Heathkit® GD-1B Grid Dip Meter Tuning Dial

As some of you may remember, I made mention at the GCARC May 2024 General membership Meeting of the fact that I was in the middle of a refurbishment of a Heathkit® GD-1B Grid Dip Meter (Figure 1). This is a piece of test equipment that is not often seen – or used – anymore, but it is nonetheless a useful tool for measuring the resonant frequency of a given circuit.

Figure 1 - Heathkit® GD-1B Grid Dip Meter

As a very brief explanation, the device is equipped with interchangeable coils wound for certain specific frequency ranges, and the tuning dial is marked with frequencies in those specific ranges. To use the equipment, the chosen coil is plugged into the meter body. The meter is turned on and is then brought into close proximity to the circuit under test, allowing for some mutual inductance to occur in which energy from the circuit under test is transferred into the grid dip meter's circuitry. The grid dip meter's tuning knob or dial is rotated until a noticeable decrease or "dip" is noted in the current level as indicated on the ammeter of the test device. At that point, the frequency to which the grid dip meter is tuned can be read from the dial or frequency indicator, which would, of course, be the operating frequency of the circuit under test.

On the GD-1B, the tuning "knob" is actually a clear plastic dial of about 2.6" diameter. Mounted to the back side of this dial, and therefore visible through the dial, is a card upon which are printed the frequency values for each of the available coil ranges. As the dial is rotated to tune the device, the current tuned frequency will be indicated by the value that is aligned with an index line on a window installed to the face of the unit.

Due to age and use, the plastic dial of the subject GD-1B was yellowed, crazed, and cracked, and the card behind the dial was yellowed and stained (Figure 2). Because of the manner in which the dial had cracked, the setscrew that is used to lock the dial to the tuning shaft was unable to adequately secure the dial. The hub by which the dial is mounted to the shaft was split diametrically and would simply open wider as the setscrew was tightened. At some point in the history of this unit, an attempt had been made to repair the dial in that it had been glued and a piece of copper wire had been wrapped around the hub and soldered in place to keep the hub crack from widening. The repair was ineffectual, so I decided that the dial would need to be replaced. Of course, there is no such thing as spare or replacement parts for this piece of equipment.

I set out to create a 3-D drawing of the dial, which I did quite easily using the *Autodesk Fusion 360* software. From *Fusion 360*, I exported the .STP file, which I then converted to an .STL file. During the drawing process, I made a small modification of the arrangement of the dial, with an eye towards possible application of a label to the dial face… but I am getting ahead of myself.

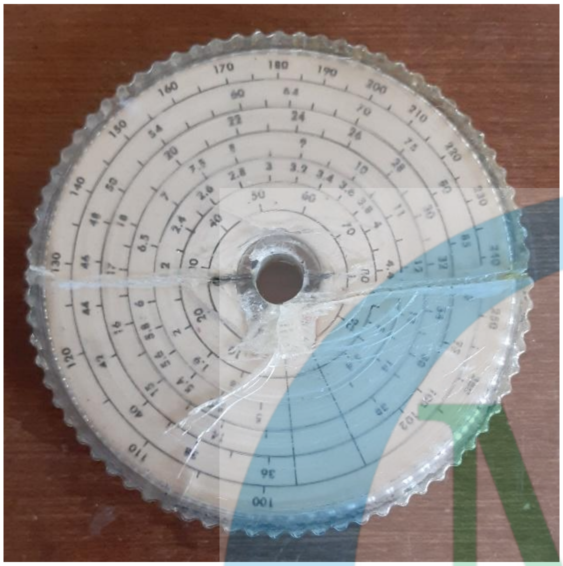

Figure 2 - Original dial and frequency card

The dial's circumference is equipped with a scalloped edge to provide finger grip on the dial. However, this scalloped edge is not the full width of the edge of the dial. Instead, there is a solid margin about a tenth of an inch wide along the rear of the circumferential edge. The modification that I made was to move this solid margin to the front of the dial. I did this so that I would have a solid surface of the dial right to its circumference instead of having scallops along that front face. This would provide a flat face for the full diameter of the dial, making for better support of the full diameter of a dial-diameter label that I may need to apply to the dial. At this point, I was not at all sure that I could successfully source a clear (see-through) replacement dial, which would permit rear-mounting of the frequency card behind the dial. I believed then that I might need to print the frequency card as an opaque label and mount it to the front face of the dial.

Once I had the drawing complete, I sent it to **Rich Subers W2RHS**, who frequently does some 3-D printing for me. Rich printed three copies of the dial, using translucent filament and various fill and speed settings, in an attempt to come up with a usable print. One of his samples would have worked well if I could polish out the lay-up lines in the dial. However, it would still have only been translucent, not transparent, which is what I really needed. I now set out to find a vendor who could (and would) print it using transparent material.

My search led me to a company called *Fictiv* ([https://www.fictiv.com)](https://www.fictiv.com) located in Fremont, California. Their pricing was attractive and the ordering process was easy. I uploaded the .STL and .STP files to their order system and placed my order for a one-off print of the dial. I placed the order on Friday, 26 April, and delivery was promised by 16 May. I received an email on Wednesday, 1 May telling me that the part had shipped, and I received it today, 2 May, six days after ordering the item.

While the finished product was not quite optically clear, it was more than adequately transparent for my needs. It is obvious that the part was solvent-vapor treated, as one surface was very smooth and highly polished. It is equally obvious that the part was resting on its opposite face during the treatment, as that surface was not of the same finish. I am confident that I could have improved on that face of the dial with a bit of polishing, but quite frankly, it worked as it was, so I left it alone.

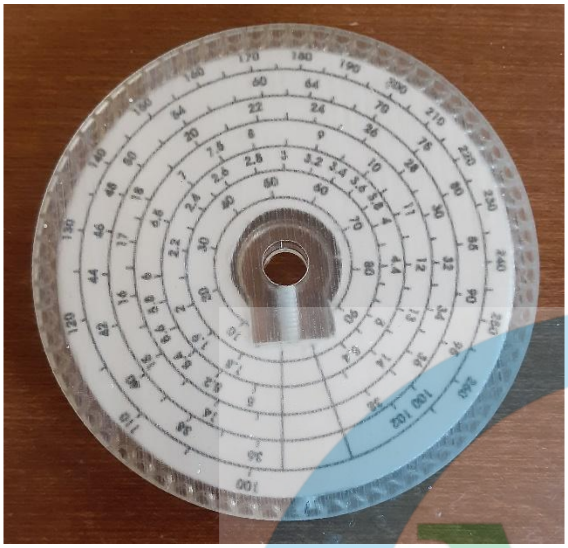

Figure 3 - Replacement dial and frequency card

While I was waiting for the part to arrive, I fired up *CorelDraw!* And created a replacement frequency card to fit inside the dial. This card, printed on bright white 67-pound cardstock, turned out to be quite good. Most important was the positioning of the various frequency markings with respect to each other. I considered it to be a job well done. The card was cut out of the sheet on which it was printed and set aside for installation onto the new dial.

The new dial had been designed with a 0.089" transverse bore through the hub for placement of a dial-securing setscrew. My original thought was to simply thread the setscrew into the hub without worrying about first forming threads in the hub transverse bore. However, upon further thought, I decided not to risk damaging the dial, so I set about forming the required 4-40 threads in that bore.

I started by removing the scallop peak on the circumference of the dial in direct alignment with the transverse bore in the dial hub. Next, I drilled a 1/16" hole in the circumferential edge of the dial, aligned with the transverse bore. I then selected a 4-40 x 3/8" setscrew from my assortment, and using a small triangular file, I formed three longitudinal notches in the closed end of the setscrew, 120° apart around the circumference of the setscrew, and deeper at the end of the setscrew. This effectively turned that setscrew into a makeshift tap. This was necessary because there was insufficient clearance to use even a short 4-40 tap in this case. Using an Allen wrench, I used the modified setscrew to cut the required threads in the transverse bore in the dial hub. Once the threads were formed, I replaced the 3/8"-long setscrew with a 3/16" long version for the actual securement task.

After all of that, I installed the frequency card to the back side of the dial, fixing it in place with short pieces of tape as the original card had been installed. The replacement dial was now complete (Figure 3) and ready for installation to the GD-1B grid dip meter.

Is it perfect? No… I messed up a little bit in cutting out the frequency card, especially when cutting out the keyhole opening in the center to fit around the hub. Does it do the job? Absolutely… the instrument can now be tuned properly and the tuning dial does not slip on the shaft as it had been doing. I am confident that the owner of this unit will be satisfied with the result.

All told, I had about an hour into this replacement part. Fifteen minutes or so to draw the part in *Fusion 360,* another fifteen minutes to recreate the frequency card in *CorelDraw!,* and the remaining time spent in forming the threads and then in trimming and fitting the frequency card to the dial, and we have our hour consumed in this task.

The moral of this story is that with modern software and production capabilities, even obscure parts like this tuning dial can be replaced today. We just have to think it through and find the perfect solution.