I. Introduction.

Thank you for purchasing the Scotty's Sled Shed Component Kit for Heathkit HO-10 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
12. Note that the online manuals for the HO-10 are missing several key pages so its best to find an original or reprinted manual.

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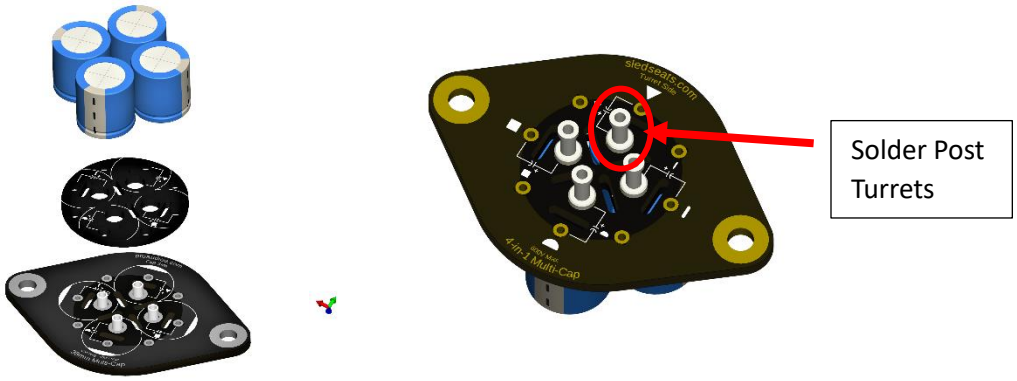
II. Preparation-Capacitors.

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.

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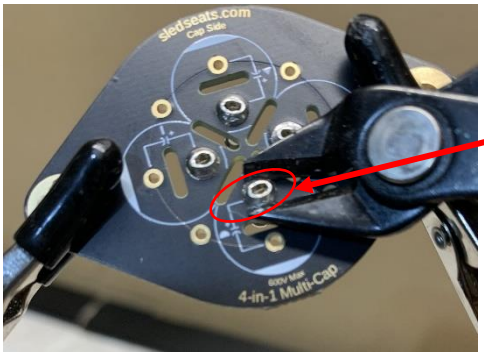
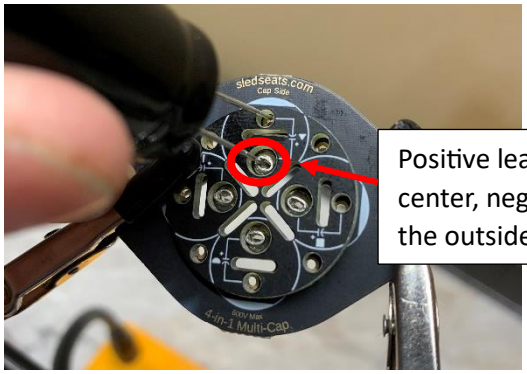
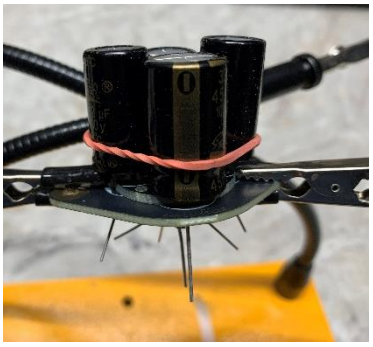


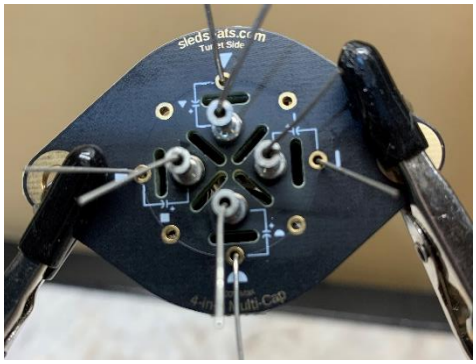
Slightly squeeze the short end of the Solder Post Turret on the "Cap Side". It requires very little pressure.

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.





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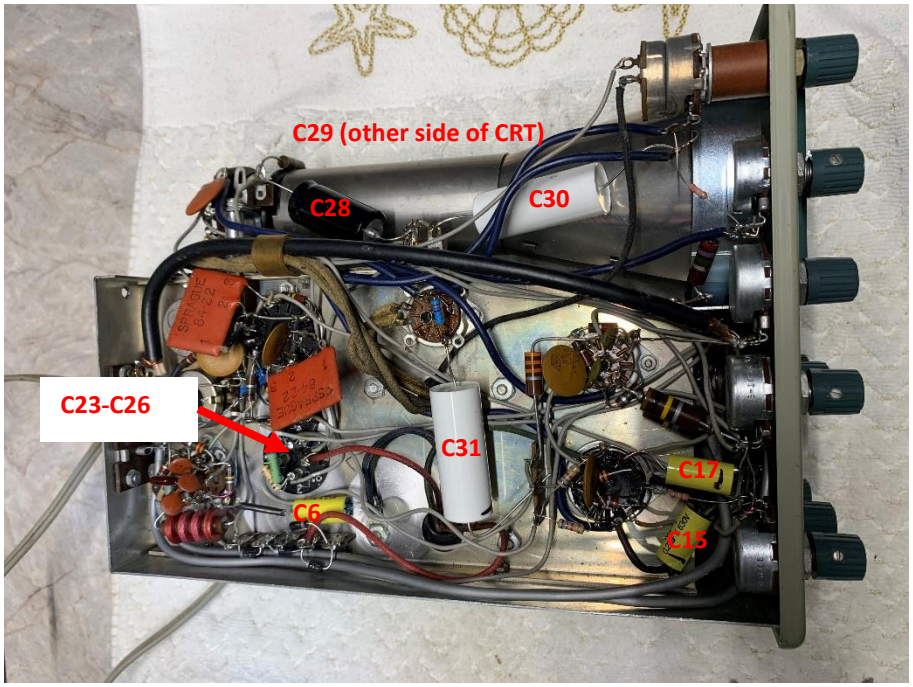
9. If you have an oscilloscope and follow the theory of finding the foil side of all the film capacitors, do that now to all the film capacitors and mark the foil side. There are several YouTube Videos on this procedure. I do not advocate one way or the other. It is your choice.

III. Replace C28, C29, C30, C19, C31, C6, C15, C16, C17.

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 C28 and C29 are fully discharged before proceeding. See images below for location of capacitors and refer to OEM manual.

1. Replace the two large (**C28 & C29**) 40uF 450v Electrolytic capacitors first, one at a time. Replace with provided 47uF 450V axial capacitors.
2. Replace the 10uf axial capacitor **C19** at Pins 6 V4 (6J11) with supplied 10uF 50V axial capacitor. This can be difficult to access and may require removing the 1M ohm resistor to access the capacitor.
3. Replace **C30** 0.15uF large film capacitor with the supplied 0.15uF 1600V (may be sub'd with 2kV) film capacitor.
4. Replace **C31** 0.15uF 1600V film capacitor with supplied 0.15uf 1600V (may be sub'd with 2KV) film capacitor.
5. Replace **C6, C15 and C17** with supplied 0.22uF 630V film capacitors. C6 you may want to wait till you have replaced C23-26.
6. Replace **C16** (top by switches) with supplied 2uf (or 2.2uf) 250v (may sub with 630V) capacitor.



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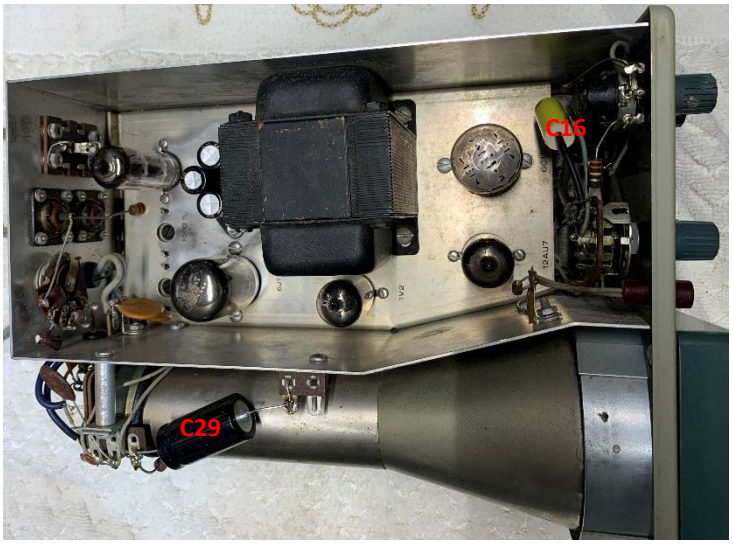
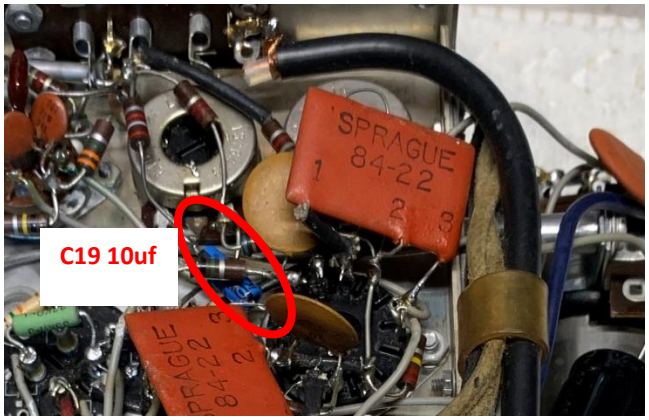
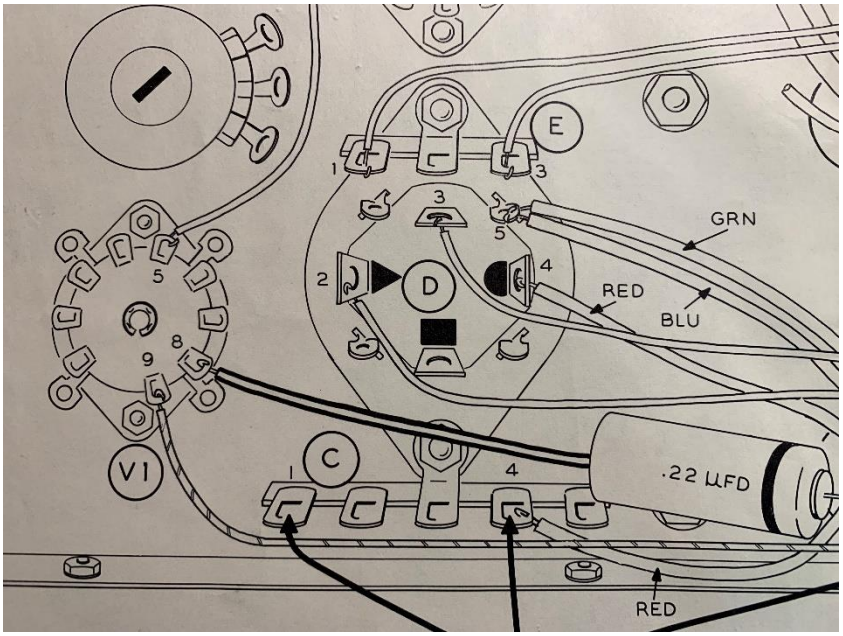




IV. Replace Multi Section Capacitor C23,24,25,26.

1. Multi Section Capacitor (Twist Tab) can capacitor is labeled C23-C26 with markings Half Moon, Square, Triangle and Dash (or none). Values are as follows:
   - **a.** C23 (Triangle) 20uF
   - **b.** C24 (Dash or none) 20uF
   - **c.** C25 (Square) 20uF
   - **d.** C26 (Half Moon) 30uF.
2. We will replace this with the Multi-Sector PCB capacitor assembly from Section II of this guide.
3. Note the orientation of the original capacitor from bottom side. Triangle is usually facing the rear and Half Moon toward the front.



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4. This is the time to start marking wires and resistors where they go as you remove them. I like to use a label maker.
5. Find the 5 lug contains the full wave bridge rectifier. This can sometimes break when trying to move, so a replacement is provided along with 4 rectifier diodes to rebuild. Unbolt and move out of the way. Clean the common tab with wire brush (if not replacing)
6. Find the three lug terminal strip near V4 that is attached to C23-26. This can get messy so you may want to rebuild from scratch. If you are careful, you can remove the resistors at the terminal strip and from C24 (dash or no marking). Desolder and remove the terminal strip. A new terminal strip is supplied in your kit, along with all the resistors to rebuild between V4 and C23-26.
7. Mark each lead attached to C23-C26 by symbol. IE Blue and Green are Ground (GND), there is a Red and Grey wire at Half Moon (MN), two grey wires to Square (SQ), one grey wire to Dash/None (/ or -)
8. Mark and remove.
9. Desolder or break tabs off that are soldered to the flange.
10. Remove the Multi-Section Capacitor.
11. Clean around the bolt mounting holes top and bottom, with wire brush to provide a good, clean connection to chassis ground. THIS IS A CRUCIAL STEP. The outer flange is ground on the new capacitor board. Clean the original bolts nuts washers or replace them with #6-32.
12. Install the new Multi-Sector Cap assembly from the top side of the chassis noting the orientation of the markings should match original orientation.
13. Be sure to install the 3lug and 5 lug terminals to the mounting bolts as those make connections to chassis ground.
14. Near the 5 lug terminal strip is a bolt with a nut that goes to the transformer. Remove the nut, clean around the area well with wire brush and install the supplied #6 Ground Lug and reinstall the nut. Make sure it is snug for good ground.
15. Solder the Blue and Green Leads marked GND to the #6 ground lug you just installed.
16. Reconnect the remaining wires previously removed in steps 7 and 8 above, wrapping leads around the solder posts. Solder but do not fill the hollow end of turret with solder yet.
17. There is a supplied 33kohm 1w and a 15kohm 1w resistor in your kit. Put the leads into the hollow end of the turrets. May wish to trim the leads a bit first.
    - **a.** 33kohm 1w to Dash and Square. Solder at Dash only.
    - **b.** 15kohm 1W to Square and Triangle. Solder at both turrets.
18. There are two 1k ohm 2w resistors in your kit to replace R42 and R43 by the CRT, as well as two 100k 2w resistors to replace R7A R7B connected to Pin 6 of V2B.
19. There are also 4 rectifier diodes (if not already replaced) to replace D1, D2, D3, D4 at the 5 lug terminal strip near C23-26.
20. Replace any out of spec resistors as you go along.
21. 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. Suggest powering up with a variac, slowly.

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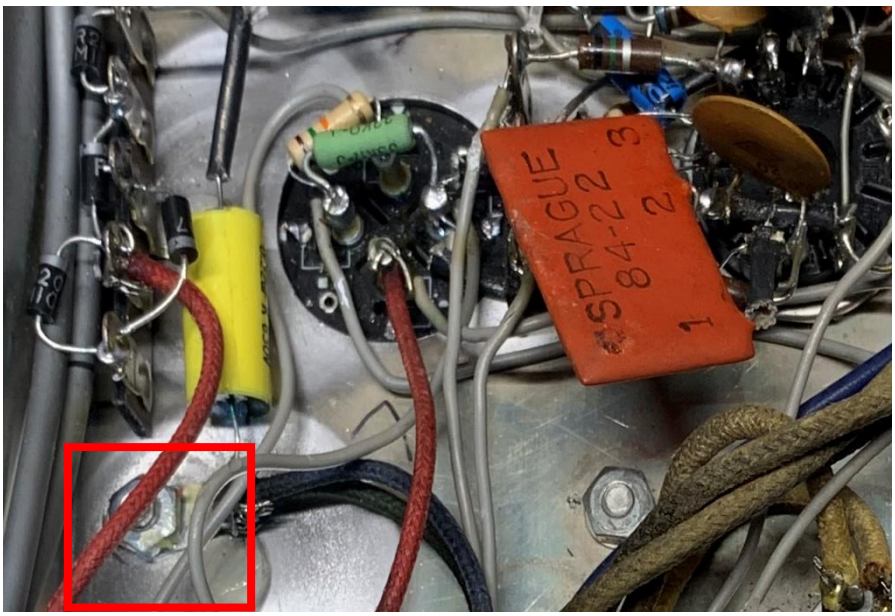

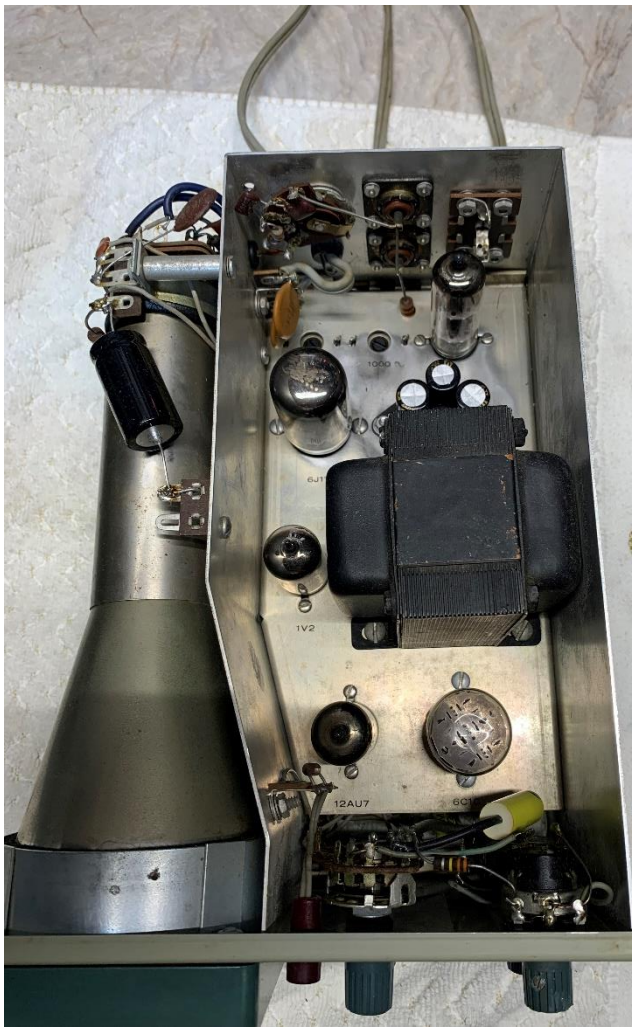

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I welcome feedback on any tips or tricks you find to make the project go faster.

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

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