Station Signal Monitor Access Port Build

I had occasion to want to look at a sample of the RF output signal envelope from a radio that I had on the bench recently, so I built a small adapter (Figure 1) that makes taking off an RF sample quite simple and straightforward. The device is based upon a pair of SO-239 jacks and a pair of 50Ω female BNC jacks, all of them panel-mount style, together with some very basic circuitry consisting completely of passive devices.

Figure 1 - Station monitor access port adapter

The schematic diagram of this sampler, shown in Figure 2, reveals just how simple this device really is. However, credit *must* be given when and where credit is due. In this case, I used a video by **Alan Wolke W2AEW** as the basis of my sampler. This video can be readily found online at https://www.youtube.com/watch?v=y4Zt_LJX1Tc. My circuit is virtually identical to his, and of course it operates in the same manner.

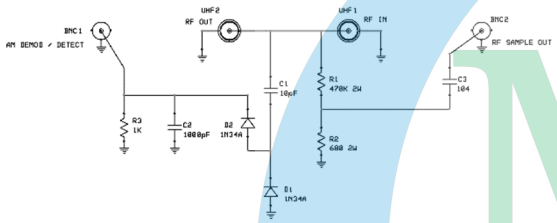

Figure 2 - Schematic diagram

The circuit is basically broken into two segments, a voltage divider that picks off a sample of the RF signal and AC-couples it to one of the two BNC jacks. This is, of course, one of the two outputs to an oscilloscope provided by this sampler. The second segment serves as a simple AM detector/demodulator and it in turn directs that detected output to the oscilloscope via the second BNC jack.

The first segment, comprised of resistors R1 and R2, and capacitor C3, directs a sample of the RF carrier to the oscilloscope port. The voltage divider formed by resistors R1 and R2 is set at a 470kΩ to 680Ω ratio, or effectively at a 691:1 ratio, and it will extract a signal that is about 0.15% of the actual carrier signal. As such, the 2-watt resistors used are certainly overkill, but I had them on hand and so I used them. The 0.1µF capacitor ensures AC coupling to the oscilloscope is preserved.

The second segment, comprised of the remainder of the components (D1, D2, C1, C2, and R3), serves to send a sample of the demodulated payload on the RF carrier to the oscilloscope. The 10pF capacitor C1 serves to AC-couple the demodulator input to the through-RF signal flowing from one SO-239 jack to the other. The demodulated signal is developed in the pair of 1N34A germanium diodes, and is expressed across the 1,000pF capacitor C2 with a 1kΩ bleed-off resistor across the capacitor. The signal presented to the BNC jack is a representation of the demodulated RF amplitude.

The actual through-RF path from the radio output to the load (antenna or dummy load) is by way of the pair of SO-239 jacks, with one being the RF-in jack and the other obviously being the RF-out. The jack types were chosen for convenience; N jacks could easily have been substituted for the SO-239's. Either way, the BNC jacks are ideal for the oscilloscope connections.

Figure 3 - Unit wiring

The whole thing was assembled point-to-point directly to the working side of the jacks (Figure 3), with a solid 10AWG wire being used as the through-RF bus. Because the finished unit would be installed into an enclosure that is simply an ABS tub with an aluminum plate as its top cover, I fabricated a shield out of copper-clad boards. This shield is tied to the cover plate and therefore to the braid sides of the connecting cables. When the unit is assembled, the shield tub (Figure 4) sits inside the plastic tub, and the cover sits down on the tubs, making contact with the shield tub. However, as already mentioned, a ground wire also positively bonds the shield tub to the cover plate.

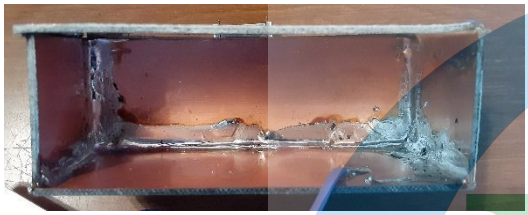

Figure 4 - Shield tub

This is a quick and easy way to be able to sample the AM RF output of any transmitter, but is especially suited to those used in the amateur radio discipline. Parts count is minimal, and almost any enclosure can be used. The build itself is simplicity personified, and took all of about twenty minutes, including drilling the holes. In my build, the most time was spent in building the shield tub.

All in all, this is a project that any ham should be able to take on, and it provides ready access to the RF signal for presentation and observation of that signal on the oscilloscope.

