Calibration and Repair for Bird Wattmeter Elements

Follow these simple, easy steps—and save big money!

by Francis Kelson HL9BK/K2KSY

Some time ago, I received some burned out and well-used Bird and Sierra wattmeter elements.

As I looked over the elements, I wondered if it was possible to gain access to the passive and active elements inside for replacement or restoration. At 55 bucks per, I figured it was worth my time and effort to check it out, since I had well over a thousand dollars worth laying on the bench in front of me. My investigations paid off handsomely.

The front data plates of most elements are simply glued to the face. Take a sharp-edged instrument, insert it beneath the edge of the plate, and peel it back. Some units have the data plates mounted on with rivets—it's quite simple to drill or buff off the heads to remove the plate. Be sure to keep the data plates since you can reuse them. If the plate is destroyed upon removal, you can replace it with an adhesive metallic tape. When cut to the proper diameter, the tape makes an excellent cover and shield.

A Peek Within

Removing the plate exposes the head of a screw that holds the front brass housing to the unit. You'll notice just below this screw a small hole with just the right diameter to permit the entrance of an alignment tool. If the meter's error is linear (that is, always off by the same amount), a simple tweak of the element's variable resistor, located within, brings the meter within specifications. If there is no variable resistor, remove the mounting screw in the center. This should let the brass housing drop out. There you will find a fixed resistor, which you should replace with a Helitrim 7138 mini variable for future calibration.

Diode Fixes

If the meter's element does not work over the specified frequency range, or if it gives no measurement indication at all, its diode may be defective. As with all wattmeters, the diode is usually the culprit in a failed element. It functions to rectify the incoming signal and to provide something of a DC level. The signal is then filtered as usual by a capacitor, which is followed by one or two load resistors.

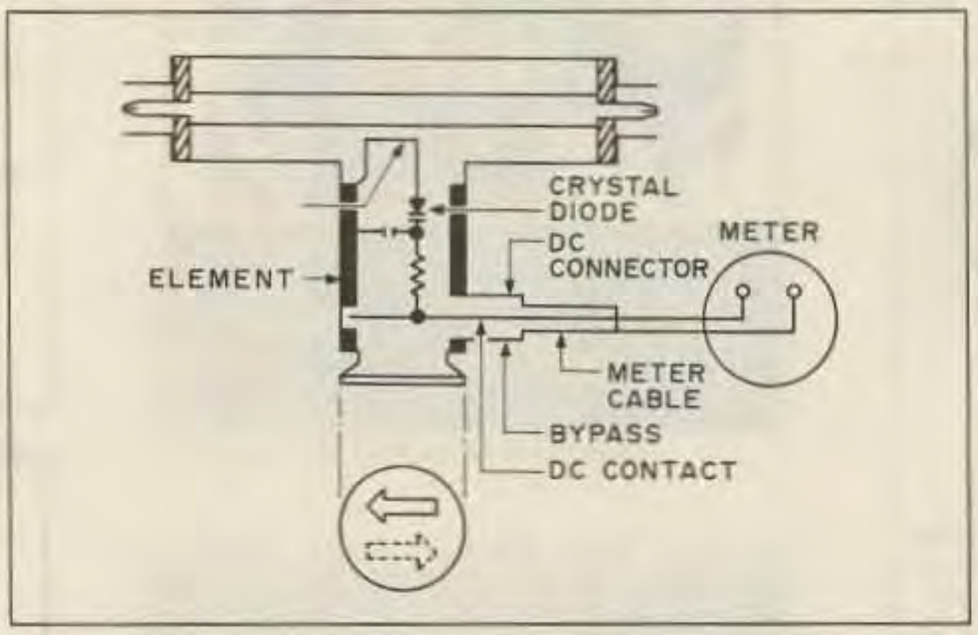

Figure 1. Basic element circuit.

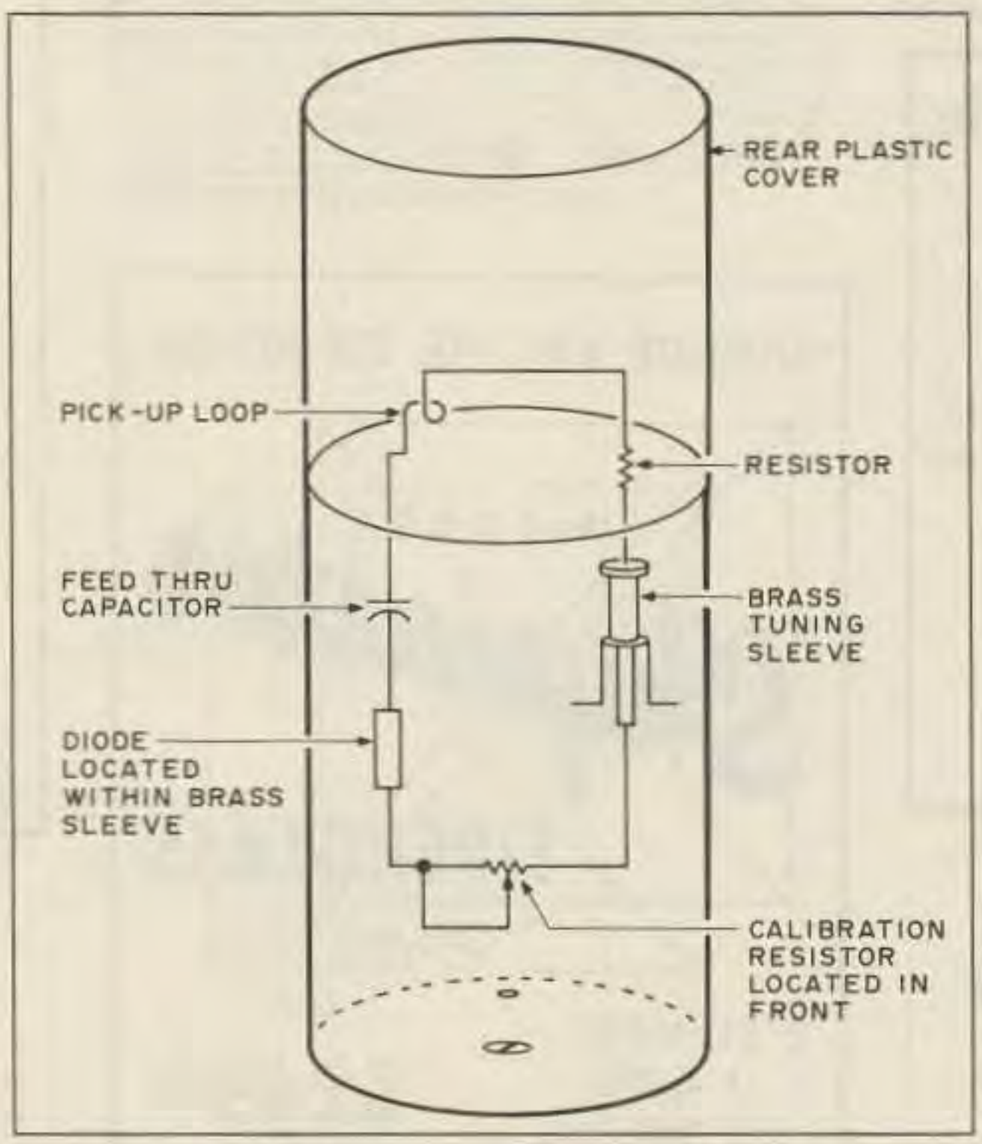

Figure 2. Circuit for the AN/URM -120 element.

To get to the diode, first remove the brass housing in front of the unit, described before. Observe the variable or fixed resistor, and also notice the two recessed screws. Remove them. Then grasp the front housing with one hand and with the other, rotate the plastic cap on the rear. Then exert an outward pressure to force the cap to pop off; this too can be easily replaced.

With the plastic cap removed, notice the two screws in the rear. Desolder the resistor in the front housing. Remove the two screws in the rear and all the components can easily be removed through the rear of the unit.

Check the diode for its proper front-to-back ratio. If it's incorrect, replace it with a suitable diode with the desired frequency response. Remember that diodes and resistors are frequency responsive. If they've been overheated or burned, their main characteristics have changed.

With the rear plastic cap removed, the first item seen is the diode and load resistor. In some cases, as with the 2 through 30 MHz elements, notice the small ferrite block with several turns of #18 enamel wire wrapped around it. This will also be in shunt with a 6Ω resistor. The resistor needs to be desoldered to check the continuity of the coil, which is around 7Ω. This is used to establish the low frequency response along with a feed-through capacitor, which is normally trouble free. Refer to Figure 1 for the concept details.

Something Old, Something New

Some of the older folk should recognize the element shown in Figure 2—the AN/URM-120. It goes all the way back to WWII and is still in use today. Plug those monsters in through the top of the meter housing and rotate the whole slug for forward or reverse.

One of the major wattmeter companies miniaturized the old 120 and created a slug the size of the Bird elements. This one is called the CU2214/U and works considerably better than its older, larger grandfather.

In Figure 2, notice the brass sliding sleeve located on the right side. This is used for frequency response. Within the brass shield, adjust the enclosed diode, the feedthrough capacitor, and the pick-up loop exactly like the CU 753, 754, 755 slugs that went into the AN/URM-120. The CU2214/U slugs are accessed in the same manner as the Bird elements.

Bird and Sierra wattmeters are known and respected throughout the amateur fraternity and engineering fields. The wattmeters are ruggedly constructed and better able to withstand the rigors of military and amateur service—much better than their digital cousins, more so in higher density RF fields. Although the initial money outlay for wattmeter and elements is high, you can now dramatically reduce further expenses on elements with the tech ingenuity hams are famous for! 73