Heathkit of the Month #66:
by Bob Eckweiler, AF6C

This article is the second in a Heathkit Maintenance series that I will occasionally write as I find myself doing something unusual to get or keep a Heathkit working.

MAINTENANCE
HD-1250 DIP METER - Meter Repair

Introduction:

The current project here is restoring an antique Hallicrafters S–40B communications receiver (Figure 1). The S-40B is a single conversion superheterodyne receiver with a 455 Kc intermediate frequency. When first purchased and powered up (with the usual precautions) it worked on three of four bands. It suffered the usual old age ills of scratchy pots, dirty switches, etc. Someone had recently replaced the multi-section filter capacitor can with another one that might be one of the last of its type manufactured, with a late eighties date code. It still checks good.

After the replacing all the paper capacitors, a couple of small electrolytic capacitors, and some resistors that were out of tolerance, band D (15.5 Mc to 44 Mc) still was receiving nothing. My tenet is to replace capacitors and resistors in a radio one stage at a time, checking that the radio is still working before continuing. It is a lot easier to troubleshoot a stage than a whole radio. When doing the RF stages all components (except the coils) related to Band D were removed and checked. Nothing obvious relating to the problem showed up. The Band D coils were checked with an ohmmeter, though that only confirmed the coils had continuity. Instead, the plan was to check the coils with my Heathkit HD-1250 solid-state dip meter. (See Heathkit of the Month #8).

Figure 1: Hallicrafters S-40B Under Restoration

One thing that was noticed when the radio was first examined was the Band D slugs were half out of their respective coils. Does the local oscillator tune above or below the received frequency? That information is not given in the S-40B manual, but it is in the earlier S-40 manual. The local oscillator tunes above the received frequency on Bands A, B and C, and below it on Band D. Perhaps someone also tried to tune the Band D local oscillator above. That would account for the coil slug positions.

Heathkit HD-1250 Dip Meter (S/N 08004):

It had been awhile since my HD-1250 dip meter had been used. A battery was put in and it was turned it on. The meter needle moved about one-fifth of the way up scale and stuck

Figure 2: Sticking Meter from HD-1250

there. This recalled memories of the last time it was used; back then it had begun showing signs of sticking, but nothing as bad as the current problem.

An HD-1250 Parts Unit (S/N 05722):

I also remembered picking up a second GD-1250 meter very cheaply for parts about the time I noticed the meter problem on mine, hoping for a good replacement meter. That dip meter had been left in its case for so long that the foam that holds everything in place had disintegrated, leaving a sticky, hard to clean, mess on the coils and the top panel of the dip meter and causing bad corrosion. However, the meter movement looked fine so I paid all of a buck and took it home, but never replaced the meter until I had the recent problem with the S-40B.

Repairing the HD-1250:

Replacing the meter on a Heathkit HD-1250 is not a simple task. To remove the meter you need to undo the sides of the case and two screws on either end that hold the top front panel on. Remove the panel and the meter can then unsoldered and it lifts right out. The complex part is reinstalling the front panel. One of the two screws, both of which fasten with a lock washer and nut, is situated so that you must remove the small oscillator board before you can secure the screw. This involves a lot of unsoldering of short leads and heavy braid in tight places.

Figure 3: My Heathkit HD-1250 – Repaired, re-calibrated and sporting a replacement meter.

Once the meters were removed from both units it was evident they were different, even though they shared the same part number. The later meter cover (from the parts unit) was held on by brass screws, but the damaged meter was held on by dried out cellophane tape (Figure 2). A quick check of the replacement meter with an appropriate current limiting resistor showed it to be working properly, with good balance and zero. The meter is rated at 150 µA full-scale.

After installing the good meter, the oscillator board was removed momentarily so the cover could be reinstalled. With the cover in place and the oscillator board reinstalled the dip meter was tested – it no longer worked. An examination showed nothing obvious. After isolating the amplifier circuit from the oscillator board a measurement across one section of the two-section variable capacitor, that should measure infinity, measured 150 ohms. The cause turned out to be some foreign junk caught in the little trimmer that is part of that capacitor section. - perhaps a piece of disintegrated foam? After reinstalling the oscillator board for the third time, the unit worked and so it was realigned.

Back to the S-40B:

Using the working dip meter, troubleshooting revealed the Band D oscillator wasn't working and that the resonant frequency was way off. A close examination showed a short between the coil primary and secondary where insulation had worn off at the point the coil leads crossed. After applying a dab of enamel insulating paint the coil was as good as new.

Band D immediately came to life, though signals were very weak which I attribute to the total lack of alignment on that band. The S-40B

now sits, its IF aligned but awaiting my construction of an RMA dummy antenna before the RF gets final alignment. By the way, this receiver while old on the inside is cherry on the outside with original paint. I think the owner must have polished it once a year!

That Bad HD-1250 Meter:

Being of a curious nature, the bad meter cover was removed and the meter examined with a loupe and bright light. Moving the needle carefully with a finger revealed the cause of the meter sticking. On the front edge of the moving coil were globs of what looked like glue. They looked stringy and two stuck out enough to interfere with the stationary frame that held the front meter pivot. With a pair of fine tweezers enough of the stringy material was removed to allow the meter to move freely.

After reading up on meter construction and repair it became obvious that the globs were some form of cement used as weights to balance the meter. The meter in the HD-1250 is inexpensive, and while most meters have three balancing arms with adjustable springs that can be moved to balance the meter movement, this meter was balanced by the weight of drops of cement. Evidently the cement used in the older style meter tended to swell with age and finally began to interfere with the surrounding support structure causing the meter to stick.

The repaired meter was no longer in balance with the weights gone. This meter is used for indication with just a relative 0 - 10 scale. Perfect balance is not an issue; still it was worth investigating the way to rebalance the meter, and do it!

Meter Balancing:

On the Heathkit Yahoo Group recently, one of the discussions turned to meter balancing. In one of the threads an article was referenced by Phil Atchley - KO6BB: In the September 1943 issue of QST*, page 40, William Triplett - W8OWW, a relative of Ray Triplett who founded Triplett Corporation, the meter company, wrote an article: *Rejuvenating Old Meters*. In a section of the article he covers the procedure for balancing meters. Using his technique the now-unstuck meter was balanced reasonably closely (within one needle width); however having to change weights by adding and removing drops of glue made the task hit and miss and time consuming to even get close. Here's the technique, and the order in which it should be performed:

Figure 4: Circled are two glue type tail-weights. The side weights have already been removed from the coil top. Note the hairy growth on the left weight. This growth on a side weight caused the meter to stick.

Setting Meter Zero:

Place the meter so the scale plate is parallel with the ground and the axis of the pivots is vertical (Figure 5A). In this position set the meter to point to zero using the zero adjusting screw. The meter in the HD-1250 doesn't have an external zero screw, but the zero was right on and no adjustment to it was needed.

Setting Tail Balance:

Once the zero is set, place the meter so the face is vertical and the meter needle is parallel with

* Available in the QST archives on the ARRL website; free for ARRL members.

the earth and pointing to the left (Figure 5B). If the needle now points upscale the tail weight needs to be reduced on the tail arm. If the meter has adjustable weight springs, the spring on the tail arm needs to be moved towards the pivot; if the weight is cement some cement needs to be removed. If the needle points off the scale below zero the weight needs to be adjusted/added in the opposite fashion.

Setting Side Balance:
Next, rotate the meter with the face vertical so the needle points up vertically (Figure 5C). If the meter reads upscale off zero you must increase the weight the on the left side arm and reduce the weight on the right side arm until the meter needle is vertical and points to zero. Try to make your adjustments equal and opposite on both side balances to prevent changing the spring torque.

Repeat the three step sequence a few times if needed to get the best balance.

The above procedure assumes the meter zero is on the left of the scale. If the zero is on the right (as is the case of the HD-1250 meter when oriented pointer up) you will need to reverse left and right in the steps above.

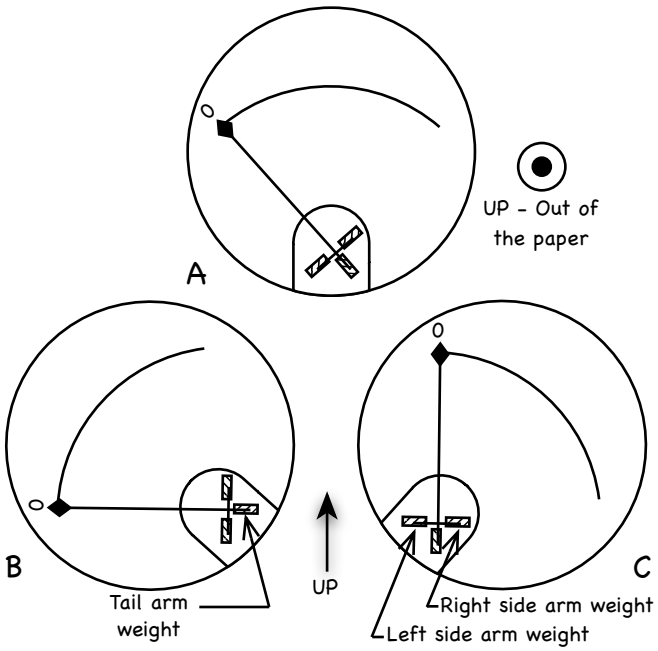

Figure 5: The three steps to balancing a meter.
A - set the zero; B - set the tail balance;
C - set the side balance

Adjusting weights:
The spring weights can be turned with a fine jeweler's needle-nose pliers. Be careful and go slowly.

On meters that use glue, I can recommend what not to use. My first attempt used Duco Cement. It was applied with a tiny toothpick. The glue wanted to stick to the toothpick and not to where I was trying to put it. Thinning it with acetone helped some, but I was afraid of damaging the meter movement or getting some on the plexiglass. Every time I got enough glue on, it was tall enough to recreate the original sticking problem. The cement is easy to remove before it gets hard, and I did this numerous times till I finally hit a balance that, while not perfect, was close enough.

I did get to play with the balancing spring weights on an old meter that whose needle was badly mangled but still had the rest of the movement intact. I was amazed that I was able to turn the weights and get the needle position to change.

Next Month
I hope to get back into a monthly schedule in the next month or two. I do have some small and large Heathkits that I plan on covering. I'm also gathering information on the HW-12 series of radios.

73, from AF6C

This article originally appeared in the June 2015 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.

Be sure to update> Thanks - AF6C