I. Introduction.

Thank you for purchasing the Scotty's Sled Shed Component Kit for Heathkit SB-610 Monitor Scope.

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

The multi-section capacitors are hard to find, expensive and sometimes obsolete. The kit includes a custom designed circuit board to use modern capacitors in place of the obsolete multi-sector capacitors.

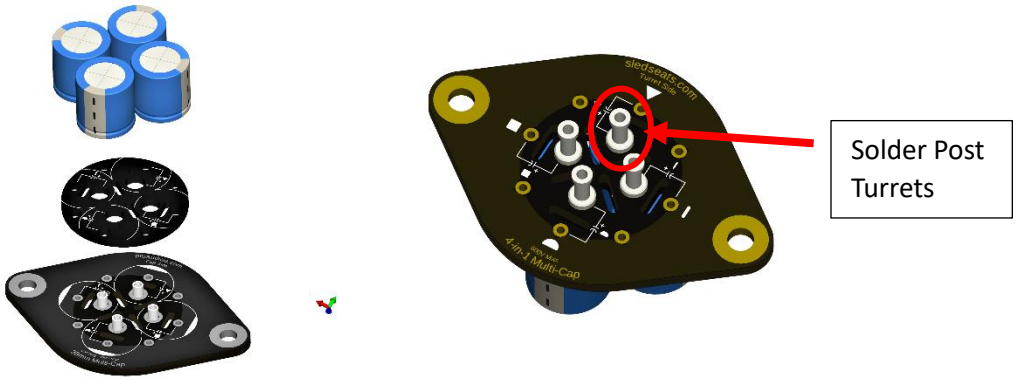
Before you get started there is a list of items to be aware of.

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. The supply be a mix of ½ and 1watt resistors in your kit depending on supply chain. If the price was the same or less for 1 watt, then we will supply a 1watt resistor.
2. Scotty's Sled Shed LLC is only providing you with components for a DIY installation.
3. The following instructions are only a guide. Experienced users may have a preferred method of installation.
4. **CAUTION: Lethal voltages are present in these devices**. If you are not aware of that by now, you should NOT be performing this upgrade.
5. The CRT has -1400VDC applied to Pins 1,2,4 and 12 of the CRT, as well as -880VDC at pin 4. **DO NOT TEST THESE VOLTAGES WITH A STANDARD MULTI-METER!** You will need at least a 10M ohm VTVM, or high voltage 100X probe for an oscilloscope.
6. Scotty's Sled Shed LLC is NOT liable for any damage caused to your equipment, bench, house, Power supply or that your spouse is mad at you for working on this 50-year-old piece of equipment. You are ON YOUR OWN.
7. Customer assumes all responsibilities and agrees to check all resistances, capacitance, and voltages before and after installation.
8. Customer assumes all responsibility to know how to read a schematic and perform the task this kit requires.
9. Customer assumes all responsibility to SAFELY perform procedures by following the Heathkit OEM manual.
10. You get the point; you are responsible for yourself.
11. Please be sure to download the manual if you do not have it. They are readily available online at: https://www.vintage-radio.info/heathkit

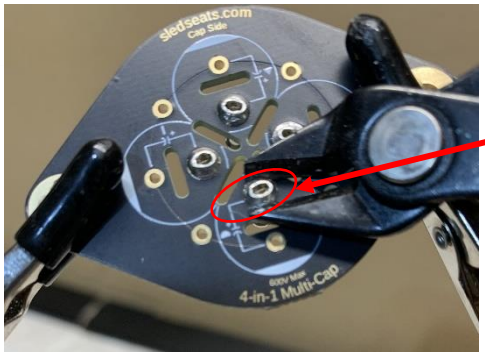
II. Preparation-Capacitors.

Assembly and Installation guide for the Multi-Cap capacitor circuit board.

1. Open the bag and check that all components listed on the bag cover are included.
2. Identify the different sides of the circuit board.
    a. The board has two sides. One side is marked "Cap Side" the other side is marked "Turret side".
    b. The board is marked on both sides with a Square, Triangle, Half-Moon, and Dash.
    c. The Spacer Board is also marked with the same symbols which correspond to the original multi-sector capacitor.
    d. The "Turret Side" is where the long side of the Solder Post Turret will mount.
    e. Capacitors mount on the "Capacitor Side".
    f. Spacer is bi-directional.
    g. Below image is the order in which the components are installed.
    h. Note that the Negative side of the capacitor faces the outside. All the Positive legs mount inside the turrets in the center.

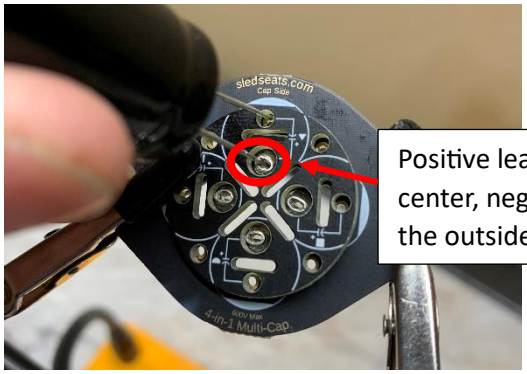


3. Install a turret in one of the 4 center holes. It will only fit in the positive post hole in the center.
    a. Slightly squeeze turret from the Cap Side to make it oblong to prevent from falling out. I use small snips. It only requires a slight amount of pressure to make the solder turret oblong. Do not squeeze too hard or you will collapse the hollow turret. ***(See image below)***
    b. Add some solder flux to both sides of the board around the pin (optional).
    c. Solder on the "Turret side". Add some solder to the Capacitor side as well.
    d. Be careful not to have too long of a dwell time. A good hot iron will make the work fast and smooth.
    e. Repeat for the other three turrets.
    f. If you close the hole just snip down a bit more to the board and the hole in the turret will be enough to get the capacitor leg through.

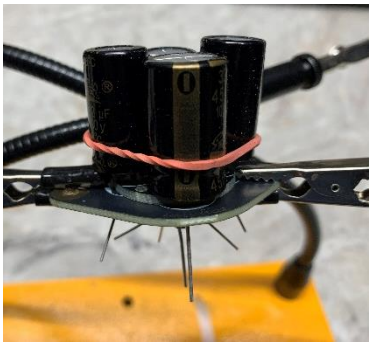


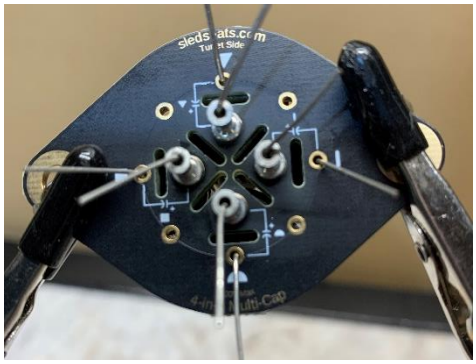
Slightly squeeze the short end of the Solder Post Turret on the "Cap Side". It requires very little pressure.

4. Install spacer board on the "Capacitor Side" aligning the symbols on the spacer board with the Multi-Cap Board. If the Turret sits flush or above the spacer board, you have not trimmed enough of the turret off. The turret must sit below the top of the spacer board.
5. Install a 33uF 450V Electrolytic Capacitor at the Half-Moon location, with the POSITIVE leg inside the turret on the + side. The NEGATIVE goes to the outside hole. The outer hole and entire outer area of the bottom of the board is tied to all 4 Negative Pin leads and the mounting holes of the board.
6. Bend the legs on the Turret Side to get the capacitor to hold the spacer board tight and flush to the Multi-Cap board. Add some solder paste (optional) and solder the NEGATIVE leads ONLY on the Turret Side. Do not solder the positive lead yet.
7. Repeat for the remaining three locations with the three 22uF 450V capacitors. Snip off the excess lead lengths.
8. Optional-hold the 4 capacitors together with a zip tie or rubber band. I found this works for keeping all the capacitors evenly installed while soldering. Remove after installation is complete.



Positive lead goes in center, negative to the outside.



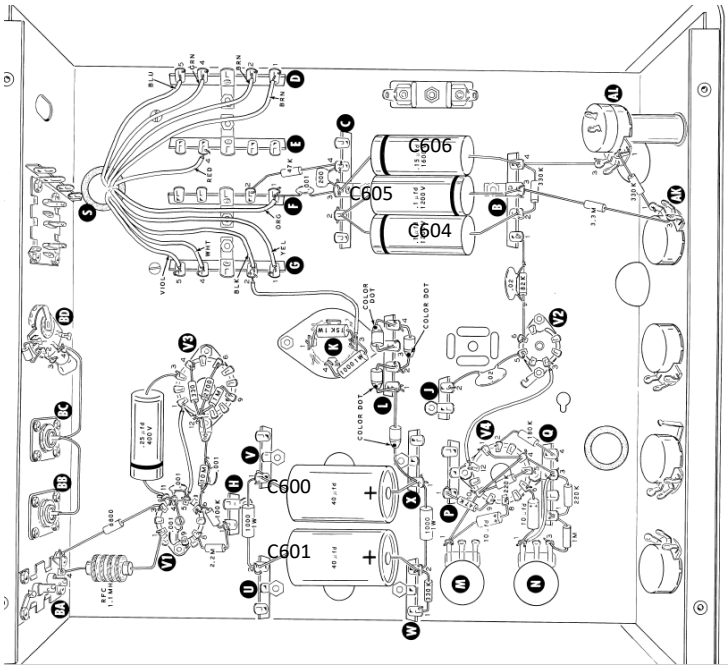


9. If you have an oscilloscope and follow the theory of finding the foil side of film capacitor, do that now to all the film capacitors and mark the foil side. There are several YouTube Videos on this procedure. I do not advocate one way or the other. It is your choice.

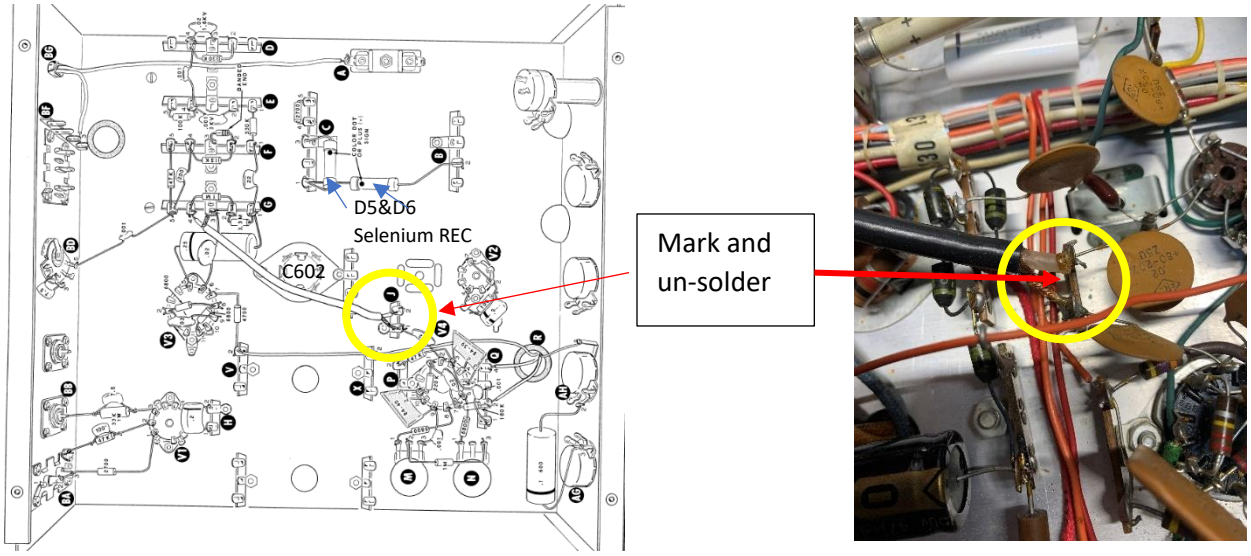
III. Component removal and installation.

The technique for desoldering joints and removing old legs is a personal preference. I prefer to use a good Chemtronics desoldering wick vs a desoldering iron. Cutting the legs off the capacitors and resistors before desoldering will make the work go faster. Check with a Multi-Meter that C600 and C601 are fully discharged before proceeding.

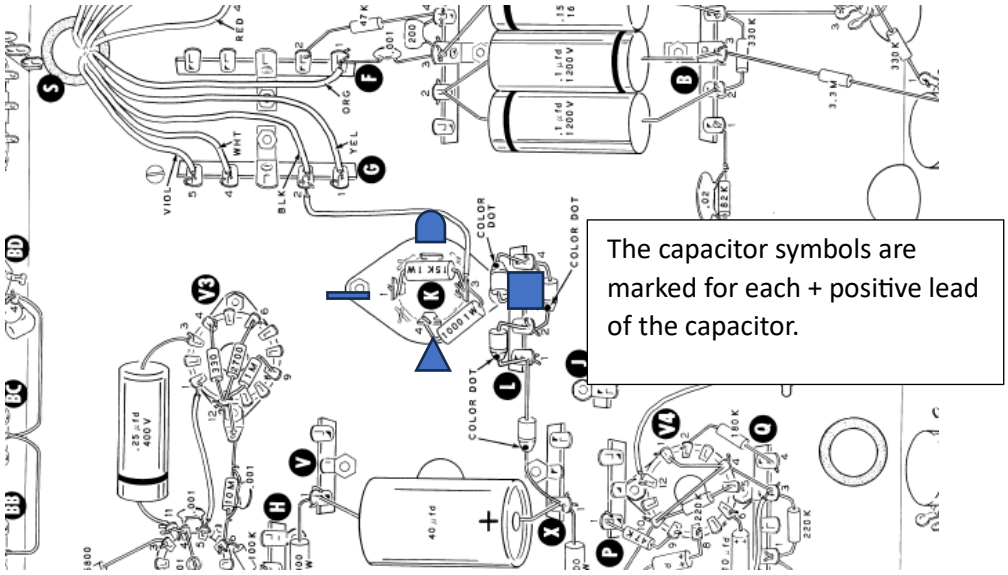
1. Replace the two large (C600 & C601) 40uF 450v Electrolytic capacitors first, one at a time. Replace with provided 47uF 450V axial capacitors.
2. Replace the 10uf axial capacitors (C401 & C404) at Pins 6 and 8 of V4 (6J11) with supplied 10uF 50V axial capacitors. These can be difficult and may require removing the 6.8K ohm resistors to access the capacitors.
3. Replace C606 0.15uF large film capacitor with the supplied 0.15uF 1600V (may be sub'd with 2kV) film capacitor.
4. Replace C604&C605 0.1uF 1200V film capacitor with supplied 0.1uf 1200V (may be sub'd with 1.6KV) film capacitor.
5. **NOTE:** I have yet to find an issue with the original selenium rectifiers D5 and D6 near C604,605 and C606. They will test open with a standard DMM in because of the high knee voltage of around 130VDC. Many people think they are bad due to misunderstanding how they work. You can replace it with 2KV or two 1KV rectifier diodes (not included in the kit) in series.



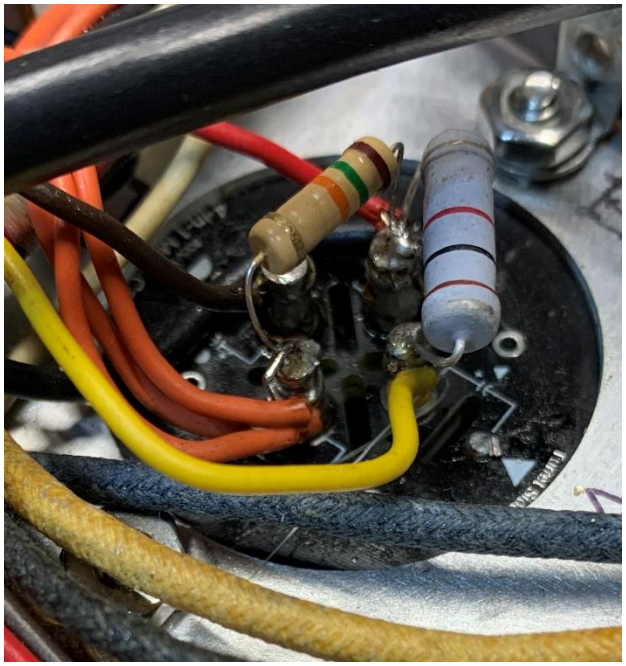
6. There is a black coaxial jumper that runs from terminal strip **J** to terminal strip **G.** This jumper will be in your way to work on the large Multi-Sector Can Capacitor C602. Mark and tag where this jumper connect to terminal block **J** and unsolder. Move out of the way.



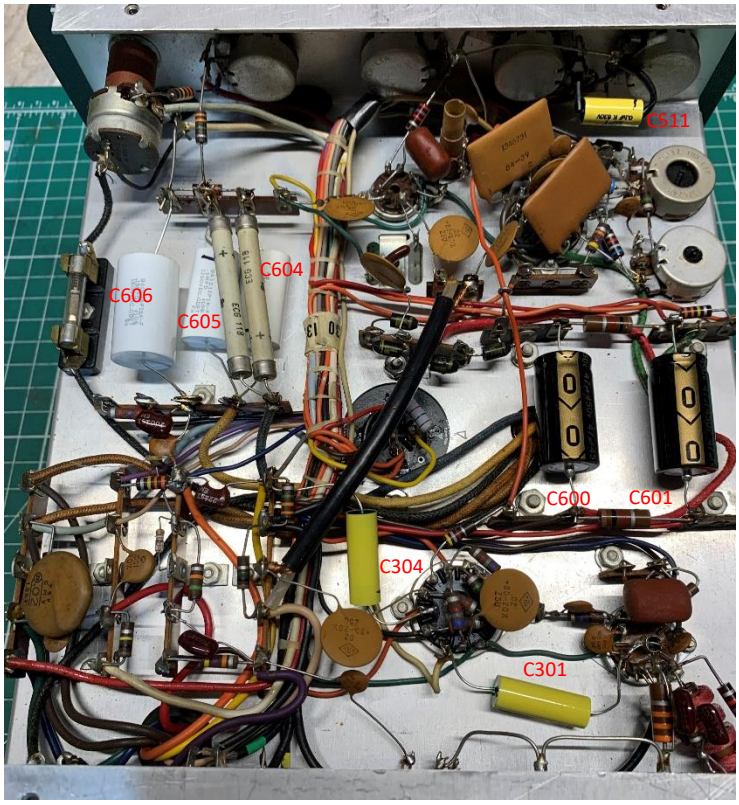
7. Note the orientation of the 4 sections of the Multi-Sectional Can Capacitor. On the bottom of the capacitor there will be three cut outs, Half Moon, Triangle and Square. The 4th one is sometimes marked with a Dash or left blank. The top and bottom of the supplied Multi-Cap board will also be marked with Half-Moon, Triangle, Square and Dash. The Heathkit Manual does not depict this very well. The orientation is as marked below. May be installed 180' from diagram.

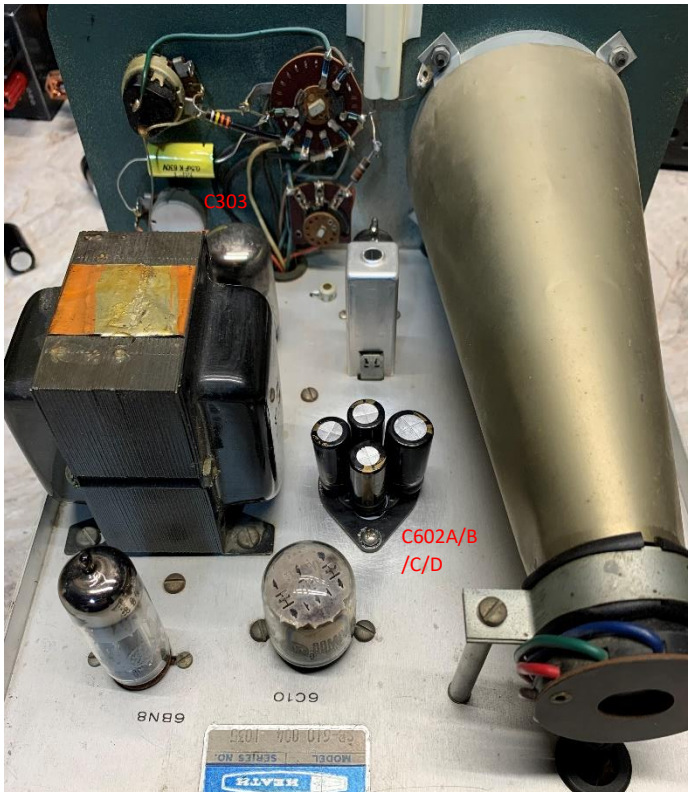


8. Mark each set of wires to denote where what wire goes to which terminal end. Color codes can vary between units and how the installer assembled. This the most common:
    a. Half Moon-1 brown wire
    b. Square-1 red or pink wire and one black or green wire.
    c. Triangle-1 yellow wire
    d. Line-3 orange wires.
9. The 1K and 15K resistors will be replaced so you can cut those out of the way if you wish.
10. Desolder the wires to each tab of C602 Multi Sectional Can Capacitor.
11. There will be at least one twist tab that is soldered to the mounting flange. If you are going to discard the capacitor, just break the twist tabs off with pliers and remove the capacitor. Otherwise, you will need to de-solder the grounded tabs and remove.
12. Unbolt and remove the mounting flange. This will not be re-used.
13. Clean the chassis surface area top and bottom around the mounting holes with a wire brush. Harbor Freight has a full set for about $5.00 that fits in tight spots well.
14. Install the new Multi-Cap board assembly from the top side. I use painter's tape to hold the bolt heads in place while I get the tooth washer and nut started on the bottom.
    a. Note the orientation.
    b. Square should be facing the terminal strip, triangle facing the two 47uF capacitors C600/C601.
15. Clean the surface of the terminal strip that bolted to the capacitor. Re-install the bolt and snug up both nuts holding the Multi-Cap assembly in.
16. Attach and solder the appropriate wires to their associated terminal as stated in step 8 above.
17. Insert the supplied 15k 1W resistor in the turrets of Line and Square. Solder on Dash (Line) only.
18. Insert the 1K 2W supplied resistor in the turrets of Square and Triangle. Solder all 4 turrets.



19. Before you reconnect the coaxial jumper to terminal strip **J,** replace the .25uF film capacitor (C304) that is connected to pin 1 of terminal strip **G** and pin 5 of **V3** 6C10, with the supplied 0.25uf 630V film capacitor.
20. Reconnect coaxial jumper to terminal strip **J**.
21. Replace the 0.25uf C301 film capacitor that is connected to Pin 3 of **V3** 6C10 and the Ground tab of **V1**(this may go to ground somewhere else).
22. Replace the 0.1uf 600V film capacitor C511 that is connected to the wiper of the Vertical position potentiometer and ground (usually the outer lead of Horizontal Pos potentiometer) with the supplied 0.1uF 630V film capacitor.
23. Replace the 0.5uf film capacitor C303 (top side) that is between outer lead of Horizontal Gain potentiometer and pin 6 of switch S1-A (INT. RF Trap RTTY).
24. Replace any out of spec resistors as you go along.
25. This completes the installation of the restoration kit. Double check all your connections before powering the unit up. Validate the resistance measurements as shown in the Heathkit Manual on page 29. Suggest powering up with a variac, slowly.
26. The final installation should look like the following.





I welcome feedback on any tips or tricks you find to make the project go faster.

I would like to see customer pics of final installations.

If you find an error in this document, please kindly let me know at mysledshed@yahoo.com

Please be professional in your communique.

Thank you, and good luck!

73's

Scott

W8AOR