

Heathkit of the Month #84:
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KIT RESTORATION:

Heathkit V-6 VTVM Restoration Part I
“Siliconizing” the V-6 Selenium Rectifier
(Heathkit part # 57-1, Sarkes Tarzian Model 35)

Introduction:

I didn't think I'd have a Heathkit article this month. However, while awaiting parts to arrive I decided to see if I could convert the #57-1 selenium rectifier to silicon (See figure 1) in the V-6 VTVM under restoration. It presented a bit of a challenge and one I was happy to undertake slowly, whenever I needed a break from the less exciting task of doing taxes. Now, all the parts I believe I need have arrived save one (one vendor sent me the wrong part and is resending a correct one).

Currently the rebuild of the V-6 is coming along slowly, mostly due to the lack of parts and a lot of other obligations. However, the preliminary wiring of the chassis assembly is finished, and the assembly and wiring of the front panel is in progress. Still to do, before mating the two, is the teardown, cleaning and lubrication of the function switch, and the cleaning and lubrication of the the range switch. The precision resistors remain attached to the range switch since they are hard to replace and delicate. One resistor is open, but a replacement is finally on hand. After that, assembly can be completed and testing and calibration can begin.



Figure 1: Heathkit #57-1 Selenium Rectifier.
(Sarkes Tarzian Model 35)

The Selenium Rectifier:

The power supply in the early Heathkit VTVMs uses different forms of rectification as the models progress. The V-1 and V-2 use a 6X5 dual diode vacuum tube. The V-3 is battery powered (though whether any were sold is in question). The V-4(A)* uses a selenium rectifier (part # V97) which is a green commercial multi-plate rectifier similar to the one shown in figure 2. The V-5(A), and V-6 use a small Sarkes Tarzian Model 35 selenium rectifier (Heathkit part # V123, renumbered 57-1 in their revamped parts numbering system). Finally Heathkit settled on a sealed, small and inexpensive selenium rectifier in the V-7(A) (part # 57-13), also manufactured by Sarkes-Tarzian (Model 50); it is rated for 130 vac and 50 ma. In 1963 it sold in single quantities for 48¢; likely, significantly less at Heathkit quantities.

* **Note:** When a Heathkit model number is shown with one or more letters after it in parentheses it refers to multiple kits. Thus:

V-4(A) refers to V-4 and V-4A.

HP-23(A)(B)(C) refers to HP-23, HP-23A
HP-23B and HP-23C

Here is a link to the index of Heathkit of the Month (HotM) articles:

http://www.w6ze.org/Heathkit/Heathkit_Index.html

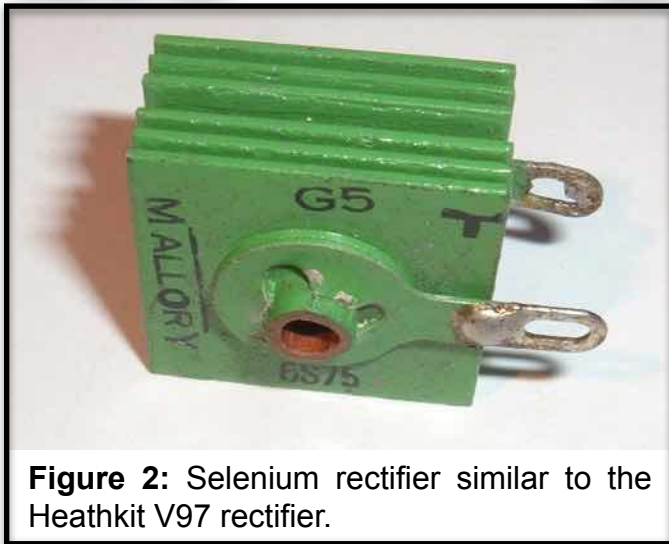


Figure 2: Selenium rectifier similar to the Heathkit V97 rectifier.

Selenium rectifiers tend to deteriorate over time according to many sources. And though I've never had a failure nor felt the need to replace one of the later sealed #57-13 rectifiers, the unsealed #57-1 worried me. The simple solution is to remove the rectifier, mount a Cinch 810 terminal strip in the hole where the rectifier mounted, and solder a 1N4004 diode across the two terminals of the terminal strip. However, this reduces the authenticity of the restoration. It would be better to convert the selenium rectifier to silicon, and keep its form factor.

An examination of the 57-1 rectifier shows it is held together with a spring clip and easily disassembled into a phenolic housing, two phenolic end plates, two terminal end plates and a stack of selenium-coated plates (figure 3).

The selenium plates were wrapped and discarded as toxic waste. Selenium, in excess, is toxic so wash your hands well when you are done. Next, the two metal terminal end pieces were cleaned and a small hole drilled in the center of the large rectangular section of each plate. (a #55 drill - 0.052" dia. was used). The area around the holes were tinned on one side. The leads of a 1N4004 diode were also tinned. The cathode end of the diode was then soldered through the hole in one terminal end plate (tinned side towards the diode cathode), and the lead trimmed flush to the plate. This cathode terminal should be marked as such with a felt-tip marker.

A 1/2" diameter phenolic spacer, about 0.325" in length, was found in the junk box. It just barely wouldn't slip into the phenolic case until four flats were ground 90° apart around the spacer. One phenolic end plate and the terminal end plate with the diode attached



Figure 3: The disassembled 57-1 Rectifier.

- 1. Phenolic case
 - 2. Phenolic end plates
 - 3. Terminal End plates
 - 4. Selenium coated plates
- Not shown - Spring clamp with mounting tab (#5 in figure 4)

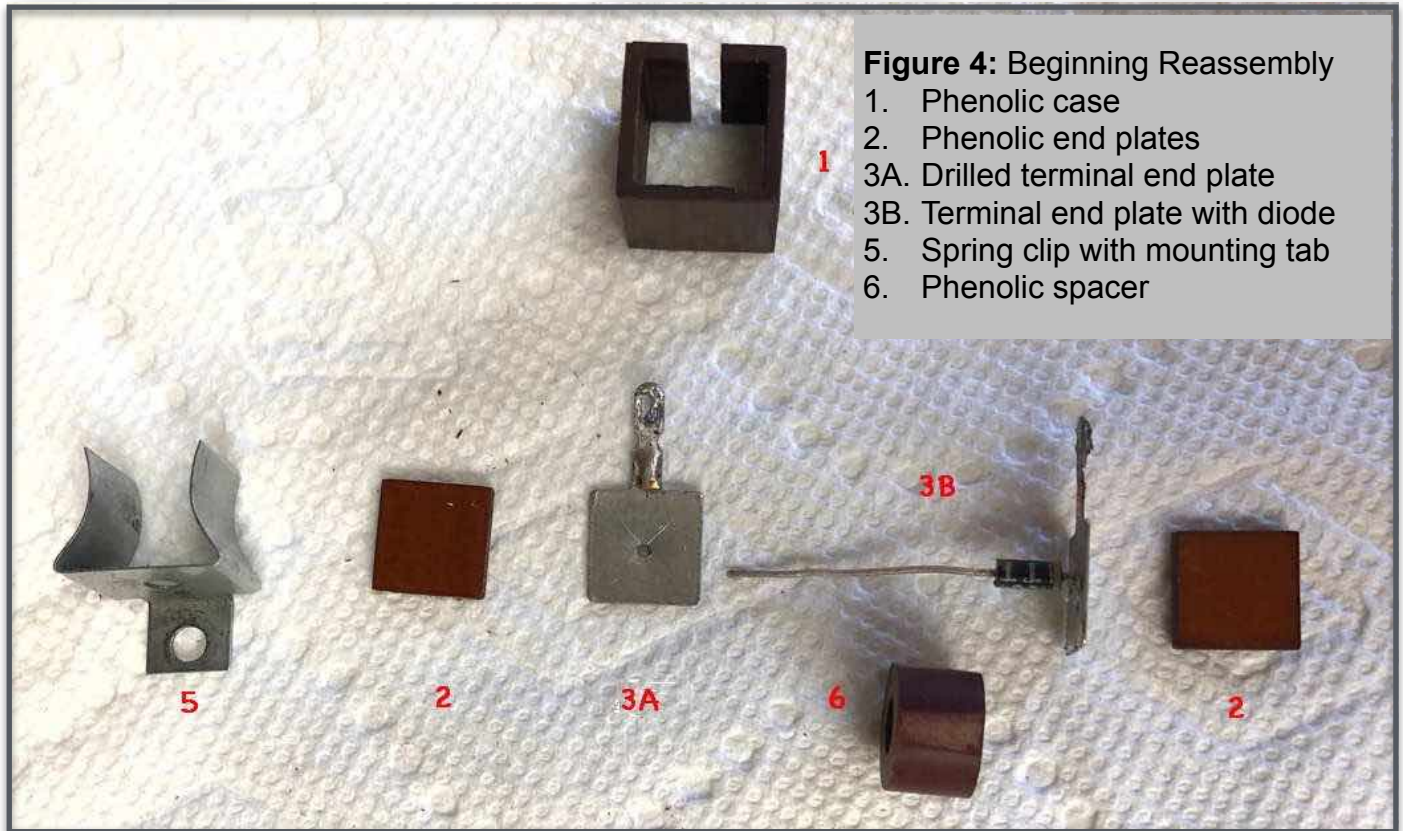


Figure 4: Beginning Reassembly
 1. Phenolic case
 2. Phenolic end plates
 3A. Drilled terminal end plate
 3B. Terminal end plate with diode
 5. Spring clip with mounting tab
 6. Phenolic spacer

were slid into the phenolic case. The spacer was then slid over the diode and the second terminal end plate was pressed flush to the phenolic spacer and soldered. If the diode lead was already tinned along with the side

of the terminal end plate that is towards the diode, the solder should be drawn into the hole with little solder remaining on the outer side. This diode lead is then also cut off flush to the terminal end plate. Finally the second phenolic end plate is placed above the top terminal plate and the whole assembly is

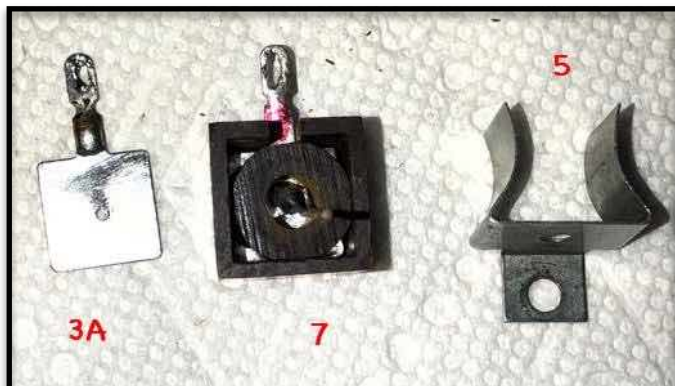


Figure 5: Partial Reassembly.
 3A. Drilled terminal end plate.
 5. Spring clip with mounting tab
 7. Assembly of:
 a. A phenolic end plate
 b. A end terminal plate with diode soldered on
 c. Phenolic case
 d. Phenolic spacer

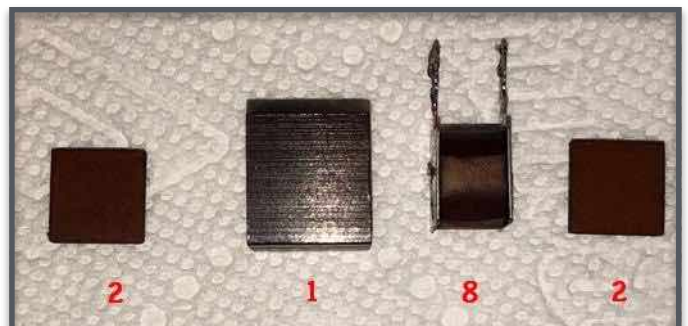


Figure 6: Ready for Final Assembly
 1. Phenolic case (slot up)
 2. Phenolic end plate
 8. Assembly of:
 a. two terminal end plates
 b. phenolic spacer
 c. 1N4004 diode (or equivalent)



Figure 7: Completed Selenium Rectifier Converted to Silicon with Cathode Marked

Prior to installation in the V-6, the 'K' was cleaned off with alcohol, but the red marking on the cathode terminal stem was left on.

placed into the spring clip with mounting tab. This has to be assembled so the cathode terminal end, with its lug pointing up, is towards you when the mounting clip is pointed to the right (See figures 4, 5, 6 and 7).

The result is a silicon 1N4004 rectifier diode mounted inside the case of the #57-1 selenium rectifier case. This diode should outlast the V-6 VTVM.

Comments:

Usually I try to write about an unusual kit for the April issue. There was the Heathkit mahogany candlestick (my favorite), the Heathkit "freebee" flashlight. Once I even published a writeup of an imaginary kit, the Heathkit C-7 Lakota. Needless to say the author was a historian of General Custer. Other unusual Heathkits that were covered in the April issues are a log splitter, a garbage compactor, a \$6,000+ 15 lb. 386 based laptop computer, and a motorbike. I hope this article is esoteric enough to fit in.

Ten Year Anniversary:

Can you believe that it was ten years ago this past February that the first Heathkit of the

Month article appeared in the Orange County Amateur Radio Club newsletter *RF!* In those ten years there have been 84 feature articles including this one, and a few short articles. That amounts to over eight articles each year. No, it's not exactly accurate to call the series *Heathkit of the Month*, but's close enough that I don't have any guilt feelings. That first article covered the GR-121 Clock Radio that followed me through my college days.

The New Heathkit:

It's been some time since the new Heathkit started operations. The current kits they offer are a TRF AM Radio (in soldered and solder-less versions), a Stealth 2m/0.75m antenna, a Digital Clock, and a Precision RF meter (for which Heath is currently accepting preorders). They also have some neat accessories, updates and replacement parts for various legacy Heathkits such as the AJ-1510(A) tuner, the HG10(B) VFO, the IG-18 audio generator, and some replacement parts for the weather stations. You might want to checkout their website at:

www.heathkit.com

Their GC-1006 "Most Reliable Clock" sells for \$99.95 which some feel is expensive for a digital clock. However, in 1990 dollars that is \$52. Hopefully the new Heathkit will release some ham related kits that will draw the new generation of hams back into kit building.

73, from AF6C



This article originally appeared in the April 2018 issue of RF, the newsletter of the Orange County Amateur Radio Club - W6ZE.

Remember, if you are getting rid of any old Heathkit Manuals or Catalogs, please pass them along to me for my research.

Thanks - AF6C