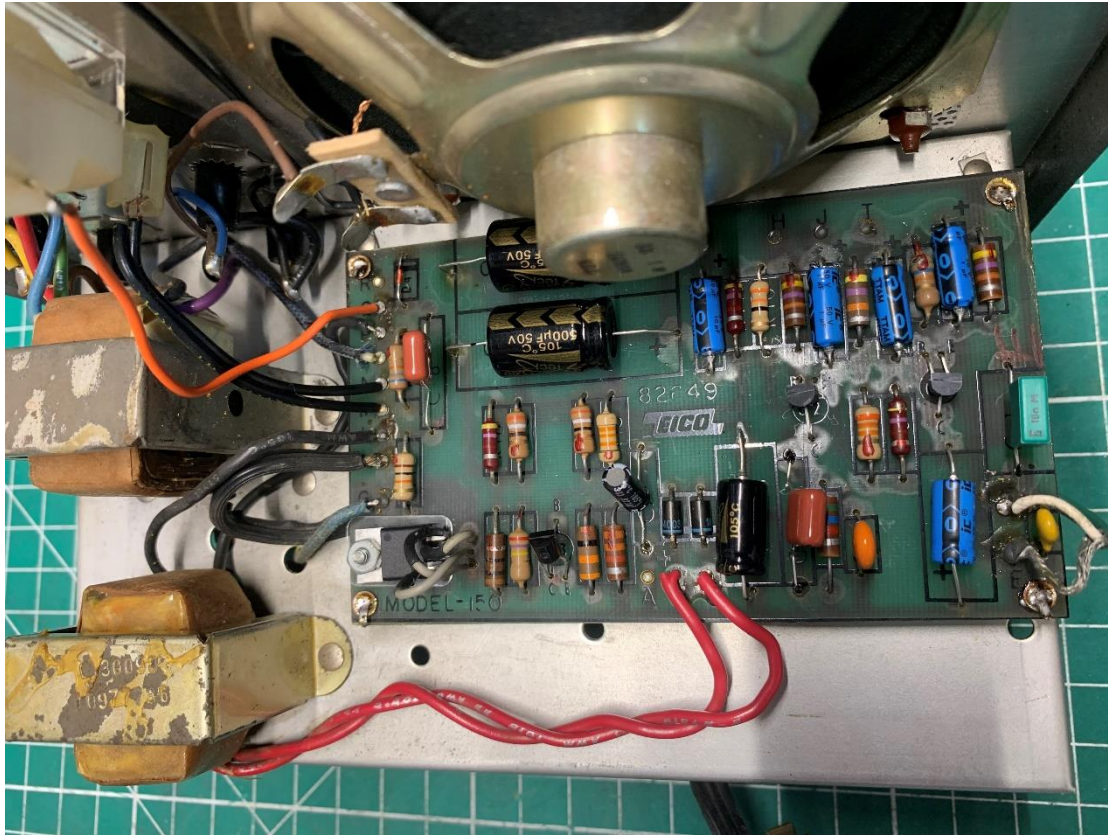
You will still need to be able to access the underside of the board to replace Q4 so hopefully you have not resoldered the board corner mounts.

1. Desolder the connections of the transistor to the board.
2. Remove the nut, washer, bolt, and insulators.
3. Remove the transistor.
4. On the NTE152 bend the legs up into a "crouch position".



5. Add solder to each leg to make connections easier.
6. Strip off 3 pieces of 1 ½ -2" of solid stranded wire (CAT 5 wire works too).
7. Strip insulator off about 1/8-1/4" from each end.
8. Solder one end of each wire to each leg of Q4 NTE152
9. Add insulator tubing if desired over solder leg connection.
10. Insert the jumper wires from the Base of NTE152 to the hole marked B on the board.
11. Insert the jumper wire from the Collector of NTE152 to the hole marked C on the board.
12. Insert the jumper wire from the Emitter of NTE152 to the hole marked E on the board.
13. Use multi meter to ensure the Tab of the NTE152 is not shorted to ground. Reinstall insulators if tab is grounded.
14. Solder the leads to the board.
15. Double check your work.
16. Triple check your work.
17. The final installation should look like the following image.

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Final installation: Reinstall the hollow rivets for the mounting tabs in each corner and solder. Be sure the spring mounts below are successfully contacting the board.

Congratulations you have completed the upgrade/restoration and should get many more years of life out of your EICO 150 Signal Tracer.

If you have any questions, comments or would like to send pics of your install, please contact me at mysledshed@yahoo.com

Kind regards, 73's and long live vintage!

Scotty's Sled Shed LLC